BATTERIES 1D

INDEX

GENERAL

The batteries for 1981 Jeep vehicles are lightweight and have low-antimony/lead compound plates. In addition to helping reduce overall vehicle weight, they require less frequent electrolyte level inspections, have a decreased self-discharge rate from local action and have a longer shelf life. Electrolyte level inspections are required only at the beginning of each winter season and every 15,000 miles (24 000 km).

In addition to the standard equipment 380 cold crank amps battery, a 450 cold crank amps battery is optionally available for vehicles equipped with heavy-duty equipment. Both batteries are 12-volt, lead-acid units.

The vehicle battery tray has a removable spacer that, when removed, will permit the installation of a substitute conventional size group 24 battery in the event a lightweight replacement battery is not available.

NOTE: *A 440 Cold Crank Amps with 135-Minute Reserve Capacity is optionally available for 1981 J-Series vehicles equipped with a Police Package.*

BATTERY CLASSIFICATIONS, RATINGS AND CODES

Group Size Classification

The group size classification provides, by reference to Battery Council International listings or applicable SAE standard, the physical characteristics and electrical criteria for the applicable battery.

Reserve Capacity Minutes Rating

Reserve capacity minutes is defined as the number of minutes a fully charged battery at 80°F (26.7°C) can be discharged at a steady 25 ampere rate until a terminal voltage equivalent to 1.75 volts per cell (10.50 volts total battery voltage) is indicated. The reserve capacity rating for each Jeep battery is either listed on a label or stamped into the battery case. The batteries are also color coded to denote the rating.

Cold Crank Amps Rating

The cold crank amps rating specifies the minimum amps a fully charged battery can deliver at 0°F (-17.7°C) for thirty seconds without the battery terminal voltage dropping below 7.2 volts. The cold crank amps rating is either listed on a label or stamped in the battery case.

Battery Ratings

Group Size	Cold Crank Amps	Reserve Capacity Min.
55-380	380	75
56-450	450	90
24-440	440	135

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Battery Codes

Each battery is date coded at the time of shipment from the manufacturer. This code is stamped into the edge of the plastic case cover (fig. 1D-1). A second code number stamped on the side of the battery case represents manufacturing data and may be ignored.

The date code is decoded as follows:

- **Month:** Jan., Feb., etc.
- **Year:** 80—1980, 81—1981

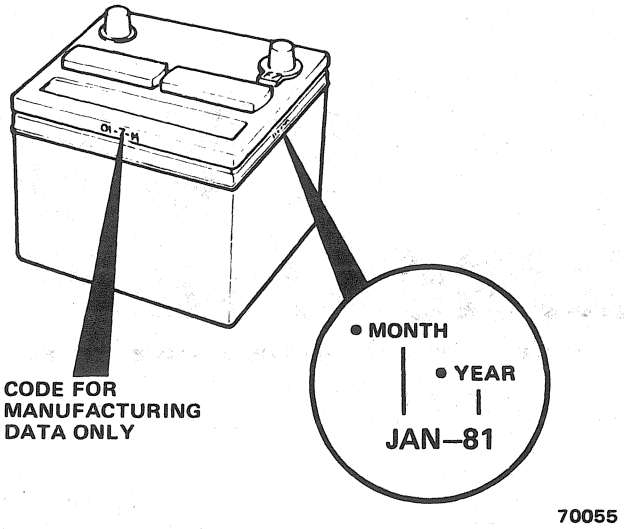

Fig. 1D-1 Date Code Location—Typical

BATTERY REPLACEMENT

Removal

(1) Loosen cable clamps.

(2) Use puller to remove cables if necessary. Remove positive cable first.

WARNING: *Use extreme care to prevent dropping battery and splattering the electrolyte because it can cause severe eye injury and skin burns. Rubber gloves, rubber aprons, protective eye shields and steel-toed shoes will decrease the hazards of this type accident. Immediate first aid is required for electrolyte splashed into the eyes and on the skin. Electrolyte spills should be immediately neutralized with a solution of sodium bicarbonate (baking soda) and water and then thoroughly rinsed with water.*

(3) Loosen holddowns and remove battery.

(4) Inspect cables for corrosion and damage. Remove corrosion using wire brush or post and terminal cleaner and soda solution. Replace cables that have damaged or deformed terminals.

(5) Inspect battery tray and holddowns for corrosion. Remove corrosion using wire brush and soda solution. Paint exposed bare metal. Replace damaged components.

(6) Clean outside of battery case if original battery is to be installed. Clean top cover with a diluted ammonia soda solution to remove acid film. Flush with clean water. Ensure soda solution does not enter cells. Remove corrosion from terminals with wire brush or post and terminal cleaner. Inspect case for cracks or other damage that would result in leakage of electrolyte.

Installation

(1) Refer to Specifications to determine if battery has correct rating for vehicle.

(2) Use hydrometer to test battery electrolyte. Charge if necessary.

CAUTION: *Ensure battery tray is clear of loose hardware or debris that could damage battery case.*

(3) Position battery in tray. Ensure positive and negative terminals are correctly located. Cables must reach their respective terminals without stretching.

(4) Ensure tang at battery base is positioned in tray properly before tightening holddown.

CAUTION: *It is imperative that the cables are connected to the battery positive-to-positive and negative-to-negative. Reverse polarity will damage alternator diodes and radios.*

(5) Connect and tighten positive cable first. Then connect and tighten negative cable.

NOTE: *The tapered positive terminal is 1/16 inch (1.6 mm) larger in diameter than the negative terminal. The opening in the positive cable clamp is correspondingly larger.*

(6) Apply thin coating of petroleum jelly or chassis grease to cable terminals and battery posts.

(7) Inspect negative cable connections on engine and vehicle body for condition, security and electrical continuity.

MAINTENANCE

Always observe the correct polarity when connecting a charger to a battery. Reversed battery connections will damage the alternator diodes and radios. The NEGATIVE battery terminal is grounded to the engine and body.

WARNING: *Explosive gases are present within and around the battery at all times. Avoid open flames and sparks. The danger of battery explosion is compounded by the fact that the acid would be splattered in every direction. Wear protective eye shields and clothing when servicing any battery. Ensure battery has adequate ventilation when charging.*

It is important that the battery be fully charged when a new vehicle is delivered. Maintaining a battery at partial charge could shorten its life.

Inspect electrolyte level in the battery at 15,000 mile (24 000 km) intervals and at the beginning of the winter season. Add distilled water to each cell until the level reaches the bottom of the vent well. DO NOT OVERFILL. Operate the engine immediately after adding water (particularly in cold weather) to assure proper mixing of the water and electrolyte.

Inspect to determine the external condition of the battery and the cables periodically.

The holddown should be tight enough to prevent the battery from vibrating or shifting position and cause damage to the battery case.

CAUTION: *Keep filler caps tight to prevent the neutralizing solution from entering the cells.*

Take particular care to ensure that the top of the battery is free of acid film and dirt between the battery terminals. For best results when cleaning the battery, wash with a diluted ammonia or soda solution to neutralize any acid present and flush with clean water.

To ensure good electrical contact, the battery cables must be tight on the battery posts. Ensure the terminal clamps have not stretched. This could cause the clamp ends to become butted together without actually being tight on the post. If the battery posts or cable terminals are corroded, disconnect the cables by loosening the terminal clamp bolts and remove the terminals with the aid of a puller. Do not twist, hammer or pry on a terminal to free it from the battery post. Clean the terminals and posts with a soda solution and wire brush or post and terminal cleaner. Connect the cable terminal clamps (positive terminal first) to the battery posts and apply a thin coat of petroleum jelly or grease. Inspect the battery negative cable and body ground cable for condition and good electrical continuity with engine and body.

Frozen Electrolyte

WARNING: *Do not attempt to charge or use a booster on a battery with frozen electrolyte. The frozen battery may explode!*

A 75 percent charged battery will not freeze. Maintain batteries at 75 percent charge or more, especially during winter weather.

Replace the battery if the electrolyte becomes either slushy or frozen. A battery in this condition, depending on the severity of the freeze, may accept and retain a charge, and even perform satisfactorily under a load test. However, after 120 to 150 days in service, a reduction in storage capacity and service life will become apparent as the individual plates lose their active material.

Electrolyte Freezing Temperature

Specific Gravity (Corrected to 80° F)	Freezing Temperature
1.270	– 84°F (– 64°C)
1.250	– 62°F (– 52°C)
1.200	– 16°F (– 27°C)
1.150	+ 05°F (– 15°C)
1.100	+ 19°F (– 7°C)

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Battery Storage

All wet cell batteries will discharge slowly from local action when stored. Batteries discharge faster when warm than when cold. For example, at 100°F (37.8°C), a normal self-discharge rate of 0.0024 specific gravity per day can be expected. At 50°F (10°C), a discharge rate of 0.0003 specific gravity per day is normal. Refer to Self-Discharge Rate chart.

Before storage, clean the battery case with a solution of sodium bicarbonate (baking soda) and water, rinse and wipe the case dry. When storing a battery, charge fully (no change in specific gravity after three tests taken at one hour intervals) and store in a cool, dry location. Refer to Charging and Testing.

Fully charge a stored battery before putting it into service. Refer to Charging for procedure. Refer to Battery Replacement for installation procedure.

Self-Discharge Rate

Temperature	Approximate Allowable Self-Discharge Per Day For First Ten Days
100°F (37.8°C)	0.0024 Specific Gravity
80°F (26.7°C)	0.0009 Specific Gravity
50°F (10°C)	0.0003 Specific Gravity

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CHARGING

General

A battery stores electrical energy in the form of chemical energy. When it is used to power an electrical device (e.g., a starter motor), the stored energy is released, or discharged, in the form of electrical energy.

The more cells and plate area a battery has, the greater its capacity for storing energy. When the maximum amount of energy is being stored, a battery is commonly said to be "fully charged." The relative amount of charge or stored energy is directly proportional to the specific gravity value of the electrolyte. This allows the use of a hydrometer to determine the state of charge or energy storage level of a battery in relation to the maximum possible charge (full charge).

Dry Charge Battery

WARNING: *Before activating a dry-charged battery, carefully read the instructions and poison/danger warning on the electrolyte carton.*

Do not remove seals until battery is to be activated. Once the seals are removed, the battery must be activated immediately. Discard seals after removal.

Activation Procedure

(1) Fill each cell with battery electrolyte to bottom of well, observing handling precautions listed on electrolyte carton.

(2) After cells are filled, tilt battery from side to side to release air bubbles.

(3) Recheck electrolyte level in each cell and add as necessary.

NOTE: *Uneven filling of cells will affect the battery capacity and service life.*

(4) Install caps supplied with battery.

(5) Inspect battery case for leakage to ensure no damage occurred in handling.

(6) Boost charge battery for 15 minutes at 30 amps or slow charge until battery electrolyte is gassing freely.

(7) Install battery in vehicle. Refer to Battery Replacement-Installation.

NOTE: *Because the apparent state of charge of a battery as indicated by a hydrometer is depressed for the first few cycles, load testing is the only valid test at the time of activation. Hydrometer testing may be used after the battery has been cycled in service.*

The specific gravity of a newly installed Jeep battery will be approximately 1.225 (±0.010). The specific gravity will normally rise to 1.250 to 1.265 after a few days in service.

NOTE: *Electrolyte is composed of sulfuric acid and water. Approximately 35 percent by weight or 24 percent by volume is acid.*

WARNING: *Never add pure acid to a battery.*

Slow Charge

WARNING: *Battery charging generates hydrogen gas, which is highly flammable and explosive. Hydrogen gas is present within and around a battery at all times, even when a battery is in a discharged condition. Keep open flames and sparks (including cigarettes, cigars, pipes) away from the battery. Always wear eye protection when handling, testing or charging a battery.*

Slow charging is the preferred method of recharging a battery. The slow charge method may be safely used, regardless of charge condition of the battery, provided the electrolyte is at the proper level in all cells and is not frozen.

WARNING: *Do not attempt to charge or use a booster on a battery with frozen electrolyte because it can cause the frozen battery to explode.*

The normal charging rate for a lightweight battery is 3 to 5 amps. A minimum period of 24 hours is required when charging at this rate. Charge time is inversely proportional to the temperature of the electrolyte.

A battery may be fully charged by the slow charge method unless it is not capable of accepting a full charge. **A battery is in a maximum charged condition when all cells are gassing freely and three corrected specific gravity tests, taken at one-hour intervals, indicate no increase in specific gravity.**

Fast Charge

CAUTION: *Always disconnect the battery cables before using a fast charger.*

A battery may be charged at any rate that does not cause the electrolyte temperature of any cell to exceed 125°F (51.7°C) and does not cause excessive gassing and loss of the electrolyte.

A fast charger cannot be expected to fully charge a battery within an hour, but will charge the battery sufficiently so that it may be returned to service. The battery will be fully charged by the vehicle charging system, provided the engine is operated a sufficient length of time.

Booster Charging

WARNING: *If the battery electrolyte is not visible or frozen, do not attempt to jump-start because the battery could rupture or explode. The battery must be warmed up to 40°F (4.4°C) and water added if necessary before it can be safely charged or the engine jump-started.*

The correct method for starting an engine with a discharged battery requires either a portable starting unit or a booster battery. When using either method, it is essential that connections be made correctly.

When using a portable starting unit, the voltage must not exceed 16 volts or damage to the battery, alternator, or starter may result. Because of the accompanying high voltage, a fast charger must not be used for jump-starting engines.

(1) Remove vent caps from booster battery and cover cap openings with dampened cloth.

CAUTION: *If the engine is being jump-started with a battery located in another vehicle, the vehicles must not contact each other.*

(2) Connect jumper cable between positive posts of batteries. Positive post has "+" stamped into it. POS is also embossed on battery cover in 1/8-inch letters adjacent to battery post.

(3) Connect one end of second jumper cable to negative terminal of booster battery. NEG is embossed on battery cover in 1/8-inch letters adjacent to battery post. Ensure cable clamps have good electrical contact with posts. **DO NOT CONNECT OTHER END OF JUMPER CABLE TO NEGATIVE TERMINAL OF DISCHARGED BATTERY.** Connect cable to screw, bracket, nut or other good ground connection on engine. Do not connect cable to carburetor, air cleaner or fuel line. Keep cable clear of fan, belts and pulleys.

WARNING: *Use extreme caution when engine is operating. Do not stand in direct line with fan. Do not put hands near pulleys, belts or fan. Do not wear loose clothing.*

(4) When engine starts, remove jumper cables. Disconnect cable from engine first.

(5) Discard cloth used to cover cap openings because it has been exposed to sulfuric acid.

(6) Install battery caps.

TESTING

General

NOTE: *A complete battery test includes cleaning the top of the battery case, cleaning posts and cable terminals and performing hydrometer and heavy load tests.*

The condition of a battery may be determined from the results of two tests—state of charge (hydrometer test) and ability to supply current (heavy load test). Refer to Battery Diagnosis and Repair Simplification (DARS) chart.

Perform the hydrometer test first. If specific gravity indicates less than 1.225, the battery must be charged before proceeding to further testing. A battery that will not accept a charge is defective and further testing is not necessary.

NOTE: *A battery with sulfated plates may require an overnight slow charge to determine if the sulfate coating is thin enough to be eliminated by a charge.*

A battery that is fully charged and does not pass the heavy load test is defective.

If a battery discharges and no apparent cause can be found, the battery should be fully charged and allowed to stand on a shelf for three to seven days to determine if the self-discharge is excessive. The Self-Discharge Rate chart lists allowable self-discharge for the first ten days of standing after a battery has been fully charged. A battery is fully charged when all cells are gassing freely and three corrected specific gravity tests, taken at one-hour intervals, indicate no increase in specific gravity.

Hydrometer Test

NOTE: *Periodically disassemble the hydrometer and wash components with soap and water. Inspect the float for possible leaks. If the paper inside has turned brown, the float is defective.*

Prior to testing, visually inspect the battery for any damage (cracked container, cover, loose post, etc.) that would cause the battery to be unserviceable. To interpret the hydrometer correctly, hold it with the top surface of the electrolyte in the hydrometer at eye level (fig. 1D-2). Disregard the curvature of the liquid where the surface rises against the float because of surface cohesion. Draw in only enough electrolyte to keep the float off the bottom of the hydrometer barrel with the bulb released. Keep the hydrometer in a vertical position while drawing in the electrolyte and observing the specific gravity. Exercise care when inserting the tip of the hydrometer into a cell to avoid damage to separators. Damaged separators can result in premature battery failure.

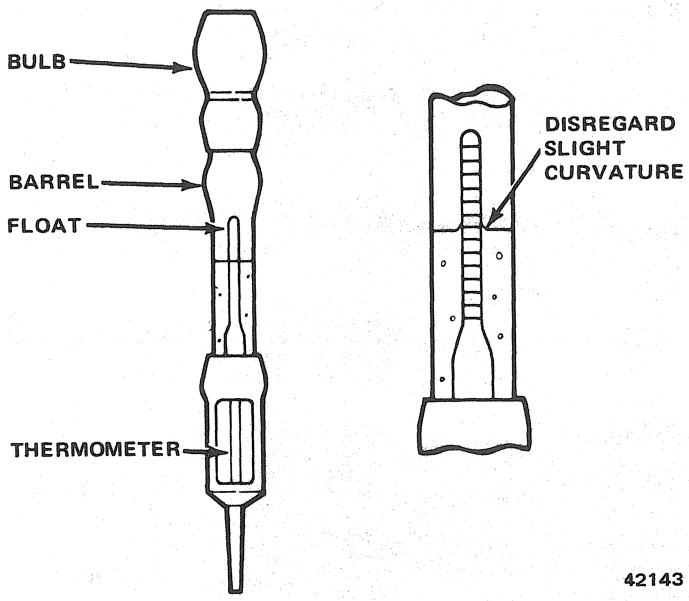

Fig. 1D-2 Hydrometer

Hydrometer floats are generally calibrated to indicate the specific gravity correctly at only one fixed temperature, 80°F (26.6°C). When testing the specific gravity at any other temperature, a correction factor is required. The correction factor is approximately a specific gravity value of 0.004, referred to as 4 points of gravity. For each 10°F above 80°F (5.5°C above 26.6°C), add 4 points. For each 10°F below 80°F (5.5°C below 26.6°C), subtract 4 points. Always correct the specific gravity for temperature variation. Test the specific gravity of the electrolyte in each battery cell.

Example: A battery is tested at 10°F and has a specific gravity of 1.240. The actual specific gravity is determined as follows:

Number of degrees above or below 80°F equals 70 degrees (80 minus 10).

70° divided by 10° (each 10° difference) equals 7.

7 multiplied by 0.004 (temperature correction factor) equals 0.028.

Temperature is below 80°F, therefore temperature correction is subtracted.

Temperature corrected specific gravity is 1.212 (1.240 minus 0.028).

A fully charged battery should have a temperature corrected specific gravity of 1.250 to 1.265.

If the specific gravity of all cells is above 1.235, but the variation between cells is more than 50 points (0.050), it is an indication that the battery is unserviceable. Remove the battery from the vehicle for additional testing.

If the specific gravity of one or more cells is less than 1.235, recharge the battery at a rate of approximately 5

amperes until 3 consecutive specific gravity tests, at one-hour intervals, are constant.

If the cell variation is more than 50 points (0.050) at the end of the charge period, replace the battery.

When the specific gravity of all cells is above 1.235 and variation between cells is less than 50 points, the battery may be tested under load.

Specific Gravity

State of Charge	Specific Gravity (Cold and Temperate Climates)
Fully Charged	1.265
75% Charged	1.225
50% Charged	1.190
25% Charged	1.155
Discharged	1.120

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Heavy Load Test

NOTE: *The following instructions refer to Amserv Battery-Alternator-Regulator Tester, Model 21-307.*

(1) Before performing heavy load test, battery must be fully charged. Refer to Slow Charge.

(2) Turn carbon pile rheostat knob of battery tester to **OFF** position (fig. 1D-3).

(3) Turn selector knob to **AMP** position.

(4) Connect test leads as illustrated in figure 1D-3.

(5) Turn carbon pile rheostat knob clockwise until ammeter indicates correct test amperage:

- 135 amperes for 55-380 battery (75 reserve capacity minutes, 380 cold crank amps).
- 180 amperes for 56-450 battery (90 reserve capacity minutes, 450 cold crank amps).

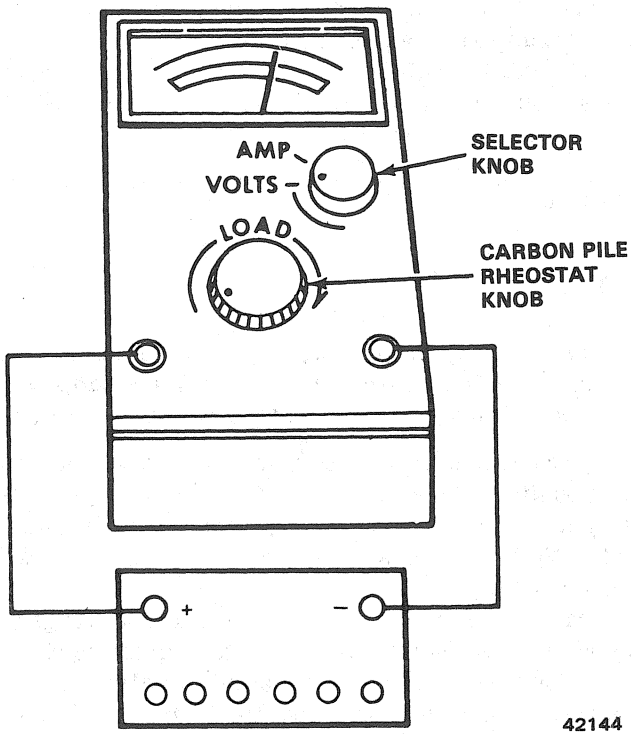


Fig. 1D-3 Heavy Load Test

- 230 amperes for 24-440 battery (135 reserve capacity minutes, 440 cold crank amps).

(6) Maintain load for 15 seconds. Turn selector switch to **VOLTS**, and note voltage.

If the voltmeter indicates 9.6 volts or higher with the battery temperature at a minimum of 70°F (21°C), the battery is in good condition. If less than 9.6 volts, replace the battery.

BATTERY DIAGNOSIS AND REPAIR SIMPLIFICATION (DARS) CHART

Note: Refer to Chapter A – General Information for details on how to use this DARS chart.

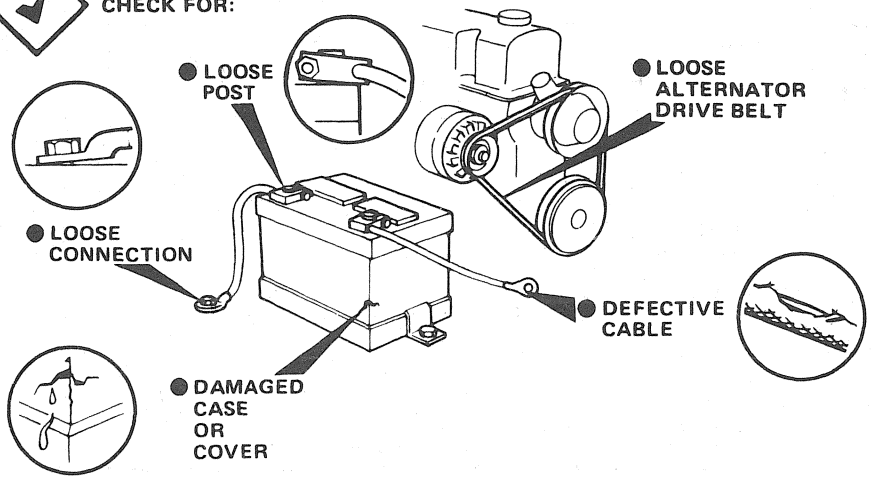
PROBLEM: ENGINE WILL NOT CRANK

Chart 1

STEP | **SEQUENCE** | **RESULT**

1

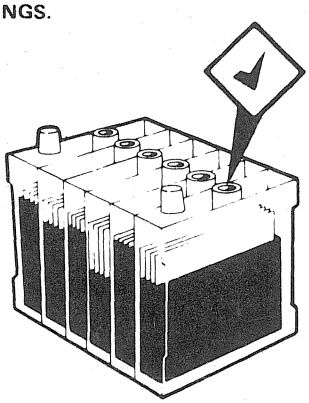
CHECK FOR:



REPAIR OR REPLACE IF NECESSARY → **2**

2

- CHECK ELECTROLYTE LEVEL AND SPECIFIC GRAVITY IN EACH CELL AND RECORD READINGS.



ELECTROLYTE LEVEL TOO LOW FOR SPECIFIC TEST–ADD WATER. CHARGE BATTERY FOR 10 MIN. AT 20 AMPS. MEASURE SPECIFIC GRAVITY.

OK → **5**

AVERAGE SPECIFIC GRAVITY 1.225 OR MORE CELL READINGS EQUAL WITHIN .050

O.K → REPLACE BATTERY → **6**

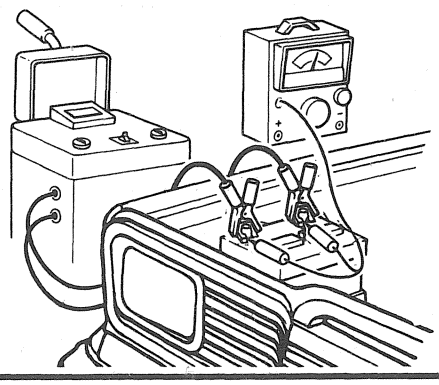
AVERAGE SPECIFIC GRAVITY 1.225 OR MORE BUT CELL READINGS VARY .050 OR MORE

O.K → **3**

AVERAGE SPECIFIC GRAVITY BELOW 1.225

3

- CONNECT BATTERY CHARGER AND VOLTMETER
- CHARGE BATTERY FOR 3 MINUTES AT 40 AMPS
- AT THE END OF 3 MINUTES READ VOLTMETER WHILE CHARGER IS STILL CHARGING



OK → **4**

VOLTAGE IS 15.5 OR LESS

O.K → SLOW CHARGE BATTERY AT 3 TO 4 AMPS FOR 48 TO 72 HOURS → **5**

VOLTAGE ABOVE 15.5

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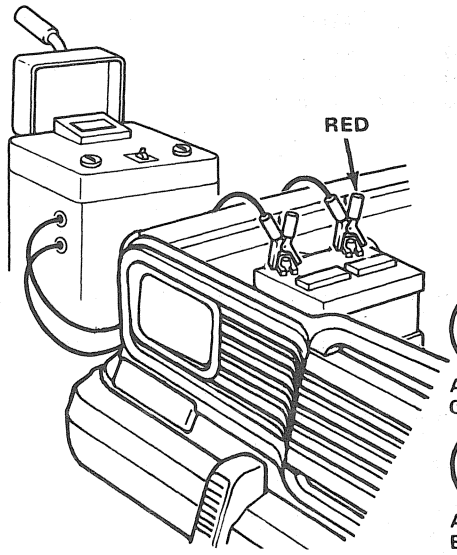
STEP — SEQUENCE — RESULT

4



CHARGE BATTERY AS INDICATED IN CHART, AFTER CHARGE IS COMPLETED, RECHECK SPECIFIC GRAVITY.

AVERAGE SPECIFIC GRAVITY	CHARGE RATE (AMPS)	TIME
LESS THAN 1.125	5	12 HOURS
1.125 TO 1.149	20	90 MIN.
1.150 TO 1.174	20	70 MIN.
1.175 TO 1.199	20	50 MIN.
1.200 TO 1.224	20	30 MIN.

OK → **5**

AVERAGE SPECIFIC GRAVITY 1.225 OR MORE
CELL READINGS EQUAL WITHIN .050

OK → REPLACE BATTERY → **6**

AVERAGE SPECIFIC GRAVITY 1.225 OR MORE
BUT CELL READINGS VARY .050 OR MORE

5

- CLEAN BATTERY POST AND CABLE ENDS
- CONNECT HEAVY LOAD TESTER
- DETERMINE HEAVY LOAD FROM CHART
- ADJUST TESTER TO LOAD
- HOLD LOAD FOR 15 SECONDS
- READ VOLTMETER

HEAVY LOAD OUTPUT TEST

HEAVY LOAD CHART

GROUP SIZE	COLOR CODE	RESERVE CAPACITY (MINUTES)	COLD CRANK AMPS	HEAVY LOAD (AMPS)
55-380	Green	75	380	135
56-450	Red	90	450	180
24-440	Yellow	135	440	230

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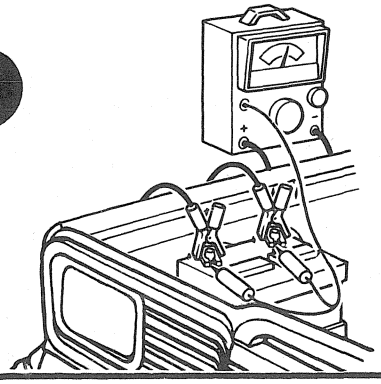

- VOLTAGE READING 9.6 OR MORE → **6**
- VOLTAGE READING LESS THAN 9.6 → REPLACE BATTERY → **6**

6

OK → ENGINE CRANKS → STOP

OK → ENGINE DOES NOT CRANK → PERFORM STARTER DIAGNOSIS IN STARTER CHAPTER

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SPECIFICATIONS

Battery Specifications

Engine	Group Size	Rating
151, 258, 304, and 360	55-380	380 amps 75 min.
Optional, Factory Installed	56-450	450 amps 90 min.
Optional, Police and Diesel	24-440	440 amps 135 min.

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Torque Specifications

Service Set-To Torques should be used when assembling components. Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	USA (in-lbs)		Metric (N·m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Battery Box Screw	145	95-180	16	11-20
Battery Holddown Screw	75	50-95	8	6-11
Battery Cable Clamp	75	60-90	8	7-10

All Torque values given in inch-pounds and Newton-meters with dry fits unless otherwise specified.

Refer to the Standard Torque Specifications and Capscrew Markings Chart in Section A of this manual for any torque specifications not listed above.

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AMA 21-317
CIRCUIT TESTER