# SINGLE-CELL DISCHARGE CAPACITY TEST

# FOR STORAGE BATTERIES

# 180- TO 1680-AMPERE-HOUR CAPACITIES

## 1. GENERAL

1.01 This section describes a short-time high-rate discharge capacity test of a single lead-acid storage cell of 180- to 1680-ampere-hour capacity. This test will determine the approximate 8-hour capacity of the cell. Section A201.033 covers single-cell capacity tests for storage batteries up to and including 180 ampere hours capacity.

1.02 The J87116 single-cell discharger has two carbon-pile rheostats ("coarse" and "fine") connected in parallel to provide continuously variable resistance from 0.0013 to 0.5 ohm. See Fig. 1. A 100-millivolt shunt rated at 600 amperes is provided with a switch to connect the proper terminal of the multirange ammeter to the shunt depending on cell discharge rate. The discharger weighs approximately 145 pounds, plus 20 pounds for the load leads. The over-all dimensions are approximately 24" high, 25" wide, and 17" long.

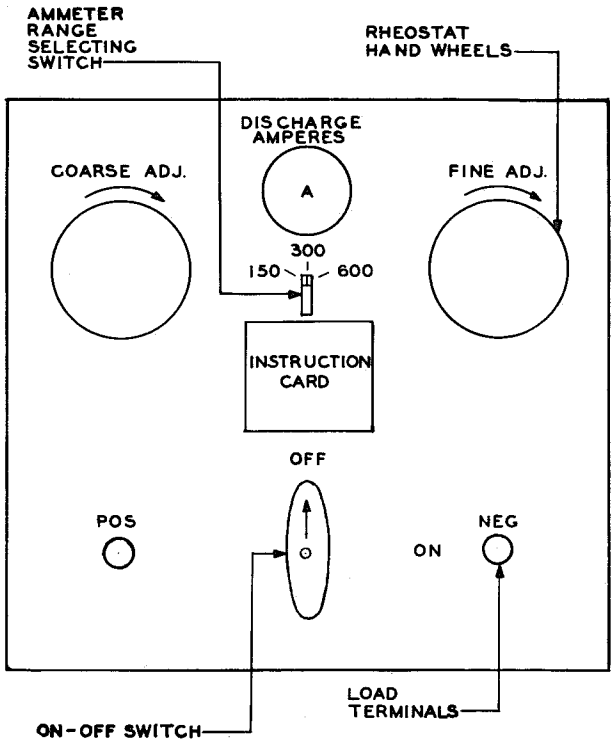


Fig. 1 - Discharger Panel

1.03 If desired, this test may be applied to a cell in a floating battery with no change in the battery regulator setting and with negligible interference with service. Before starting a discharge, however, recharge facilities such as the J86264 single-cell charger or equivalent must be on hand and ready for use.

1.04 The test described herein may be applied (a) to each cell of a battery, (b) to only cells suspected of low capacity, or (c) as a battery spot check based on at least 3 cells of each string. On a spot check select cells to include a cell with lowest voltage on float, a cell with lowest corrected specific gravity, and a cell on the top tier with electrolyte at the highest temperature on that tier.

1.05 The test consists of discharging at 2.6 times the 8-hour rate of the cell and recording the time it takes for the cell voltage to reach 1.75 volts. By reference to Fig. 2, this time can be converted to 8-hour capacity which in turn can be corrected in accordance with Fig. 3 for temperature. Besides being quicker than a full capacity discharge test at the 8-hour rate, this test has the great advantage that an appreciable part of the 8-hour capacity remains in the cell at the end of the test.

1.06 Some cells do not reach 100 per cent capacity for the first two or three years. Any cell more than three years old that tests less than 100 per cent should be reported to the supervisor, who may wish to approve one or more of the following.

(a) Recheck in 9 to 12 months. This should be satisfactory only where the test showed 95 per cent capacity or over.

(b) Give a boost charge to the cell in question or to the entire battery, and retest to be sure low reading was not due t undercharge instead of low capacity.

(c) Check the full capacity of the low cell at the 8-hour rate. This might not be acceptable on a single-string battery because no reserve would be available at the end of the discharge.

(d) Give single-cell capacity test to other cells in the string to see if they also have low capacities.

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(e) Give full capacity discharge test at the 8-hour rate, office peak rate, or busy-hour rate to the string. As in (c) this might not be acceptable except on duplicate string batteries.

(f) Order replacing cell if tests or other cell investigation indicates probability of failure, reduced reserve, or the need for excessive maintenance.

Caution: The J87116 discharger is designed primarily for use on one cell and may be damaged if connected to higher voltage.

Caution: To avoid sparking at the cell and possible explosion of battery gasses, use the switch on the discharger to connect the discharger to or disconnect the discharger from the cell.

## 2. APPARATUS AND MATERIAL

(Equivalents may be substituted.)

2.01 Charger, single cell, J86264.

2.02 Cloth, cleaning, KS-14666.

2.03 Discharger, single cell, J87116, List 1.

2.04 Hydrometer, as available at the battery.

2.05 Soda, table (bicarbonate).

2.06 Spirits, petroleum.

2.07 Thermometer, as available at the battery.

2.08 Voltmeter, KS-8039 preferred, 3 volts, Model No. 280 acceptable if recently calibrated at 2 volts.

2.09 Watch or clock as available.

## 3. TEST

3.01 Determine and record the discharge current which shall be 2.6 times the 8-hour discharge rate of the cell. Turn the ammeter range selecting switch to 150 if discharge current is less than 145 amperes, to 300 if current is from 145 to 295 amperes, and to 600 if current is from 295 to 550 amperes.

3.02 Connect the red lead to the discharger POS terminal and the black lead to the discharger NEG terminal.

3.03 With ON-OFF switch in the OFF position and both rheostat handwheels full counterclockwise, clamp the connecting blocks of the leads to the cell terminals, red to positive and black to negative. Arrange leads so as to reduce chance of stumbling over them. When connecting to cells on the top tier of a 3-tier rack, support the leads by tying or clamping them to the rack.

3.04 Take and record the cell voltage using a portable voltmeter and test picks applied at the terminals. In the case of 4-terminal cells, apply one test pick to a terminal to which a discharger lead is connected and the other pick to a terminal not having a discharger connection. Record electrolyte temperature, hydrometer reading, and corrected specific gravity.

3.05 Record time, turn ON-OFF switch to the ON position, and raise the discharge current to recorded value. See 3.01. Raise current nearly to desired value with the COARSE ADJ handwheel and trim with the FINE ADJ handwheel.

3.06 Hold discharge current constant at recorded value by operation of handwheels at intervals as necessary until cell

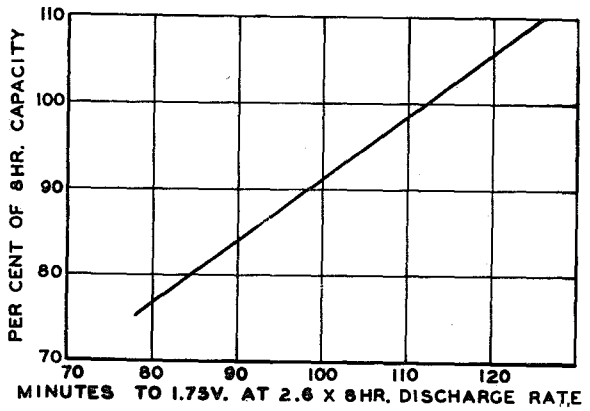


Fig. 2 - Approximate Capacity at the 8-hour Rate Found by Measuring Time in Minutes to Discharge to 1.75 Volts at 2.6 Times the 8-hour Rate.

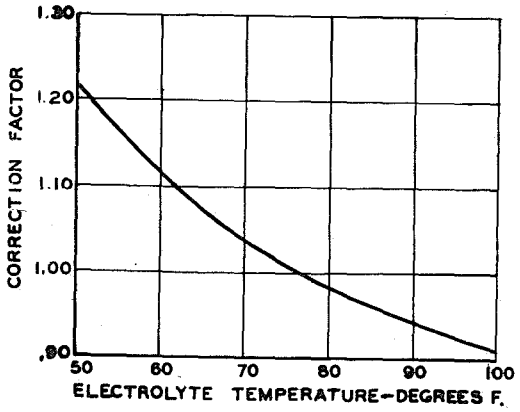


Fig. 3 - Capacity Correction to 77F

voltage falls to 1.75 volts. End discharge by turning both handwheels full counter-clockwise and then turning ON-OFF switch to the OFF position. Turn ammeter range selecting switch to 600.

3.07 Record time of ending the discharge. This should be also the time that the cell voltage reaches 1.75 volts.

3.08 From Fig. 2 and time of high rate discharge determine the approximate 8-hour capacity of the cell for recorded electrolyte temperature. See 3.04.

3.09 From Fig. 3 determine the approximate 8-hour capacity for an electrolyte temperature of 77F.

Example

Assume electrolyte temperature of 60F at start of discharge and 100 minutes of discharge. From Fig. 2, the 8-hour capacity with 100-minute discharge is approximately 91 per cent at the discharge temperature of 60F, and from Fig. 3, the approximate 8-hour capacity corrected to 77F would be 1.115 times 91 or 101 per cent.

3.10 Recharge as soon as practicable per Section A301.340 or equivalent or give a boost charge to the single cell per Section A301.005.

3.11 Note that the ON-OFF switch is in OFF position, disconnect the leads from the cell, and wipe the connecting blocks of the leads and clamps with a cloth moistened in soda water. Disconnect the leads from the discharger as desired to facilitate relocating the equipment.

3.12 The outside of the discharger, including the control panel, should be kept clean by wiping with a dry cloth. A cloth moistened in soda water need be used only when there has been exposure to acid.