

STORAGE BATTERIES

SINGLE-CELL DISCHARGE CAPACITY TEST

(KS-5553 AND KS 15544 LIST 300, 400, AND 500 TYPE CELLS)

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- Explains Form P 528 used to record the results of the mechanical inspection and discharge test
- Provides battery replacement criteria based on the electrical and mechanical characteristics of the cells
- Describes how to process Form P 528.

1. GENERAL

Note: This information was previously located in Section 157-601-503PT, Appendix 1.

1.01 This appendix:

1.02 (Reserved for future use)

- Lists the procedures for obtaining test equipment
- Includes a discharge capacity test for KS-5553 and KS-15544 List 300, 400, and 500-type cells based on their age and mechanical condition
- Provides instructions regarding bypassing the boost charge on discharge capacity tests
- Describes the mechanical inspection of cells

1.03 Table A lists the recommended discharge test intervals. Each office shall be responsible for scheduling capacity tests when their batteries reach the ages shown in Table A. Refer to Sections 157-001-011 and 157-001-012PT.

1.04 All offices shall contact the Equipment Power Engineering District when a discharge test is required. They will arrange to have the test equipment delivered to the location. Assistance

TABLE A

RECOMMENDED DISCHARGE TEST INTERVALS

AGE (YEARS)	CONDITION	MEASURED CAPACITY	ACTION REQUIRED
10	SINGLE STRING BATTERIES	LESS THAN 75%	(SEE NOTE 1)
		75% TO 85%	RETEST IN 1 YR
		85% TO 95%	RETEST IN 2 YRS
		OVER 95%	RETEST IN 3 YRS*
10 OR MORE	MULTISTRINGS, WHEN 80% OF THE BATTERY CAPACITY IS NEEDED TO MEET THE REQUIRED OFFICE RESERVE.	LESS THAN 75%	(SEE NOTE 1)
14	ALL	75% TO 90%	RETEST IN 2 YRS
		OVER 90%	RETEST IN 3 YRS*

Notes:

1. Tests may be requested by the Equipment Power Engineer or Power Maintenance Staff if physical field inspection or other tests show the capacity to be suspect.
 2. See Table B, Notes 1, 2, and 3.
- *Significant positive plate growth (greater than 1/4-inch), or cover rise in excess of 3/8-inch, warrant annual capacity tests to ensure against sudden loss of capacity.

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

**SECTION 157-601-701PT
APPENDIX 1**

will be given to make the discharge capacity test, if required.

1.05 For Northern Counties only: Test sets are located at major exchange and toll maintenance centers throughout the area. Contact these centers to obtain a test set when required. If assistance is needed to locate a test set, contact the Equipment Power Engineering District.

1.06 The discharge capacity test consists of a maximum of four cells from each string (see Table B). Cells to be discharged shall be selected randomly.

Note: Do not discharge emergency cells.

1.07 In order to protect service, make battery cell discharge in PBXs and central offices (COs) only when emergency stand-by ac service is available.

TABLE B

DISCHARGE CAPACITY TEST

ALL MANUFACTURERS
SAMPLE 2 CELLS SEE NOTE 2 IF $\bar{x}2 > 84\%$ SEE NOTE 3 IF $\bar{x}2 < 64\%$ IF $\bar{x}2 \geq 64\% \leq 84\%$ TEST 1 MORE
SEE NOTE 2 IF $\bar{x}3 > 83\%$ SEE NOTE 3 IF $\bar{x}3 < 72\%$ IF $\bar{x}3 \geq 72\% \leq 83\%$ TEST 1 MORE
IF $\bar{x}4 < 82\%$ SEE NOTE 1
$\bar{x}2, \bar{x}3, \bar{x}4$, ARE THE AVERAGE CAPACITIES OF THE 2, 3 OR 4 CELLS UNDER TEST.

MATHEMATICAL SYMBOLS	
> IS GREATER THAN	≥ GREATER THAN OR EQUAL TO
< IS LESS THAN	≤ LESS THAN OR EQUAL TO

Notes:

1. Battery may require replacement, subject to the findings of a study conducted by the Equipment Power Engineering District. Retest as directed by the Equipment Power Engineering District.
2. No further testing required. (See Table A.)
3. No further testing required. (See Note 1.)

2. TESTS

Discharge Capacity Test Procedure

2.01 Discharge cells individually using the KS-20770 or KS-20142 discharge-recharger. The description and use of these test sets can be found in Sections 157-601-504, 157-601-505 and 157-601-506.

1. Select cells according to 1.06 and Table B.
2. For KS-15544 cells, adjust test set at 2.55 volts.
3. For KS-5553 cells, adjust test set at 2.35 volts.
4. Measure and record the temperature of the cell.
5. Measure and record the corrected sepecific gravity (last 3 digits).
6. Program the test set to discharge the cell at the five hour rate (see Table C) by passing the BOOST CHARGE as described in the section covering use of the test set.

Note: Before starting the test verify that all connections are clean and tight. Poor electrical connections will distort the accuracy of test.

Mechanical Inspection of Cells

2.02 The mechanical condition of all cells in each string that is tested shall be recorded on Form P 528. This form should be forwarded to the Equipment Power Engineering District.

TABLE C

5-HOUR DISCHARGE RATE

LIST NO.	DISCHARGE CURRENT IN AMPERES
310	31.0
311	31.0
402	43.0
403	52.0
405	74.0
407	93.0
409	120.0
501	145.0
503	180.0
505	230.0
508	290.0

2.03 Maximum Cover Rise (Hard Rubber Jars):

The only visual indication of plate or strap growth is cover rise at the positive terminal or bulging of the jar.

1. Measure the distance with a plastic ruler from the top of the cover at both the positive and negative terminal ends of the cover.
2. Record the difference to the nearest 1/8 of an inch.

2.04 Maximum Jar Bulge (Hard Rubber Jars):

1. Place a plastic or wood straight edge along the jar wall and measure the maximum amount of protrusion from a plane formed by the corner edges of the jar.
2. Record the dimension to the nearest 1/8 of an inch.

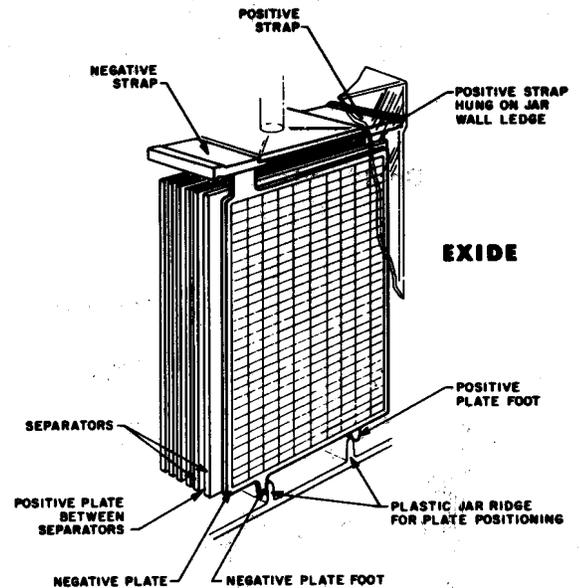
2.05 Transparent Jars (Plate Growth): Visually gauge the plate growth. Only the positive plates are expected to grow. When new, the edges of the positive plates do not project beyond the separators. As growth progresses, the plate edges will gradually move out past the separators and eventually touch the inner wall of the jar. Further growth will apply pressure to the jar wall which is evidenced by the nosing of the plate edges or flattening of the black plastic wrapper (where equipped) against the jar wall. Plate growth will also occur in the vertical plane and, in some designs, will apply pressure on the cover in an upward direction. Record one of the following conditions:

- 0 — Little or no growth (plate within separator edge)
- 1 — Slight growth (plates flush with separator edge)
- 2 — Plate growth from separator edge to point of touching jar (no nose effect)
- 3 — Plate touching jar and nose effect

2.06 Transparent Jars (Strap Growth): The upper edges of the positive plates are burned into a lead bar which is called a strap. This strap can also grow enough to apply pressure to the jar wall. On cells made by Exide or C & D, the straps are adjacent

to the plastic jar wall (Figs. 1 and 3). In cells made by Gould, the positive strap is located in from the wall and has individual plate hangers (Fig. 2). The plates fit into a slotted plastic hanger which rests on the inner wall ledge of the jar. When the strap or the plastic hanger is nosing on the jar wall, flattened air bubbles are usually evident. Record one of the following conditions:

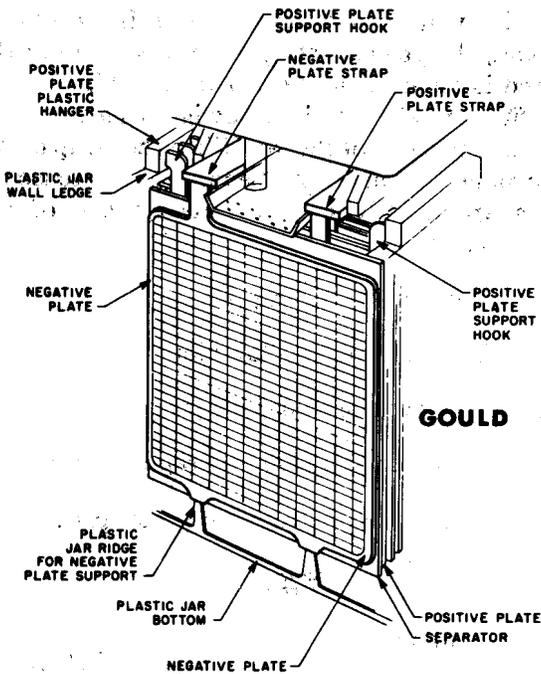
- 0 — Strap not touching jar
- 1 — End of strap touching jar
- 2 — Side of strap touching jar
- 3 — Both end and side of strap touching jar
- 4 — End of strap nosing jar under pressure



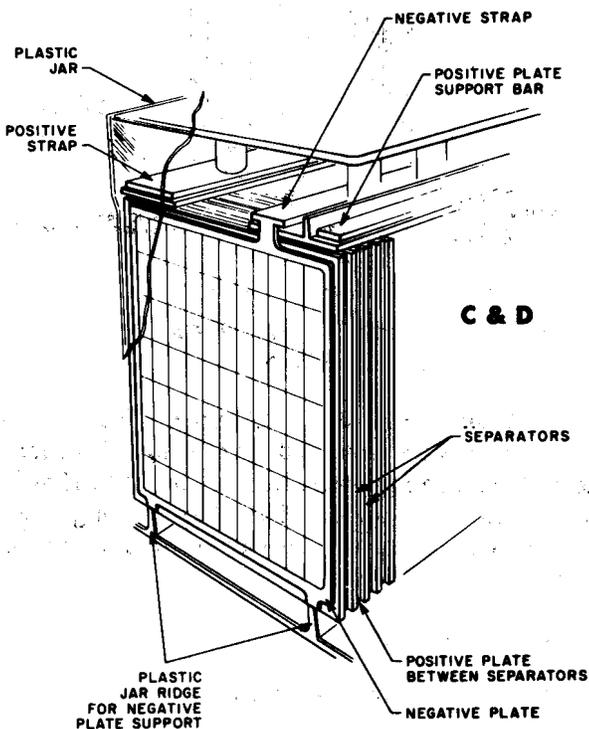
**Exide Cutaway View
Fig. 1**

2.07 Transparent Jars (Crazes): Usually, jar cracks are preceded by crazing of the jar at the plate or strap pressure points. Crazing is hard to see but shows up under a light beam as a group of hairline cracks. Record one of the following conditions:

- 0 — No crazing
- 1 — Crazing in strap area
- 2 — Crazing in plate edge area
- 3 — Crazing in both areas



Gould Cutaway View
Fig. 2



C and D Cutaway View
Fig. 3

2.08 Transparent Jars (Cracks): Cracks due to plate or strap growth may occur in the jar or cover. When the cracks are above the electrolyte level, leakage may not occur, but the explosion-proof vent is by-passed. It is only a matter of time before strap and plate growth will cause cracks below the electrolyte level to leak. Record one of the following conditions:

- 0 — No cracks in cover or jar
- 1 — Cracks in cover
- 2 — Jar cracks in strap area not leaking
- 3 — Jar cracks in plate edge area not leaking
- 4 — Jar cracks in both areas not leaking
- 5 — Leaking cracks in strap area
- 6 — Leaking cracks in plate area
- 7 — Leaking cracks in both areas

2.09 Terminal Post Corrosion: Corrosion of the battery terminals is a problem due to leakage of electrolyte through the terminal post cover seal. Evaluate the degree of corrosion found on the terminal posts and intercell connectors. (See Section 157-601-702.) Record one of the following conditions:

- 0 — Clean
- 1 — Tolerable
- 2 — Bad

3. FORM P 528

3.01 Record the requirements listed in Part 2 (type, manufacture, age, etc) on Form P 528 (Exhibit 1). List T or R after the manufacturer's name (T for transparent or R for hard rubber cells).

3.02 Prepare Form P 528 in triplicate.

1. Retain one copy for the office file.
2. Send two copies with the chart paper directly to the Equipment Power Engineering District.

3.03 After evaluation of Form P 528 and the chart paper by the Equipment Power Engineering District, one copy of the form will be returned to the reporting office with instructions for retest or other recommendations.

