CHARGING STORAGE BATTERIES

MEASURED END CHARGE

CONTENTS

1. INDEX
2. GENERAL
   2.1 Scope
3. TOOLS AND SUPPLIES
4. PRELIMINARY OPERATIONS
5. TEMPERATURE OF ELECTROLYTE
6. INITIAL CHARGE - CELLS SHIPPED FILLED
   6.1 General
   6.2 Charge to Stability
   6.3 Charge at Stability
7. INITIAL CHARGE - LEAD-ANTIMONY CELLS SHIPPED DRY
8. END OF CHARGE READINGS AND REQUIREMENTS
9. CHARGING PARALLEL STRINGS
10. MAINTENANCE TO TURNOVER
11. BOOST CHARGE
12. TURNOVER TO TELEPHONE COMPANY
   12.1 Float Voltage Readings and Requirements
   12.2 Rejected Cells - Below .06 Volts
   12.3 Accepted Cells - .05 & .06 Volts Below Average
   12.4 Rejected Cells - .05 & .06 Volts Below Average
   12.5 Gravity Readings and Requirements
13. RETURNING CELLS
14. DELAYED INITIAL CHARGE
15. CLEANING AND FILLING
16. DISPOSITION OF ID-1285

1. INDEX

Subject	Paragraph
Acceptable Cells Out of Limits	12.31-12.33
Replacements	13.
Boost Charge	11.1,11.2
Cells Shipped Dry	7
Charge Rate	Table B & 7.3
Charge Voltage Requirement	7.6
Electrolyte	7.4
Charge	
During Stability	6.32
Interruption	6.33
Start	6.21
Table A	6.3
Charge Voltage Requirements	6.36,8.1,8.2,8.22
Cleaning	15.
Delayed Initial Charge	14.
Electrolyte	
Adjustment	12.54
Correction	6.35,15.1
Level	13.1
Overflow	6.22
Float Voltage Requirements	12.11,12.12,12.33
Gravity	
Adjustments	12.54
Readings	12.41,12.54
Requirements	12.531-12.533
Hydrometer	12.55
ID-1285	4.2,5.2,6.24,6.34 7.52,12.33,12.52, 12.54,16.1
Maintenance	10.1,10.2,15.1
Paralleling Strings	9.1,9.2
PEM 7101	12.32
Pilot Cell Voltage	6.12
Rejected Cells	8.23,12.21,12.41
Returning Cells	13.
Scope	2.11
Stability	6.23,6.31

This section includes material from BSP AA618.421
Copyright, 1960 & 1962 by American Telephone and Telegraph Company
Printed in U.S.A.

1. INDEX (Cont'd)

Subject	Paragraph
Temperature	5.3,5.4 Table C
Thermometer	5.1,5.2
Voltage	
Average	12.13
Limits	6.12
Minimum	2.11
Requirements	2.12
Temperature Correction	8.21
Voltmeter	8.11

2. GENERAL

2.1 Scope

2.11 This section contains detailed information on the procedures to follow when using the charge to Measured End method for the initial charge of an enclosed type storage battery, both for cells shipped filled and cells shipped dry. A charge by this section can only be used when the voltage can be raised to at least 2.40 volts per cell.

2.12 It also contains the voltage and gravity requirements necessary for completing the charge and charge records which previously was covered separately in Sections 18D and 18E respectively.

2.13 This section is to be used with the other sections in the 17 and 18 series.

3. TOOLS AND SUPPLIES

3.1 The required tools and supplies are listed in Section 18A.

4. PRELIMINARY OPERATIONS

4.1 Preparation of cells for charge are covered in the "Charging - General" Section of this handbook.

4.2 Continue the ID-1285 form originated in Section 17A by checking "Measured End" under type of charge. Indicate pilot cell number selected per Section 18A, number of strings charged in parallel, voltage regulation employed and whether or not battery is connected to working equipment while being charged. Record the complete date the charge is started.

5. TEMPERATURE OF ELECTROLYTE

5.1 The thermometer should be inserted in the cell funnel opening and held in the electrolyte for at least two minutes before reading.

5.2 When there is insufficient clearance to insert the thermometer an acceptable alternate to reading each cell is to lay the thermometer on top of a cell in the center of a row and again on a cell at the end of a row. Allow 10 minutes before reading and use the average temperature as an approximation of the temperature of all cells in the row. Indicate temperature was approximated on ID-1285 in the space for remarks. This approximation may not be used for temperature correction of voltage when such a corrected voltage would condemn a cell.

5.3 The electrolyte temperature shall not exceed 110F for more than 3 hours during any part of the charge. At no time shall the electrolyte temperature exceed 120F.

5.4 If it is apparent that the next reading will exceed the limits stated above, interrupt the charge and allow the electrolyte to cool to about 95F after which the charge may be resumed.

6. INITIAL CHARGE - CELLS SHIPPED FILLED

6.1 General

6.11 The trend in rectifier design no longer provides for charging at higher voltages and higher currents. The reduction in the maximum charging voltage limit also restricts the charge current appreciably. Because of these reasons charging at a constant current is no longer feasible and this method has been removed from the section.

6.12 The average or pilot cell voltage shall not exceed 2.50 during any part of the charge.

6.2 Charge to Stability

6.21 Start the charge. If the charging equipment is adequate charge until the voltage limit of 2.50 volts per cell is reached. If not adequate charge at the maximum output of the charging equipment which shall be at least 2.40 or higher, otherwise use Section 18C. This is the fastest way of warming the electrolyte and approaching a stable condition of charge.

6.22 Guard against electrolyte overflow. If it should become necessary to remove electrolyte to prevent overflowing, record removals on ID-1285 under the "Electrolyte Level, Correction" column. Retain electrolyte for possible reuse.

6.23 Some types of automatic charging equipment are arranged for current limit control until the voltage rises to a "regulated charge setting" in which case the charger will automatically switch itself to voltage regulation. With this arrangement the stable period will be approached with no subsequent readjustments if the automatic switching point is temporarily readjusted from its normal setting of 2.20 or 2.30 volts per cell to 2.50.

10-1285 (4-58)
WESTERN ELECTRIC COMPANY, INCORPORATED
TELEPHONE SALES-DIVISION - INSTALLATION

STORAGE BATTERY REPORT

THIS COPY FOR _____

TOWN AND STATE	OFFICE	JOB ORDER NO.	KS LIST	MEASURED ARBITRARY END / LENGTH	PILOT CELL NO.	DATE CELLS SHIPPED	NO. OF STRINGS CHARGED IN PARALLEL	SHEET OF SHEETS
Maryland Park, Md.	#5 X Bar	69394-H	15544 508	X /	16	5-17-58	1	1 1

STREET ADDRESS	TELEPHONE COMPANY	SUPPLIERS ORDER NO.	SUPPLIER	VOLTAGE REGULATION	CONNECTED TO WORKING EQUIP.	DATE CHARGE STARTED	BATTERY DESIG.
716 Pleasant Street	C & P of Maryland	WE-13016-A	CAD [ ] EXD [X] GLD [ ]	MAN [ ] AUTO [X]	YES [ ] NO [X]	9-3 , 58	48 Volt "B"

INDIVIDUAL CELL MEASUREMENTS

CELL NO. 17A	ELEC. LEVEL 17A (NOTES ON BACK) AS REC.	CORR. [ ] 1/4 INCHES [X] PINTS	INITIAL CHARGE 18B OR 18C DATE 9-5-58 VOLTS MEAS.	VOLTS IN EXCESS OF 2.00 CORR.	TEMP. °F	FLOAT AT TURNOVER DATE VOLTS MEAS.	VOLTS IN EXCESS OF 2.00 CORR.	TEMP. °F	GRAVITY MEAS.	GRAVITY IN EXCESS OF 1.000 CORR.
1	L	W01	50	50	84					
2	L	W06	50	50	84					
3	M1		50	50	85					
4	L	W03	50	50	85					
5	L		50	50	85					
6	L		50	50	85					
7	L		55	55	85					
8	L	W03	53	53	85					
9	M2		53	53	85					
10	L		51	51	85					
11	L	W01	52	52	85					
12	L	W07	47	48	88					
13	L		50	51	88					
14	L	W01	50	51	88					
15	L	W02	51	52	88					
16	L	W01	50	51	87					
17	L	W06	47	48	87					
18	L		51	52	87					
19	L	W05	49	50	88					
20	L	W06	50	51	88					
21	L		50	51	88					
22	L	W05	50	50	86					
23	L		49	49	86					
EM 1	L	W05	52	52	86					
EM 2	M1		52	52	86					
EM 3	L		54	54	85					
EM 4	L	W04	51	51	85					
AVERAGE				510						

VOLTAGE, TEMPERATURE AND GRAVITY READINGS REQUIRED PER PAR. 12.11, 12.12, 12.51, 12.52, 12.531 – 12.533. REFER TO SECTION 18F FOR EXAMPLE

SECTION 17A PAR. 5.5
2 PINTS ADDED WHEN CELLS ARRIVED ON JOB TO COVER PLATES.

SECTION 18A PAR. 14.5
ADDED 3 ADDITIONAL PINTS TO BRING TO MIN. LEVEL.

PAR. 6.22 AS NECESSARY
PAR. 6.35 ADDED 1 PINT TO BRING TO MAX. LEVEL.

PAR. 8.1 & 8.2
INDIVIDUAL CELL VOLTAGE AND TEMPERATURE READINGS.

SECTION 18D PAR. 3.4
AVERAGE CELL VOLTAGE

PILOT CELL MEASUREMENTS

INITIAL CHARGE 18B OR 18C — MEASURED END OR ARBITRARY LENGTH

DATE	HOUR	AMPS	VOLTS IN EXCESS OF 2.00	TEMP. °F	GRAVITY IN EXCESS OF 1.000
9-3	9A	140		77	197
	10	80	50	81	199
	11	65	50	84	203
	12N	55	50	87	203
	1P	48	50	89	205
	2	42	50	91	208
	3	38	50	91	207
	4	35	50	91	208
	4	Charge Interrupted			
9-4	8A	140		79	217
	8:30	30	50	82	216
	9:30	22	50	85	216
	10:30	14	50	87	216
	11:30	9	50	88	215
	12:30P	X 8	50	89	216
	1:30	-8	50	89	216
	2:30	8	50	89	216
	3:30	8	50	88	216
	4:30	-8	50	88	216
	4:30	Charge Interrupted			
9-5	8A	140		80	218
	8:30	-8	50	83	215
	9:30	-8	50	85	202
	10:30	-8	50	87	211

MAINTENANCE CHARGE 18F — FROM INITIAL CHARGE TO TURNOVER

PAR. 6.21 & 6.24
CHARGE STARTED AND MANUALLY REGULATED UNTIL VOLTAGE LIMIT OF 2.50 WAS REACHED AND MAINTAINED BY VOLTAGE REGULATION.

PAR. 6.33
CHARGE RESUMED UNTIL VOLTAGE LIMIT OF 2.50 IS REACHED.

PAR. 6.31
STABILITY ESTABLISHED AT 1:30p.m. WHEN UNCORRECTED SPECIFIC GRAVITY WAS AT LEAST 1.180 AND UNCORRECTED VOLTAGE AND CURRENT WERE NO LONGER CHANGING FOR THIS SECOND HOURLY READING. THE TEMPERATURE OF 89° AND VOLTAGE OF 2.50 SHOWN AT THE FIRST OF THESE READINGS 12:30p.m. ARE APPLIED TO TABLE "A" WHICH REQUIRES 6 HOURS OF CHARGE.

PAR. 6.32 & 6.33
CREDIT TOWARD THE TOTAL HOURS REQUIRED BY TABLE "A" IS RESUMED AT 8:30a.m. AFTER THE STABLE CURRENT OF 8 AMPS AND SAME VOLTAGE OF 2.50 AS APPLIED TO TABLE "A" ARE REACHED. NOTE; THESE 3 HOURLY READINGS CONSTITUTE 2 HOURS OF CHARGE. THESE 2 HOURS ADDED TO THE 4 HOURS BEFORE THE LAST INTERRUPTION MAKES THE TOTAL OF 6 HOURS.

PAR. 6.35
WATER ADDED AT BEGINNING OF LAST QUARTER OF CHARGE.

Charge Complete 6 Hours Stable

* Cell 13 returned to mfg. due to excessive spillage. Replacement received 6-12 on supplier's order WE-13023-A. Emergency cells charged in series with regular string.

REMARKS:

DATE OF TURNOVER _____ 19____

MEASUREMENTS BY _____

APPROVED BY _____ DATE _____

(RP-18350-M)

(OVER FOR NOTES)

FIG. 1 EXAMPLE OF A MEASURED END STORAGE BATTERY REPORT

6.24 On ID-1285 under "Pilot Cell Measurements, Initial Charge" record the start of the charge and hourly readings thereafter until the stable period is established. Record date, hour, current in amps, decimal portion of pilot cell volts (uncorrected), temperature and decimal portion of pilot cell specific gravity (uncorrected). See Figure 1.

6.3 Charge At Stability

6.31 See Figure 1. Stability is achieved when, for two hourly readings, the current and uncorrected pilot cell volts are no longer changing and the uncorrected specific gravity is at least 1.180. The first of these hourly readings is the beginning of the stable period. The second identical reading confirms the start of the stable period with the previous reading. The first reading is not counted when counting the total number of hours per Table A. The pilot cell voltage and temperature at the first stable reading shall then be applied to Table A for the total hours to charge at stability. Hours of charge differ for each five degrees of temperature. Estimate to the nearest hour the charge to be made for intermediate degree readings.

NOTE: Six consecutive hourly readings represent only 5 hours of charge, etc.

TABLE A

MEASURED END CHARGE (PAR. 6.3)

VOLTS PER CELL	PILOT CELL ELECTROLYTE TEMPERATURE F										
	100	95	90	85	80	75	70	65	60	55
	TOTAL HOURS CHARGE AT STABILITY										
2.50	4	4	5	6	7	9	10	12	15	17	21
2.49	4	5	6	7	8	10	12	13	16	19	23
2.48	5	6	7	8	9	11	13	15	18	21	26
2.47	5	6	8	9	10	12	14	17	20	24	29
2.46	6	7	8	10	12	14	16	19	23	27	32
2.45	7	8	9	11	13	15	17	22	26	30	36
2.44	7	9	11	13	15	17	20	25	29	33	40
2.43	8	10	12	13	17	18	23	27	32	37	45
2.42	9	11	13	15	17	21	25	30	37	42	50
2.41	10	12	14	17	20	23	28	33	40	47	56
2.40	12	13	16	18	23	27	31	37	45	52	63

6.32 If the voltage or current changes during the stable period a new selection of hours shall be taken from Table A based on the new stabilized condition and the charge then continued at the voltage and for the hours indicated.

6.33 If the charge is interrupted for a period not in excess of three days at a time during the period of stability the battery should be brought back to stability at the same voltage and current and the time of stability before and after the interruption should be added together. Disregard changes in temperature after the interruption.

EXAMPLE: Assume the battery voltage is brought up to 2.50 volts per cell and held at this value until the gravity is at least 1.180 and the current is stabilized at which time electrolyte temperature is 90°F. From Table A, 6 more hours of charge at 2.50 are required. If it is necessary to interrupt the charge after 4 hours of stability, the battery shall be charged after the interruption until again stabilized at the previous current and at 2.50 volts. The charge is then continued for 2 hours.

6.34 Continue taking hourly readings of the pilot cell during stability until charge is completed, recording date, hour, current in amps, decimal portion of cell volts (uncorrected), temperature and decimal portion of specific gravity (uncorrected).

6.35 At the beginning of the last quarter of the charge per Table A, when the gassing action can be utilized for mixing, add approved water as necessary to bring electrolyte in each cell up to "maximum level." If electrolyte was removed earlier to prevent overflow electrolyte shall be reused to bring the cell to "maximum level". Record these additions on ID-1285 under "Electrolyte Level, Correction" column.

6.36 Continue with Paragraph 8 before shutting down charging equipment.

7. INITIAL CHARGE - LEAD-ANTIMONY CELLS SHIPPED DRY

7.1 Lead-calcium cells shipped dry do not meet Bell System standards and no section in this handbook covers the charge of these cells. See Section 18A.

7.2 The measured end charge for cells shipped dry shall be applied under constant current or current control with either automatically controlled or manually controlled charging equipment.

7.3 The charge may be made at one of two charging rates. Charge at a current rate of 25% or 40% of the cells Eight-Hour rate until 100% of the Ampere-Hour capacity has been applied. See Table B for choice of charging current and number of hours of charge, the combination representing 100% of the Ampere-Hour capacity. Since this charge is made at a constant current the voltage will necessarily exceed 2.50 per cell.

7.4 At the end of 20 or 32 hours of charge add approved water to each cell until minimum level is reached. Then raise electrolyte in each cell to "maximum level" with electrolyte of 1.210 ± .010 specific gravity and continue the charge until both voltage and gravity have ceased to rise. With this stable condition of voltage and gravity continue to charge for 6 hours (7 hourly readings) 25% of the 8-hour if rate is used and 4 hours (5 hourly readings) if 40% of the 8-hour rate is used.

TABLE B

CHARGING TABLE FOR CELLS SHIPPED DRY

(PAR. 7.3)

Cell KS Number	Cell List No.	★Amperes For 32 Hours	★Amperes For 20 Hours
KS-5361 Lead-Antimony	100	.1	.2
	110	.3	.5
	111	.3	.5
	116	.3	.5
	116B	.3	.5
	116C	.3	.5
	120B	.57	.8
	120C	.57	.8
	130B	.9	1.5
	130C	.9	1.5
	140A	1.6	2.5
	141A	1.6	2.5
	150A	3.1	5
	151A	3.1	5
	151H	4.1	6.5
KS-5553 Lead-Antimony	310	5.6	9
	311	5.6	9
	402	7.5	12
	403	9.4	15
	405	13.1	21
	407	16.8	27
	409	20.6	33
	501	26.3	42
	503	33.8	54
	505	41.3	66
	508	52.5	84
KS-5562 Lead-Antimony	04	125	200
	05	156	250
	06	188	300
	07	219	350

★Column 3 lists the charge at 25% of the 8 hour rate and Column 4 lists the charge at 40% of the 8 hour rate.

7.5 On ID-1285 under "Pilot Cell Measurements" and "Initial Charge" record the following:

7.51 At the start of the charge record the date, hour charge started, charging current and number of hours of charge which constitute 100% of the ampere hour capacity.

7.52 At the completion of this 100% charge record hourly thereafter the charging current, decimal portion of pilot cell volts (uncorrected), temperature and decimal portion of pilot cell specific gravity (uncorrected).

7.6 Continue with Paragraph 8 before shutting down charging equipment.

8. END OF CHARGE READINGS AND REQUIREMENTS

8.1 Just before the charge is stopped take individual cell voltage and temperature readings. Do not reduce or change charging voltage until all readings are taken. Record these readings and the date on ID-1285 under "Individual Cell Measurements, Initial Charge." See Figure 1.

8.11 It is suggested the installer borrow the (Weston Model 931 0-3 volt) meter from the telephone company to insure comparable readings. Otherwise, the ITE-4040 can be used.

8.2 No cell voltage, corrected for temperature, shall be more than .10 volt above or below the average for the string.

8.21 For method of correcting voltage for temperature, refer to Section 18D.

8.22 If a cell or cells are out of voltage limits at end of the initial charge, give a second initial charge. This charge may be discontinued if at any time the voltages are found to be within limits.

8.23 Cells out of limits after two full initial charges are unsatisfactory and should be replaced through normal channels.

9. CHARGING PARALLEL STRINGS

9.1 When two or more strings requiring an initial charge are charged in parallel, the charge shall be continued until the pilot cells of all strings meet stability. Assume the current is not changing when the ammeter, indicating the combined currents through the parallel strings, is not changing. The last string to reach stability shall be the one whose pilot cell determines, per Table A, the number of additional hours of charge for all of the strings. This cell shall continue to control the charge through interruptions, etc.

9.2 For the strings depending on the pilot cell of another string for the number of hours of charge, a notation shall be made over "Remarks" on each of the corresponding ID-1285 forms. As an example on the form for 48V C:

"Length of charge determined by 48V B string," etc.

This will justify any apparent error between the number of hours required on 48V C and the actual number charged per 48V B if there should be any difference.

10. MAINTENANCE TO TURNOVER

10.1 As soon as possible after the initial charge, when the plant is under continuous attention either directly or by means of tested and attended alarm circuits, place the battery on continuous float.

10.2 Refer to Section 18F for detailed instructions and requirements.

11. BOOST CHARGE

11.1 If time from the end of the initial charge to turnover exceeds six weeks, give the battery a boost charge during the final week.

11.2 Refer to Section 18F for the method of applying the Boost Charge and for the associated records to be kept.

12. TURNOVER TO TELEPHONE COMPANY

12.1 Float Voltage Readings and Requirements

12.11 Within a week before turnover, but at least three working days after the initial charge, record individual cell corrected voltages on float after at least 5 hours of continuous float. The final acceptable set of readings shall be recorded on ID-1285 under "Float at Turnover".

12.12 No cell corrected voltage shall be more than .10 volt above or more than .04 volt below the average for the string.

12.13 See Section 18D for determining the average for the string.

12.2 Rejected Cells - Below .06 Volts

12.21 Cells more than .10 volts above or more than .06 volts below the average for the string are unsatisfactory and should be replaced through normal channels. See Paragraph 13.

12.3 Accepted Cells - .05 & .06 Volts Below Average

12.31 Cells .05 or .06 volts below the average for the string almost always meet requirements within a few weeks of continuous float operation.

12.32 Discuss this condition with the telephone company who may accept the battery on the recommendation of A.T.&T. Company's PEM 7101. When the telephone company accepts the battery per PEM 7101 this obligates Western Electric to replace free of charge and free of a Formal Engineering Complaint on the part of the telephone company, any cell not meeting the .04 volt below the average requirement after 10 weeks of continuous float operation.

12.321 To replace any unsatisfactory cells, accepted but still out of limits after 10 weeks of continuous float operation, the telephone company should issue a nonbillable, furnish and install requisition on the W.E. Co. Distributing House, worded as follows:

> Fur and Install No Charge:
> (Qu y) Battery, Storage, (Exide, C
> & D ould), KS-List__, to replace
> defe e cell furnished on Order No.__
> and e returned on RMN__ per P.E.M.__
> 7101 . Engineering Complaint No.
> EC-129[illegible]0.

Cross reference all papers connected with the replacement. See Paragraph 13.

12.33 At any time during or at the end of the 10 week period an endeavor should be made to obtain an accpetable set of readings for all cells.

12.331 An installer should take the readings if he is on the job or if it is reasonably convenient to return to the job. Otherwise, the telephone company may agree to take the readings and report them to the installer for record on ID-1285.

12.332 If taking readings at the end of ten weeks is expected to cause enough inconvenience to justify doing so, the cells may be replaced immediately. The Western Electric Company is then liable for transportation charges to and from the factory, for the difference between the cost of the new cell and the salvage allowed for those replaced and, the cost of removing and replacing the cell.

12.4 Rejected Cells - .05 & .06 Volts Below Average

12.41 Cells .05 and .06 volts below the average for the string not accepted by the telephone company should be discussed through supervisory channels. The job may be held open up to 10 weeks while waiting for the cells to stabilize or the cells may be replaced without waiting to determine whether or not they are defective. The charges for which Western Electric is then liable is described in Paragraph 12.332.

12.5 Gravity Readings and Requirements

12.51 Take the specific gravity and temperature readings of each cell within a week before turnover. Delay additions of water until after taking readings.

12.52 The acceptable set of readings shall be recorded on ID-1285 under "Individual Cell Measurements" - "Float at Turnover". If there is a boost charge required these readings may be taken before, during or after the charge.

12.53 The specific gravity requirements for fully charged cells corrected to 77°F per Table "C" and at the specified level are as follows:

12.531 Cells at 15 ampere-hour capacity and larger shall be from 1.195 to 1.225 inclusive.

12.532 On cells with charge indicators the gravity shall be sufficient to float all indicator balls.

12.533 The maximum specific gravity variation between cells of the same string shall not be greater than 15 points (.015).

12.54 If the cells are equipped with electrolyte withdrawal tubes true gravity readings will be indicated without a waiting period. Electrolyte readings taken from the top of cells not equipped with electrolyte withdrawal tubes may not reflect the true gravity for several months. After the initial charge, when it is impractical to get final acceptable gravity readings before turnover, discuss this with the telephone company to determine if they will furnish the readings for record on ID-1285 or if the installer will be required to return for final readings. If it should seem necessary to adjust electrolyte the installer shall discuss this by originating a Route "G" JIM on the "Supplies Inspection Organization." Provide information thoroughly identifying the cells and completely describing the applied charge and how the cells are defective.

12.55 Additional information on the use of the hydrometer and temperature correction is found in Section 18E.

TABLE C

TEMPERATURE CORRECTIONS FOR HYDROMETER READINGS (PAR. 12.53)

CORRECTION VALUES TO BE APPLIED TO HYDROMETER READINGS		Degrees F. With REFERENCE TEMPERATURE AT 77°F		
ADD	SUBTRACT			
	.007	55	56	57
	.006	58	59	60
	.005	61	62	63
	.004	64	65	66
	.003	67	68	69
	.002	70	71	72
	.001	73	74	75
0	0	76	77	78
.001		79	80	81
.002		82	83	84
.003		85	86	87
.004		88	89	90
.005		91	92	93
.006		94	95	96
.007		97	98	99
.008		100	101	102
.009		103	104	105
.010				
.011				

13. RETURNING CELLS

13.1 Add water as necessary to bring electrolyte to minimum level before returning cells.

13.2 Note complete information on the accompanying ID-177 tag in accordance with the job clerical handbook and include a history as to length of charges, rates and total amount of water added.

13.3 Cells failing to meet minimum and maximum gravity requirements or charge voltage requirements should be further identified as defective and the reason stated.

13.4 Cells returned without waiting for float voltage stability within a given string or spread gravity stability within a given string should be identified as unacceptable and the reason stated.

13.5 Return cells promptly after replacements are made.

14. DELAYED INITIAL CHARGE

14.1 When a delayed initial charge is given under conditions described in Paragraph 5.2 of Section 18A, it is recommended that the Arbitrary Length charge in Section 18C be used, due to the extended charge period required.

15. CLEANING AND FILLING

15.1 As a final measure before turning the battery over to the operating company and with the battery on float, fill all cells with approved water to the "maximum level". Record additions on ID-1285. Only when on float, clean the cells to remove dust and other foreign matter with a dry cleaning cloth KS-14666 or equivalent.

16. DISPOSITION OF ID-1285

16.1 Completed and approved ID-1285 forms shall be distributed in accordance with Job Clerical Handbook instruction.

→ Arrowed lines indicate new or changed information.

[Vertical line at side of paragraphs indicates requirements.

R. W. HILLEGAS

Engineer of Installation

Reason for Reissue:
(1) To provide alternate method of measuring temperature when thermometer cannot be placed in cell.
(2) Because of rectifier capacity limitation and lowered voltage limits the method of charging at a constant current for cells shipped filled has been removed.
(3) Charging at voltages below 2.40 has been removed from this section.
(4) To include charging table for cells shipped dry.
(5) To include voltage and gravity requirements previously shown in Sections 18 nd 18E respectively.
(6) To allow replacement of cells failing charge voltage requirements after tv itial charges.
(7) To require cells be placed on continuous float as soon as possible after th nitial charge.
(8) To allow replacement of cells failing float voltage requirements by an amount lower than .06 volt.
(9) To clarify the intent of PEM 7101 and more strongly recommend the telephone company accept marginal cells.
(10) To repeat for emphasis the instruction to indicate the defect on returned cells.
(11) To allow supervision to determine action on cells not turned over which have failed float voltage requirements by no more than .02 volts.
(12) To recognize cells may be equipped with electrolyte withdrawal tubes which aid in determining the true gravity reading.
(13) Cells failing gravity requirements discussed with factory representative or replaced.
(14) To remove Delayed Initial Charge from this section.
(15) To guide in the disposition of completed ID-1285 forms.
(16) To waive charge & float voltage requirements on lead-calcium cells shipped dry.
(17) To require initial charge be repeated when cells fail end of charge (under charge) voltage requirements.
(18) To direct cleaning of cells and filling before turnover.

Replaces Section 18B dated 6-16-60.