CONDENSED
MAINTENANCE INSTRUCTIONS
for
Type DL and DS Exide Batteries
in Locomotives

(Note - If batteries received dry charged follow instructions on tag accompanying batteries for putting into service. If tags not on batteries, follow dry charged instructions given at end of these instructions.)

1. CHARGING REGULATOR SETTINGS

Keep the voltage regulator in adjustment in order to maintain battery fully charged as shown by a hydrometer reading.

The voltage regulator setting to use depends somewhat upon the number of hours per day that the locomotive is in service. However, for 8-12 hours' daily service, set regulator at 38 volts open circuit for the 16-cell battery as a trial start. (For a 32 cell battery the corresponding voltage is 76)

It may have to be changed for local conditions. Any adjustments should be made in small steps, 1/2 volt at a time. Use an accurate voltmeter. Follow the instructions furnished with the locomotive in making adjustments and adjust with the regulator on open circuit and with its coil hot.

The voltage setting should be decreased if the battery specific gravity is found at the full charge value and with the electrolyte temperature more than 15° F. above the outside air, or if the amount of water required is more than shown in Section 3.

The voltage setting should be increased if the battery specific gravity drops off from day to day.

2. READINGS AND RECORDS

DAILY

- Take hydrometer reading, electrolyte temperature and level of pilot cell at end of a working period. Every month use a different cell as a pilot.

- Daily readings are desirable when the equipment is new, or after repairs, or after changes are made in the voltage regulator setting. When five daily readings show no adjustment needed, the pilot cell reading may be taken weekly.

MONTHLY

- Record hydrometer reading of every cell. Compare these with previous readings to detect any irregular readings.
- Check and record setting of voltage regulator.
- Record amount of water added from time to time.
- Keep the records in a log book for reference by the supervisor.

3. ADDING WATER

Add approved or distilled water to each cell. The high point is 1/16 inch below bottom of filling tube (or 9/16 inch above top of separators). Add before level lowers to top of separators.

Sufficient watering space has been provided so that with normal conditions water is required only once a month. However, check level each week.

All cells should take the same amount of water. If one takes more than the others, examine it for leakage.

If more than the maximum amount of water shown in table below is required unnecessary overcharging is indicated and the voltage regulator setting should be checked. If the minimum is not used for a battery in average service, undercharging is expected.

Size & Type Battery	Water addition per month for 16 cell battery (for 32 cell battery double these amounts)	
	Minimum	Maximum
16 DL-25	4 pints	8 pints
16 DL-45	7½ pints	15 pints
16 DS-41	6 pints	12 pints

4. KEEPING BATTERY CLEAN

Keep vent plugs tight and in place at all times. Examine vent plugs to see that holes for escape of gas are not plugged. Keep these holes open. Once a month (in dusty locations as often as necessary to keep clean) wash off with a hose, batteries and battery compartment. If batteries are so located that water from a hose would damage other equipment blow off dirt from cell covers and compartment with moderate air pressure.

An accumulation of acid-soaked dirt on top of the cells and in the compartment causes grounds, shorts and corrosion. If cell covers are damp with electrolyte, wash them with bicarbonate of soda solution (one pound soda to one gallon of water), rinse off with water and blow moisture off cell covers and out of compartment with moderate air pressure.

Keep connections clean and tight.

5. SPECIFIC GRAVITY - HYDROMETER READINGS

The specific gravity or hydrometer reading of the battery is an indication of the state of charge. The specific gravity reaches a maximum when the battery is fully charged, but this maximum value varies somewhat with the temperature and height of the electrolyte.

With the electrolyte level 1/16 inch below bottom of filling tube, the full charge specific gravity at different temperatures is as follows:

Temperature of Electrolyte	*Battery filled with low gravity electrolyte for use in Tropical climate	Battery filled with high gravity electrolyte
77° F.	1.200 - 1.220	1.270 - 1.285
107° F.	1.190 - 1.210	1.260 - 1.275
47° F.	1.210 - 1.230	1.280 - 1.295
17° F.	1.220 - 1.240	1.290 - 1.305

* For Tropical climates (where water never freezes) best results are obtained if battery is filled initially with low gravity electrolyte. For other climates use high gravity.

With the electrolyte level at a lower point, the specific gravity for each temperature would be a few points higher.

A specific gravity about 75 points below values given above would indicate a battery approximately one-half charged. - Example - Battery filled with low gravity electrolyte reading 1.130 gravity at 77° F, approximately half discharged. Battery filled with high gravity electrolyte reading 1.200 gravity at 77° F. approximately half discharged.

6. IMPORTANT POINTS

Do not work on battery or in battery compartment without first opening the main battery switch.

Keep all flames away from the battery.

Do not lay any tools on top of cells.

Low electrolyte temperatures temporarily reduce the battery capacity. Restoration of normal temperatures restores the usual capacity.

Continued and frequent temperatures above 115° F. shorten the life of the battery. Provide full ventilation in warm weather.

With proper operation, the battery temperature should not be more than 15° F. higher than the temperature of the outside air.

For more detailed battery information, ask for Instruction Book Form 2399.

INSTRUCTIONS
For Putting Into Service Dry-Charged EXIDE BATTERY
DL-25, DL-45, DS-41, XCK-21-3S

This battery is shipped with the plates in a partly charged condition. The vent plugs must be left tightly in place until ready to fill the battery.

The electrolyte to use for filling is dilute sulphuric acid. It must be pure and suitable for storage battery use and of proper specific gravity (see table). The temperature of the filling electrolyte should not exceed 90° F.

	Temperate Climate	Tropical* Climate
Filling Gravity	1.270	1.210
Max. Temperature	110° F.	125° F.
Final Gravity	1.270-1.285	1.200-1.220

* A Tropical climate is one in which water never freezes.

To Prepare battery for service:

1. Unscrew vent plugs. For storage purposes the vent plug is closed with rubber string or sealing compound. Remove rubber string or 'button' or compound with finger, making sure the escape holes are left clean. The string or compound should be thrown away.

2. Fill each cell with the prepared electrolyte to 5/8 inch above top of separators.

3. Allow the battery to stand at least one hour after filling with electrolyte. If level has fallen, add electrolyte to restore it. Replace vent plugs in cells. If any electrolyte was spilled on battery, it should be removed by means of a cloth slightly dampened with a weak solution of baking soda and water.

4. A freshening charge should be given before placing in service. Make certain the positive terminal of battery (marked POS or + or painted red) is connected to the Positive of the charge circuit, and negative terminal of battery (marked NEG or — or painted black) is connected to negative of charge circuit.

Type	Charge Rate Amperes
3-DS-41-1R	21
DL-25	18
DL-45	33
XCK-21-3S	10

5. Charge until four consecutive hourly readings show no rise in both specific gravity and voltage for the lowest cell. If above rate is maintained length of charging time will be at least 12 hours; lower rates will increase the time proportionately. If necessary to restore electrolyte level during charge, use only approved water.

6. After completion of charge, the gravity should be as shown in table, corrected to 77° Fahrenheit and with the level 5/8 inch above top of separators. If it is not, adjust by removing some solution and replacing with approved water or electrolyte as required. Charge to mix solution before testing again.

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