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TECHNOLOGY ASSESSMENT PROGRAM

# Equipment Performance Report Supplement

## Transceiver Battery Testing

July 1986

A second edition of *Transceiver Battery Testing* was published in January 1986 by the Technology Assessment Program Information Center (TAPIC) of the National Institute of Justice. It measured 64 different models of nickel-cadmium (NiCad) rechargeable batteries for portable FM transceivers against NILECJ-STD-0211.00 (June 1975), Batteries for Personal Portable Transceivers.

Twelve of the models tested were in full compliance with the requirements of the Standard for all minimum operating parameters. None of the lots tested was in full compliance with the labeling requirements of the Standard; however, 10 were found to satisfy the intent of the Standard.

Since publication of the report, further tests have been reported on two of the battery models tested, Motorola models NLN6761A (lot "M1" for purposes of the test) and NLN4463B ("M2").

The M1 is designed as a slow-charging battery, requiring a minimum 16-hour charging period at a nominal voltage of 15 and a capacity of 450 milliampere hours. The M2 is fast charging, with a 1-hour minimum charging period at the same voltage and capacity.

The NIJ Standard requires that batteries provide a minimum service life of 8 hours, or one shift, when discharged at ambient temperatures (68 to 86 degrees F) during continuous operation with a 10-10-80 (transmit-receive-standby) duty cycle. The Standard also sets service life requirements at low and high temperatures: 2 hours at 22 degrees F; 7 hours at 140 degrees F. In addition, integrity of a battery's internal connections is tested.

The new tests were performed by Columbia Research Corporation, Arlington, Virginia, one of two contractors competitively chosen for testing of transceiver batteries against the Standard. In the new tests, however, lots of seven batteries of each model were tested. In the earlier tests, batteries were tested in lots of three.

**All 14 batteries tested (7 of each model) met all the minimum requirements of the Standard during both the service life tests and the internal connection tests.** In addition, M1 met all labeling requirements except that for recharge rate, although the month and year of manufacture appear in code. M2 met all labeling requirements except those for rated capacity and recharge rate, with the month and year coded.

In the earlier tests, M1 had met all performance standards, but M2 did not meet the ambient or high-temperature service life tests. The publication of the earlier results noted that the manufacturer did not consider the specimens of M2 tested at that time to be representative of current production. Other batteries from this manufacturer that underwent the earlier tests were no longer in production at the time of publication.

Using a statistical procedure described in the Standard, a performance factor (PF) was calculated for each lot. For samples of seven batteries, as in the new tests, a PF of 1.15 or higher is required. (For samples of three, as in the original publication, a PF of 0.958 or higher is required.) A table details results of the retesting; it corresponds with Table 3 in the original publication.

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**Service life test results for individual battery lots**

| | Ambient temperature | | Low temperature (-22 F) | | High temperature (140 F) | |
|---|---|---|---|---|---|---|
| Code | Mean life (h) | PF | Mean life (h) | PF | Mean life (h) | PF |
| M1 | 12.15 | 11.22 | 5.33 | 15.86 | 11.19 | 6.55 |
| M2 | 9.15 | 2.56 | 5.36 | 11.2 | 9.12 | 21.21 |

A battery passes the internal connection test when its voltage equals or exceeds 1 volt per cell after a 2-minute discharge at a rate 5 times that required to discharge the battery in an hour. Both the battery models tested contain 12 cells each. Lowest endpoint voltage for any M1 tested was 13.36 volts, with a mean of 13.43. Lowest endpoint voltage for any M2 tested was 13.43, with a mean of 13.48.

Those readers who have questions concerning the *Equipment Performance Updates*, are interested in the results of specific tests, or need information on other equipment standards are invited to call the Technology Assessment Program Information Center toll free at 1–800–24–TAPIC. In Maryland, Alaska, and Metropolitan Washington, D.C., call 301–251–5060.

Test results and analyses do not constitute product approval or endorsement by the National Institute of Justice, the U.S. Department of Justice, the National Bureau of Standards, the U.S. Department of Commerce, Aspen Systems Corporation, or the laboratories that conducted the equipment testing.