



NMRA Recommended Practice	
Electrical	
May 14, 2024	RP-9 DRAFT

1 General

1.1 Introduction and Intended Use (Informative)

5 These RECOMMENDED PRACTICES address electrical matters that are not mandatory for achievement of NMRA Conformance Warrants as required by NMRA STANDARDS for products electrical characteristics but provide details for various topics that have been found to be the best for interchangeability of operational products.

1.2 References

These NMRA RECOMMENDED PRACTICE should be interpreted in the context of the following NMRA STANDARDS.

10 1.2.1 Normative

- S-1.1 General – Proto Scales
- S-1.2 General – Standard Scales
- S-1.3 General – Scales with Deep Flanges
- S-9 Electrical

15 1.3 Terminology

Term	Definition
Line Operated Device	Any device operating on local common current, for instance in Canada and the United States, in most locations, 110-120 volt 50-60 Hertz (Hz) Alternating Current (AC)

2 Recommended Practices

2.1 Line Operated Devices (See Notes 1, 2, and 4 below)

- 20 A. Devices shall be certified by the Underwriters Laboratory (UL) or Canadian Standards Association (CSA) in North America or the 'CE' mark shall appear on products traded in the extended Single Market in the European Economic Area (EEA). The 'CE' mark signifies that products sold in the EEA have been assessed to meet high safety, health, and environmental protection requirements including both line and low voltage electrical safety mandates.
- 25 B. Devices provided with a National Electrical Manufacturers Association (NEMA) "U" ground plug, or equal, shall have a ground terminal capable of carrying 30 amperes continuously.
- C. Speed controllers in power packs shall have a minimum operating range of 180 degrees if rotary, or 3 inches if linear.
- D. Direct current (DC) power supplies and packs for propulsion use shall produce between 7 and 27 volts while delivering rated current.
- 30 E. Alternating current (AC) power supplies and packs for propulsion use shall produce between 18 and 27 volts while delivering rated current.

- F. The maximum resistance of rheostats (if any) shall be marked on the case of power packs or listed in the instruction manual.

2.2 Motors for Propulsion Service

- 35 A. Nominal torque or power, and speed data shall be supplied with motors.
- B. The manufacturer's recommended maximum continuous current rating under conditions of poor ventilation shall be supplied with motors.

2.3 Powered Equipment (See Note 3 below)

- 40 A. Powered equipment shall operate at a speed within 20 percent of their nominal maximum prototype speed up to 125 miles per hour (MPH) (See Note 5). Scale speed may be determined across distance over time when distance is divided by the appropriate scale factor, the proportion found in NMRA STANDARDS S-1.1, S-1.2, and S-1.3 under the following conditions:
 - 45 a. The input voltage shall be the maximum voltage stated in Table 2.3 of NMRA STANDARD S-9.1 appropriate to the scale being used.
 - b. The unit shall be running "light" after a run in and lubrication according to the manufacturer's instructions, on level, tangent track of sufficient length to measure speed laid at minimum gauge.
- 50 B. A low resistance connection shall be provided from motor terminals to the wheels without relying on axle to side frame contact, or truck bolster to body bolster contact, or drawbar to pin contact.
- C. Couplers (including metal replacement couplers) of a model locomotive shall be insulated.

2.4 General

- 55 A. Tenders used with model steam type locomotives shall have the body insulated from both rails.
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Notes

- 60 1. Line operated devices shall be tested with "resistive" loads and an input of 115 volts, 60 Hz, or the commercial line voltage and frequency for the country in which they are initially to be sold. Power packs shall be tested with the speed controls set at maximum.
- 2. Throughout this RECOMMENDED PRACTICE, alternating current quantities are expressed as Root Mean Square (RMS) values and direct current quantities are expressed as Average Values. These are the values measured by conventional meters.
- 65 3. The term "insulation" shall mean that not less than 100K ohms resistance shall exist between the points specified as measured with a conventional ohmmeter.
- 4. Hertz, or Hz., has replaced "cycles per second" as the name of the basic unit of frequency
- 5. High Speed Trains (HSTs) such as the French Tres Grandes Vitesse's (TGVs) or Japanese Shinkansens may be excepted from recommended maximum speed parameters as it may be unlikely to perform scale speed tests accurately or practically.

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3 Document History

Date	Description
May 1973	Recommended Practice 9 (RP-9) Approved by the NMRA Board of Directors
May 2024	RP-9 changed to current format. Editorial changes made throughout

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