

Introduction (Informative)

This document describes the physical layer for carrying NMRAnet over a Controller Area Network (CAN) link or links. It describes nothing else. Seriously, if you want to know about Ethernet, or modular standards for power connections, or how to make really good fried chicken, look elsewhere.

Intended Use (Informative)

Suitable NMRAnet nodes can be connected by cables to form a linear CAN bus with optional short stubs. Users can expect to be able to form networks within limitations:

- Total cable length of 1000 ft / 300m; stub cables count double their length in that total; nodes count as 20 ft / 6m in that total
- Never less than 1 ft / 30cm of cable between nodes, nor between a stub connection and a node.
- No more than 50 nodes connected

NMRAnet nodes generally have two RJ45 modular connectors and can be daisy-chained together with suitable computer-network (“Ethernet”) cables. A CAN terminator is installed by the user at each end of the main bus.

A limited amount of power can be distributed via the cable, allowing up to five nodes drawing 100mA each to be powered over a 10 ft / 3m length of the common bus.

References & Context (Normative)

In this document

- “RJ45” refers to the miniature 8 position unkeyed plug and jack defined in sections Section 6.1.1.3 and Section 6.1.1.4, respectively, of the TIA-968-A specification.
- “UTP” refers to CAT-3 or better cable as defined in TIA/EIA-568-B.2 or the successor TIA/EIA-568-C.
- “CAN” refers to the electrical and protocol specifications as defined in ISO 11898-1:2003 and ISO 11898-2:2003 and their successors.

External certification of parts shall be accepted for conformance to these standards. Conformance with a later version of a standard shall be accepted as conformance with the referenced versions.

Physical Interconnection (Normative)

CAN connections between nodes shall be made using UTP cable. Connectors are not required, but if connectors are provided, there shall be a RJ45 plug on the cable and RJ45 jack on the node. The UTP cables shall contain either 2 or 4 pairs. The signal, conductor and pair assignments shall be:

(Table here)

If two or more connections are provided, all conductors shall be connected in parallel with connections rated for 1A current or better.

Voltages of up to 100 volts AC or either polarity DC on the reserved conductors shall not damage the node.

Data Transport (Normative)

Data shall be transferred using a CAN signal at 125kbps and CAN frames. The bit slew rate of the CAN signal, as transmitted, shall be less than 10V/microsecond and more than 4V/microsecond.

Supply of Power (Normative)

Node may, but are not required to, provide power to the cable. If they do, they shall provide at least 9VDC and no more than 15VDC from zero current draw up to their specified maximum current. Their specified maximum current shall not exceed 1A. The specified maximum current shall be permanently written on the node in a location visible to the user. (needs a “shall withstand” clause for applied external voltage?)(needs a “shall withstand short circuits on the output ...”?)

Consumption of Power (Normative)

Nodes may, but are not required to, draw power from the cable. Nodes shall be labelled with the maximum current they draw. Nodes shall not draw more than 100mA when powered at any voltage from 7.5VDC to 15VDC. Nodes shall operate properly with a supply voltage of 7.5VDC to 15VDC on the cable. (needs a “shall withstand” clause for applied external voltage?)(needs a discussion of isolation, ala Dick's vampire diodes?)