

How do I check the health of my NMEA 2000 cabling before powering my network?

Maretron recommends using an N2KMeter to properly check NMEA 2000 network health when powered and devices are operational. The N2KMeter can also provide a real-time detection of powered device communication issues such as excessive error frames, bit timing anomalies, device level bandwidth usage, and more. The N2KMeter is the official technician's assistant to quickly locate NMEA 2000 network issues. This article's purpose is to cover the basic diagnosis using a Digital Voltage/Ohm Meter (DVOM) to systematically check all connections of your NMEA 2000 network are trouble free.

The next steps will help identify potential cabling issues before component damage can occur. You should always perform the following steps to ensure the cabling concerns are excluded before diagnosing detected anomalies on your operational NMEA 2000 network.

The pin assignments for NMEA 2000 Micro, Mid, and Mini size cabling is as follows:

Pin 1: Shield (Bare)

Pin 2: NET_S (+12VDC, Red)

Pin 3: NET_C (Ground, Black)

Pin 4: NET_H (CAN High, White)

Pin 5: NET_L (CAN Low, Blue)

First, visually check the following items on your NMEA 2000 network:

- 1) All connections are properly seated and secured in the NMEA 2000 network.
- 2) The NMEA 2000 network has a fused link connected to the Power Tap tee
- 3) (If you're using a Micro/Mid yellow power tap, verify that the +12VDC connection is the brown and white wires, and the blue, gray, and black wires are all connected to DC- or your DC Ground).
- 4) Verify the NMEA 2000 network has two terminating 120Ω resistors connected on opposite ends of the entire network.

The next few steps will require the use of a Digital Volt/Ohm Multi-Meter (DVOM).

Turn off the NMEA 2000 network power, remove the two terminating resistors (120Ω)

- 1) Proceed to measure each wire combinations (white/red, white/blue, blue/red, etc.) and verify that no shorted wires readings show on the DVOM.

- When the two network termination resistors are removed, and the power tap is connected. The DC negative and the bare shield wire will show a resistive value on the DVOM. If you see any resistive values or cable shorts the cabling requires further diagnosis. Do not proceed until the resistive short are removed from your cabling system.

Note: Technicians generally use Maretron's Field attachable connector (FA-CM-ST) to find wiring issues in NMEA 2000 systems, image shown in Figure 1.

- 2) Attach the termination resistors and connect the unpowered power tap to the NMEA 2000 network.
- 3) Turn on your systems DC power supply. Change the DVOM dial to VDC. Connect DVOM probes to pins 2 (Red wire) and 3 (Black wire) to confirm 12VDC shows. Move to various locations of your NMEA 2000 network to test that network power is consistently 12-13.5 VDC.
- 4) Turn off the NMEA 2000 network. Remember to keep all devices disconnected. Now take a measurement for resistance turn your DVOM dial to Ω setting. Start to verify the following resistance measurements: 0Ω between pins 1 (Bare) and 3 (Black) of all NMEA 2000 drop connectors (This verifies that the shield is connected to ground). illustrated in Figure 2:

Note: The shield should be grounded at single location of the NMEA 2000

network.

5) Disconnect the power tap connection therefore splitting the network into two halves. Measure the resistance between pins 1 (Bare) and 3 (Black) of a network connector. This measurement should be a very high resistance (OPEN). Reconnect the shield after this measurement is made.

6) Reconnect the Power tap and next measure about 60Ω between pins 4 (White wire) and 5 (Blue wire) of all drop connectors (This action verifies that both terminators properly to the NMEA 2000 network. If your measurement is 120 ohms, then only one terminator is connected. If you measure a very high resistance, then no terminator is connected. The two terminators connected measurement is shown in Figure 3:

NMEA 2000 Network Rules:

- 1) The two terminators are installed at opposite ends of the “trunk line” of the network.
- 2) Each node has a drop from the trunk of no more than 6 meters
- 3) The sum of the length of all drops is less than 78 meters.
- 4) The maximum cumulative network length from device to device is as follows: 100m Micro/Mid, 250m Mini cable.

If you have gone through each of these steps free from issue, try adding components one by one to the NMEA 2000 network to bring communications on the network up slowly.

(NOTE: there must always be at least two components in a NMEA 2000 network (or any CAN network) for data communication to take place.

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