B&G Service

In case of instability or missing data on the NMEA 2000 network, or if you just wish to check the network, you can do this using a multimeter and a cable.

The information below is for advanced users. Below are some links to other helpful NMEA 2000 information:

Lowrance NMEA 2000 Network Basics - Video

NMEA 0183, NMEA 2000, or Ethernet?

NMEA 2000 - Standard Layouts

Parts required

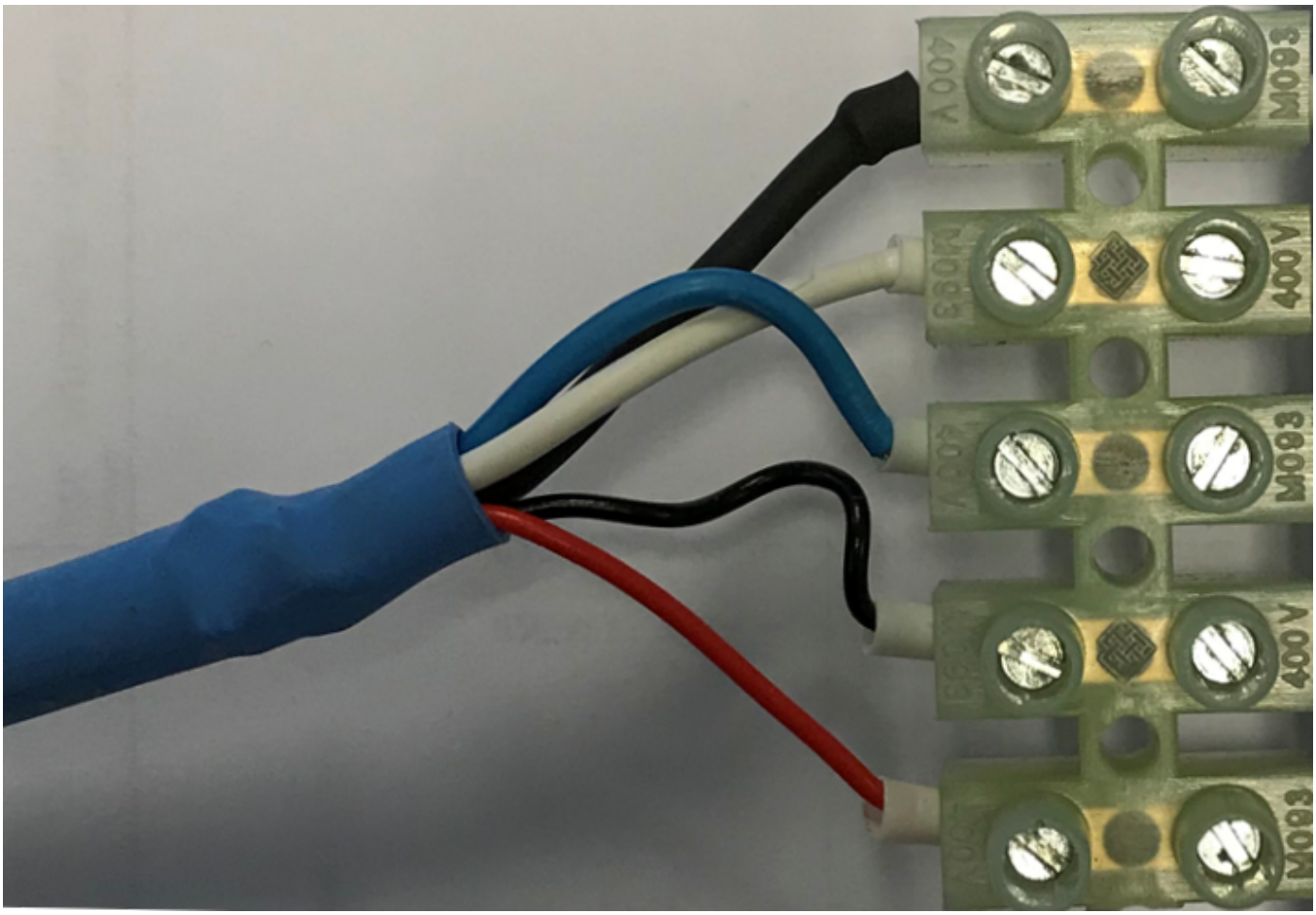
N2KEXT-6RD	1.8 m NMEA 2000 cable, used as either drop-cable or backbone cable
Multimeter	Capable of measuring Resistance (Ohm) and Voltage (DC 0 - 24 V)
Electrical connector block	

1. Take the 1.8 m NMEA 2000 cable and cut off the female connector (it is only possible to connect the Male connector to a T-Connector on the NMEA 2000 system backbone)
2. Remove approximately 5 cm of the outer cover
3. Remove the outer aluminium foil shield and the braided wire from around all the wires
4. Remove the aluminium foil shield from around the red and black pair of wires (power)
5. Remove the aluminium foil shield from around the white and blue pair of wires (data).

You should now have five wires as follows:

Colour	Name	Function
Bare	Shield	Drain
White	NET-H	Signal
Blue	NET-L	Signal
Red	NET-S	Power
Black	NET-C	Ground

Now connect these wires to the connector block as shown below:



Testing an NMEA 2000 Network

As described in the separate Guide ‘How to design and build an NMEA 2000 network’, there should be three unused T-connectors located in the network:

- One is for diagnostic purposes, directly next to the power insertion point
- The other two are for diagnostics purposes located at each end of the backbone.

If not present, please install these now.

Tests

Termination check

1. Switch-off the power to the NMEA 2000 network
2. Connect the test cable to the diagnostic T-connector next to the power insertion point
3. Using the multimeter, measure the voltage between the RED and BLACK wires. This should be zero volts
4. Measure the resistance between the WHITE and BLUE wires. This should be approximately 60 Ohms:
    - Resistances less than 60 Ohms (for example 30 or 40 Ohms or even lower) indicates there are too many terminators installed on the network. Another possibility could be a resistive short caused by water in a connector somewhere.
    - Very high resistances (open-circuit readings) or 120 Ohms could indicate:
        - Very high resistance (open-circuit) - possibly no terminators installed;
        - 120 Ohms suggests only one terminator installed.
5. Before continuing with any further tests, ensure the network resistance value reads approximately 60 Ohms. Incorrect network termination will cause data communication problems.

Power Check

1. Switch-on the power to the NMEA 2000 network
2. Note: with NMEA 2000 networks, it is possible to connect and disconnect (hot-swap) cables/devices with the power on
3. Connect the test cable to the diagnostic T-connector next to the power insertion point
4. Measure the voltage between the RED and BLACK wires. This should be 12 V approximately. Typically, on-board vessels, this will be around 13.8 V with fully charged batteries. Make a note of this value

5. This value should never read 24 V! The voltage limits for powering an NMEA 2000 network are 10 – 16 V DC. In practice, you need at least 11 V.
6. Next, move the test cable to the diagnostic T-connector at the beginning of the NMEA 2000 network:
    - Measure the voltage between the RED and BLACK wires. This should read higher than 10 V. Make a note of this value.
7. Move the test cable to the diagnostic T-connector at the end of the NMEA 2000 network:
    - Measure the voltage between RED and BLACK wires. This should read higher than 10 V. Make a note of this value.
8. You can use this table for entering the values:

	Measurement Point	**Voltage**
1	Power Insert Point	
2	Start of Network	
3	End of Network	

9. Now compare the voltage measurements (2) and (3) recorded in the table above. They should be reasonably close to each other; for example 12.5 V against 12.7 V. Any value within 1.0 V is okay.
10. If you have a difference of more than 1 V, for example 13.2 V against 11.2 V then move the power insertion point. See the Guide: 'How to design and build an NMEA 2000 network' for instructions how to find the best power insertion location.
11. The goal is to achieve a 'balanced' network for power in regards to the 'Branch A' (to the left of the power point) and 'Branch B' (to the right of the power point)
12. Systems with measured voltages under 10.5 V will experience data communication errors and devices reporting 'Low Voltage' alarms for the network. In practice, a value of 11 V is the minimum desired network voltage
13. Compare the recorded voltage measurement (1) with (2) and (3). The difference between (1) to (2) and/or (3) should not exceed 2

Volts. If this voltage is exceeded, then the backbone is ‘loaded’ too much with either too many devices or devices with a high LEN value. It might be necessary to connect an extra power point (disconnect the BARE wire from BLACK) or use MID or Medium backbone cables.

Shielding Check

1. Switch-off the power to the NMEA 2000 network
2. Connect the test cable to the diagnostic T-connector next to the power insertion point
3. Measure the resistance between the BARE and BLACK wire. This should read 0 Ohms or very close to 0 Ohms
4. If you measure a value higher than 1 Ohm or no resistance at all, there is either a bad connection between the BARE and BLACK wire or no connection at all
5. Repeat this measurement at diagnostic points at the beginning and end of the NMEA 2000 network.
6. These measurements should be equal to the first measurement.
7. The connection of the shield is very important to provide adequate shielding around each NMEA 2000 cable. It significantly reduces any electronic disturbance influence on the NMEA 2000 network.
8. Only make one connection between the BARE and BLACK wire. Do this at the power insertion point. If using a Navico power cable from the NMEA 2000 Starter Kit, you do not have to make this as this is already done in the Navico power cable
9. Never connect the bare wire on more points to the black wire. This creates ground loops, which can create many problems. Be careful to avoid this when inserting a second power point using the Navico power cable. In this case, use a normal NMEA 2000 cable for the additional power point, cut-off the female connector, strip the wire and only connect the RED and BLACK wires to the same power source as used for the original power insertion point.
10. Never connect the bare wire to the vessel ground. Again, this may create ground loops. Connecting it to black (also known as the

negative or minus terminal) is very different to the ship's ground.

11. Never use more than one power source for powering the NMEA 2000 network if you use multiple power insertion points. All power insertion points should be powered from the same source.