ELECTRONIC INNOVATION Inc.

DeviceNet Trouble Shooting Guide

Adapted from an article by Geoff Jones, SST

Some of the common network problems that can be experienced in any CAN based network (or any network for that matter)

- Faulty devices
- Opens & shorts in the network wiring
- Faulty connectors or cable
- Electrical interference
- Incorrect grounding or broken shield
- Signal distortion & attenuation
- Faulty connectors

It has been our experience that the most common failure point in a DeviceNet system in a harsh environment are broken DeviceNet Tees. The EII hardware is built with input and output DeviceNet and Auxilliary Power connectors in order to eliminate as many Tees as possible. The wiring inside the Tee breaks internally, and looks perfectly normal visibly. This will cause intermittent problems, possibly throughout the entire system.

Some additional problems that are specific to DeviceNet:

- Missing terminators
- Excessive common mode voltage
- Excess power consumption or cable length
- Faulty connectors or loose terminal blocks
- Low power supply voltage

Troubleshooting Check List

1. Check Network Power

- Measure the power supply voltage at each device. If there are only EII nodes on the system the voltage can be as low as 9Vdc. If there are DeviceNet nodes from other manufacturers on the system they will require a minimum voltage of 11 VDC.

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- If the voltage falls below the minimum limit, check for faulty or loose connectors and verify power system design calculations by measuring current flow in each section of cable with an ammeter

2. Check the Termination Resistance

- With a standard ohmmeter measure the resistance between CANL and CANH (the blue and white wires respectively).
- If the value is much greater than 60 ohms there could be a break in one of the signal wires or missing network terminator(s)
- If the value is less than 50 ohms look for a short between the network wires or extra terminating resistor(s)

3. Check the Shield Integrity

- Connect a DC ammeter (16 amps max) from DC common to the shield at the opposite end of the network from the power supply •There should be some current flow
- If there is no current, the shield is broken or the network is improperly grounded
- If the power supply is in the middle of the network, do this test at each end
- This test can also be performed at the end of each drop if practical

4. Check the Common Mode Voltage

- Shield must be continuous and have no current flow in it (tested previously)
- Measure and record the voltage between the shield and DC common at each device
- The maximum difference should be < 5V between any two devices

5. Check for Ground Loops

- Break the shield at a few points in the network and insert a DC ammeter
- If there is current flow, the shield is connected to DC common or ground in more than one place, creating a possible ground loop.

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6. Check Network Communications

The Network Status LED included in many products is an excellent diagnostic tool for this purpose.

- When first turned on the Status LED should turn red for half a second and then green for half a second, indicating the module has executed the internal self tests correctly.
- If the node is the only node on a network, the light will stay off
- If there is more than one node on the network, the LED should be flashing green on all devices, indicating that they are existing on the network at the same baudrate.
- If the LED on all or some of the nodes turns solid red, this indicates a communication fault possibly incorrect baud rate, or a duplicate MAC ID.
- If the LED turns flashing red, this usually indicates a poor electrical connection on the power or CAN lines.
- The LED will turn solid green when it is successfully allocated by a master scanner.

7. Bus Division

If the troubleshooting by analysis method does not yield any results, there is always the Low-tech Approach

- At the furthest end of the network from the scanner, begin disconnecting parts of the network and watch where the fault goes
- This method does not work well for problems such as excessive common mode voltage, ground loops, electrical interference and signal distortion because disconnecting part of the network frequently solves the problem
- If the network was previously operating, ask the question "what has changed?"

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