North Hills Model DBT100A 1553 Network Tester

BETA TRANSFORMER TECHNOLOGY CORPORATION
A subsidiary of Data Device Corporation

Application Note

AN/255

OPERATION

To use the tester, there are five press-to-test buttons. Testing only occurs when the appropriate button is depressed. The button should be held down for approximately five seconds to allow the test circuit to stabilize to its final determination. It is suggested that the tests be performed in the sequence S1-S5 for unambiguous pass/fail meaning. The five buttons are:

S1. Stub-to-shield sort? - Go/No-go LED. This is a DC insulation resistance test. Any resistance between conductors and shield less than 50K Ohms will constitute a short-to-shield. It can also be used with the bus short-to-shield test to differentiate between bus and stub failures. This test will only detect shorts-to-shield on the stub or cable it is connected to. This test cannot be used in systems which have a DC path-to-shield/ground (ie. MACAIR buses). These buses will show a stub conductor-to-shield short on this test. For these systems a stub conductor-to-shield short will manifest itself as a bus conductor-to-shield short (S3) and a bus terminator fault only on the faulty stub.

S2. Stub Open? - DC resistance. Measures DC resistance from 0 to 199.9 Ohms (the value is displayed on the LCD). This function is useful for continuity testing. When used on the stub cable, this will test for continuity of the stub cable and the presence of the transformer. The value will be the cable resistance plus the transformer winding resistance. It will typically be between 1 and 5 ohm. You can detect an open cable, connector or transformer winding. On the bus, readings can be compared on the "A" and "B" buses. Resistance values for total bus measurements should be in the 4-to-80 Ohm range, depending on the length of the bus and the number of stubs. Each stub is roughly equal to a 120 ohm resistor in parallel with the terminator, ie. a 20-stub bus without terminators will have a resistance of approximately 6 Ohms (120/20) plus the cable wire resistance.

S3. Bus terminator open? Short? - Go/No-go LED. This mode tests for shorts and opens on the conductors. Bus and stub failures can be differentiated by first testing the stub (see Step S2 above). It can test for open, shorted or missing terminators from a stub port.

S4. Bus-to-shield short? - Go/No-go LED. This function tests for shorts from the high or low conductor to shield on the bus cable. You test from a stub and detect shorts-to-shield on the stub or a short-to-shield on the bus. To differentiate you must use the stub short-to-shield test (See Test S2 above), which only tests for stub-to-shield shorts. If Test S1 is passed and Test S3 fails, the short is on the bus. If both tests fail, the short is on the stub.

S5. Phase test/crossover- Go/No-go LED. This test requires the connection of the remote unit to another stub cable. The test determines if there are phase reversals (wiring crossovers) of the conductors between the remote unit and the tester.

The first step in testing a network is to establish a good stub. To do this, connect the tester main unit to a convenient stub, preferably one of the end stubs, and perform Tests S1 through S4. If a failure is detected it is best to correct that problem before proceeding to the next test, since the failure may give misleading results on subsequent tests. Once this stub has passed Tests S1 through S4, remove the main unit and replace it with the remote unit. Turn the remote unit on. Now connect the main unit to the next stub to be tested and perform Tests S1 through S5. If Test S5 passes, then the phasing on both stubs and the bus between them is good. Leaving the remote unit on the first stub, continue testing the remaining stubs.

Note: It is important to perform Tests S1 through S5 in sequence and to fix each failure as it occurs (rather than continuing the testing), to avoid trying to interpret misleading results on subsequent tests.

In the "Phase test/Crossover test," the main unit interrogates the remote, which in turn responds, as indicated by the XMT LED on the remote lighting. This response signal is detected by the main unit and phasing is checked. If the test passes, it shows that not only is the phasing correct but also the two transformers, in the loop between the main and remote, are good.

TROUBLE SHOOTING HINTS

For ringing out a bus for the first time after installation or rework the best way to start is as described above. Start at one end of the bus and work your way to the end fixing each fault as it is detected. Most faults will be in the connector terminations and splices, if any. It is not uncommon for bus A and bus B to be interconnected.

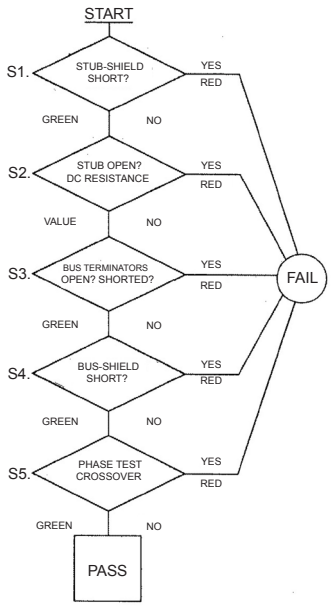

Fig. 1. Test Sequence

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If the bus has been working and suddenly is not it is not likely to have a phase test failure (S5). This does not mean you

should not perform this test because you can still get useful information from the test. In general you will know which part of the bus and which stubs are involved in the problem. Faults on the bus are best isolated and located by a process of successive elimination. Put the response unit on a working, uninvolved stub not located between the involved stubs of the bus and start with the tester at the suspected problem stub. Perform tests S1 through S5 fixing any failures found. Repeat this on the other involved stubs. When both/all involved stubs pass all tests put the remote unit on one of involved stubs and test the other involved stubs with the main unit. If/when these tests pass you know the bus is OK. If system problems persist after all involved stub problems have been corrected and the tests passed, the problem is either in the equipment or the involved stubs have not been fully/correctly identified.

When the number of involved stubs is large it is indicative of a bus fault rather than a stub fault. In this case the fault can be localized by successive approximation, successively halving the bus. i.e. put the tester on the middle stub then half way to either end and keep splitting the distances in half until you have narrowed the location of the fault to a segment between two adjacent stubs. It can be very helpful to segment the bus by disconnecting all the feed through connectors on the bus itself. Don't forget though that these segments will have only one or no terminators in place. The cable itself can be further checked by using the S2 Ohmmeter function to check for continuity and or shorts (make an adapter cable with pigtails and alligator clips to access the connector contacts as desired).

Note - when measuring continuity a short will read 1 Ohm. Also, bus cable runs about 26 Ohms/ 1000 ft. so a 100 ft. bus conductor will have 2.6 Ohms resistance and a 5.2 Ohms resistance for the loop.

TABLE 1 - TEST RESULTS, BASIC DATA BUS NETWORK TROUBLESHOOTING

Fault	Test Buttons on Main Unit (Press and hold for 5 seconds)				
	S1 Stub-shield short?	S2 DC resistance stub open?	S2 DC resistance stub open?	S4 Bus-shield short?	S5[1] Cross over phase?
Stub conductor to shield short	Fail	-	-	-	-
Stub open, conductor or transformer	-	Meter out of range[2] (Fail)	-	-	-
Bus conductor to shield short	-	-	-	Fail	-
Bus conductor open	-	-	Open (Fail)	-	-
Terminator open	-	-	Open (Fail)	-	-
Terminator open	-	-	Short (Fail)	-	-
Terminator missing	-	-	Open (Fail)	-	-
Phase reversal/hi-low swap	-	-	-	-	Fail
Open coupler transformer (Equipment side)	-	Meter out of range2 (Fail)	-	-	-
Open coupler transformer (Bus side)	-	-	Open (Fail)	-	-
horted coupler transformer (Stub Side)	-	1.0-1.5	-	-	-

1. The crossover/phase test requires the connection of the remote unit to another stub cable.
2. The number one will appear on the far left of the DBT100A tester display screen.

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