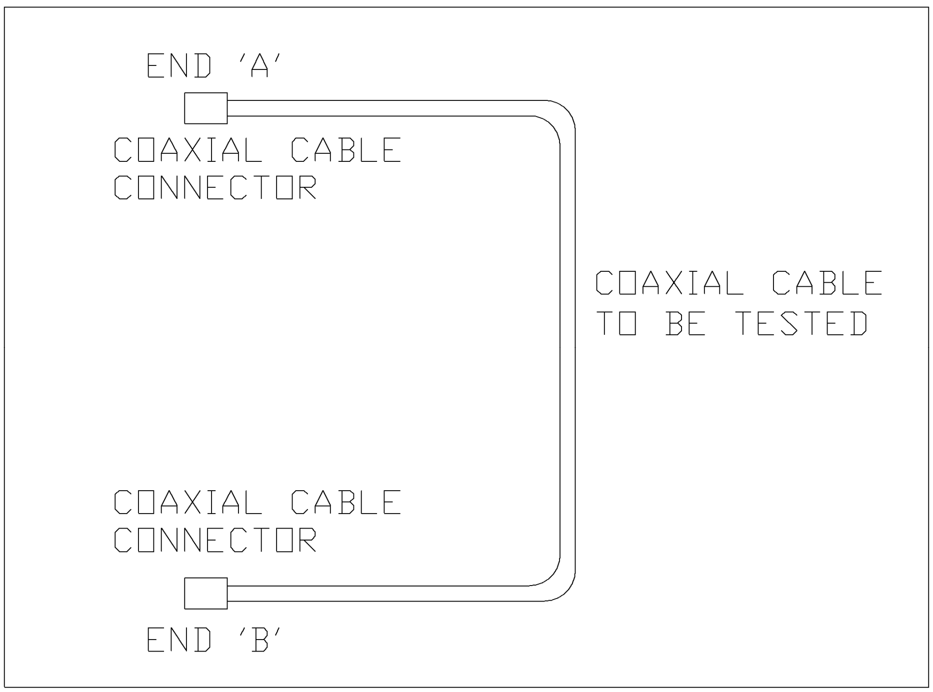
MTDR COPPER CABLE TESTING PROCEDURE

Data Systems Performance Engineering LLC uses the following procedure to test coaxial cables (RG-6U, RG-11U, RG-59 U, etc). This document is not intended to be training material for metallic coaxial cable testing.

Equipment needed:

Laboratory grade Metallic Time Domain Reflectometer (MTDR)
Coaxial cable short



Step 1. Assure that the MTDR is set up for the particular cable to be tested. The most important values to be determined are cable characteristic impedance and velocity of propagation. Most MTDR units are factory set for testing 50 ohm cable and adjustments may have to me made if other impedance cables are used. If velocity of propagation is not set correctly the measured cable length or measured distance to a fault indicated on the MTDR will not be accurate. There may also be other cable values to be determined and set into the MTDR.

Step 2. Disconnect BOTH ends of the cable to be tested. Applying a voltage to the MTDR output connector may damage the MTDR. Measurement through several coupled connections may not be accurate due to reflections and insertion losses at the connections. Each cable length should be tested separately.

Step 3. Connect end A to the MTDR. Turn on the MTDR. The MTDR should indicate a good open condition at end B (wavehape goes positive vertical). Gently flex the cable as it goes into the coaxial connector and look for changes to the launch waveshape. If the launch waveshape changes at all, the connector is bad. Look down the length of the cable. No faults should be indicated. Observe the cable length measurement from the MTDR display.

Step 4. Apply the short to end B. The MTDR should indicate a good clean short condition at end B (waveshape goes negative vertical). Gently flex the cable as it goes into the coaxial connector and look for changes to the launch waveshape. If the launch waveshape changes at all, the connector is bad. Look down the length of the cable. No faults should be indicated.

Step 5. Disconnect end A from the MTDR. Connect end B to the MTDR. Turn on the MTDR. The MTDR should indicate a good open condition at end A. Gently flex the cable as it goes into the F connector and look for changes to the launch waveshape. If the launch waveshape changes at all, the connector is bad. Look down the length of the cable. No faults should be indicated.

Step 6. Apply the short to end A. The MTDR should indicate a good clean short condition at end A. Gently flex the cable as it goes into the coaxial connector and look for changes to the launch waveshape. If the launch waveshape changes at all, the connector is bad. Look down the length of the cable. No faults should be indicated.

If anomalies are indicated along the displayed trace that is the cable length there may be a problem with the cable. An anomaly can be a crushed dielectric, a problem with cable manufactured quality, inadequate bend radius, a broken center conductor, or many other issues. If the MTDR is properly calibrated for the cable being used, the exact distance of the anomalies from the launch point can be calculated. One reason for testing the cable from BOTH ends is that fault indications can be reflections and not true faults; if the displayed anomalies move when moving the cable end connections to the MTDR the fault is usually genuine. For example, an anomaly appears 20 feet from the end A MTDR launch point on a 100 foot cable. When end B is connected to the MTDR that anomaly should appear to be 80 feet from the launch point. If it persists in staying at 20 feet from the MTDR launch point it is most likely a reflection.

Changes in waveshape to open or shorted end connections when flexing the cable end usually indicate a defective connector installation. The connector should be removed and a new connector installed.

It is important to use a high resolution MTDR to test short lengths of cable (under 2000 feet). If a low resolution MTDR is used, particularly on short cable lengths (less than 25 feet) anomalies may not be recorded.

The table below indicates specifications for two laboratory grade MTDR units.

Specification	Mohr CT100	Tektronix® 1502C (no longer manufactured)
Risetime, ps* (20-80%, 10-90%)	100, 150 (CT100) 60, 100 (CT100HF)	130, 200
Pulse amplitude (into 50Ω load)	300 mV	300 mV
Sequential sampling rate	5 - 250 kHz	5 kHz
Sampling resolution	16 bits	8 bits
Horizontal scale	0.003 - 200 ft/div (0.001 - 50 m/div)	0.1 - 200 ft/div (0.03 - 50 m/div)
Horizontal range	5000 ft (1.5 km) (minimum)†	2000 ft (0.6 km)
Horizontal resolution	0.003 in (0.008 cm)	0.05 in (0.12 cm)
Vertical scale	0.004 - 500 mρ/div	0.5 - 500 mρ/div
I/O options	USB host/client 10/100 Ethernet	Thermal printer optional RS-232, Ethernet
Data storage	Thousands of traces	Temporarily store single trace
Network integration	10/100 Mb Ethernet	None
Display	4.3" 480x272 backlit color TFT LCD	4.7" 256x130 backlit mono LCD

Specification	Mohr CT100	Tektronix® 1502C (no longer manufactured)
Processor	312 MHz 32-bit	6 MHz 8-bit
TDR trace display	Unlimited	2 traces
TDR frame rate	500 fps	25 fps
TDR digital filtering	smooth, subtract, derivatives, FFT	smooth