![AEA Technology, Inc. logo] **ÆA**
Testing Made Simple!
AEA Technology, Inc.

E20/20 Step TDR & Avionics TDR
Versions 2.1
Quick Start Guide

This is a generalized Quick Start Guide and is applicable to all versions of the E20/20 TDRs and Avionics TDR.

The E20/20 and Avionics TDRs are both "Step" Time Domain Reflectometers. "Pulse" type TDRs send out single pulses on the cable and listen for reflections from each pulse. A step TDR sends a continuous wave in sweeps. The advantages are no "dead zone" on any range, impedance data, faults in actual Ohms, loop resistance, and an overall clearer trace of faults and the cable's electrical end.

Before Starting

1. Charge the TDR using the AC wall adapter provided. If not charged, the TDR can operate from the AC wall adapter, DC Vehicle adapter, or using AA alkaline cells.
2. Check the cable's specifications for Impedance and Velocity Factor (VF) (aka: VP, VoP, or NVP).
3. Select the cable type from the "PICK/EDIT LIST" under the **Cables** Key or edit a cable type (**Bcksp**) close to cable type to be tested and add the new cable to the "PICK/EDIT LIST."
4. If you need help setting up the TDR for testing press the **Help** key, then ▶ at "Setup Wizard" and follow the instructions.

Menu Navigation Guide

→ - Menu Cursor moves vertically with ▼ ▲ keys
▶ - Enters/activates menu items marked by →
◀ ▶ Move through horizontal menu selections
0 – 9 – Used for alpha-numeric entries when required
ENTER – Use to accept a name or numeric entry
Bcksp – Use to delete a character or enter cable edit
ESC – Saves selections and exits to Measurement Screen or exits back one menu level

TDR Measurement Screen
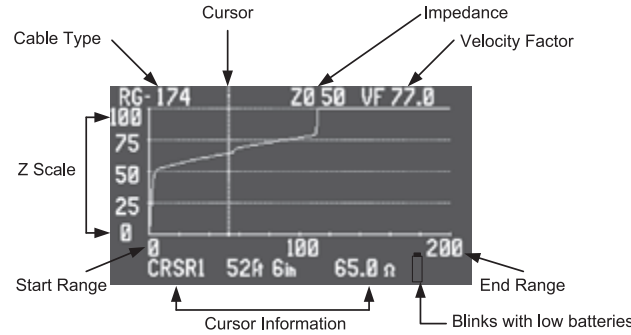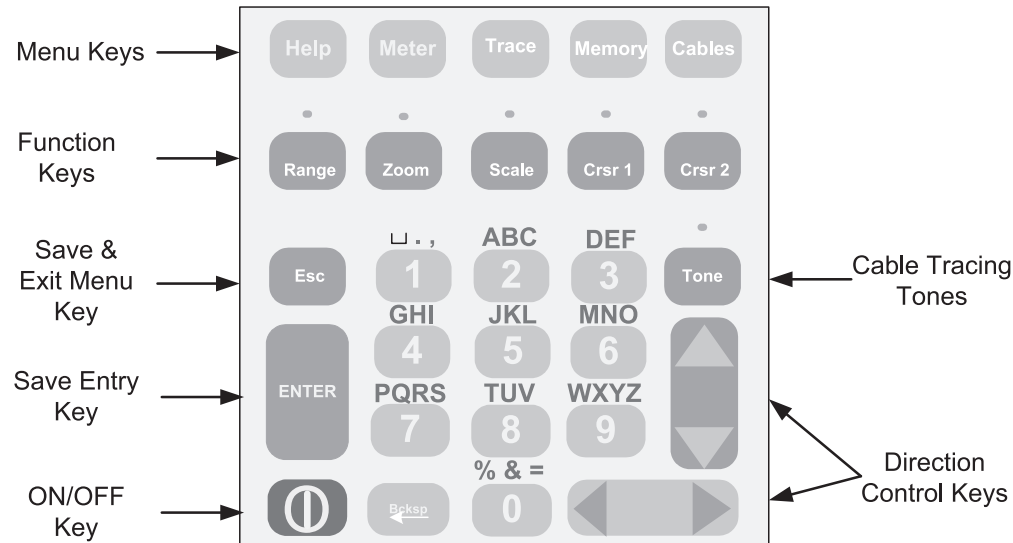
TDR Keypad

Function Keys

Function keys activate when pressed, have a green LED lit when active, and de-activate when pressed again. Some keys automatically de-activate others to make the ▲ ▼ & ◀ ▶ keys exclusive for their actions.

Range - ◀ ▶ Controls display range in set increments 10ft (2m) minimum to 20Kft (5Km) maximum.

Zoom - ◀ ▶ Controls zoom in/out range on the active cursor. Each ◀ press doubles the zoom on the cursor position until minimum range is reached. Each ▶ press restores the range one level until the original range setting is reached.

Z Scale - ▲ ▼ Controls the impedance scale in set values. Minimum is ± 10 Ohms on Z_0, maximum is 1KOhms. At lower values the Z_0 setting will be kept vertically centered in display.

Crsr 1 & Crsr 2 - ◀ ▶ Control each cursor's position in the display. Either cursor or both cursors can be used at the same time. The last cursor key pressed is the active cursor. The active cursor has its data and the differential data for the other cursor position displayed.

Tone – Activates a menu screen to select the desired tone frequency (warble, steady, or pulsed). Use standard inductive amplifiers (probes) to detect tones. For "Pocket Toners" using DC volts to activate the toner at the far end, the TDR will place 10VDC on the coax output.

Control & Alpha-Numeric Keys

ENTER – Saves and exits after name, number, or user action entries.

ESC – Saves menu changes and exits to the Measurement Screen or up one menu level.

Alpha-Numeric Keys – First press enters the number, Repeated presses cycles through the characters shown above the number. The "0" key cycles to more characters than are shown.

Bcksp – Erases the character to the left of the character cursor position. When viewing a table of items (Cables, Tones, etc) The Bcksp key initiates the editor.

User Tips

Setup for Measuring a Cable – Guided Setup
Press **Help** Key then ▶ to enter SETUP WIZARD and follow the on-screen guidance. Use ESC to accept current setting shown and move to next selection. Selections are:

Cable Selection
PICK/EDIT LIST – Choose a cable from the list directly or choose a cable and edit to desired cable type
MANUAL ENTRY – Create a cable (no list add)
VELOCITY SRCH – Determine Velocity Factor based on known distance to an event or end of cable
SAMPLE A CABLE – Sample a cable to determine its Velocity Factor

Units (of Measurement)
Feet or Meters

Range
10 to 20,000 feet (2 to 5,000m)

Start Distance
0 = TDR's connector. Enter value to shift plot range's starting point

Input Channel
Coax or RJ-45 pair desired (select models only)

Test Lead Null
ON – Subtracts nulled lead length from measurements
OFF – Starts measurements at Start Distance.
Use **ENTER** to measure a test lead and store for use when ON. Next press of **ESC** returns to the Measurement Screen.

Setup for Measuring a Cable – Un-Guided Setup
All steps listed below are not generally required. Use only the required menu keys and features needed. Menu keys can jump directly between menus and ESC saves the settings and returns to the Measurement Screen.

Select a Cable – Press Cable key and choose selection method per list shown in Setup Wizard above.

Measurement Settings – Press Trace key:
Z SCALE – Use ▼ ▲ keys to set. 20 to 1K Ohms
TRACE RANGE – Use ◀ ▶ keys to set. 10 to 20Kft (2 to 5Km).
START DISTANCE – Use ▶ key then numeric keypad to enter distance. 0 = TDR connector.
DISTANCE UNITS – Use ◀ ▶ to select feet or meters.
TEST LEAD NULL - ON – Subtracts nulled lead length from measurements. OFF – Starts measurements at Start Distance. Use ENTER to measure a test lead and store for use when ON. Next press of ESC returns to the Measurement Screen.

Input Channel Setting – Press Meter Key:
INPUT CHANNEL - ◀ ▶ to select COAX or RJ-45 pair (select models only). See Operator Manual for RJ-45 CHAN to pair guide for different standards.

Operational Tips

Position the cursor at left edge of any impedance change for the most accurate distance to faults or end of cable. See figure below and Cursor 1 positioning.


```
GENERIC-ANTENN Z0 50  VF 82.7
100
75
50
25
0
0        10        20
CRSR1  12ft 3in   52.2 Ω
```
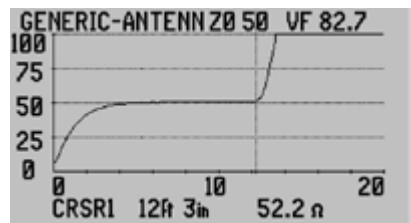
Velocity Factor (VF) – Published VF can be off by a small percentage and VF can change in a cable exposed to abuse, heat, moisture, etc. For the most accurate distance try to measure a sample cable length 10-50ft (3-15m). and use the SAMPLE CABLE feature in the **Cables** menu.

Velocity Search – Located in **Cables** menu. Use this feature to find a cable's correct VF if measuring an installed cable with known distances to an event or end of cable. Permits marking the distance to an event or end of cable with a cursor, then adjusting the VF using ▼ ▲ keys until the trace envent or end of cable is at that distance.

Dribble Up – A Step TDR phenomena where the DC loop resistance of a cable (2 wires of a pair or centre conductor and shiedl of coax cable) is added to the impedance measurement ofver length. The result is an upward slope in the trace depending on the loop resistance. See the Operating Manual for example slopes for different wire gauges, coax types and their loop resistance.

Zoom – Zooms on the active cursor. With **Zoom** active press the ◀ key to zoom down in range on an event. Zoom will stop when the shortest range (10ft or 2m) is reached. Press ▶ key to zoom out in range. Zoom out will continue until the original range setting is reached.

Saved Test Results are also Saved Test Setups – When testing or retesting a cable, it's not always necessary to perform manual setups. Recalling a saved test with the same cable type will result in resetting the TDR to the same testing parameters. After recalled a test result, press the **ESC** key to return to live testing and the instrument will used the Zo, VF, Range, and all other parameters of the selected saved test.
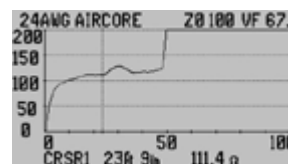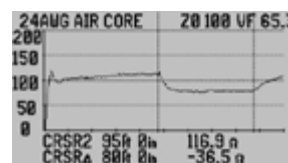
Example Traces
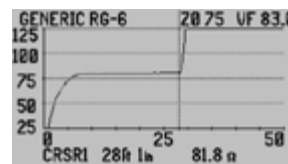
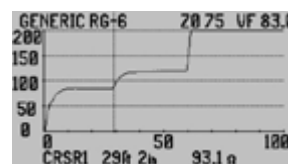75 Ω coax with slightly high impedance and open end.
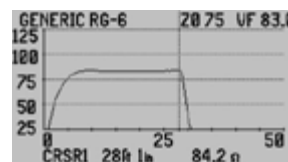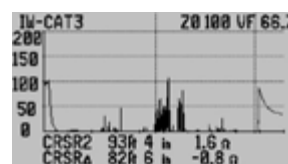

Same cable as above and shorted end

Twisted pair cable with bad splice and open end

Wet cable, coax or twisted pair, always dips trace to a lower impedance (Z).
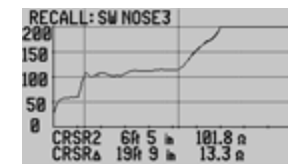

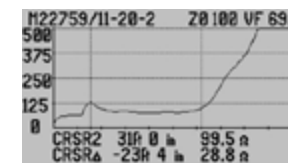Series resistive fault at cursor. Typical cause is corroded connection.

Intermittent fault or connection. Same for coax or twisted pair (distance undetermined)
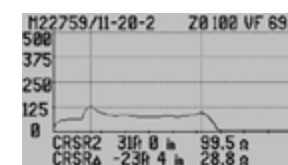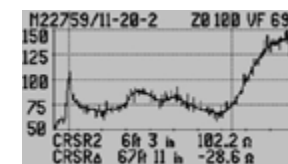
Example Aircraft Wiring Traces

50Ω test lead into single-wires in harness and open far end
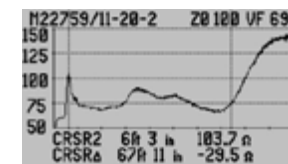

50Ω test lead into single-wire to airframe and open far end

Same single-wire to airframe as above and shorted to airframe at far end

Single-wires in harness with RF interference

Single-wires in harness with Noise Filter ON

Notes:

1. For RJ-45 channels to twisted pair wiring standards see Operating Manual, Appendix B.

2. Twisted pairs can be tested with Telco test leads, RJ-45 test lead, or BNC/F-to-Alligator Clips via coax port.

3. For detailed information on testing coax, twisted pairs and single-wires in a harness see the Operating Manual, Section 3.

4. To correct any operational issue perform a Soft Reset; hold ENTER key, press ON/OFF to turn ON, 1 second later release ENTER key.