



Advanced Systems Tester 900AST Series Coaxial Wire Testing



Technical Tip

December 2005
78-8135-6156-6-A

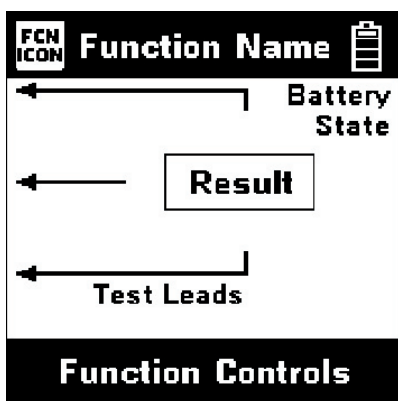
Setup for Use

Battery Requirement

The battery holder holds six “AA” standard alkaline batteries and should be installed prior to using the unit. Please see the 900AST tester manual or DVD for battery installation instructions. Always initiate a self-calibration after installing new batteries.

The battery symbol in the upper right-hand corner of the display gives an indication of the approximate battery capacity. Each bar represents one-quarter of the full capacity.

Front Panel



Test Leads

The test lead icons are shown on each of the measurement screens and appear after a function or test is selected. Each lead points to a color dot on the front label that corresponds to the actual test lead and test jack to be used. This on screen display is the connection diagram for the selected test. The active control keys are displayed on the bottom of the screen and act as a guide through setup and testing.

For TDR applications using the special coaxial TDR test lead(s), the test lead icons indicate which test jacks (also denoted by colors) to use.

Operational Help

For operational information, refer to the 900AST tester manual or “Help”  control key on the 900AST tester keypad. For technical service, warranty or repair questions, call 800 426 8688 (US and Canada) or contact your local 3M representative.

Keypad

The 900AST tester keypad has twelve yellow and red “Control Keys” and nine blue “Function Keys”. Additional blue keys on the keypad are reserved for future expansion and have no designation or current function.

Control Keys

Use the red and yellow keys to control and setup the 900AST tester and its functions.



Use the [Return] key to return to a previous step in a function.



Use the [Contrast] key to adjust the contrast or to turn the backlight on or off.



Use the [Save] key for storing TDR traces.



Use the [On/Off] key to turn the 900AST power on or off (also see “Power Down Timeout”).



Use the [Tab] key to select between different options.



Use the [Setup] key to change the setup of a function.



Use the [Help] key to get context sensitive help with any screen or function.



Use the [Enter] key to accept changes or move to the next step in a function. To insert a space to the left of the cursor press enter.



Use the [Up] and [Down] keys to scroll to different menu options or insert/delete characters when editing.



Use the [Left] and [Right] keys to select different options or move the TDR cursor

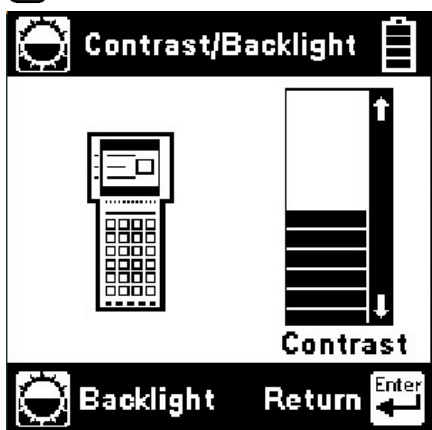
Contrast and Backlighting

Note: *Use of backlight decreases available battery capacity.*

Press the  key to display the contrast screen.

Use the  and  keys to adjust the contrast. Press the  key again to turn the backlight on or off.

Use the  key to return to previous screen.



Function Keys

Use the blue keys to select the different tests in the 900AST tester. The blue keys become number or letter keys when editing.

 Use the [Voltage] key to measure DC or AC voltage.

 Use the [Load] key to measure the current through a simulated load lamp.

 Use the [Resistance] key to measure resistance and access the 'Soak Test' and 'Contact Resistance' functions.

 Use the [Toolbox] key to access: Self Calibration, Stored Results, Special Resistance, and the Ohms to Distance Calculator

 Use the [Capacitance] key to measure the capacitance of a component or circuit.

 Use the [Tone] key to send interrupted tone for circuit identification.



Use the [RFL] key to find the distance to a resistance fault between two conductors or a conductor and ground.



This key is used for editing only.



Use the [TDR] key to activate the Time Domain Reflectometer.



Use the [Auto] key to activate automatic TDR trace analysis.

CAUTION

The 900AST tester is a tool for troubleshooting wiring problems. It is not designed for troubleshooting electronic circuits or instrumentation. The ohms, soak, contact resistance, special resistance and RFL functions generate a current limited (< 1 mA) 80V stimulus. TDR and Auto TDR functions generate high-energy electromagnetic pulses. Unexpected measurement results and/or damage are possible if applied to electronic circuits.

Circuit testing should be performed by personnel trained in electrical safety practices and in accordance with applicable safety standards.

Connecting to Coaxial Wires for Testing

Ensure that electrical power has been removed and components disconnected from the wiring to be tested before beginning wiring tests.

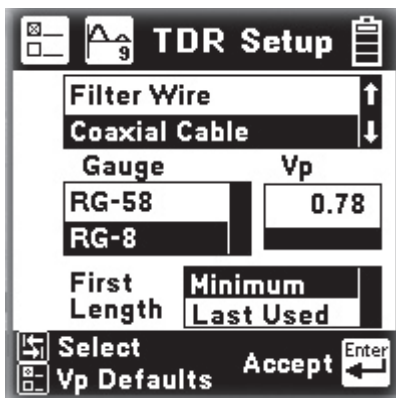
Note: For best operation, use the special coaxial TDR test leads supplied with your 900AST tester to perform coaxial wire TDR measurements.

The TDR test cable has a standard male BNC connector on the end. Plug the opposite end of the TDR test leads plug into the Red/Black and/or Blue/Yellow test jacks on the 900AST tester (one or more cables may be used depending on the desired TDR mode.)

Connect the end of the TDR test cable to the coaxial wire to be tested. Use a BNC adapter (if needed) to connect to the coaxial circuit under test.

TDR Setup

The TDR features a setup function that allows you to select the type of Coaxial wire to be tested.



From the TDR Menu, press the  Setup key to enter the TDR Setup.

Press the  select key and the  and  arrow keys to highlight coaxial cable for wire type.

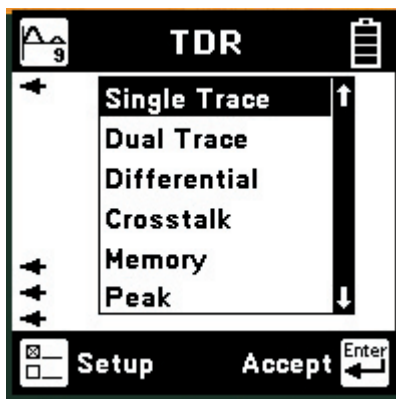
Use the  select key to move to the wire gauge box. Use the  and  keys to highlight the type of coaxial cable to be tested and select ‘minimum possible’ or ‘last used’ initial measurement length setting.

Note: *The 900AST tester maintains modified Vp settings in internal memory. Press the  key in the TDR Setup screen to restore original default Vp settings for all wire types.*

Use the blue numeric keys changes the velocity factor for the selected coaxial wire type or use the default setting.

Press the enter key  to accept changes and proceed.

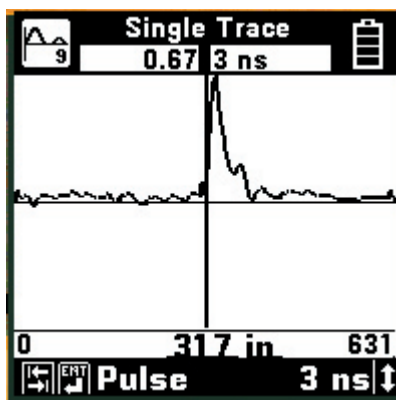
TDR Test Modes



Press the  or  keys to move to the desired mode.

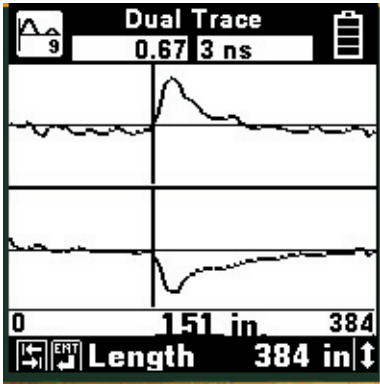
Press the  key to accept the highlighted mode and start the measurement.

Single Trace



Use the TDR Single Trace mode to test a single coaxial wire or circuit.

Dual Trace

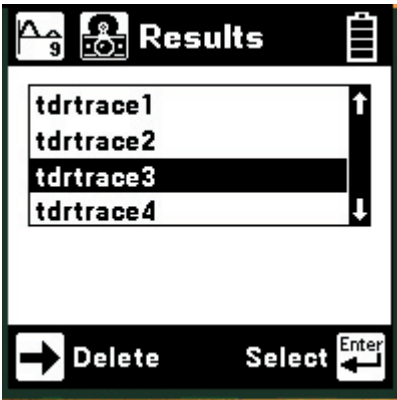


Dual Trace is used to compare two coaxial circuits at the same time (usually a faulted and a good circuit).

Connect the TDR test leads to the (Red and Black jacks) and connect the second TDR test lead set (Blue and Yellow jacks) to the reference circuit. This mode is valuable when testing a system with multiple coaxial wires serving the same system.

Memory

Memory mode is used to compare a circuit under test to a stored trace in memory. The first screen in memory mode will show a list of the ID numbers for all stored TDR traces. Use the  and  keys to highlight the desired stored result.



Press the  key to select the highlighted result and display the stored results list for that ID number by type (TDR), date and time.

You can delete individual stored results by pressing the  key.

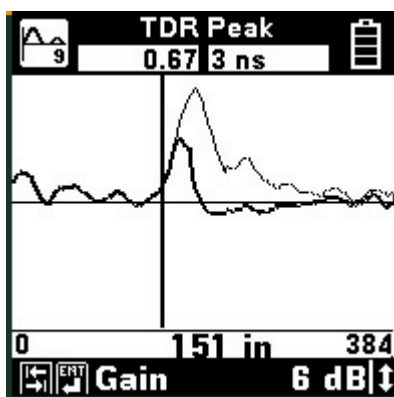
Use the  and  keys to highlight the desired stored result. Press the  key to display the stored trace on the bottom of the TDR screen and the “live” trace on the top. You may move the cursor by using the  and  keys.

The control settings for the stored trace can be viewed by pressing the  or  keys but the settings cannot be changed.

The TDR Memory function includes a Difference (‘Diff’) control, accessible from the memory screen by pressing the  key. The default is Difference Control OFF. Use the  and  arrow key to turn the Difference Control ON. Diff combines the live trace with the stored trace to show the difference in the two readings.

Peak

Use the TDR Peak mode to capture events that may be intermittent. The ‘live’ trace is displayed continuously. As a new maximum or minimum trace is detected, it will replace the previous one on the display.



If the circuit being tested is stable (no intermittent faults), then the minimum, maximum and “live” traces should appear as a single trace.

Note: *If any of the control values are changed, the peak histories will be erased and new values will begin to display.*

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Length allows you to set the distance (or span) from the left side of the screen to the right side. The left side of the screen is at the end of the BNC test lead and the right side is the farthest distance that can be displayed with the selected length



Use the  or  keys to move forward or backward through the TDR controls. Use the  and  keys to change the parameters for the control selected.

Available controls are Length, Filter, VP, Pulse, and Gain. Individual controls and their parameters are described in the 900AST Series Instruction Manual.

Move Cursor

Note: The 900AST tester automatically compensates for the length of the special TDR test leads. Zero distance is at the end of the test lead BNC male connector.

Always place the cursor to the left side of an event to mark its location. Use the  and  arrow keys to move the cursor across the screen. The distance from the 900AST tester to the cursor is always shown in the center of the distance bar. The left side of the screen is at the end of the test leads, and the right side is the farthest distance that can be displayed with the selected length.

TDR Save for Coaxial Wiring Comparison

Approximately 200 TDR screenshots can be saved. You can save only the active “Single Trace” TDR screen.

Select the TDR control parameters so the screen displays the trace as desired.



Press the  key.

The 900AST tester will display the Save Results screen as follows:

Use the blue keys to enter an alphanumeric ID. The ID may have up to twelve digits. Whether a number or letter is entered depends on how many times the key is pressed. As an example, if the Ohms key is pressed once, the number “3” will be displayed. If the same key is pressed twice, the letter “d” will be displayed.

Use the  arrow to position the cursor under the first space and enter the first character, and then use the  arrow to move the cursor under the next space.

Insert the next character and use the  cursor again to position the cursor to the next position.

Continue entering numbers or letters in this manner until all have been entered.

Use  to insert a space to the left of the cursor.

To delete a character, press the  key.

Use  to add a ‘dash’ in a record name.

Once the ID has been entered, press the  key to save the current TDR trace information.

Event Recognition

Events are the “dips” and “peaks” seen on the screen caused by faults or changes (such as an open circuit or short) on the conductor or pair. Connectors

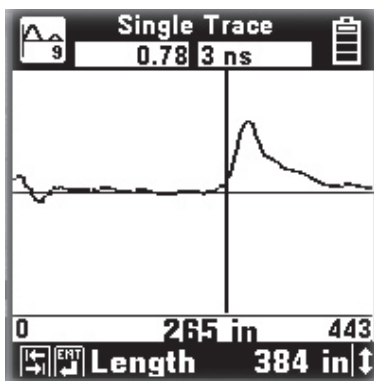
generally cause small upward peaks due to a change in impedance. To determine if an upward event is an impedance change or a main event fault you may go to the other end of the coaxial cable and disconnect it. Next, take a jumper and short the inner conductor to the outer shield. If you see a large downward deflection in the trace the small peak is impedance change. Conversely, if you can't see the short or downward deflection you have an open circuit in the cable.

Target Contact

The first peak or dip on the screen is usually the “target contact” which occurs at the point where the 900AST tester connects to the circuit under test. Since impedances of the different types of coaxial conductors vary significantly, the initial event caused by the 100-ohm TDR launch circuit contacting the target can usually be ignored. Remember that distance zero (0”) begins at the end of the test leads for the TDR function. Should the dip after the initial peak move significantly below the line you may have a short at the shield termination point on the end of the cable. Move to the other end of the coaxial conductor and connect the tester leaving the first end open. The end of the trace should produce an upward deflection at the end of the cable. A downward deflection may indicate a short.

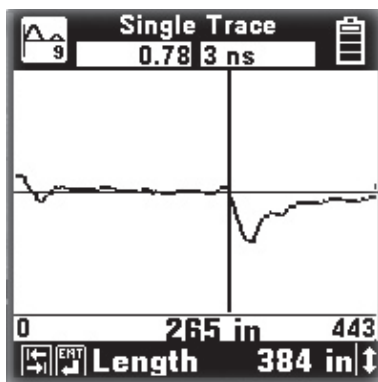
Open Circuit

Any open circuit will show up as a peak on the screen. A complete open will be the tallest peak you will see. You cannot see events past a complete open.



Short Circuit

A short circuit (or zero-Ohm resistance fault) will show up as the lowest dip on the screen. You cannot see events past a short circuit



Branch Circuit

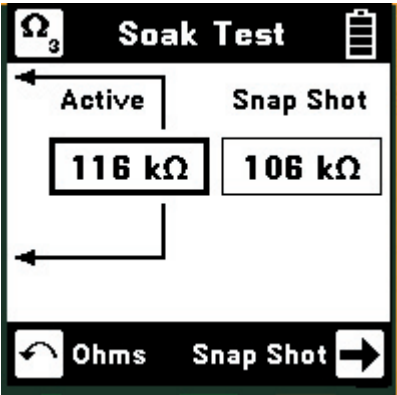
The beginning of the branch circuit will look like a small dip and the end of the branch will look like an open (upward peak). Use the 900AST tester Resistance function to measure the resistance of the conductors. If the resistance is high, you may suspect a branch circuit.

Resistance Faults on Coaxial Cable

A resistance fault will show as a dip on screen. The lower the value of resistance (or the closer to a zero-ohm short), the lower the dip. Use the resistance function to check the coaxial cable for a resistive fault. Use the Soak test function to determine if the resistive fault is caused by moisture, corrosion or if it is purely resistive.

Soak Test

Use the Soak Test function to continuously measure the insulation resistance of a coaxial conductor inner conductor to shield.



Connect the 900AST test leads to the coaxial conductor under test.

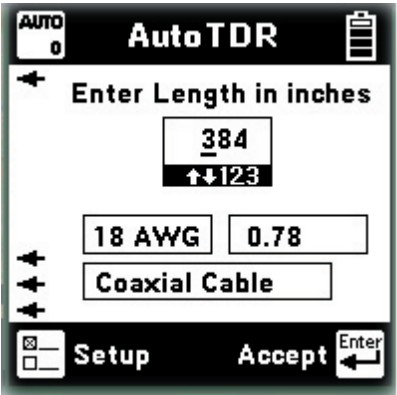
Press the  key to access the Soak test from the Resistance screen.

Use the  key to save the active resistance to the “Snap Shot” area.

Rising resistance in the active box typically indicates moisture while falling resistance indicates corrosion.

Auto TDR for Coaxial Fault Detection

Use the Auto TDR function to have the 900AST tester analyze and interpret a TDR coaxial cable trace.



The Auto TDR function imports the coaxial configuration selected in the TDR function using the Setup key.

To change the coaxial configuration go to the TDR function and press the Setup key.

Use the  and  keys and the Blue numeric keys to enter the length of cable to analyze. Enter a length longer than the cable being tested but as close as possible to the total length of the cable.

When the correct information is displayed on the Auto TDR screen, press the  key to start the analysis. The 900AST performs tests to determine if the cable is shorted, open circuited, or has a resistance fault.

Note: *Auto TDR operates from a captured trace. The trace is not 'live' as in the standard TDR mode.*

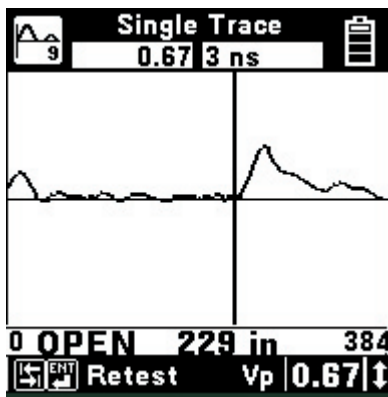
Auto TDR Resistive Faults

Note: *Resistance faults are very difficult to detect using TDR techniques. If a resistance fault is detected, the 900AST tester prompts you to consider using the RFL (Resistance Fault Locate) function as shown below.*

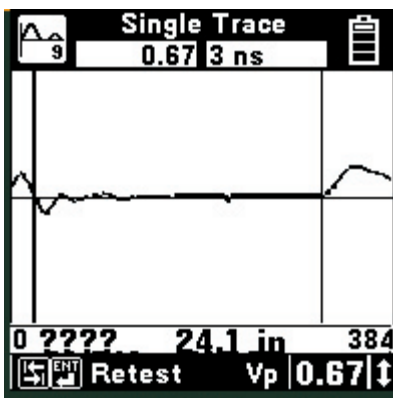


Auto TDR Trace Analysis

If the Auto TDR detects an open circuit, the cursor is positioned at the location of the open circuit and OPEN is displayed below the trace. If the Auto TDR detects a short circuit or low resistance fault, the cursor is positioned at the location of the short circuit and SHORT is displayed below the trace.



In this case the low impedance anomaly at 24 inches is detected but not classified. The Auto TDR displays ‘????’ below the trace.



Restoring the Aircraft After Testing/ Troubleshooting

Disconnect the 900AST TDR test cable from the aircraft wiring. Also, remove any adapters (if used). Ensure the other end of the coaxial cable is reconnected. Reinstall the line replaceable unit or component that was removed to accomplish testing or troubleshooting and perform all applicable maintenance manual procedures and operational checks.

Care and Maintenance

Please see the 900AST Series Instruction Manual for care and maintenance information.



This is the EU symbol for equipment that is covered under the Waste from Electrical and Electronic Equipment (WEEE) directive per CENELEC Specification 5041. It indicates that certain products should not be discarded in the trash, but rather should be recycled. This applies to all electronic pluggable and battery powered products.

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Aerospace and Aircraft Maintenance Division Transportation Business

3M Center, Building 220-9W-14
St. Paul, MN 55144-1000
1-800-364-3577 or 651-737-6501
www.3M.com/aerospace

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