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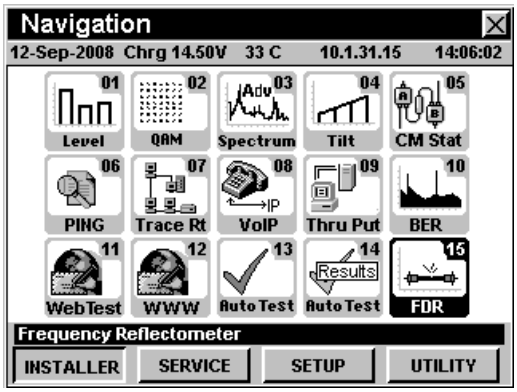
Application Note

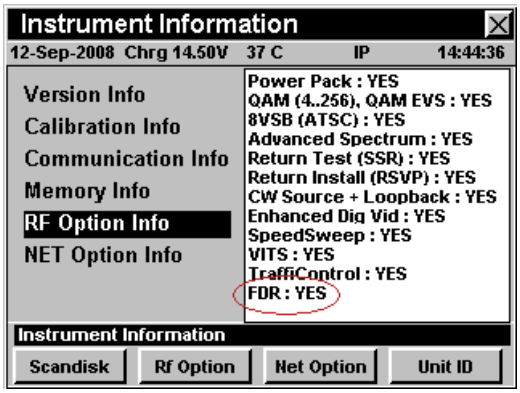
860 DSPi Frequency Domain Reflectometer

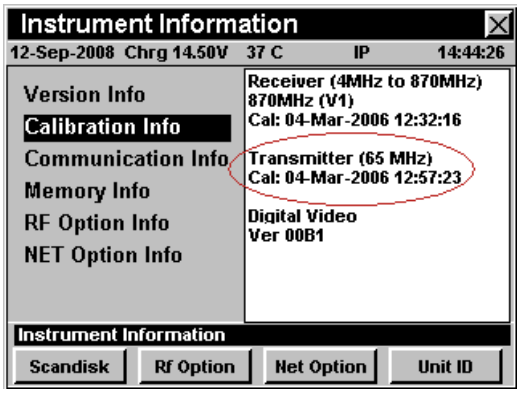
The 860 DSPi Frequency Domain Reflectometer (FDR) Option provides a simple, convenient and accurate tool for determining the distance to cable faults. The option works by sending a sweep into the cable and analyzing the complex reflected wave to determine the distance to various sources of reflection (opens, shorts, splitters, etc.). The reflecting events are indicated on an amplitude versus distance display, and markers are used to identify the distance to the source of the reflection, and the return loss at that point.



How can I see if my 860 DSPi supports FDR?

The easiest method to see if your 860 DSPi supports FDR is to go to the Information Menu on the Setup TAB. Examine the RF Option Information List and see if you have the option. If you do not, you can call the factory and purchase the option provided that your meter has the latest firmware installed and you have the Return Transmitter Board Option Installed. To order the option for your 860 use part number 0930081016.





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Trilithic Applications Engineering
1-800-344-2412 or 317-895-3600
support@trilithic.com or
www.trilithic.com

How do I use the FDR mode?

The FDR mode allows users to find reflection points in a cable network. When the user enters FDR mode, the 860 DSPi starts transmitting signals from its REVERSE/BOTH port and measures the reflections returned to the same connector. These reflections are analyzed to determine the distance to the source of the reflection and the return loss.

The Reference Level (REF = X dBRL) can be adjusted in 3 dB steps to allow the user to zoom in on small signals.

The Step Size can be adjusted to either 0.5 MHz or 1 MHz. The Maximum Distance that FDR mode can accurately measure is inversely proportional to the step size. The maximum distance for 0.5 MHz and 1 MHz is approximately 400 ft and 200 ft respectively, depending on the velocity factor. Because the FDR measurement speed is inversely proportional to the number of frequency points, the measurement will be faster with a step size of 1 MHz (as opposed to 0.5 MHz) assuming the reduced maximum distance is tolerable.

The Velocity of Propagation (VOP) factor can be changed manually by tabbing to the field and using the up / down arrows. There are also five (5) presets (Get VOP) with default values for RG-59, RG-6, RG-11, SemiRigid, and HardLine. The user can also determine the VOP of a particular type of cable by connecting a long (50 ft to 150 ft) coax cable of known length to the REVERSE/BOTH port and using the calculate function (Calc VOP).

The positions of Marker A and Marker B can be changed to determine the distance to the reflection source, as well as the distance between two reflection sources. The Distance field in the upper right always shows the distance between Marker A and B, so if the absolute distance from the 860 DSPi is desired, set one of the markers to 0.

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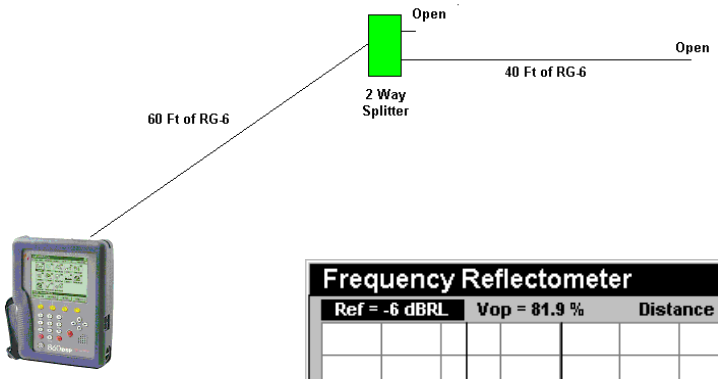
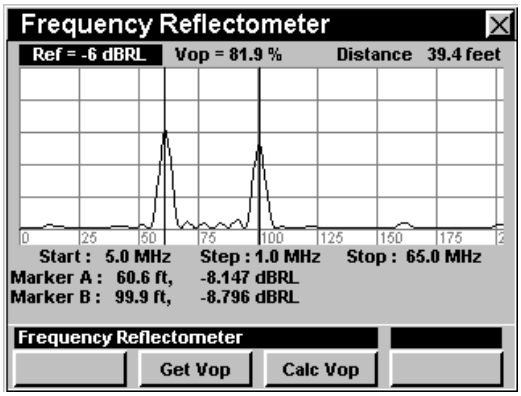
An FDR usage example

For the following images, a test setup was constructed as shown here.





The above schematic shows an unterminated splitter at 60 feet with one port connected to 40 feet of unterminated coax. Below, the display shows the FDR measurement mode in operation and clearly showing two reflections.

1) Reflection #1 at 60 feet :
    a. Signal goes down 60 feet of coax losing x dB
    b. Signal goes through a splitter losing 3.5 dB
    c. Reflection goes back through splitter losing 3.5 dB
    d. Reflection goes back through 60 feet of coax losing x dB
    e. Final result of -8.147 dBRL (dB Return Loss)

2) Reflection #2 at 100 feet :
    a. Signal goes down 60 feet of coax losing x dB
    b. Signal goes through a splitter losing 3.5 dB
    c. Signal goes down 40 feet of coax losing x dB
    d. Reflection goes back through 40 feet of coax losing x dB
    e. Reflection goes back through splitter losing 3.5 dB
    f. Reflection goes back through 60 feet of coax losing x dB
    g. Final result of -8.796 dBRL (dB Return Loss)

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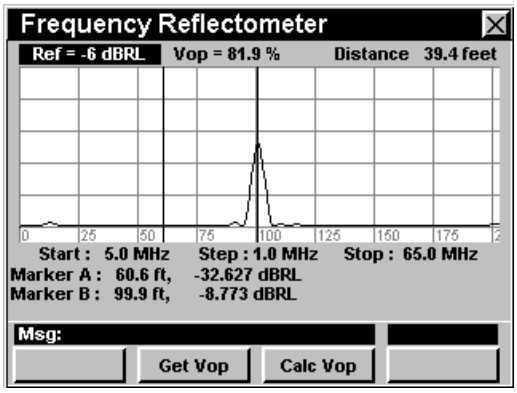
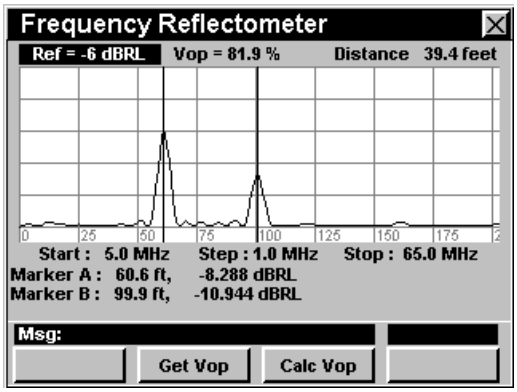
The following picture shows what happens when you terminate the open end of the splitter. Notice how the 60 feet reflection disappears.



The following picture shows what happens when you add a 1 dB pad to the end of the 40 feet of coax. Notice how the 100 feet reflection goes down by 2 dB (1 dB going and 1 dB back).



Workbench Support?

Workbench version 2.1.0 and later supports FDR data logs and VOP preset configuration.

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