RF Scout
Interference Hunter
Quick Start User Manual

www.tektronix.com
071-1901-01

Tektronix

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For product information, sales, service, and technical support:

- In North America, call 1-800-833-9200.
- Worldwide, visit www.tektronix.com to find contacts in your area.

Warranty 2

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by Tektronix for warranty work may be new or reconditioned to like new performance. All replaced parts, modules and products become the property of Tektronix.

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This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Use Proper Power Cord. Use only the power cord specified for this product and certified for the country of use.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

The inputs are not rated for connection to mains or Category II, III, or IV circuits.

Power Disconnect. The power cord disconnects the product from the power source. Do not block the power cord; it must remain accessible to the user at all times.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Do Not Operate With Suspected Failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Replace Batteries Properly. Replace batteries only with the specified type and rating.

Recharge Batteries Properly. Recharge batteries for the recommended charge cycle only.

Use Proper AC Adapter. Use only the AC adapter specified for this product.

Do Not Operate in an Explosive Atmosphere.

Terms in this Manual

These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Symbols and Terms on the Product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

The following symbols may appear on the product:

Environmental Considerations

Product End-of-Life Handling

Observe the following guidelines when recycling an instrument or component:

Equipment Recycling. Production of this equipment required the extraction and use of natural resources. The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. In order to avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.

The symbol shown below indicates that this product complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). For information about recycling options, check the Support/Service section of the Tektronix Web site (www.tektronix.com).

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2002/95/EC RoHS Directive. This product is known to contain lead, cadmium, mercury, and hexavalent chromium.

Preface

This manual describes the installation and basic operation of the RF Scout Interference Hunter. For more detailed information, see the online help on your instrument.

Key Features

The RF Scout is a rugged, multi-standard spectrum analyzer and interference mapping tool optimized for field use. Key features include:

- Interference hunting functions that help find interference quickly
- Spectrogram display for detection and logging of intermittent signals
- Signal strength, AM/FM demodulation, and noise floor measurements
- Scanners for GSM/GMSK/EDGE, UMTS/W-CDMA/HSDPA, cdmaOne/cdma2000, and cdma2000 1xEV-DO signals
- iMap Integrated Mapping for in-field analysis of interference and coverage problems

Documentation

To read about	Use these documents
Installation and operation (overviews)	*RF Scout Interference Hunter Quick Start User Manual*. The quick start user manual contains general information about how to put your instrument into service, guides to user interface controls, and application examples.
Help using the application	*RF Scout Interference Hunter Online Help*. The online help is context sensitive, displaying information appropriate for the active screen.

Software Upgrades

Periodic software upgrades may become available. The software is only operational if you have a valid option key for the specific application module and serial number.

To check for upgrades:

1. Go to the Tektronix Web site (www.tektronix.com).
2. Select **Software & Drivers** to link to the **Software and Firmware Finder** Web page.
3. Select **Network Management & Diagnostics** in the **Browse by product category** list.
4. Select **Wireless Field Test Products** in the **Browse by product series** list.
5. Select **GO** to display a list of software downloads.

Conventions Used in This Manual

This manual describes how to operate the RF Scout Interference Hunter application. Although the methods of operation are identical for all measurement options, differences in configuration or application are identified in the text by the option to which they apply.

The following icons are used in this manual:

Sequence Step

Front panel power

Connect power

Preventing Personal Injury from Lightning

WARNING. *To prevent personal injury from the effects of lightning, exercise the following precautions when using this product:*

Before connecting this product to any source

- Check your local weather forecast for the possibility of thunderstorms or lightning.
- If weather conditions could allow thunderstorms or lightning to develop, be sure to visually check the sky and weather conditions in your area frequently.
- If you can hear thunder or if you see lightning, do not connect this product to any source which may be exposed to the effects of lightning.
- Use your own good judgement and common sense. You must protect yourself from the effects of lightning.
- You must assume that hazardous voltages will be present on exposed surfaces of this product if it is connected to a source exposed to lightning. The insulation of this product will not protect you from these hazardous voltages.

Do not connect this product to any source which might be subject to the effects of lightning

If thunderstorms or lightning are in your vicinity:

- When weather conditions that could lead to lightning activity exist in your area, ***you could be at risk of a lightning strike*** before the cloud is close enough for you to hear thunder or see lightning.
- When lightning strikes a structure or facility, current travels through rebar, concrete, pipes, cables, vent stacks, and electrical system.
- Lightning can induce electric and magnetic fields into structures and portions of wiring. The length of a conductor affected by the magnetic field of a lightning strike may exceed two miles.

Be alert and aware of the effects of lightning

- When lightning strikes a conductor, which in turn introduces the current into an area some distance from the ground strike point, equipment can be damaged and personnel injured if they become an indirect path in the completion of the ground circuit.
- Conductors such as the braided shields of cables or unshielded wires will have significant transient currents flowing in them in regions exposed to the electric field effect of lightning.
- Induced voltages may cause breakdown of insulation in wiring at connectors and in electrical components or breakdown of air.

Installation

Carefully unpack your instrument and verify that it includes the standard accessories.

Standard Accessories

Accessory	Tektronix Part Number
NetTek Y400 Analyzer Platform	Y400
NetTek YBT250 Field Transmitter & Interference Tester	YBT250
AC Power Adapter	119-6984-xx
Lithium-Ion Battery	146-0151-xx
NetTek Y400 Analyzer Setup Reference	071-1430-xx
RF Scout Interference Hunter Quick Start User Manual	071-1901-xx
NetTek YBT250 Field Transmitter & Interference Tester installation CD	063-3476-xx

Your instrument may also include optional accessories. Verify that the optional accessories you ordered are included with your instrument. For a current list of accessories, upgrades, and options, including service options, available for your RF Scout, visit the Tektronix Web site, www.tektronix.com.

Operating Considerations

RF Scout Interference Hunter

AC Adapter	Input voltage and current: 100 V - 240 V AC, 1.8 A Input frequency: 47 Hz to 63 Hz Output voltage and current: 24 V DC, 3 A
Dimensions	Height: 25 cm. (9.75 in) Width: 33 cm. (13 in) Depth: 9 cm. (3.5 in)
Weight	5.52 kg (12.125 lbs) (with one battery)
Temperature Range	Operating: 0 °C to +50 °C specified performance, -10 °C to +50 °C typical Nonoperating: -40 °C to +60 °C
Humidity	Operating: 5% to 95% Relative Humidity (RH), noncondensing: up to +30 °C Nonoperating: 5% to 45% Relative Humidity (RH), noncondensing: +30 °C up to +50 °C
Altitude	Operating: Up to 4,600 m (15,092 ft.) Nonoperating: Up to 15,240 m (50,000 ft.)
NetTek YBT250 Module, RF INPUT	Input frequency range: 30 MHz to 2500 MHz Coupling: AC Input impedance: 50 Ω (nominal) Maximum Input Power without Damaging Instrument: 50 W CW or peak envelope power

Cleaning

- Clean the exterior surfaces of the instrument with a dry lint-free cloth or a soft-bristle brush.
- Use a cloth or swab moistened with deionized or distilled water, or a 75% isopropyl alcohol solution for more stubborn stains, to clean the instrument or touch screen; use just enough moisture to dampen the cloth or swab.
- Use a gentle amount of force when cleaning the touch screen.

CAUTION. *Do not get moisture inside the instrument during exterior cleaning.*

Do not wash the front-panel On/Standby switch. Cover the switch while washing the instrument.

Do not spray liquids directly on the instrument or touch screen.

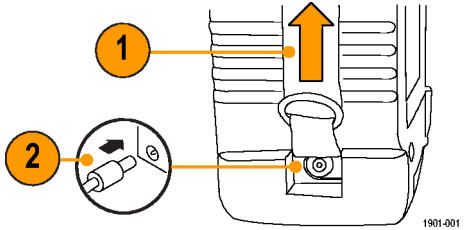
Do not use abrasive cleaners, or chemical cleaning agents that contain benzene, toluene, xylene, acetone, or similar solvents; they can damage the instrument or touch screen. Do not use commercial glass cleaners to clean the touch screen.

Do not scrub the touch screen with excessive force while cleaning.

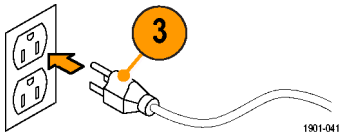
Connecting the AC Adapter

1. Lift the instrument strap to expose the power adapter connector.

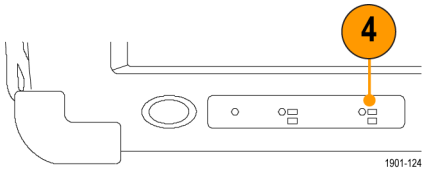
2. Connect the AC power adapter to the instrument.



3. Connect the AC adapter to a properly-grounded AC power source using the provided power cord.



4. Charge the batteries before using the instrument on battery power for the first time. (See page 5, *Charging the Batteries*.)



Charging the Batteries

Charge the batteries before using the instrument on battery power for the first time. Batteries are partially charged and calibrated at the factory. A calibrated battery allows the instrument to more accurately estimate how long the application modules can operate before the instrument automatically powers off. The front-panel BATTERIES charge status indicator turns off when charging is complete.

Approximate charge time

Number of batteries	Instrument powered on	Instrument powered off
1	8 hours	3 hours
2	16 hours	6 hours

NOTE. *These are typical numbers for batteries that are low but not completely discharged. Newer-model instruments can contain higher-capacity batteries, resulting in increased run time and longer charge time.*

For more information on battery charging, battery calibration, and instrument power management, access the instrument online help: **Start > Help > Tektronix Basics > Power Management**.

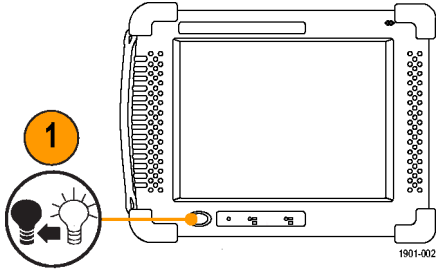
Powering On and Off the Instrument

1. Tap the **On/Standby** button to power on the instrument.

   The instrument WindowsCE Status bar shows the Battery icon when the instrument is operating on battery power and the External Power Connected icon when the instrument is operating with an external adapter.

   To power off the instrument, tap the **On/Standby** button again.

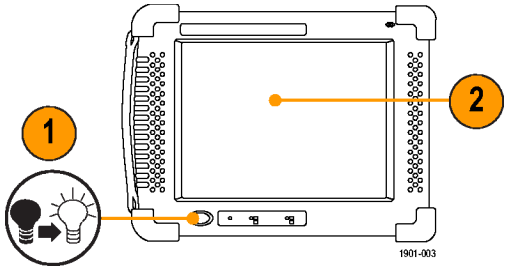
For information on the instrument on/standby power modes, access the RF Scout online help: **Start > Help > Tektronix Basics > Shutting Down the Instrument**.



Functional Verification

Perform this functional check to verify that your instrument is operating properly

1. Power on the instrument.
2. Watch the screen. Verify that the instrument does not display any power-on diagnostic error messages.



Touch Screen Concepts

The RF Scout user interface is based on touch-screen technology. Instead of using physical button and knob controls to select functions, set values, and take measurements, you tap (touch) virtual controls on the instrument screen. Virtual controls behave the same way as physical controls.

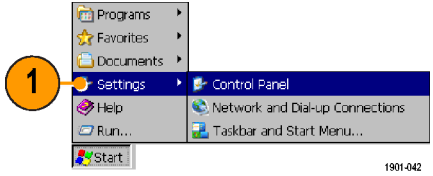
The following are touch screen terms used in this manual:

Term	Description	Equivalent mouse operation
Stylus	The physical object you use to touch the screen. A stylus is either your finger or an appropriate plastic-tipped stylus. Do not use any metal-tipped objects or pens for a stylus, as they can damage the touch screen.	The mouse pointer.
Tap	Touch the screen briefly with the stylus. Selects the item on the screen.	The left mouse button.
Drag	Press gently on the screen with the stylus, drag the stylus to a new position, and then raise the stylus from the screen. Moves an item or selects an area.	Drag (hold down the left mouse button, move the mouse, and then release the button).

Calibrate the Touch Screen

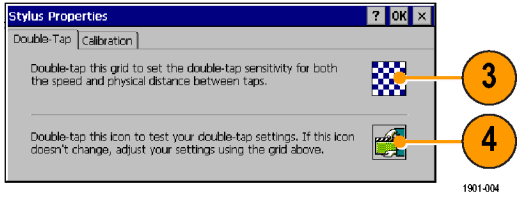
Calibrate the touch screen display to respond correctly to your taps.

1. Tap **Start > Settings > Control Panel** to open the Control Panel Screen.

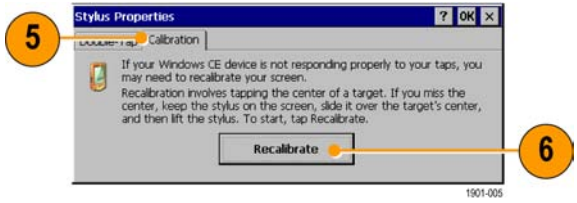


2. Double-tap the **Stylus** icon on the Control Panel screen.

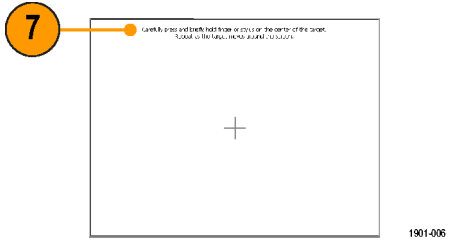
3. In the Double-Tap tab, double-tap the checkerboard grid at a comfortable speed with your stylus or finger to set the tap rate.
4. Double-tap the test icon to verify your settings.



5. Tap the **Calibration** tab and read the instructions.
6. Tap the **Recalibrate** button to open the Cursor Position target screen.



7. Follow the target screen instructions. When the position target disappears, touch anywhere on the screen to return to the Calibration tab.

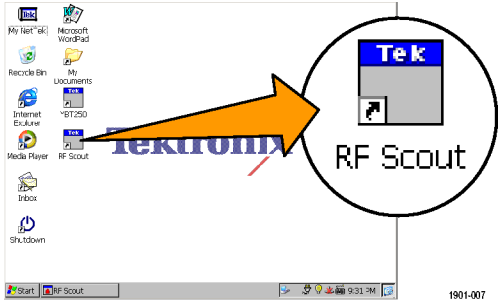


8. Tap **OK** to save calibration settings.

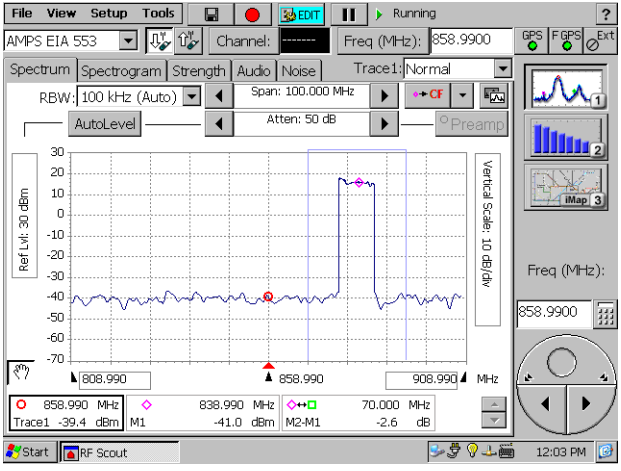
Starting the RF Scout Application

If purchased preloaded, RF Scout starts automatically when you power on the instrument. If RF Scout does not start automatically, or you have stopped the application, use either of the following methods to start the application:

- Double-tap the **RF Scout** icon on the instrument screen
- Select **Start > Programs > NetTek > RF Scout**



The RF Scout application appears similar to this figure.



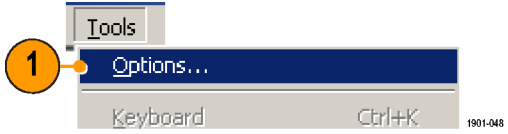
NOTE. *You cannot run RF Scout at the same time as the YBT250 applications. However, you can run RF Scout and the YBA250 application module measurements as long as you are not measuring Insertion Gain/Loss.*

The Microsoft WindowsCE taskbar displays a button for each running application. To bring the RF Scout to the front of the screen, tap the ***RF Scout*** *button in the taskbar.*

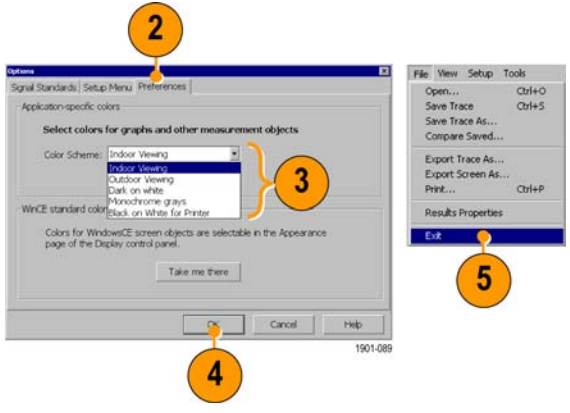
Setting Display Colors

You can change the color scheme used in the instrument display. The color schemes optimize the display colors for use in different environments (outdoors or indoors) and for better printing quality on black and white (monochrome) printers.

1. Select **Tools > Options**.



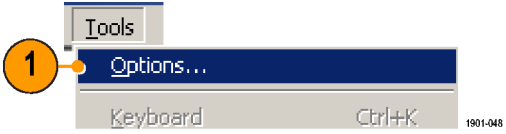
2. Tap the **Preferences** tab.
3. Tap the **Color Scheme** list field and select a display color scheme.
4. Tap **OK**.
5. Select **File > Exit** to close RF Scout. Then restart the RF Scout application to enable the changed color scheme.



Enabling Signal Standards

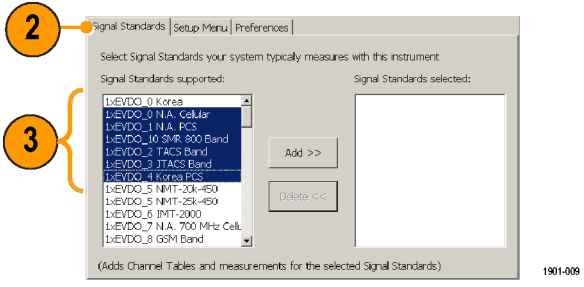
Before you begin using the RF Scout, you must enable (select) the signal standards that you want to measure. You can only take measurements on enabled standards.

1. Select **Tools > Options**.



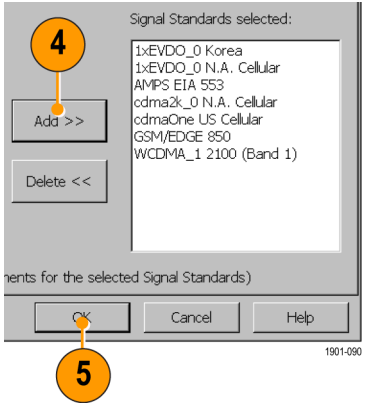
2. Tap the **Signal Standards** tab.

3. Tap the name of the standard in the **Signal Standards supported** list that you want to enable. Drag the stylus to select two or more contiguous standards.



4. Tap the **Add >>** button to add the selected standard(s) to the **Signal Standards selected** list.

5. Tap **OK**. The enabled standards are now selectable from the main window Signal Standards drop-down list.

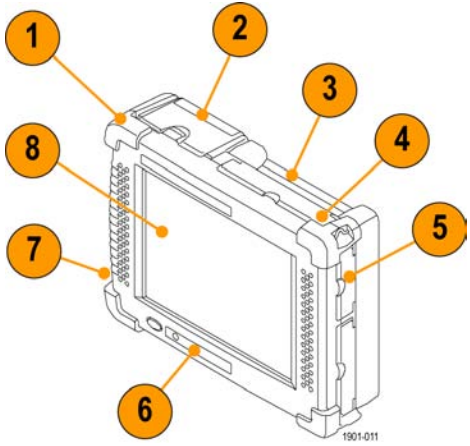


NOTE. *Limiting the number of enabled standards to just those that you regularly test makes it easier and faster to select a standard from the Signal Standard drop-down list.*

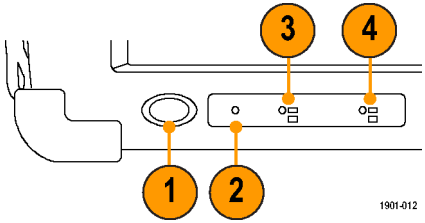
Getting Acquainted with Your Instrument

RF Scout Elements

1. NetTek Y400 Analyzer Platform.
2. Battery compartment.
3. NetTek YBT250 Application Module.
4. Input/Output ports. (See page 19, *Input/Output Connectors (NetTek Y400)*.)
5. PCMCIA card ports.
6. Power and Status panel. (See page 18, *Power On/Standby and Status Panel*.)
7. External adapter power connector. (See page 4, *Connecting the AC Adapter*.)
8. Touch screen.



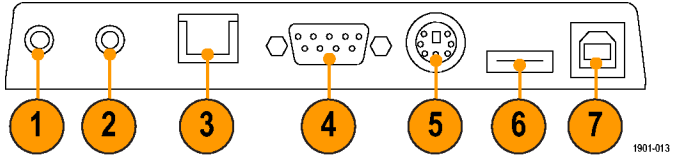
Power On/Standby and Status Panel



1. Power On/Standby button. Push to power on or off the instrument. For more information, access the online help: **Start > Help > Tektronix Basics > Shutting Down the Instrument**.
2. Recessed instrument reset button. Performs a hardware reset; all programs and data loaded into volatile memory since power-on are lost. Generally only used to recover from a system lock-up. Use a thin probe or similar item to push the recessed switch.
3. Power/Display status. Green indicates that the instrument is powered on. Amber indicates that the instrument is powered on but the display is turned off (for power conservation).
4. Battery status. Green indicates that the instrument is connected to an external power source and is charging installed batteries. Red indicates a low battery. No color indicates that the batteries are charged.

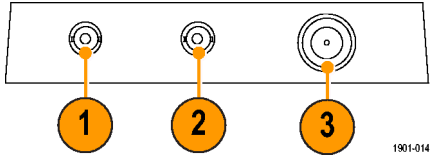
Input/Output Connectors (NetTek Y400)

1. Microphone input
2. Headphone jack
3. Ethernet connector (RJ-45)
4. Serial RS-232 connector
5. PS/2 keyboard connector
6. USB Host connector
7. USB Slave connector



NetTek YBT250 Module Signal Connectors

1. Timing Input. Connects to an external timing reference signal, such as a BTS Even Second Clock signal, or the timing signal from a Tektronix YBGPS1 GPS Timing Reference.
2. Frequency Reference Input. Use an external frequency reference signal to improve measurement accuracy.
3. RF Input. The RF Input connects the RF input signal source or measurement antenna to the instrument.

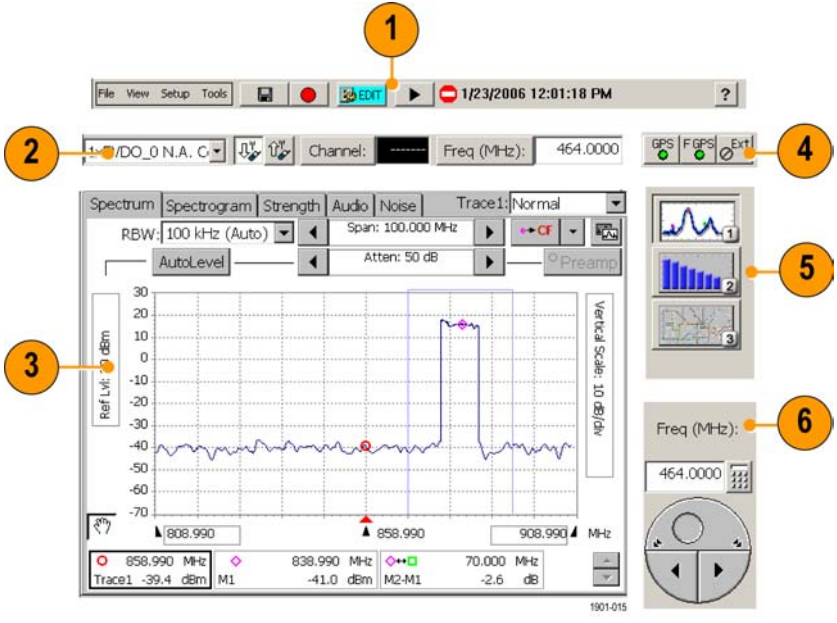


Microsoft WindowsCE Elements

The Microsoft WindowsCE user interface is similar to other Microsoft Windows operating systems. You use standard Microsoft Windows operations to start (run) applications, select and move objects, and open folders or files. For more Microsoft WindowsCE information, access the online help: **Start > Help > WindowsCE Basics**.

The Status area, located at the bottom right of the screen, contains icons that display important information about the instrument power status. For an explanation of all status area icons, access the online help: **Start > Help > WindowsCE Basics > Understanding Taskbar Icons**.

The RF Scout User Interface

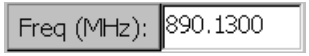


1. **Command bar**. Contains the application menus, as well as buttons for saving measurement results, opening the application setup dialog box, and running/pausing the application. (See page 24, *The Command Bar*.)
2. **Tuning controls**. Selects the signal standard, signal direction (uplink or downlink), measurement channel, and measurement frequency. (See page 25, *The Tuning Controls*.)
3. **Measurement Results**. Shows the waveform displays, measurement results, and mapping screen. The appearance of this area changes depending on the selected measurement mode and measurement type.
4. **GPS, External Reference and RF Signal Gain/Loss status buttons**. Indicates status and sets GPS, measurement reference frequency source, and input signal attenuation or amplification parameters. (See page 26, *The External Signal Status Buttons*.)
5. **Measurement Mode buttons**. Selects the Spectrum (button 1), Channel (button 2), or Mapping (button 3) measurement modes. (See page 28, *The Measurement Mode Buttons*.)
6. **Parameter Entry controls**. Provides controls for entering or changing numeric values of the selected user interface field or item. (See page 29, *The Parameter Entry Controls*.)

The Command Bar

Element	Description
File View Setup Tools	Menus. See the RF Scout Online help topic *Menus* for information on the RF Scout menu functions.
	Save Results button. Saves the current measurement acquisition to a file. See the RF Scout Online help topic *The Save & Export Tab* for how to set file save parameters.
	Log Measurements button. Enables automatically taking and saving a measurement at specified time intervals. See the RF Scout Online help topic *The Logging Dialog Box* for how to set the time interval between measurement acquisitions.
EDIT OPEN	Edit button. Opens the Setup dialog box that contains instrument settings tabs. See the RF Scout Online help topic *Setup Tabs* for information on the setup dialog tabs. Open button. Shows the Open dialog box that lists saved instrument setup files to load and configure instrument settings. See the RF Scout Online help topic *The Setup Menu Tab* for directions on how to switch the button between the Edit and Open modes.
	Run/Pause button. Runs or Pauses the current measurement acquisition.
?	Help button. Opens the online help. Help is context-sensitive and will display a help topic related to the current RF Scout measurement mode.

The Tuning Controls

Element	Description
	The Signal Standard drop-down list displays the enabled signal standards from which you select a standard to measure. (See page 14, *Enabling Signal Standards*.)
	The Downlink and Uplink buttons change the Freq (MHz) setting to the forward link (downlink) or reverse link (uplink) frequency of the current signal standard and channel. For W-CDMA signals, these buttons set the corresponding forward or reverse channel number.
	The Channel button sets the channel number. The field next to the button shows the current channel number. Tapping the button opens the numeric keypad, with which you enter a channel number. The current signal standard defines the available channel numbers. Setting the channel number sets the instrument measurement frequency to the appropriate value for the selected signal standard and up or downlink mode setting.
	The Freq (MHz) button sets the Measurement Frequency. The field next to the button shows the frequency. Tapping the button opens the numeric keypad, with which you enter a frequency value.

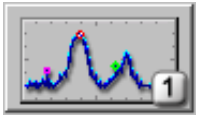
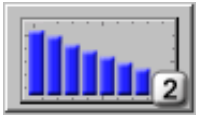
The External Signal Status Buttons

Element	Description
	The GPS status button indicates the GPS signal lock status of an attached GPS receiver. A green dot indicates that the GPS receiver is active (locked to four or more satellites and able to calculate accurate position data). Tap this button to open the GPS setup tab. See the RF Scout Online topic *The GPS Tab* for more information on setting GPS parameters.
	The Measurement Reference Frequency status button indicates the measurement frequency reference source. Tap this button to open the Inputs tab. Use this button if you connect an external measurement reference frequency source to the RF Scout. The available measurement reference frequency sources are the internal instrument frequency reference (F INT), an external reference (F EXT), or a GPS-derived timing reference from the Tektronix YBGPS1 GPS Timing Reference (F GPS). See the RF Scout Online topic *The Inputs Tab* for more information on setting the measurement reference frequency source.

Element	Description
   	The RF Input Signal Gain/Loss status button shows the external attenuator or amplifier status. Tap this button to open the Inputs tab where you can set the input signal amplification or attenuation values. Use this button if you connect an attenuator or amplifier to the input signal. See the RF Scout Online topic *The Inputs Tab* for more information on setting the RF signal external attenuator or amplifier parameters.

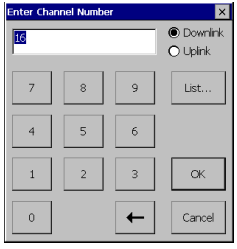
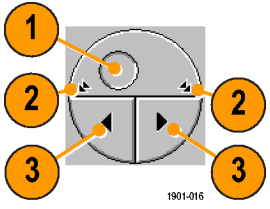
The Measurement Mode Buttons

The Measurement Mode buttons select the type of measurement or operation to perform.

Element	Description
	Select the Spectrum Measurements button to take spectrum, spectrogram, signal strength, audio demodulation, and noise floor signal measurements.
	Select the Channel Measurements button to take code power, codogram, EMF, and channel scanner/analyzer measurements.
	Select the iMap Mapping Mode button to open the Map tool and link instrument measurements to a location on a map. Use for graphically recording measurements to help analyze signal characteristics, locate interference, and save measurement/location information.

The Parameter Entry Controls

The Parameter Entry controls (keypad and knob) let you enter or change numeric values in selected fields. You can use either tool to enter or change a value.

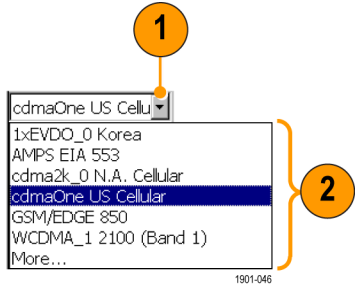
Element	Description
	The input control field shows the current value of the selected field or object, as well as the label for the field.
	Tap the keypad button to display a keypad in which to enter a value in the selected field. The keypad content changes to show the available entry functions for the selected item.
	The knob control lets you scroll through and select from all available values. **1.** Drag the knob circle left or right to quickly scroll through all available values and select a value. **2.** Tap the arrows on the top half of the knob icon to step the value in large increments. The increment value depends on the value type (channel or frequency). **3.** Tap the arrows on the bottom half of the knob icon to step the value in single unit increments.

Common Operations

Common operations are tasks that you need to do for almost all measurement functions.

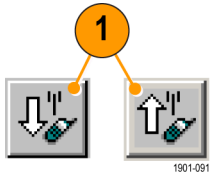
Select a Signal Standard to Measure

1. Tap the **Signal Standard List** arrow button to open the signal standard list.
2. Tap a signal standard to select it. This signal standard is used for all measurements until you change it.



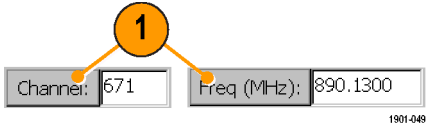
Select a Signal Link Direction

1. Tap the **Down Link** or **Up Link** to select the measurement signal link direction.



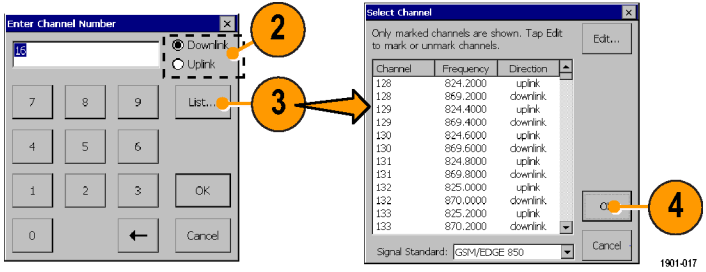
Entering a Channel or Frequency Number

1. Tap the **Channel** or **Freq (MHz)** button to open the Enter keypad.



2. For channels, tap the Uplink or Downlink option button to select the channel link direction.
3. For channels, you can also tap the **List** button to display a list of available channels from which you can select a value.

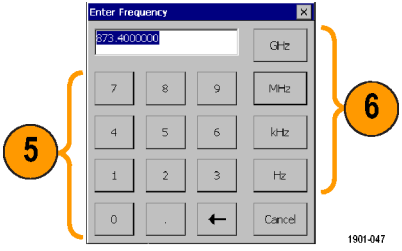
   Channel numbers are limited to those that are defined by the current signal standard. If you enter a channel number outside the valid range, the instrument sets the channel number to the closest valid number.
4. Tap **OK** to close the keypad or channel list and set the channel value.



5. For frequencies, use the keypad to enter a frequency value. This sets the center frequency of the measurement.

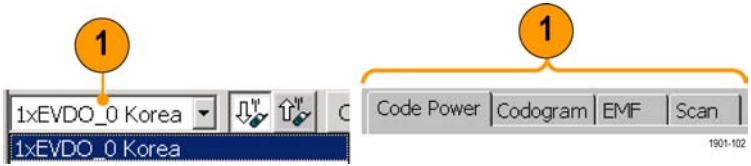
   If there is a corresponding channel number for the entered frequency, the instrument displays that channel number in the Channel field.

6. Tap a frequency unit button (such as GHz or MHz) to close the keypad and set the frequency value.

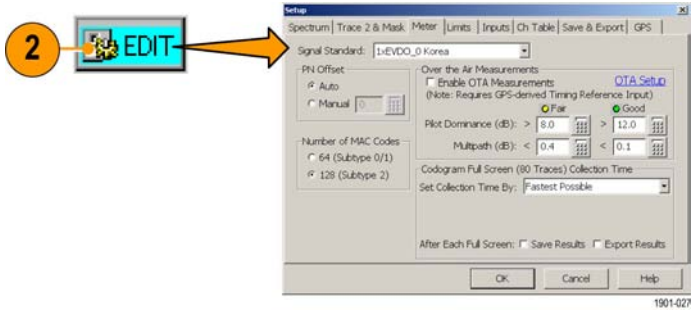


Setting Additional Measurement Parameters

1. Select a signal standard and measurement type (for example, 1xEV-DO and Code Power).

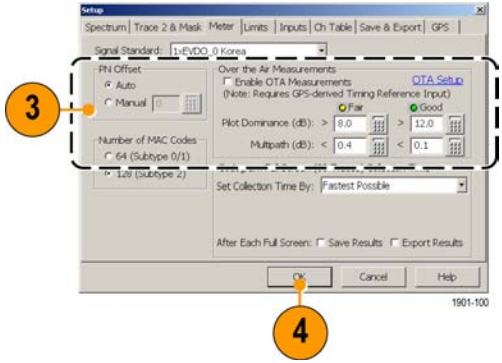


2. Tap the **Edit** button to open the **Setup** dialog box.



3. Tap the tab of the measurement parameters that you want to set.

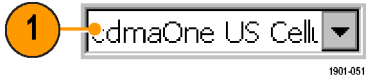
4. Tap **OK** to close the Setup dialog box and enable the measurement parameter settings.



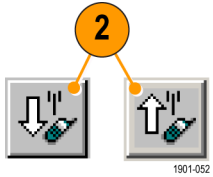
Setting Up to Take a Measurement

Perform the following steps to set up the instrument to take a measurement:

1. Select a signal standard from the Signal Standard list.

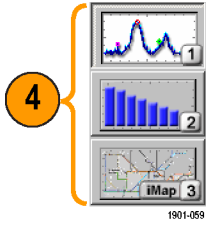


2. Tap the appropriate signal **Uplink** or **Downlink** button for the measurement that you are taking.

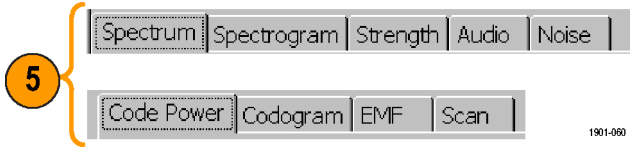


3. Tap the **Channel** button and enter a channel number in the **Enter Channel Number** dialog box. This sets the instrument to measure the frequency associated with that channel and signal standard.

4. Select a measurement mode button.



5. For Spectrum and Channel measurements, select the tab of the measurement that you want to take.



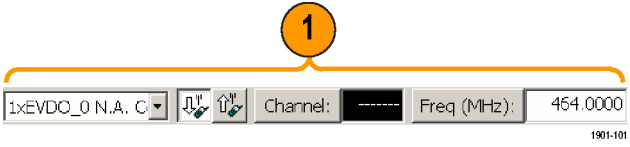
NOTE. *Most measurement procedures in this manual ask that you enter a channel number. You can enter a frequency to measure by tapping the* ***Freq (MHz):*** *button, but generally for standard measurements it is easier to enter a channel number.*

Operating Basics

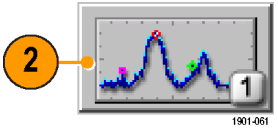
Spectrum Measurements Mode

Display a Spectrum Waveform

1. Select a signal standard, uplink or downlink button, and channel or frequency to measure.



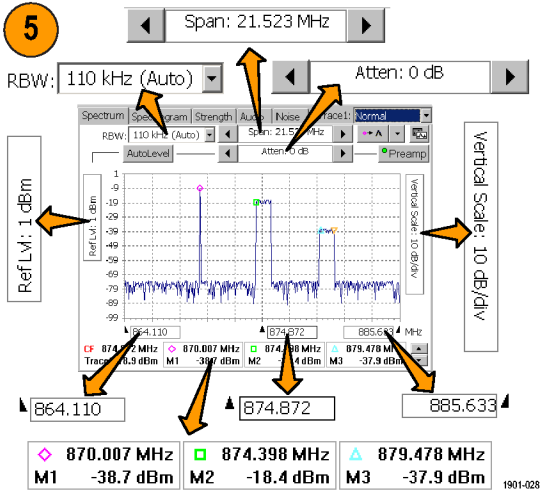
2. Tap the **Spectrum Measurement** button.



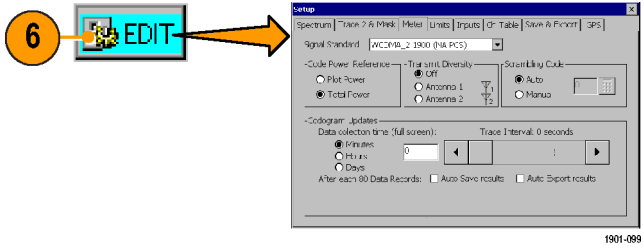
3. Tap the tab of the measurement that you want to take.

4. Tap the **AutoLevel** button.

5. Set measurement parameters if available with the measurement. For example, the Spectrum measurement lets you set the frequency span, resolution bandwidth (RBW), signal attenuation value, graph reference and division values, start and stop frequencies, and marker positions.



6. Tap the **Edit** button to open the **Setup** dialog box and set additional measurement parameters. Available parameters depend on the current signal standard and measurement type. Not all measurements have setup parameters.



Spectrum Waveform Markers

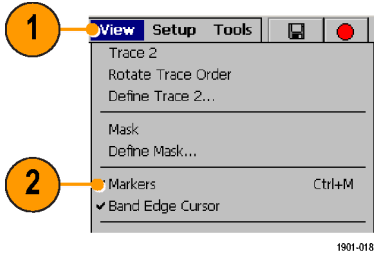
Markers are visual icons that you position on a spectrum waveform to measure signal frequency and level values. You use the markers to measure the value at a particular point on a waveform (Absolute Marker Values), or measure the difference between two markers (Delta Marker Values). The markers follow the waveform level changes.

Each marker icon has an associated marker readout, displayed at the bottom of the Spectrum display. The marker readout shows the marker icon symbol, the marker name, and the frequency and level values for the marker.

There are a maximum of six markers available, labeled M1 through M6. Each marker icon has a different shape and color. Only the first two markers are shown by default.

Turning Markers On and Off.

1. Tap **View**.
2. Tap **Markers** to turn marker display on or off.



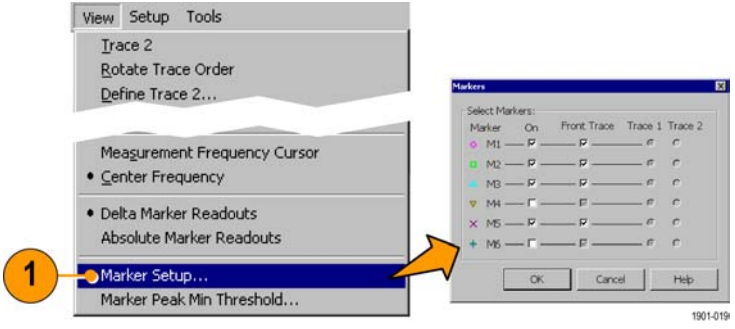
Selecting Which Markers to Display.

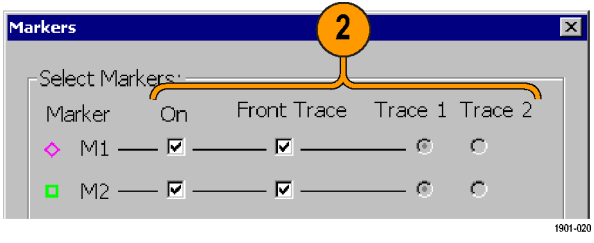
1. Select **View > Marker Setup...** to display the **Markers** dialog box.
2. Tap to enable or disable markers and set the marker mode:

   On enables or disables the selected marker.

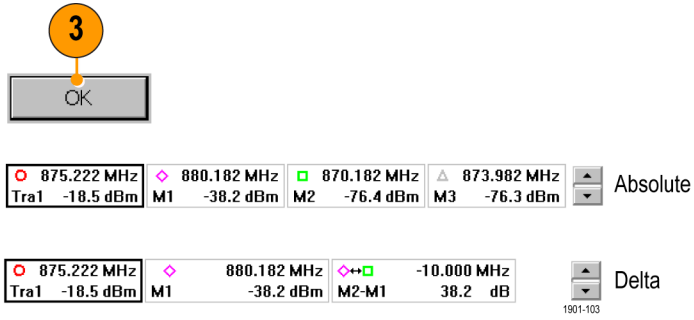
   Front Trace places the marker on the front trace.

   Trace 1 and **Trace 2** keep the marker on the specified trace regardless of which trace is in front. Use this mode to compare two waveform traces.

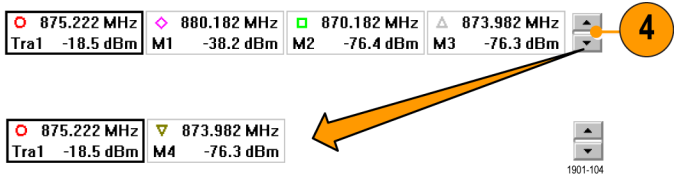




3. Tap **OK**. The instrument shows the center frequency readout plus three marker readouts at a time (in Absolute Marker Readouts mode) or the center frequency readout plus two marker readouts at a time (in Delta Marker Readouts mode).

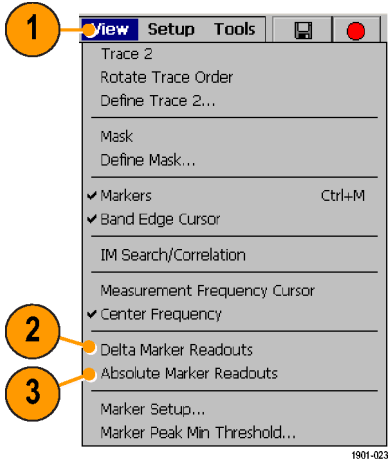


4. Tap the marker readout scroll buttons to scroll through the enabled marker readouts.



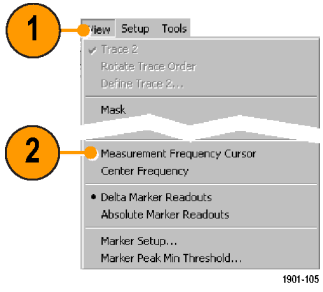
Setting the Marker Measurement Mode.

1. Tap **View**.
2. Tap **Delta Marker Readouts** to enable marker readouts to display the difference (delta) between the frequency and level values at marker M1 and the other markers. While in Delta Marker Readouts mode, all marker readouts are relative to marker M1.
3. Tap **Absolute Marker Readouts** to enable marker readouts to display the actual frequency and level values of the signal at the marker position on the waveform.

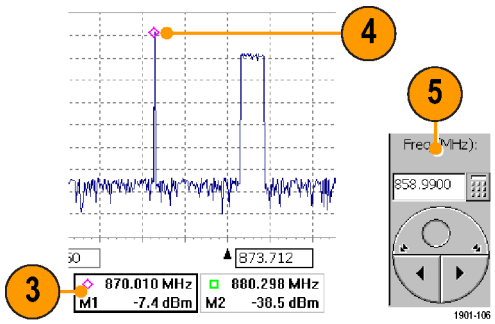


Add a Marker to a Waveform.

1. Tap **View**.
2. Tap **Measurement Frequency Cursor**.

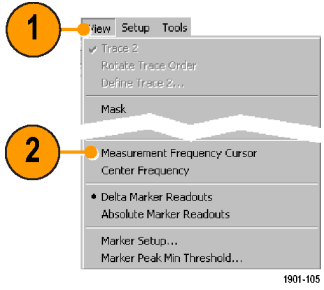


3. Tap the marker readout of the marker that you want to add to the spectrum waveform. The marker readout border darkens to indicate that it is selected.
4. Tap the waveform where you want to add the marker. The marker is added to the waveform and the readout shows the signal values at the new location.
5. Use the Parameter Entry controls to fine-tune the position of the marker on the waveform.



Moving a Marker on a Waveform.

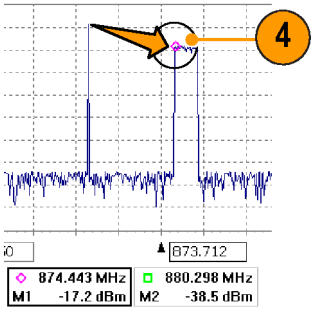
1. Tap **View**.
2. Tap **Measurement Frequency Cursor**.

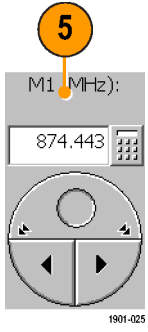


3. Tap the marker readout of the marker that you want to move. The marker readout border darkens to indicate that it is selected.

4. Tap the waveform where you want to move the marker. The marker moves to the new position and the readout shows the signal values at the new location.

5. Use the Parameter Entry controls to fine-tune the position of the marker on the waveform.



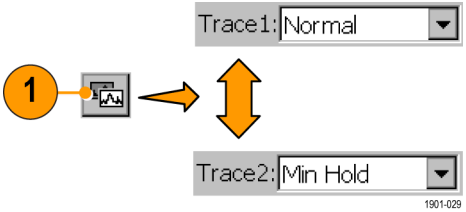


Comparing Spectrum Waveform Traces

You can compare two live waveforms (derived from the single RF input signal), the RF input signal waveform and a saved waveform, or two saved waveforms.

Selecting a waveform (Trace).

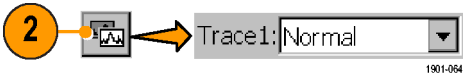
1. Tap the **Traces** button to toggle between **Trace 1** and **Trace 2**.



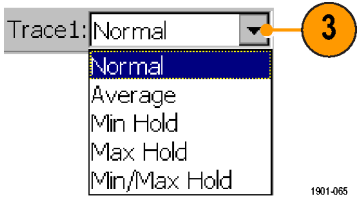
Comparing Live Waveform Traces.

1. Set the instrument Spectrum parameters to display the waveform. (See page 36, *Spectrum Measurements Mode*.)

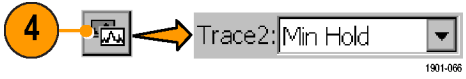
2. Tap the **Traces** button to select **Trace 1**.



3. Tap the **Trace 1** list button and then tap a trace type to select it. The instrument applies the selected operation to the RF input signal and displays the results as the trace 1 waveform.



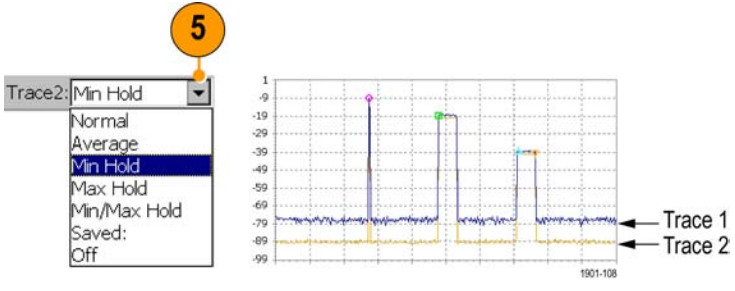
4. Tap the **Traces** button to select **Trace 2**.



5. Tap the **Trace 2** list button and then tap a trace type to select it.

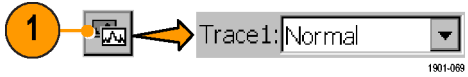
   The instrument applies the selected operation to the RF input signal and displays the results as the trace 2 waveform, along with the trace 1 waveform. The figure shows Trace 1 as an **Normal** waveform and Trace 2 as a **Min Hold** waveform.

   You can use markers to make measurements between the waveforms.



Comparing a Live Waveform to a Saved Waveform.

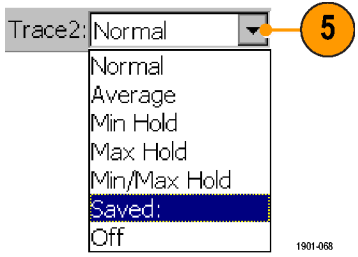
1. Tap the **Traces** button to select **Trace 1**.



2. Tap the **Trace 1** list button and then tap a trace type to select it.
3. Set the instrument Spectrum parameters to display the waveform to compare. (See page 36, *Spectrum Measurements Mode*.)

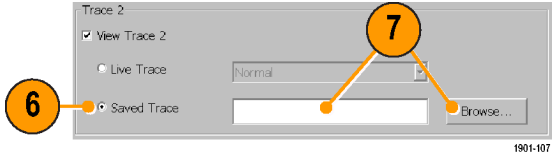
4. Tap the **Traces** button to select **Trace 2**.

5. Tap the **Trace 2** list button and tap **Saved** to open the **Trace 2 & Mask** setup tab.



6. Tap **Saved Trace**.

7. Enter a file path and name of a saved waveform file, or tap the **Browse** button to navigate to and select the saved waveform to open.



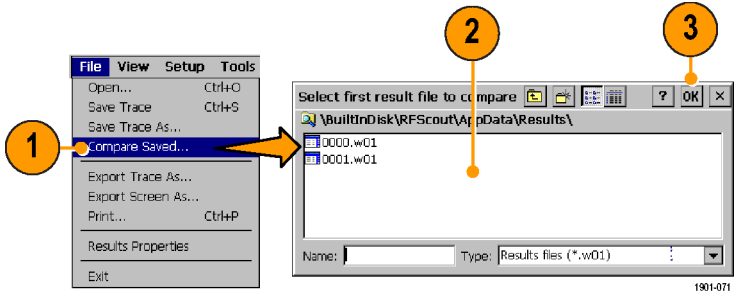
8. Tap **OK**. The instrument displays the saved waveform as the Trace 2 waveform. You can use markers to make measurements between the waveforms.

NOTE. *The current instrument measurement settings must match the instrument settings used to capture the saved waveform.*

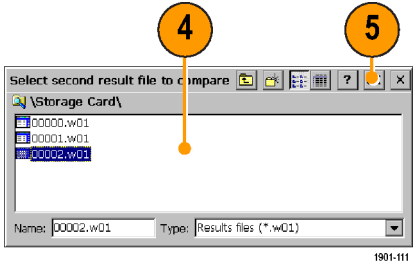
Comparing Two Saved Waveform Traces.

*NOTE. Waveform traces are saved with the settings in effect at the time the trace is saved. When a saved trace is displayed, the stored settings values are shown for reference, though no actual instrument settings change. As soon as you tap the **Run** button to return to making new acquisitions, the display settings are restored to what they were before the saved trace was opened.*

1. Select **File > Compare Saved**.
2. Navigate to and select the first waveform file to load.
3. Tap **OK** to open the **Select second result file to compare** dialog box (it looks exactly the same as the first dialog box).



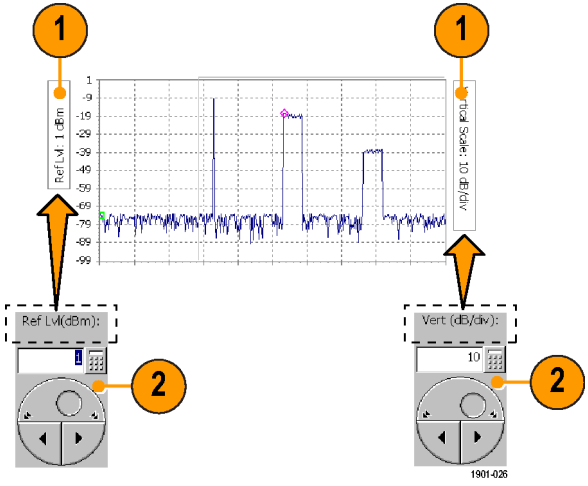
4. Navigate to and select the second waveform file to load.
5. Tap **OK** to enter the second file and close the dialog box. The instrument displays both waveforms.



6. After viewing the waveforms, tap the **Run** button to return the instrument to taking measurements.

Change the Spectrum Waveform Graph Values

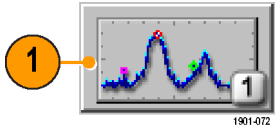
1. Tap the **Ref Lvl** field or the **Vertical Scale** field to select it.
2. Use the Parameter Entry controls to enter or change the scale setting.



For More Spectrum Measurements Help

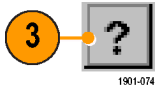
For more information on Spectrum measurements, access the RF Scout Online help:

1. Tap the **Spectrum** measurement mode button.



2. Tap the measurement tab for which you want help.

3. Tap the Help button. RF Scout opens an Online help window with information on the selected measurement, as well as links to related topics or tasks.



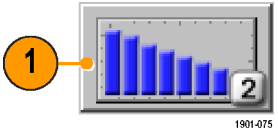
Channel Measurements Mode

Channel measurements mode includes measurements for Code Power, Codograms, EMF, Channel scanners, and Scrambling Code Analyzers.

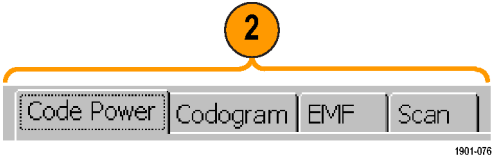
Taking a Channel Measurement

The following procedure assumes that you have already set up the measurement. (See page 34, *Setting Up to Take a Measurement*.)

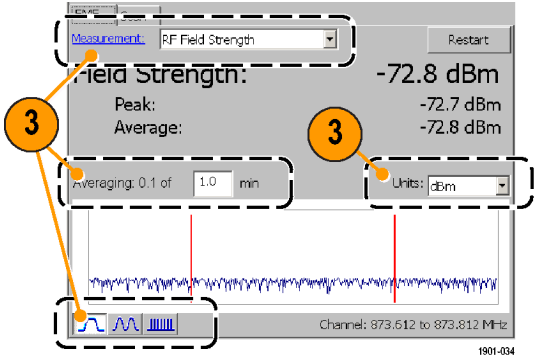
1. Tap the **Channel Measurement** button.



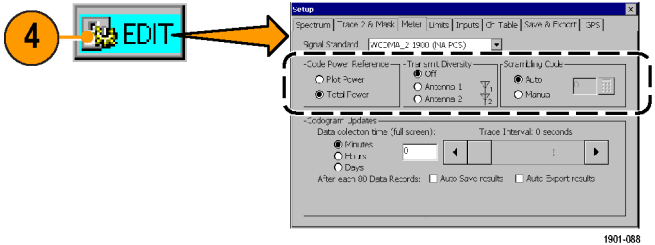
2. Tap the tab of the measurement that you want to take. The active signal standard determines the available measurements.



3. Tap available measurement parameters and use the Parameter Entry controls to set measurement parameter values.



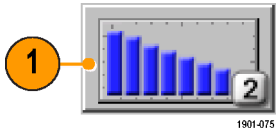
4. Tap the **Edit** button to open the **Setup** dialog box and set additional measurement parameters in the dialog box tabs. Available parameters depend on the current signal standard and measurement type. Not all measurements have setup parameters.



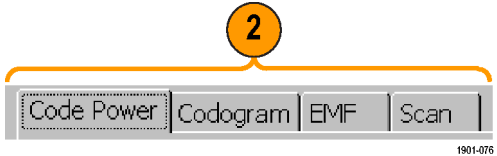
For Channel Measurements Help

For information on specific Channel measurements, access the RF Scout Online help:

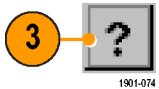
1. Tap the **Channel Measurement** button.



2. Tap the measurement tab for which you want help.



3. Tap the Help button. RF Scout opens an Online help window with information on the selected measurement, as well as links to related topics or tasks.



iMap Measurement Mapping

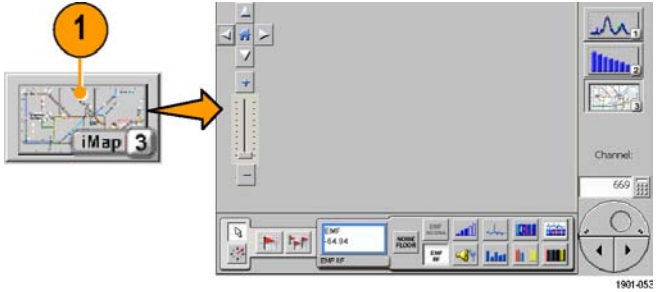
iMap integrates interference mapping, coverage mapping, in-building mapping, outdoor mapping, and provides an integrated solution for field interference and coverage problems in one instrument.

Using iMap is as easy as selecting a measurement and touching the displayed map where you want the measurement to be placed. Measurement icons are color coded to indicate if the measurements have passed or failed limit tests. You can also add a direction arrow to a measurement to indicate the direction the antenna was pointing when you took a measurement.

You can load scanned bitmap files as maps for in-building mapping, or use GSF and MIF map file formats for outdoor maps. Using GSF or MIF map files lets you use a connected GPS receiver (such as the Tektronix YBGPS1 GPS Timing Reference) to automatically place measurements at your current location.

You can save maps and associated measurement results data to common file formats such as CSV or MapInfo. Saving maps and measurement results lets you analyze measurement data (position, value, and direction) and prepare reports to help resolve interference problems.

1. To start the iMap tool, tap the **iMap** button. When you open the iMap tool for the first time, the screen displays the message **No map loaded**. Otherwise, iMap displays the last-loaded map.



Map File Concepts

The iMap tool uses two types of maps; Grid and Image.

Grid Maps. Grid maps have geophysical latitude and longitude coordinate references embedded in the map file. Such maps require specialized PC software to create or can be purchased from map-creating companies. The iMap tool can load GSF- and MIF-format grid map files. You need to convert non-GSF or MIF grid maps to GSF format before you can load them into the iMap tool. (See page 59, *Converting Map File Formats to GSF*.)

Grid maps require an active GPS receiver to correctly link measurements to geophysical map locations. An active GPS receiver is a receiver that is locked to four or more satellite signals and is providing the RF Scout with accurate GPS location data. If you load a grid map and a GPS receiver is either not connected or does not have a good satellite signal lock, the instrument considers the grid map as an image map.

Image Maps. Image maps do not have any geophysical latitude and longitude references embedded in the map file. An image map is a bitmap picture, such as a scanned building floor plan or aerial photograph, to which you can attach measurements. Save the file to 256-color bitmap format. The iMap Converter, a program that is included with the PC version of the RF Scout application, lets you convert image maps to GSF format map files, and also lets you assign latitude and longitude coordinates to an image map for use with GPS mapping.

NOTE. *Image (bitmap) files that you convert to GSF-format load faster on the RF Scout because the instrument does not have to convert the bitmap to GSF before loading. However, it is then possible to confuse image GSF maps with grid (coordinate) GSF files. Use a file-naming convention to differentiate between GSF maps that were created from coordinate maps and GSF maps that were created from bitmap files.*

Image maps to which you plan to add coordinate information must have true North as the top edge of the image.

Converting Map File Formats to GSF

RF Scout includes a map file conversion program that is installed at the same time as the RF Scout PC Simulator. The iMap Converter program:

- Converts industry-standard MapInfo Interchange Format (.mif), ArcInfo Shape (.shp), USGS Digital Line Graph (.opt) geographic coordinate maps, and 256-color bitmap images (.bmp), into GSF-format files for use with RF Scout.
- Combines multiple coordinate map files into a single map.
- Lets you add geographic coordinate information to bitmap image files, effectively converting image maps to grid maps.

NOTE. *Bitmap files that you convert to GSF-format load faster on the RF Scout because the instrument does not have to do the bitmap-to-GSF conversion in the instrument. However, it is then possible to confuse image GSF maps with grid (coordinate) GSF files. Use a file naming convention to differentiate between GSF maps created from coordinate maps and GSF maps created from bitmap files that do not have coordinate information.*

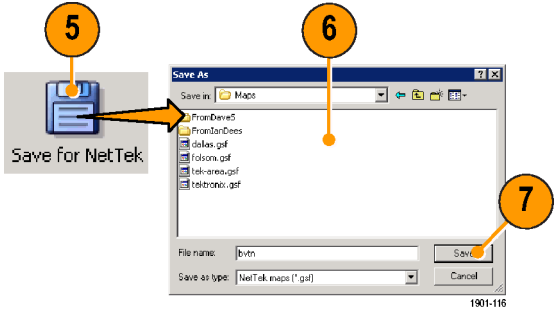
---

1. On the PC, select **Start > Programs > NetTek > iMap Converter**.

2. Click the **Open Map(s)** button to load grid (coordinate) or Bitmap (image) map files.

3. Use the dialog box to navigate to and select one or more grid map files or a single bitmap file.
4. Click **Open**. The iMap Converter loads the file, converts the data, and displays the resulting map.

5. Click the **Save for NetTek** button.
6. Use the dialog box to enter a map name and navigate to the location to save the GSF-format map file.
7. Click **Save** to save the file.



NOTE. *The iMap Converter program saves all files as GSF-format. This includes bitmap files that you convert to GSF-format to reduce the map file size and loading time. Therefore it is possible to have GSF-format maps that are not grid (coordinate) maps. Use a file naming convention to differentiate between GSF maps created from coordinate maps and GSF maps created from bitmap files to which you have not added coordinates.*

The MIF-format files take significantly longer to load than the GSF-format files. Tektronix recommends that you use iMap Converter to convert MIF map files to GSF map files, rather than loading MIF files directly on the instrument.

Adding Coordinates to an Image (Bitmap) File

The iMap Converter lets you add geographic coordinate information to an image (bitmap) map file, effectively converting it to a grid map. This feature lets you convert building or floor plan diagrams, saved images from road map programs, or photographs (such as aerial photographs) to grid (coordinate) maps for use with RF Scout GPS measurement mapping.

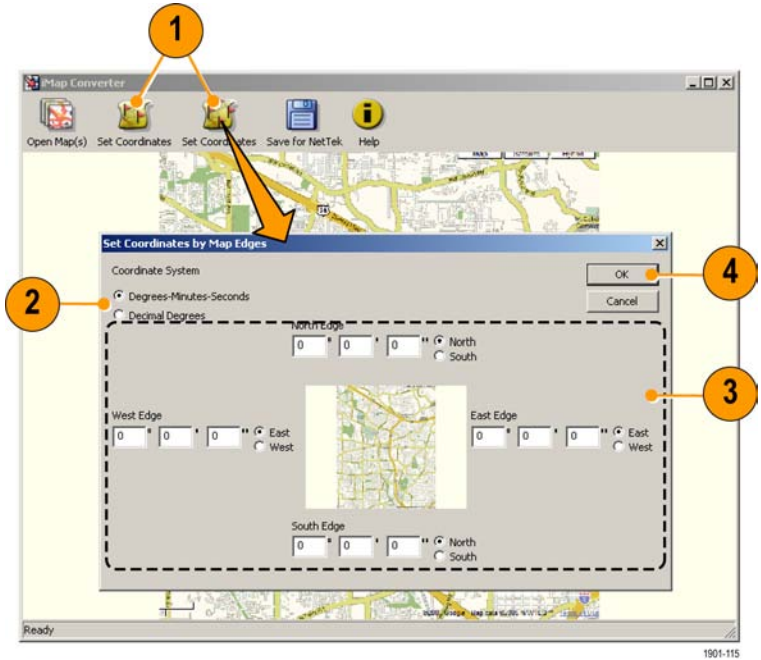
There are two methods of adding coordinates to an image file:

Element	Description
	Set Coordinates (two points) lets you enter the latitude and longitude of two points that you select on the image file. The iMap Converter uses those two points to add coordinate information for the entire image map, extrapolating the coordinates for any map area that is outside of the defined two points.
	Set Coordinates (image edges) lets you enter the latitude and longitude of the edges of the image file. iMap Converter uses these points to add coordinate information for the entire image map.

The following procedure assumes that you have loaded an image (bitmap) map file into the iMap Converter program.

NOTE. *Image maps to which you plan to add coordinate information must have true North as the top edge of the image.*

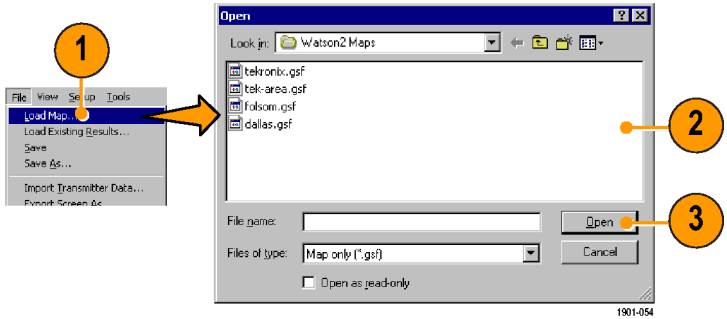
1. Click on the two point or edges **Set Coordinates** button, depending on how you want to enter the coordinate information. This example shows the Set Coordinates (image edges) button being used.
2. Set the coordinate system to either Degrees or Decimal.
3. Enter the map edge coordinates in the dialog box.
4. Click **OK**.
5. Click **Save for NetTek** to save the converted map file.



Loading a Map into RF Scout

You need to load a map before you can use the RF Scout iMap tool.

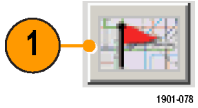
1. With iMap open, select **File > Load Map...**.
2. Navigate to and select the map file to load (Bitmap, GSF or MIF format).
3. Tap **Open**. The iMap application loads the map on the screen.



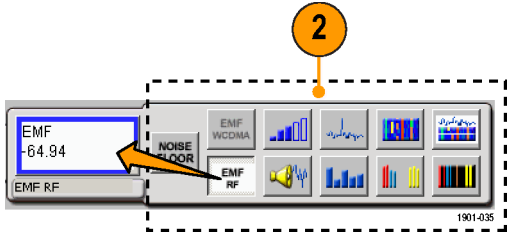
Mapping a Measurement

The following procedure requires that you have already set up the measurement. (See page 34, *Setting Up to Take a Measurement*.) You must have also loaded a map file. (See page 64, *Loading a Map into RF Scout*.)

1. Tap the **Single Measurement** button.



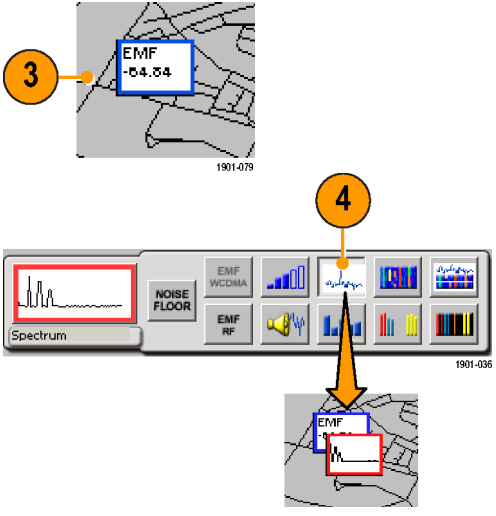
2. Tap a measurement button. Available measurements depend on the current signal standard. The selected measurement is displayed in the Measurement Thumbnail area.



3. Tap the map:

- If a connected GPS receiver is active, and you are using a grid map, a single measurement is placed at the current GPS latitude and longitude coordinates.
- If a GPS receiver is not active, or if you are using an image map (such as a building floor plan), a single measurement is placed where you tapped the map.

4. You can select a different measurement button, and then tap the map to add a new measurement to the map. Multiple measurement icons at the same location stack on top of each other.



NOTE. *To add measurements at a new location on a grid map with an active GPS receiver, you must physically move to the new location.*

iMap Measurement Icon Colors

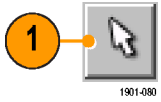
The measurement icon border color indicates the measurement limit or mask testing status:

- A blue icon border means that limit or mask testing is not enabled for the measurement.
- A green icon border means that limit or mask testing is enabled for the measurement, and that the measurement is within the set limits (pass).
- A red icon border means that limit or mask testing is enabled for the measurement and that the measurement is outside the defined limits (fail).
- For signal strength and noise floor measurements, the border color indicates the relative signal strength, from low signal levels (black) to high signal levels (red).

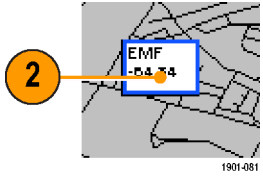
Viewing Measurement Icon Results

To view the measurement results associated with a measurement icon on a map:

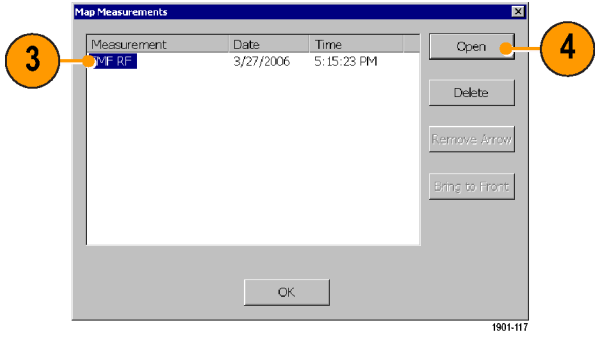
1. Tap the iMap **Select** mode button.



2. Tap the measurement icon on the map to open the **Map Measurements** dialog box.



3. Tap the measurement in the list to view.
4. Tap **Open**. iMap opens the measurement screen for the selected measurement.

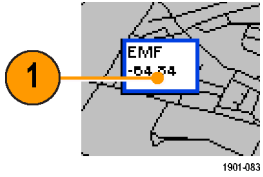


5. Tap the **iMap** button to return to the iMap screen.

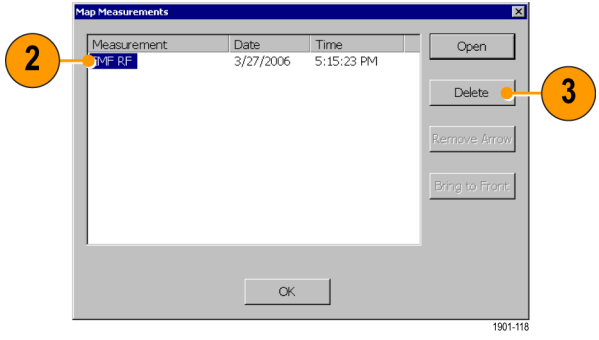
NOTE. *You can also double-tap on a measurement icon to directly open the appropriate measurement window for that measurement. If there are multiple measurements at the selected location, iMap displays the results for the measurement icon that is at the top of the list (usually the most recent measurement).*

Deleting Mapped Measurement Icons

1. Tap the measurement icon on the map.



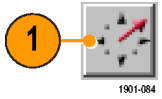
2. Tap the measurement name that you want to delete.
3. Tap the **Delete** button. iMap deletes the selected measurement results and icon from the map.



Draw a Measurement Icon Direction Arrow

The iMap direction arrow function lets you draw an arrow on a mapped measurement icon. You can use the arrow to indicate the direction your antenna was pointing when you took a measurement.

1. Tap the **Measurement Direction** button.

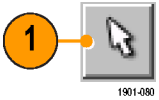


2. Tap and drag from the center of a measurement icon in the direction the antenna was pointing when the measurement was made. iMap draws an arrow from the measurement icon.

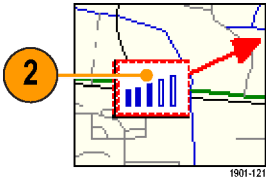
3. To change the arrow direction, draw a new line. iMap replaces the existing arrow with the new direction arrow.

Delete a Direction Arrow. To delete a direction arrow from a measurement icon:

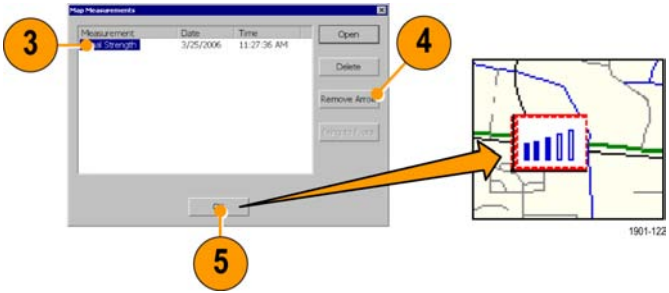
1. Tap the iMap **Select** mode button.



2. Single-tap the measurement icon with the direction arrow to delete. iMap opens the **Map Measurements** dialog box.

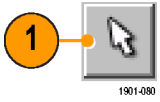


3. Tap the measurement name that has the direction arrow to delete.
4. Tap the **Remove Arrow** button.
5. Tap **OK**. iMap closes the dialog box and deletes the direction arrow.



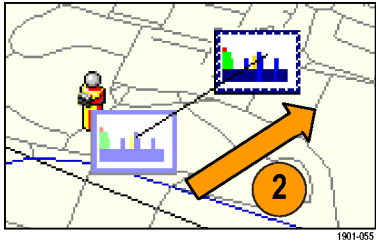
Moving a Measurement Icon

1. Tap the **Select** button.



2. Drag a measurement icon:

   - If a GPS receiver is not active, or if you are using an image map (such as a building floor plan), then iMap moves the measurement icon to the position to which you drag it.
   - If a connected GPS receiver is active and you have loaded a grid map in the instrument, then iMap repositions the entire map and all measurement icons in the direction that you drag it. No icons are moved relative to the map.

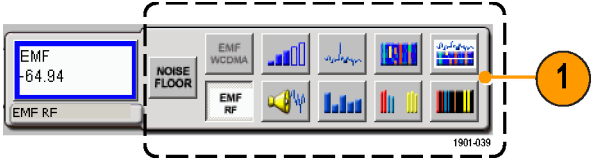


NOTE. *When moving measurement icons, be aware that when the GPS receiver is not active, you can move any type of measurement icon. This includes moving measurement icons that were placed on the map while in GPS mode. The iMap tool does not reposition moved GPS-related measurement icons back to their original geophysical position on a map when the GPS receiver is active.*

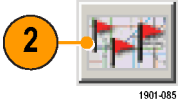
Logging iMap Measurements (Automatic Measurements)

Logging measurements lets you automatically map a single measurement at a set time interval or change in GPS position (with active GPS receiver and a grid map).

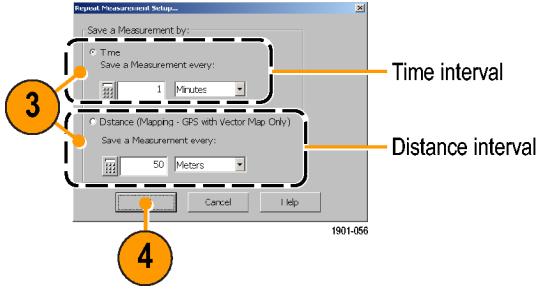
1. Tap a measurement button. Available measurements depend on the current signal standard.



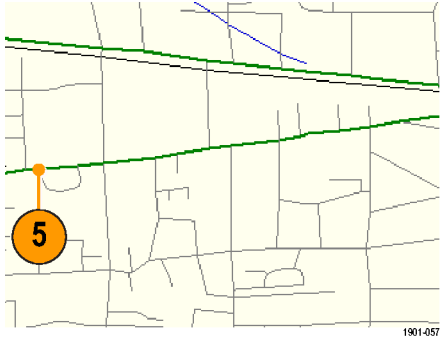
2. Tap the **Log Measurements** button.



3. Select the type of repeat measurement to take (time interval or distance between measurement positions).
4. Tap **OK** to return to the mapping screen.

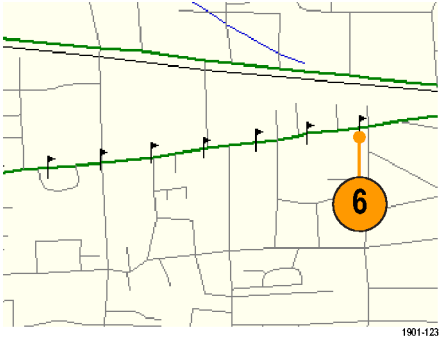


5. Tap the map to start logging measurements:
   - For grid maps with an active GPS receiver, tap the map at any point. The instrument begins adding measurement flags to the map at the current GPS position.
   - For image maps or for grid maps without an active GPS receiver, tap the map at the measurement starting location. The instrument begins taking measurements, but does not display them on the map until measurement logging is done.



6. Tap the map to stop measurements:

- For grid maps with an active GPS receiver, tap the map at any position.
- For image maps or grid maps without an active GPS receiver, tap the map at the position the last measurement was taken. Measurements are then evenly spaced between the start and stop map points.



7. To exit the logging measurements mode, tap the **Single Measurement** or the **Select** button.

NOTE. *The iMap Log measurements function automatically sets the map view measurements mode (**View > Display Measurements**) to disable viewing measurement icons on the map during logging measurement acquisition. While in Log measurements mode, iMap places flag icons on the map to indicate measurement positions. When iMap measurement logging is done, the instrument restores the map view measurements mode to the mode it was at before the iMap measurement logging was initiated.*

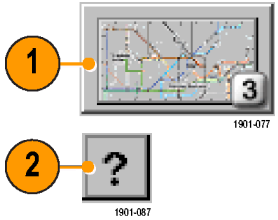
*If you tap the **Select**, **Measurement Direction**, or **Single Measurement** button while logging measurements in non-GPS mode, iMap cancels the log measurements mode and does not draw any measurement icons on the map.*

Grid maps with an active GPS receiver support logging measurements by time interval or distance change interval. Image maps, or grid maps with an inactive GPS receiver, support logging measurements by time intervals.

For More iMap Help

For more information on using the iMap tool, access the RF Scout Online help.

1. Tap the **iMap** button.
2. Tap the **Help** button. RF Scout opens an Online help window with an overview of the iMap tool, as well as links to common iMap tasks.



Specifications

This section lists the electrical, environmental, and physical specifications of the RF Scout Interference Hunter. All specifications are guaranteed unless labeled “typical”. Typical specifications are provided for your convenience and are not guaranteed.

Table 1: General characteristics

Characteristic	Description
RF Input	
Input Frequency Range	30 MHz – 2500 MHz
Input Impedance	50 ohms (nominal)
Signal Amplitude for Modulation Measurements	-50 dBm to +30 dBm for CW-like or peak envelope power Measurements may be outside this range but accuracy is not guaranteed
Signal Amplitude for Spectral Display, typical	CW or peak envelope power: -144 dBm to +30 dBm, 200 MHz to 2.0 GHz -142 dBm to +30 dBm, 2.0 GHz to 2.2 GHz -139 dBm to +30 dBm, 2.2 GHz to 2.5 GHz Levels apply when using 100 Hz resolution bandwidth
Input Overload Detect	>1 W (+30 dBm) CW or peak envelope power
Maximum Input Power without Damaging Instrument	50 W CW or peak envelope power
Coupling	AC for all measurements and spectral display modes

Table 1: General characteristics (cont.)

Characteristic	Description
Maximum Working Voltage	15 V (DC + peak AC)
Spurious Input Signals	To meet modulation measurement specifications: (Total power of interest - Total power in spurious) > 35 dB or | Center frequency of signal of interest - center frequency of spurious signal | > 1.4 MHz and (Total power of interest - Total power in all spurious) ≥ -3 dB
Frequency Reference Input	
Impedance	50 ohms (nominal)
Frequency Range	Any multiple of 1 MHz up to 15 MHz inclusive, ± 1 ppm Any multiple of 1.2288 MHz up to 19.6608 MHz inclusive, ± 1 ppm 2.048 MHz ± 1 ppm 4.8 MHz ± 1 ppm
Level Range	-15 dBm to +15 dBm
Maximum Input Level without Damage	± 3 V peak continuous
Coupling	AC
Working Voltage	3 V (DC + peak AC)

Table 1: General characteristics (cont.)

Characteristic	Description
Lock Time	< 15 seconds
Timing Input	
Impedance	10 kΩ
Minimum High Threshold	2.0 V
Maximum Low Threshold	0.8 V
Minimum High Time	10 ns
Minimum Low Time	10 ns
Maximum Input Level without Damage	± 5 V peak continuous
Coupling	DC
Timing Error	± 10 ppm
Internal Time Base Characteristics	

Table 1: General characteristics (cont.)

Characteristic	Description
Error	± 0.5 ppm drift from 0 °C to 50 °C ± 1.0 ppm aging/year Ten minute warm-up period required to meet accuracy specification. Users can connect the External Reference input to a frequency source and obtain a user correction value. This value will be used to correct time base errors in measurements to the accuracy of the external reference. The internal time base will continue to drift with temperature and age as specified above.
Signal Path Characteristics	
Phase Noise	≤ -75 dBc/Hz @ 20 kHz carrier offset
Noise Figure	1 kHz resolution bandwidth: ≤10 dB, 200 MHz to 2000 MHz ≤12 dB typical, 2000 MHz to 2200 MHz ≤15 dB typical, 2200 MHz to 2500 MHz
Displayed Average Noise Level (DANL), typical	10 Hz RBW: -152 dBm, 200 MHz to 2000 MHz 100 Hz RBW: -145 dBm, 200 MHz to 2000 MHz 1 kHz RBW: -135 dBm, 200 MHz to 2000 MHz

Table 2: Measurement characteristics

Measurement	Description
External Attenuation	User Selectable ON/OFF Attenuation = -30 dB to +80 dB
Code Domain Power (cdmaOne, cdma2000, W-CDMA)	Measures the power in each of the Walsh codes (64 in cdmaOne, 128 in cdma2000) used in a CDMA signal. Measures the power in each of (up to 512) OVSF codes used in a W-CDMA signal.
Units	dB relative to Pilot Power or Total Power
Resolution	0.1 dB
Accuracy	cdmaOne and cdma2000: ± 1 dB code domain power level > -20 dB relative to total power, using the recommended TIA/EIA-IS-97-D pilot level of -7.0 dB (20%) relative to total power. W-CDMA: ± 1 dB Code domain power level > -20 dB relative to total power, using W-CDMA 3GPP Test Model 3. Reference Information: ± 2.5 dB for -27 dB < CDP < -20 dB relative to total power in band classes 0-6 (cdmaOne, cdma2000). ± 2.5 dB for -27 dB < CDP < -20 dB relative to total power (W-CDMA).

Table 3: Spectral analysis

Characteristic	Description
Measurement Frequency	Sets the measurement frequency of the display. The measurement frequency can be set by either entering a specific frequency or by selecting a channel number.
Units	MegaHertz (MHz) or Channel Number
Resolution	1 kHz 1 channel
Range	30 MHz to 2500 MHz
Frequency Span	Sets the frequency range covered by the spectral display.
Units	kiloHertz (kHz) MegaHertz (MHz)
Resolution	1 kHz
Range	10 kHz to 2470 MHz, continuously variable or 1-2-5 steps
Resolution Bandwidth (RBW)	Width of the resolution bandwidth filter
Units	Hertz (Hz), kiloHertz (kHz), MegaHertz (MHz)
Resolution	Uses 1-3 steps to cover the range
Range	10 Hz to 6 MHz When in Auto mode, the instrument automatically sets the RBW. The RBW is set as a combination of 1-3 steps at the 1, 2, 5 span settings, and a linear range between 1, 2, 5 span settings, for a nominal value of approximately Span/125.
Reference Level	The power level indicated by the top line of the spectral display
Units	dBm

Table 3: Spectral analysis (cont.)

Characteristic	Description
Resolution	1 dBm
Range	-100 dBm to +30 dBm
Spectral Display Amplitude	
Units	dB relative to Reference Level
Resolution	0.1 dB
Accuracy	± 1.25 dB, -20 dBm to +30 dBm ± 2.0 dB, -80 dBm to -20 dBm ± 2.75 dB, -120 dBm to -80 dBm ± 5 dB -134 dBm < Input < -120 dBm, typical
	Accuracy specifications apply only for spans less than 1000 MHz and to CW-like signals.
Vertical Scale Factor	
Units	1 dB to 10 dB in 1 dB increments

Table 3: Spectral analysis (cont.)

Characteristic	Description
Display Modes	Normal: updates display with each new result Max Hold: updates displayed point only if new point > old point Min Hold: updates displayed point only if new point < old point Max/Min Hold: displays a bar between Max Hold and Min Hold Average: displays average of N (specified by user) results Reference Information: Average is calculated as follows: The last N values are saved in memory; when a new result is available, the earliest result of the N stored values is discarded, the new average is calculated from the stored values. If the number of results is less than N, then all of the results are averaged together.
Number of Averages	1 ≤ N ≤ 99
Spurious Free Dynamic Range (external signal related)	IM3 better than -70 dBc typical, 100 MHz to 2500 MHz 2nd Harmonic better than -60 dBc, typical
Residual Spurious Signals	-125 dBm at BTS Rx frequencies (776–794, 806–849, 872–940, 1453–1465, 1525–1549, 1710–1785, 1840–1910,1920–1980) MHz and GPS frequencies (L1 1570.3–1580.5, L2 1222.5–1232.8, L5 1171.4–1181.6) MHz -115 dBm at BTS Tx frequencies (746–764, 832–834, 840–960, 1477–1513, 1805–1880, 1930–1990, 2110–2170) MHz -95 dBm at frequencies not listed above, except from 1155–1168 MHz: -20 dBm in spans above 10 MHz, 1155 MHz–1175 MHz

Table 4: Interference analysis characteristics

Characteristic	Description
Noise Floor Measurement	Measures the interference power that is coming into the receiver antenna for any standard. Measurement defaults to uplink channel when specified by channel number.
Units	dBm
Resolution	0.1 dB
Accuracy	± 3 dB typical
AM Demodulation	Provides an audio output signal after AM demodulation of the user-selected signal to use for identifying a signal
Measurement Frequency	30 MHz to 2500 MHz with 1 kHz resolution
Input Signal Level	-100 dBm minimum
Measurement Bandwidth	8 kHz
Audio Output Bandwidth	4 kHz
Run Time	4 seconds per activation
FM Demodulation	Provides an audio output signal after FM demodulation of the user-selected signal to use for identifying a signal
Measurement Frequency	30 MHz to 2500 MHz with 1 kHz resolution

Table 4: Interference analysis characteristics (cont.)

Characteristic	Description
Input Signal Level	-100 dBm minimum
Maximum Signal Deviation	Up to 100 kHz
Measurement Bandwidth	8 kHz, 15 kHz, 75 kHz, 200 kHz; selected by user
Audio Output Bandwidth	4 kHz for Measurement BW = 8 kHz, 15 kHz 15 kHz for Measurement BW = 75 kHz, 200 kHz
Run Time	4 seconds per activation
Signal Strength Indicator	Provides an audio tone and a visual display that vary with the strength of the selected signal
Measurement Frequency	30 MHz to 2500 MHz with 1 kHz resolution
Input Signal Level	-110 dBm minimum

Table 4: Interference analysis characteristics (cont.)

Characteristic	Description
Measurement Bandwidth	Up to 10 MHz, dependent on span setting
Tone Type	Variable beep rate, based on signal strength Variable frequency tone, based on signal strength

Table 5: Scanner characteristics

Characteristic	Description
W-CDMA Scrambling Code Analyzer	Detects scrambling codes and pilot channel power levels of received co-channel W-CDMA downlink signals.
Input Signal Range	-117 to +30 dBm, typical
Units	Io, Ec: dBm Ec/Io: dB
Resolution	0.1 dB
Accuracy	Ec: ±2 dB for Ec ≥ -102 dBm and Ec/Io ≥ -12 dB, typical ±3 dB for Ec ≥ -112 dBm and Ec/Io ≥ -14 dB, typical
Display Controls	Sort by Power (descending Ec value) Sort by Scrambling Code (ascending SC index) Lock (set) current Scrambling Code set

Table 5: Scanner characteristics (cont.)

Characteristic	Description
cdma2000 PN Scanner	Detects PN Offset, Tau (Timing Error) and Pilot Channel power levels of multiple co-channel cdmaOne and/or cdma2000 forward link signals.
Input Signal Range	-120 to +30 dBm, typical
Units	Io, Ec: dBm Ec/Io: dB PN Offset: PN index (0 to 511) Tau: chips
Resolution	Ec, Io, Ec/Io: 0.1 dB PN Offset: 1 PN Tau: 0.1 chip
Accuracy	Ec: ±2 dB for Ec ≥ -95 dBm and Ec/Io ≥ -8 dB, typical ±3 dB for Ec ≥ -110 dBm and Ec/Io ≥ -12 dB, typical Tau: 0.5 chip, of highest power multipath component of each detected PNOS, relative to input timing reference (ESC or YBGPS1), typical.
Display Controls	Sort by Power (descending Ec value) Sort by PN offset (ascending offset values) Lock (set) current PN Offset values

Table 5: Scanner characteristics (cont.)

Characteristic	Description
1xEV-DO PN Scanner	Detects PN Offset, Tau (Timing Error) and Pilot Channel power levels of multiple co-channel 1xEV-DO forward link signals. Up to 10 PN offsets are displayed. Io: The total received power in the pilot intervals of the signal, within the signal bandwidth (1.23 MHz). Ec: The absolute power level of the detected pilot at the indicated PN Offset, in dBm.
Input Signal Range	-120 to +30 dBm, typical
Units	Io, Ec: dBm Ec/Io: dB PN Offset: PN index (0 to 511) Tau: chips
Resolution	Ec, Io, Ec/Io: 0.1 dB PN Offset: 1 PN Tau: 0.1 chip
Accuracy, typical	Ec: ± 2.5 dB for Ec ≥ -95 dBm and Ec/Io ≥ -8 dB ± 3.5 dB for Ec ≥ -110 dBm and Ec/Io ≥ -12 dB Tau: ±0.5 chip, of highest power multipath component of each detected PNOS, relative to input timing reference (ESC or YBGPS1)

Table 5: Scanner characteristics (cont.)

Characteristic	Description
Display Controls	Sort by Power (descending Ec value) Sort by PN offset (ascending offset values) Lock (set) current PN Offset values
GSM Channel Scanner	The GSM channel scanner displays channel power and related information on a maximum of 128 GSM forward link signals. Displays Channel, Frequency, Peak Power, Traffic Type, C/I, and BSIC The scanner is intended for off-air reception using an antenna, and measures only forward (down) link signals. This measurement requires that YBT250 option GS1 is installed.
Input Signal Range	-120 to +30 dBm, typical
Units	Frequency: MHz Peak Power: dBm C/I: dB
Resolution	Frequency: 0.001 MHz Peak Power: 0.1 dBm C/I: 0.1 dB

Table 5: Scanner characteristics (cont.)

Characteristic	Description
Accuracy, typical	± 1 dB, -20 dBm to +30 dBm, ± 0.75 dB for identified GSM channels The center frequency is derived from the channel number C/I is derived from EVM using the following equation: C/I = -20 * log10(EVM/100)
Display Controls	AutoLevel (graph) Sort table by power or frequency Start and stop channel select Peak hold

Table 6: Environmental characteristics

Characteristic	Description
Temperature Range	Operating: 0 °C to +50 °C specified performance, -10 °C to +50 °C typical Nonoperating: -40 °C to +60 °C

Table 6: Environmental characteristics (cont.)

Characteristic	Description
Humidity	Operating: 5% to 95% Relative Humidity (RH), noncondensing: up to +30 °C Nonoperating: 5% to 45% Relative Humidity (RH), noncondensing: +30 °C up to +50 °C
Altitude	Operating: Up to 4,600 m (15,092 ft.) Nonoperating: Up to 15,240 m (50,000 ft.)

Table 7: Physical characteristics

Characteristic	Description
Dimensions	Height: 25 cm. (9.75 in) Width: 33 cm. (13 in) Depth: 9 cm. (3.5 in)
Weight (Y400, YBT250, and 1 battery)	5.5 kg (12.125 lbs)

Table 8: Miscellaneous characteristics

Characteristic	Description
Battery Life	One battery installed: 2 hours with measurements active, 4 hours in suspend mode Two batteries installed: 4 hours with measurements active, 8 hours in suspend mode
Recommended Instrument Calibration Interval	2 years

Table 9: Safety compliance

Category	Description
Safety Compliance	ANSI/UL61010-1:2004 Electrical Equipment for Measurement, Control, and Laboratory Use. CSA C22.2 No. 61010.1:2004 Electrical Equipment for Measurement, Control, and Laboratory Use. EN 61010-1:2001 Electrical Equipment for Measurement, Control, and Laboratory Use. IEC61010-1:2001 Electrical Equipment for Measurement, Control, and Laboratory Use. ISA 82.02.01 Electrical Equipment for Measurement, Control, and Laboratory Use.

Table 10: Electromagnetic compatibility (EMC)

Category	Standards or description
EC Declaration of Conformity — EMC	Meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Union: EN 61326 Annex D, EMC requirements for Class A electrical equipment for measurement, control, and laboratory use [1] [2] [3] IEC 61000-4-2 Electrostatic discharge immunity IEC 61000-4-3 [4] Radiated RF electromagnetic field immunity IEC 61000-4-4 Electrical fast transient/burst immunity IEC 61000-4-5 Power line surge immunity IEC 61000-4-6 [4] Conducted RF immunity IEC 61000-4-11 Voltage dips and interruptions immunity EN 61000-3-2 Conducted power line harmonic current EN 61000-3-3 Voltage changes, fluctuations, and flicker
Australia/New Zealand Declaration of Conformity — EMC	Complies with EMC provision of Radiocommunications Act per the following standard(s): [1] [2] AS/NZS 2064.1/2 Industrial, Scientific, and Medical Equipment: 1992

1 EMC compliance was demonstrated using high-quality shielded interface cables.

2 Emissions that exceed the limits of this standard may occur when the instrument is connected to a test object.

3 Minimum immunity test requirement.

4 Residual spurious signals can increase to -70 dBm with exposure to the disturbance levels of this test.

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