

H600 RFHawk
User Manual

www.tektronix.com
071-2464-01

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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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 symbol(s) may appear on the product:



Standby

Environmental Considerations

This section provides information about the environmental impact of the product.

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.



This symbol 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).

Battery Recycling. This product contains a lithium ion (Li-ion) rechargeable battery, which must be recycled or disposed of properly. Please properly dispose of or recycle the battery according to local government regulations.

Mercury Notification. This product uses an LCD backlight lamp that contains mercury. Disposal may be regulated due to environmental considerations. Please contact your local authorities or, within the United States, the Electronics Industries Alliance (www.eiae.org) for disposal or recycling information.

Perchlorate Materials. This product contains one or more type CR lithium coin cell batteries. According to the state of California, CR lithium coin cells are classified as perchlorate materials and require special handling. See www.dtsc.ca.gov/hazardouswaste/perchlorate for additional information.

Transporting Batteries

The lithium ion rechargeable battery pack in this product contains less than 8 grams of equivalent lithium content, with individual cells containing less than 1.5 grams of equivalent lithium, as measured by International Civil Aviation Organization (ICAO) standards. Consult your air carrier for applicability and determination of any special lithium ion battery transportation requirements.

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.

Preface

This manual describes the installation and basic operation of the H600 RFHawk. For more detailed information on specific fields, tap the help buttons in the application to open the online help for those items.

Key Features

The H600 RFHawk is a rugged, multi-standard spectrum analyzer, signal analysis, and interference mapping tool optimized for field use. Key features include:

- Spectrum analyzer input frequency range of 10 kHz to 6.2 GHz covers most modern signal sources
- DPX™ Spectrum color bitmap display that shows signal rate-of-occurrence and trace shape changes to help highlight short-duration signal features
- Plot measurements directly onto geo-referenced maps (using GPS) or image maps for on-site analysis of interference and coverage problems
- Signal Classification with spectral correlation and signal profiles for analyzing and classifying unknown signals
- Multiple signal markers, signal traces, and trace modes provide flexible measurement capabilities
- Spectrogram display for detection of intermittent signals
- Key RF measurements

Documentation

To read about	Use these documents
Installation and operation (overviews)	<i>H600 RFHawk User Manual</i> . 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	<i>Online Help</i> . The online help is context sensitive, displaying information appropriate for the active screen or the selected help button. (See page 28, <i>Getting Help</i> .)

Instrument Software

Instrument software upgrades and tools are available on the Tektronix Web site. You must have a valid option key for the specific application module and serial number to install the instrument software. PC-based software tools do not require an option key.

RFHawk Software Upgrade Archive File	The RFHawk upgrade archive file upgrades the H600 instrument software to the latest version.
RFHawk PC Application Installation File	The H600 RFHawk PC simulator software provides a PC simulation of the instrument functionality. The simulator can display saved instrument measurement results, create and edit mask test files, and so on. The only limit to the PC simulator is that it cannot take measurements.
iMap Converter PC Application Installation File	The iMap Converter PC tool lets you convert image or industry-standard coordinate maps to GSF-format map files for use with the instrument iMap mapping function. The iMap Converter tool also lets you add coordinate information to image files or create coordinate map files from Google Earth and Microsoft MapPoint.

Signal DB Editor PC Application Installation File	The signal database editor lets you edit the instrument signal database files to customize signal definitions.
USB Slave Device PC Registration Utility	The USB slave device registration software enables a PC to communicate with the instrument through a USB cable. You must run this software before using the VirtualCE software to remotely control the instrument over a USB connection. You do not need to run this program if you plan to use VirtualCE to remotely control the instrument over an RS-232 connection.
VirtualCE PC Application Installation File	The VirtualCE PC application lets you remotely control your instrument from a virtual interface on a PC or laptop. If you intend to use a USB cable to access the instrument from the VirtualCE application, you must run the USB slave device registration program before installing and using this application.

Downloading Instrument Software

1. Go to the Tektronix Web site (www.tektronix.com).
2. Click **Software Downloads** on left side of the screen open the Software Downloads Web page.
3. Enter the product model number (**H600**) in the **Search by keyword** field and click **Go**.
4. Scroll through the list and select the appropriate link for a software item to show more information or to download the software.

The instructions to install the software are on the Web download page for each software item.

Conventions Used in This Manual

The following icons are used in this manual:

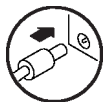
Sequence
Step



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.

H600 RFHawk Standard Accessories

Accessory	Tektronix part number
H600 RFHawk instrument	H600
<i>H600 RFHawk User Manual</i>	071-2464-xx
AC Power Adapter	119-7288-xx
Lithium-Ion Battery	146-0151-xx
GPS Antenna	119-7424-xx
Tilt stand	348-1661-xx
Soft carry case	016-1775-xx
BNC Connector cover (2)	200-0678-xx
N Connector cover (1)	200-4696-xx
Audio jack mute plug (mute all audio output from the instrument speaker)	131-8284-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 instrument, visit the Tektronix Web site, www.tektronix.com.

Operating Considerations

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: 25.5 cm. (10.0 in) Width: 33 cm. (13 in) Depth: 12.5 cm. (4.8 in)
Weight	Weight: 6.0 kg (13.25 lbs) , instrument and 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 and Nonoperating: 5% to 95% relative humidity (RH) at up to +30 °C, 5% to 45% RH above +30 °C up to +50 °C, noncondensing
Altitude	Operating: Up to 4,600 m (15,092 ft.) Nonoperating: Up to 12,192 m (40,000 ft.)
RF Signal Input	Input frequency range: 10 kHz to 6.2 GHz Coupling: AC Input impedance: 50 Ω (nominal) Maximum input power without damaging instrument: 50 W rms 10 kHz to 3.2 GHz, 15 W rms 3.2 GHz to 6.2 GHz

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.

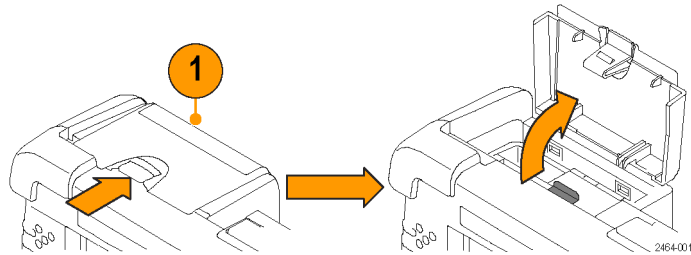
Do not use abrasive cleaners, or chemical cleaning agents that contain benzene, toluene, xylene, acetone, or similar solvents; they can damage the instrument or touch screen. Do not use commercial glass cleaners to clean the touch screen.

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

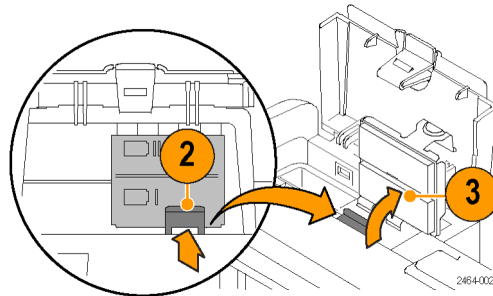
Installing Batteries

The instrument comes standard with a single battery, which is not installed when the instrument is shipped. To install the battery, do the following:

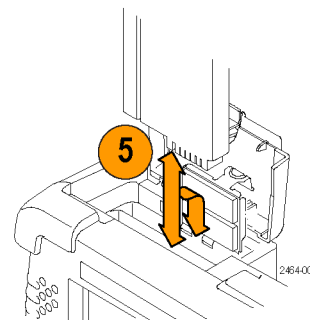
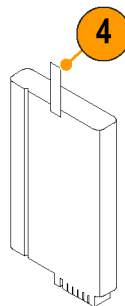
1. Push on the battery door latch, then open the battery door.



2. Push the metal battery retainer tab down and towards the back of the instrument.
3. Lift the battery retainer up.



4. Lift battery by the tab.
5. Insert the battery, oriented as shown, into either battery slot.
6. Close and latch the metallic battery retainer and the battery compartment door.
7. Reverse steps 1 through 6 to remove a battery.



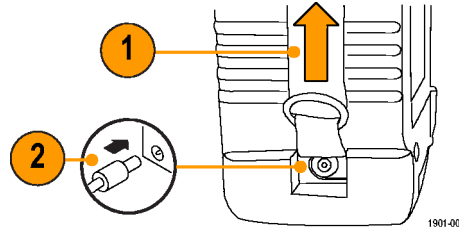
You can add a second battery to increase the operating time. Replace a battery with the specified type only. To purchase a battery, contact your Tektronix Service Center for the correct part number.

NOTE. *Disconnect power supply cables from the instrument before installing or removing batteries.*

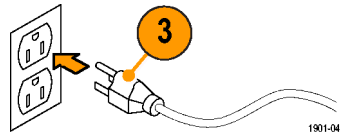
New batteries, or batteries that have not been used for an extended period, must be charged before using them to power the instrument. (See page 7, Charging the Batteries.)

Connecting the AC Adapter

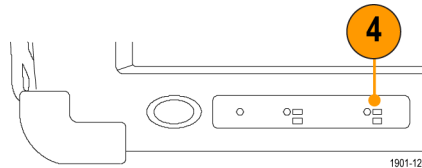
1. Lift the instrument strap to expose the power adapter connector.
2. Connect the AC power adapter to the instrument.



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 7, *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.

See the H600 application online help topic *Battery Calibration* for information on calibrating batteries.

Approximate charge time

Number of batteries	Instrument powered on	Instrument powered off
1	10 hours	5.5 hours
2	20 hours	11 hours

NOTE. *These are typical numbers for batteries that are low but not completely discharged.*

Powering On and Off the Instrument, and Functional Verification

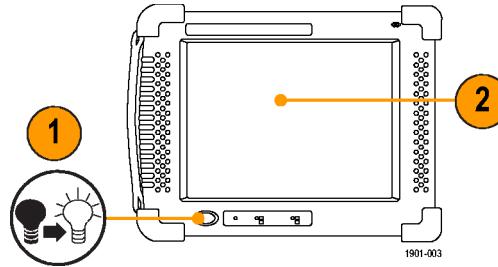
1. Tap the **On/Standby** button to power on the instrument.

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, see the online help: **Start > Help > Tektronix Basics > Shutting Down the Instrument.**

2. For functional verification, watch the screen. Verify that the instrument does not display any power-on diagnostic error messages.



Touch Screen Concepts

The instrument 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.

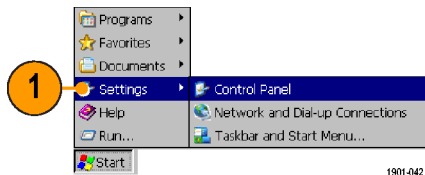
The following are touch screen terms used in this manual:

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 and hold 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).

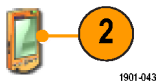
Calibrate the Touch Screen

Before using the instrument for the first time, calibrate the touch screen display to respond correctly to your taps.

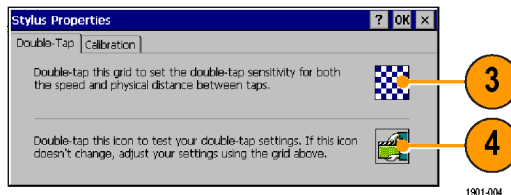
1. Tap **Start** > **Settings** > **Control Panel** to open the Control Panel screen.



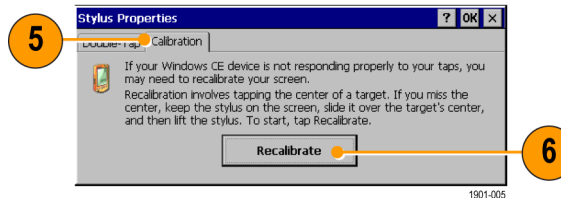
2. Double-tap the **Stylus** icon on the Control Panel screen.



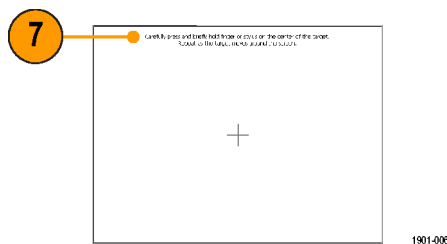
3. In the Double-Tap tab, double-tap the checkerboard grid at a comfortable speed with your stylus or finger to set the tap rate.
4. Double-tap the test icon to verify your settings.



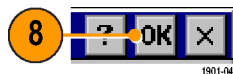
5. Tap the **Calibration** tab and read the instructions.
6. Tap the **Recalibrate** button to open the Cursor Position target screen.



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.

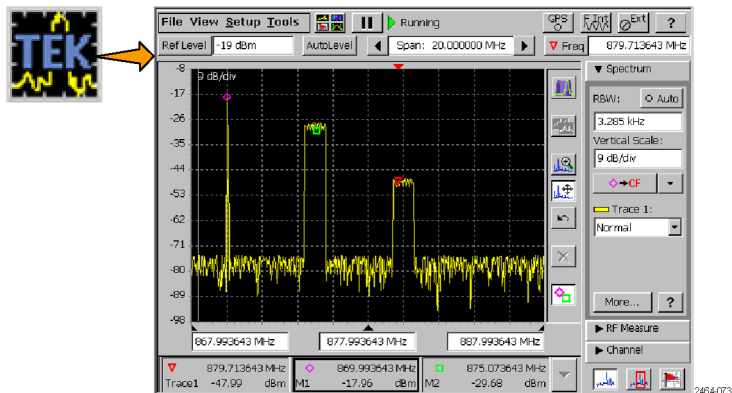


Starting the H600 RFHawk Application

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

- Double-tap the **RFHawk** icon on the instrument screen.
- Select **Start > Programs > Tektronix Applications > RFHawk**.

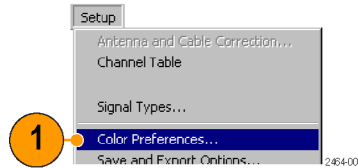
The instrument opens the application. The Microsoft WindowsCE taskbar displays a button for each running application. To bring the application to the front of the screen, tap the **RFHawk** button in the taskbar.



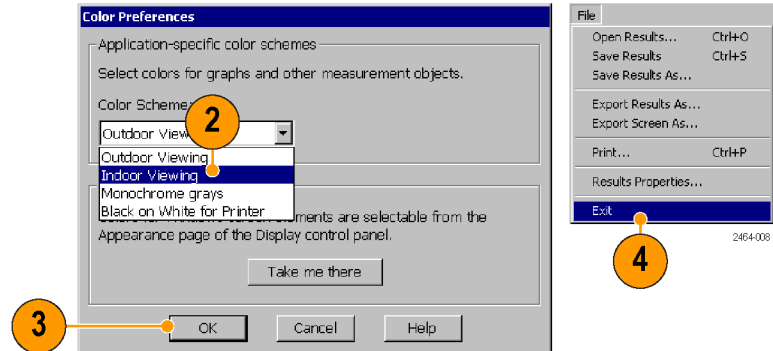
Setting Display Colors

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 **Setup > Color Preferences**.



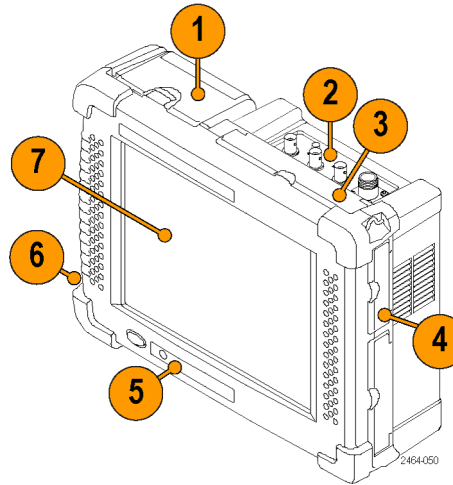
2. Tap the **Color Scheme** list field and select a display color scheme.
3. Tap **OK**.
4. Select **File > Exit** to close the application.
5. Restart the application to enable the changed color scheme.



Getting Acquainted with Your Instrument

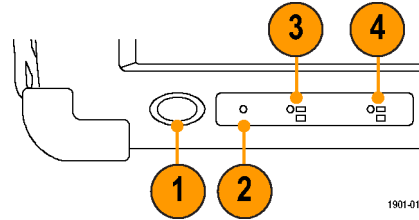
Instrument Elements

1. Battery compartment.
2. Signal Connectors. (See page 17, *Signal Connectors*.)
3. Input/Output ports. (See page 16, *Input/Output Connectors*.)
4. PCMCIA card ports.
5. Power and Status panel. (See page 15, *Power On/Standby and Status Panel*.)
6. Connector for external power adapter. (See page 6, *Connecting the AC Adapter*.)
7. Touch screen.



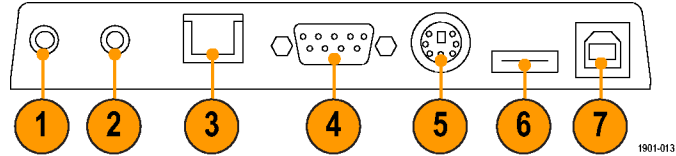
Power On/Standby and Status Panel

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. Reset button. Performs a hardware reset; all programs and data loaded into volatile memory are erased. Generally only used to recover from a system lock-up. Use a thin probe to push the reset button.
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 (to conserve power).
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.



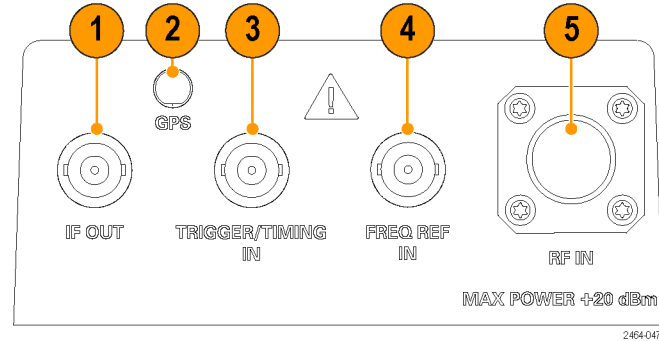
Input/Output Connectors

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



Signal Connectors

1. IF OUT. For future use.
2. GPS. Connects to the GPS antenna.
3. TRIGGER/TIMING IN. For future use.
4. FREQ REF IN. Connect to an external frequency reference signal to improve measurement accuracy.
5. RF IN. The RF Input connects the RF measurement antenna or input signal source to the instrument.



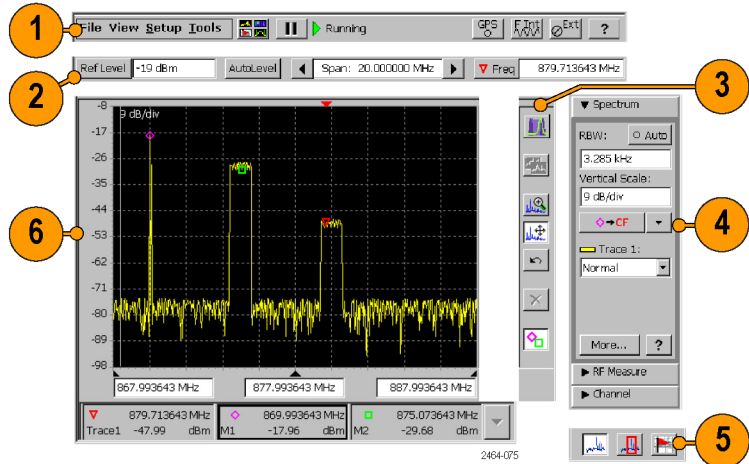
Microsoft WindowsCE Elements

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 include information about the instrument power status.

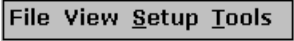

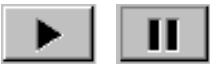

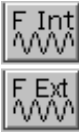
The User Interface





1. **Command bar.** (See page 19, *The Command Bar.*)
2. **Spectrum Analyzer controls.** (See page 21, *The Spectrum Analyzer Controls.*)
3. **Display controls.** (See page 23, *Display Control Buttons.*)
4. **Measurement drawers.** (See page 22, *The Measurement Drawer Buttons.*)
5. **Measurement mode buttons.** (See page 26, *The Measurement Mode Buttons.*)
6. **Measurement results.** Shows the waveform displays, measurement results, and marker readouts. The appearance of this area changes depending on the selected measurement mode and measurement type.



The Command Bar

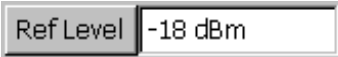


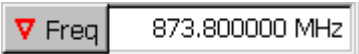
Contains the application menus, as well as buttons for running/pausing the application and setting GPS, reference signal, and external amplifier/attenuator parameters.

Element	Description
	Menus. See the online help topic <i>Menus</i> for information about the menu functions.
	Measurement Display button. Opens a dialog box from which to select the instrument measurement mode. (See page 31, <i>Select a Measurement Type</i> .)
	Run/Pause button. Runs or Pauses the current measurement acquisition.
	The GPS status button. Shows the GPS signal lock status of an attached GPS receiver. The color indicates the GPS receiver signal lock status. Tap this button to open the GPS dialog box. See the online topic <i>The GPS Dialog Box</i> for more information.
	The Measurement Reference Frequency status button. Shows the measurement frequency reference source. Tap this button to open the Inputs dialog box. Use this button if you connect an external measurement reference frequency source to the instrument. The available measurement reference frequency sources are the internal instrument frequency reference (F INT) and an external reference (F EXT). See the online topic <i>The Inputs Dialog Box</i> for more information.

Element	Description
	The RF Input Signal Gain/Attenuation 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 online topic <i>The Inputs Dialog Box</i> for more information.
	
 <small>2409-064</small>	
	Help button. Opens the online help. online help is context-sensitive and normally displays a help topic related to the current measurement mode or screen. If the current screen is not context-sensitive, the instrument opens the online help at the main help menu. Use the index, or do a word search, to locate specific information.

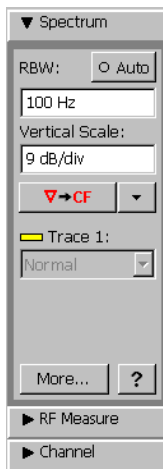
The Spectrum Analyzer Controls

Sets the display reference level (manually or automatically), the frequency span, and the measurement frequency.

Element	Description
	<p>Reference Level button and field. Shows the current spectrum signal reference level. Tap the Ref Level button to open a keypad and enter a specific level value. Tap the Ref Level field to open an increment control to increase/decrease the current reference level value.</p>
	<p>AutoLevel button. Tap the button to automatically detect the maximum input signal level across the full instrument frequency range and set the Reference Level appropriately.</p>
	<p>Span controls and field. Shows the frequency span of the displayed signal. Tap the arrow buttons to increment or decrement the span value by the default span units (1–2–5). Tap the Span field to open a keypad and enter a specific span value.</p>
	<p>Measurement Frequency button and field. Shows the spectrum signal measurement frequency. Tap the Freq button to open a keypad and enter a specific frequency value. Tap the frequency field to open an increment control to increase/decrease the current reference level value in steps.</p> <p>Use the Freq/Span tab (Spectrum drawer > More) to couple or uncouple the measurement frequency with the display center frequency.</p>

The Measurement Drawer Buttons

Element



Description

Drawer buttons provide additional controls for setting parameters. The displayed set of drawer buttons changes based on the selected measurement mode. The drawer buttons are always on screen to provide fast access to the most important controls for that measurement or setting.







Tap on a drawer button to open that drawer. A down-pointing arrow indicates an open drawer.




Tap the **More** button to open parameter tabs with which you can set additional measurement parameters.

Tap the **Help** button [?] to display information on that drawer.

Display Control Buttons




The Display Control buttons let you select the type of signal display, move the signal display area, and turn markers on and off.

Element	Description
	Spectrum button. Displays the Spectrum measurement. (See page 33, <i>Display a Spectrum Signal</i> .) When displaying a spectrum, this button is replaced with the DPX™ Spectrum button.
	DPX™ Spectrum button. Displays the DPX Spectrum measurement. (See page 38, <i>Display a DPX Spectrum Signal</i> .) When displaying a DPX spectrum, this button is replaced with the Spectrum button.
	Front Trace button. Selects which trace is in front on the display. Tap the button to cycle through all enabled traces. The Trace field in the Spectrum drawer shows the front trace name and trace type. See the online help topic <i>The Trace Tab</i> for more information.
	Zoom button. Lets you zoom (expand) the waveform by changing the span. Tap and drag from left to right to zoom in (expand) the waveform. Tap and drag from right to left to zoom out (shrink) the waveform. The zoom function only works in the horizontal (frequency span) axis. In the SC Plot mode, the zoom function works in both the horizontal and vertical axis.
	Move Display button. Lets you move the waveform display. Tap and drag on the screen to move the waveform in a horizontal or vertical direction (you cannot move the display diagonally). The vertical reference level scale changes to track the movement. If you move the display such that the measurement frequency is off-screen, the instrument sets the measurement frequency to the nearest edge of the display.
	Move Spectral Correlation (SC) Plot button. Lets you move the SC plot in a horizontal direction. If you move the display such that the measurement frequency is off-screen, the instrument sets the measurement frequency to the nearest edge of the display.

Element	Description
	Undo button. Undoes the last touch screen tap or drag action (such as a move or zoom).
	Reset button. Clears the current signal data and starts a new signal acquisition.
	Display Markers button. Shows or hides marker icons and readouts. See the online help topic <i>The Markers Tab</i> for more information.




Signal Classification Display Control Buttons

The following display control buttons are shown only when in Signal Classification mode, and replace existing spectrum display control buttons.

Element	Description
	Edit Region button. Enables the region edit mode, which lets you tap and drag on a region box to change the center frequency and span of a region. When selected, this button replaces the Zoom and Move Display buttons with the Change Span and Move Region buttons. (See page 45, <i>Edit a Signal Classification Region.</i>)
	Change Span button. Lets you change the frequency span of a region. This button replaces the spectrum Zoom button when Edit Region button is selected. You cannot use this function on a declared (classified) region. (See page 45, <i>Edit a Signal Classification Region.</i>)
	Move Region button. Lets you move a region to a new area on the signal. This button replaces the spectrum Move button when Edit Region mode is enabled. You cannot use this function on a declared (classified) region. (See page 45, <i>Edit a Signal Classification Region.</i>)

The Measurement Mode Buttons

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

Element	Description
	Spectrum Measurement button. Sets the instrument to display spectrum measurements. (See page 33, <i>Display a Spectrum Signal</i> .)
	Signal Classification button. Sets the instrument to define signal regions, analyze, identify, and classify signals of interest. (See page 42, <i>Define a Signal Classification Region</i> .)
	iMap button. Sets the instrument to place instrument measurements on a map. Use for graphically recording measurements to help analyze signal characteristics, locate interference, and save measurement/location information. (See page 56, <i>iMap Measurement Mapping Mode</i> .)

Parameter Entry Controls

Tap on a parameter field or button to open the appropriate parameter entry control for that field or button.

Element



Description


The Increment control lets you use buttons to increase or decrease the value of the field in small or large steps. The single arrow buttons make small changes. The double arrow buttons make larger changes.



Tap a keypad button to open 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.



WindowsCE provides an Input Panel (virtual keyboard) that you can use to enter text such as file names. In most cases, when the instrument opens a dialog box that includes fields for text entry, the Input Panel also opens. When you close the dialog box, the Input Panel also closes.

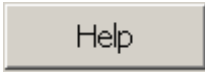
To manually open the Input Panel, tap the WindowsCE **Input Panel** button ( right-most icon in the task bar). You can open a standard keyboard or a large keyboard. Tap the Input Panel button again and select **Hide Input Panel** to close the keyboard.

You can also open the Input Panel from **Tools > Keyboard**.

Getting Help

The application includes a comprehensive online help system. You access the online help using the following methods:

Online help element	Description
	Help button. Located at the top right of the screen, as well as on most measurement function drawers or tabs Tap this button to display a help topic that is relevant to the current display mode, measurement drawer, or tab contents.
	Dialog box help button. Tap this button to display an online help topic relevant to that dialog box.

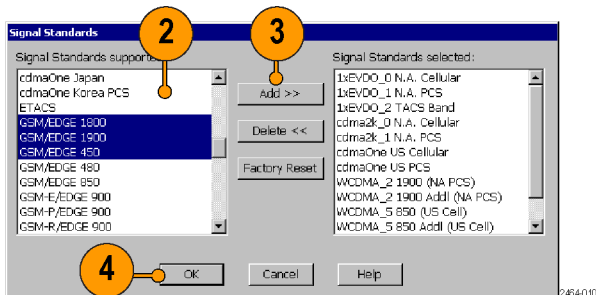
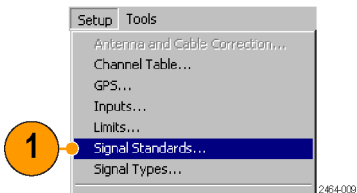


Operating Basics

Enabling Signal Standards

Enable (select) the signal standards that you expect to analyze or measure. Enabled signal standards are listed in various fields in the instrument.

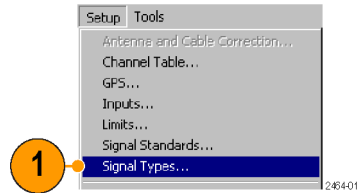
1. Select **Setup > Signal Standards**.
2. Tap the name of the standard in the **Signal Standards supported** list that you want to enable. Drag the stylus to select two or more contiguous standards.
3. Tap the **Add >>** button to add the selected standard(s) to the **Signal Standards selected** list.
4. Tap **OK**. The enabled standards are now selectable from any Standards drop-down list.



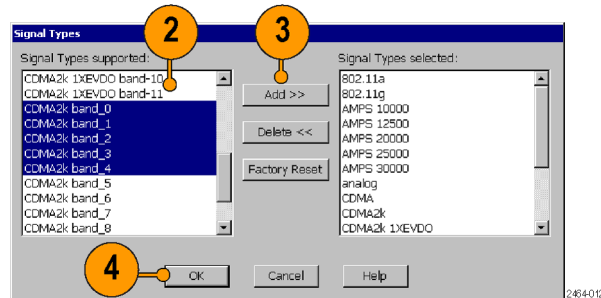
Enabling Signal Types

Enable (select) the signal types that you expect to analyze or measure. Enabled signal types are listed in various fields in the instrument. Use enabled signal types to set measurement parameters such as measurement bandwidth.

1. Select **Setup > Signal Types**.

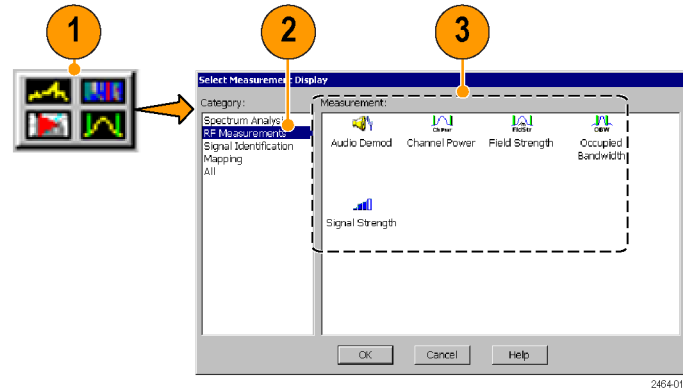


2. Tap the name of the standard in the **Signal Types supported** list that you want to enable. Drag the stylus to select two or more contiguous standards.
3. Tap the **Add >>** button to add the selected standard(s) to the **Signal Types selected** list.
4. Tap **OK**. The enabled types are now selectable from Signal Types drop-down lists.



Select a Measurement Type

1. Tap the **Measurement Display** button.
2. Tap an item in the **Category** field.
3. Double-tap an item in the **Measurement** field to open the selected measurement display mode.



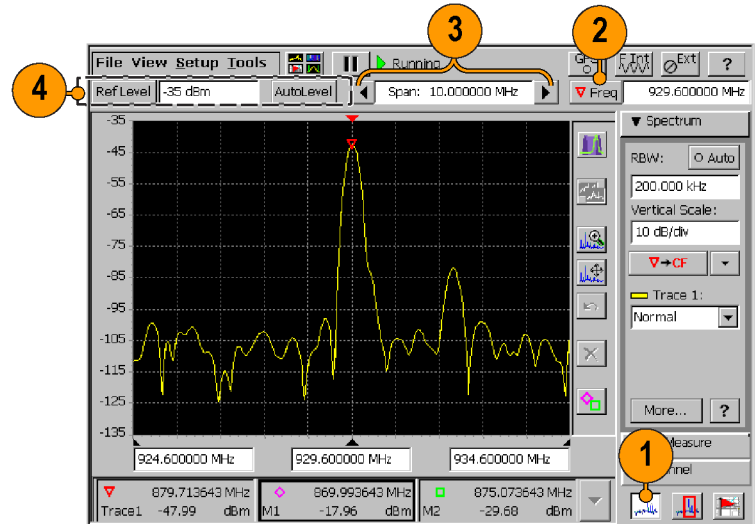
Spectrum/Spectrogram Measurements

The spectrum measurement displays the spectral content of a signal (power versus frequency). The spectrum measurement features include a measurement frequency range of 10 kHz-6.2 GHz that covers most modern signal sources, the ability to detect very low level signals, seven measurement markers, two signal traces, five trace modes, and intermodulation markers for quickly checking for this common source of unusual signals.

The Spectrogram measurement displays the spectral content (power versus frequency) of a signal over time, where the signal amplitude is represented as a color. This display is especially useful for recording intermittent signals, as you can set the spectrogram to acquire measurements from seconds to days apart, and automatically save the measurements to a file.

Display a Spectrum Signal

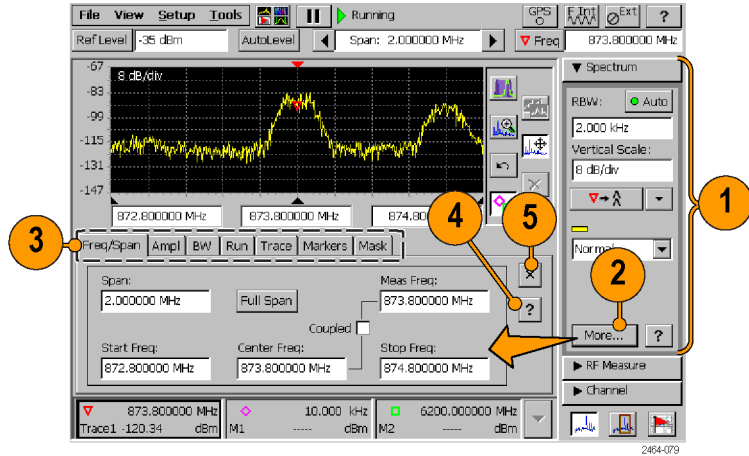
1. Tap the **Spectrum** mode button.
2. Tap the **Freq** button and enter a measurement frequency.
3. Tap the **Span** controls to change the displayed frequency span to show the waveform area of interest. Or tap the Span field and change the span value using the Increment control or the Keypad control.
4. Tap the **AutoLevel** button to set the display reference level. Or tap the **Ref Level** button and enter a value with the Reference Level keypad.



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Set Other Spectrum Parameters

1. Use the controls in the **Spectrum drawer** to set resolution bandwidth (RBW), the display vertical scale, the measurement frequency **Marker To** button actions, and the waveform trace type.
2. Tap the **More** button in the Spectrum drawer to display the spectrum parameter tabs.
3. Tap a tab to display the parameters set by that tab.
4. Tap the **Help** (question mark) button on a tab to display online help that describes the parameters for that tab. For example, to get information on measurement markers, tap the Markers tab and then tap the help button.
5. Tap the **Close** (X) button on a tab to close the tab display and return the instrument to a full-screen display mode.

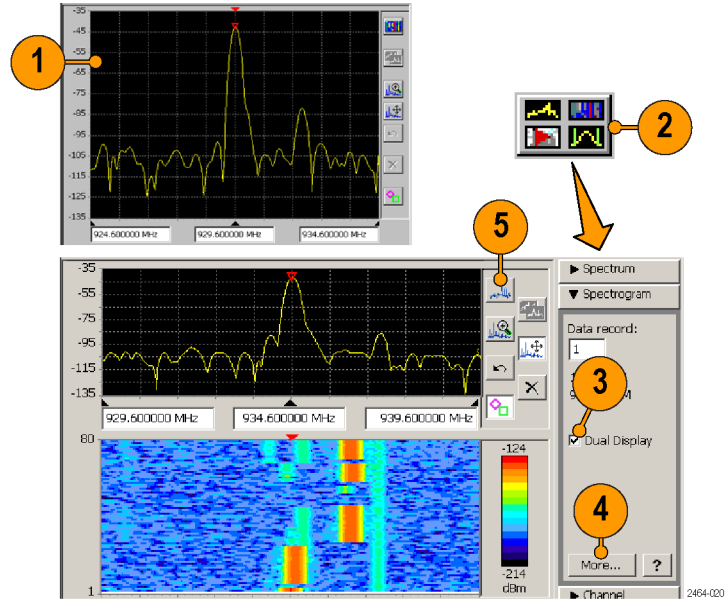


Display a Spectrogram

1. Display a spectrum signal of interest.
2. Tap the **Measurement Display** button and select the **Spectrogram** measurement.
3. Set or clear the **Dual Display** check box in the Spectrogram drawer to enable or disable a split-screen spectrum/spectrogram display.

NOTE. If tabs are open, tap the tab **Close** button (X) to close the tabs and display the spectrogram on the lower half of the screen.

4. Tap the **More** button to display the spectrogram parameter tabs.
5. Tap the **Spectrum** display control button to return to a Spectrum display.

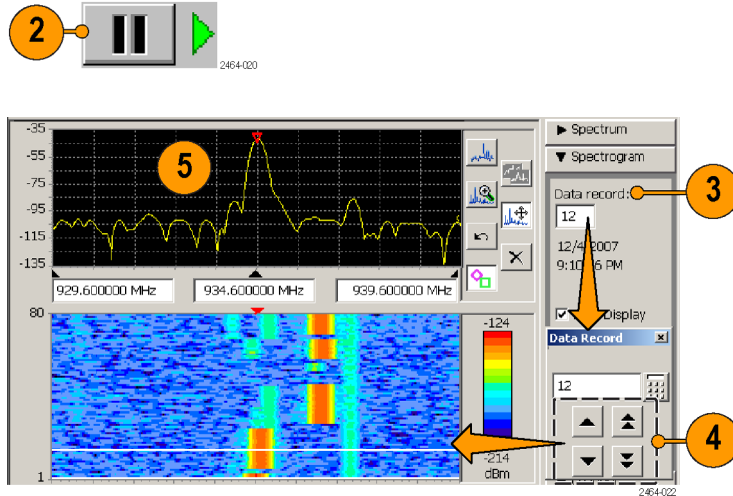


See the online spectrogram help topics for information on other spectrogram operations.

View a Spectrogram Record

1. Display a spectrogram.
2. Tap the **Stop** button to stop measurement acquisition.
3. Tap the **Data Record** field in the **Spectrogram** drawer to open the **Data Record** increment control.
4. Tap the arrow keys to move the record cursor (white line in the spectrogram plot) to a record of interest. The Spectrogram drawer shows the time and date information of the selected record directly below the Data Record field.
5. The spectrum display shows the waveform for the selected record (in dual display mode).

See the online help topic *View Saved Spectrogram Files* for information on viewing saved spectrogram records.



DPX™ Spectrum Measurement

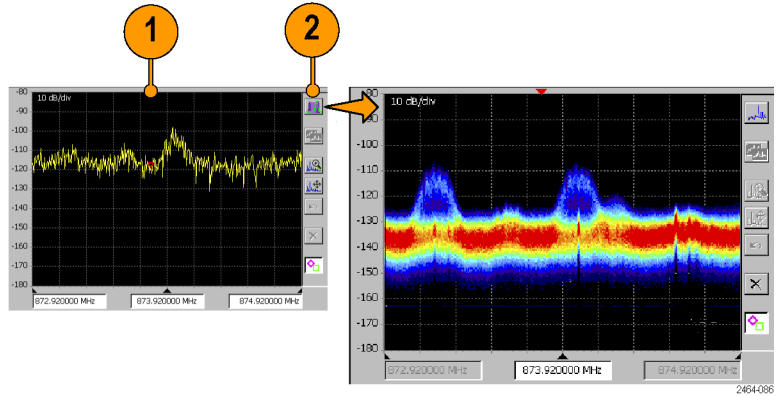
DPX Spectrum technology enables you to see how traces change over time and thus displays signal events that cannot be seen on a swept spectrum analyzer. A DPX Spectrum indicates how traces change in two ways. First, it uses color shading to show how consistent the shape of a trace is. Color reflects the rate-of-occurrence for signal features. Second, DPX Spectrum uses persistence to show how the trace shape changes.

The DPX Spectrum display works by using a two-dimensional array to represent data points on the display. Each time a trace writes to a point on the display, the instrument increments a counter for that point. A color is assigned to each point in the display based on the value of its counter divided by the number of acquisitions (hit percent). Thus, as acquisitions occur over time, the DPX waveform, referred to as the Bitmap, uses color to show how frequently a display point has been written to.

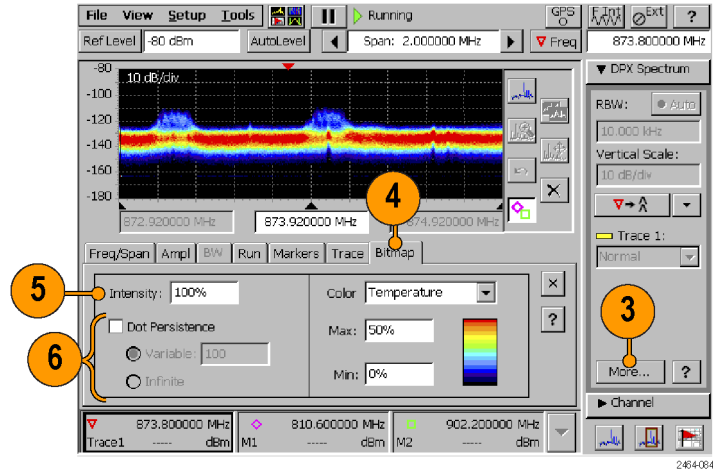
An important feature of the DPX Spectrum display is persistence. Persistence sets how long a point on the display is visible. You can set the display persistence to be *Variable* or *Infinite*. In variable persistence mode, you set a decay period that determines how long a point is displayed. In infinite persistence mode, once a point in the display has been written to, it remains visible indefinitely. Persistence lets the spectrum analyzer display infrequent events.

Display a DPX Spectrum Signal

1. Display a spectrum signal of interest. (See page 33, *Display a Spectrum Signal*.)
2. Tap the **DPX Spectrum** display control button.



3. Tap the **More** button in the DPX Spectrum drawer to display the DPX spectrum parameter tabs.
4. Tap the **Bitmap** tab.
5. Tap the **Intensity** field and set the intensity to control the visibility of events. A higher intensity level enables the display of data points from single, short events, and also makes such an events subject to the persistence controls. This allows you to see the effect of the Persistence controls on infrequent events. Intensity also affects the colors used to display the Bitmap.
6. Tap the **Dot Persistence** check box to enable Bitmap point display persistence controls. Dot persistence sets how long a point is displayed if it is not updated with new data.
Variable sets the decay period for how long a point is displayed before fading.
Infinite sets all points to remain visible indefinitely until you restart signal acquisition.



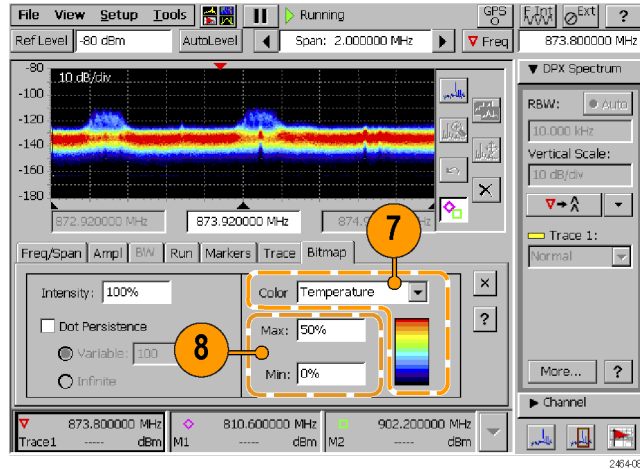
7. Use the **Color** field to set the color scheme used for the Bitmap trace.
8. Use the **Max** and **Min** fields to set the hit percent range of data points. Data points that are between the Max and Min settings are displayed using the colors in the order shown in the color scheme.

Max sets the hit percent required to display a data point using the color at the top of the color scheme. The default value is 100%.

For example, if the Max value is set to 90%, then data points that occur 90% or more of the time are displayed using the maximum (top) color of the color scheme.

Min sets the minimum hit percent required to display a data point, starting with the color at the bottom of the color scheme. The default value is 0%.

For example, if the Min value is set to 10%, then data points must occur at least 10% of the time to be displayed in the Bitmap.



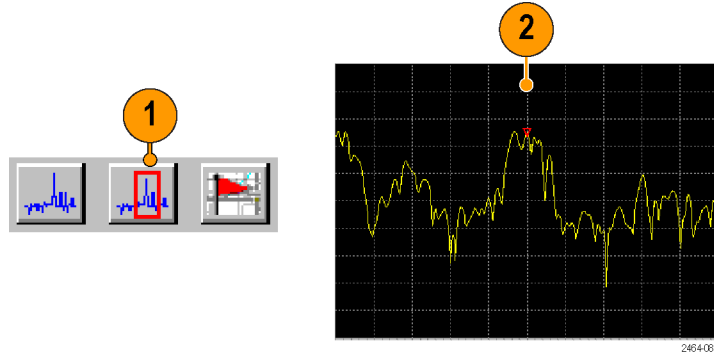
Signal Classification

Signal Classification helps you determine the various parameters of an unidentified signal. Signal Classification lets you:

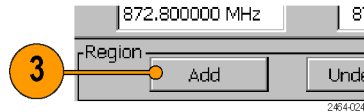
- Define areas of interest as regions (center frequency and frequency span) anywhere on the signal (See page 42, *Define a Signal Classification Region*.)
- Analyze and compare unknown signals to known signal standards (See page 48, *Spectral Correlation*.)
- Assign classification labels and notes to regions (See page 52, *Declare a Region (Classification)*.)
- Save all defined regions to a region survey file (See page 55, *Save and Load Region Surveys*.)

Define a Signal Classification Region

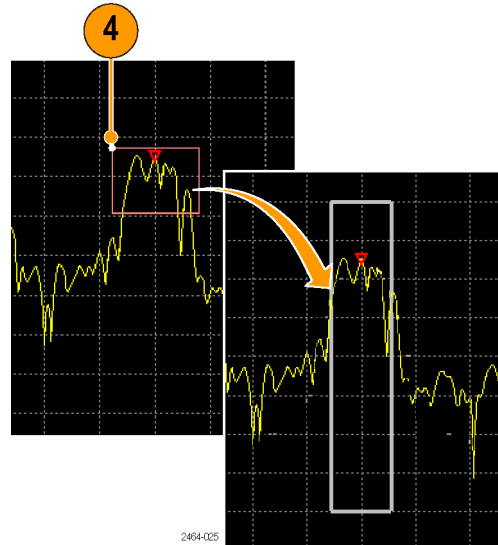
1. Tap the **Signal Classification** button.
2. Display a spectrum signal of interest.



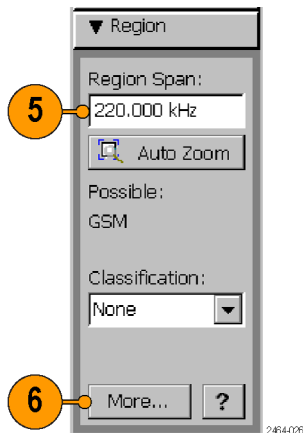
3. Tap the region **Add** button.



4. Tap and drag on the screen to define a region. The instrument draws a box to indicate the region span frequency. The amplitude portion of the signal does not need to be totally enclosed in the region box.



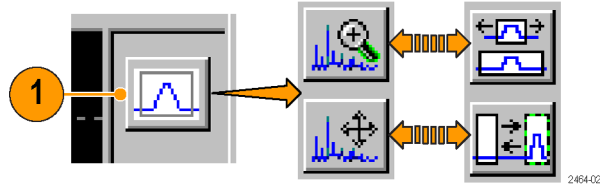
5. Tap the **Region Span** field to enter a precise frequency span of the region.
6. Tap the **More** button to display the parameter tabs to make additional region settings if required.



NOTE. A maximum of two regions can overlap the same measurement frequency. If you define a new region that covers a frequency range already contained within two other regions, the instrument displays a warning message and the region definition box is drawn with a thin red line. Tap the **Delete** button to delete the invalid region, or use the **Change Span** or **Move Region** buttons to change the span definition. You cannot do any more region tasks until you correct the invalid region definition. (See page 45, *Edit a Signal Classification Region*.)

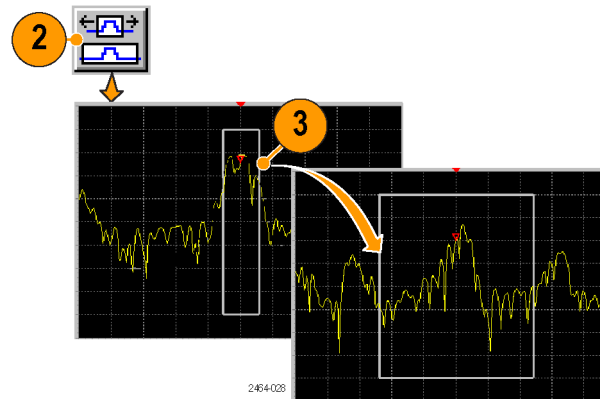
Edit a Signal Classification Region

1. Tap the **Edit Region** button to switch the Zoom and Move buttons with Change Region and Move Region buttons. This button is only shown while in the Signal Classification mode.

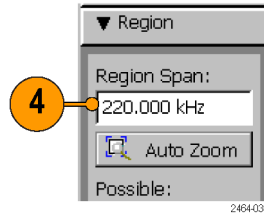


2. To change the width (frequency span) if a region, tap the **Change Span** button.
3. Tap the region to change. Then press and drag, with firm pressure, inside the region box to change the span of the region in the direction of the drag. Dragging from the center to outside of the box expands the region; dragging from the edge of the box towards the center reduces the region. Use a stylus to make tapping and dragging easier.

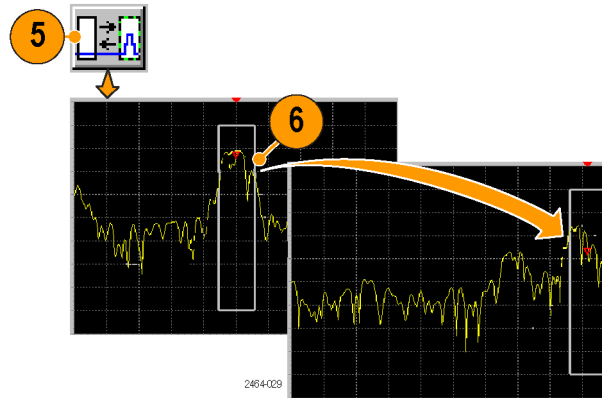
You can only move an undeclared region (Classification = None).



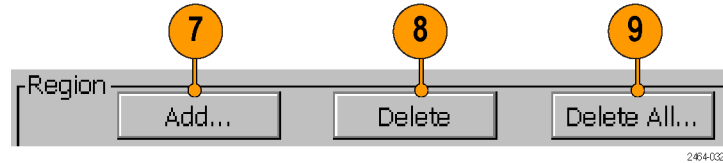
4. You can also tap the **Region Span** field in the Region drawer to enter a specific frequency span for the region.



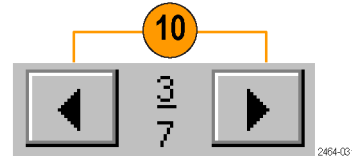
5. To move a region, tap the **Move Region** button.
6. Tap the region to move. Then press and drag, with firm pressure, anywhere inside the region box to move the region in the direction of the drag. Use a stylus to make tapping and dragging easier.
You can only move an undeclared region (Classification = None).



7. Tap the Region **Add** button to define a new region on the signal.
8. Tap the Region **Delete** button to delete the current selected region.
9. Tap the Region **Delete All** button to delete all defined regions from the signal.



10. Tap the **Previous Region** or **Next Region** arrow buttons to display and select the previous or next defined region on the signal. The region order is based on the region measurement frequency (from left to right on the waveform), not in the order that they were created. If the region is off the screen, the instrument displays the region.



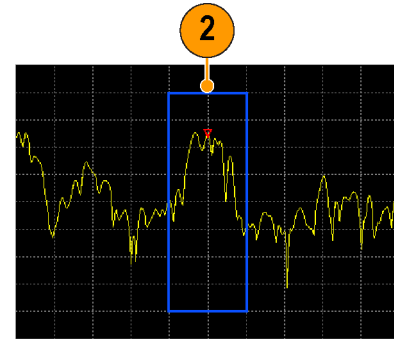
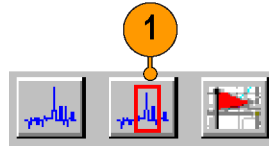
The numbers indicate the current region (top number) and the total number of regions (bottom number). Regions are listed from the lowest frequency (left end of signal) to highest frequency. As regions are added or deleted, the number assigned to a particular region may change.

Spectral Correlation

Spectral correlation (SC) compares the signal characteristics (carrier frequency, bit rate, symbol rate, chip rate, frame rate, slot rate, and so on) in two narrow subbands of the signal region of interest to the typical characteristics of a selected signal type. The closer the characteristics match, the more likely it is that the signal of interest is related to the specified signal type.

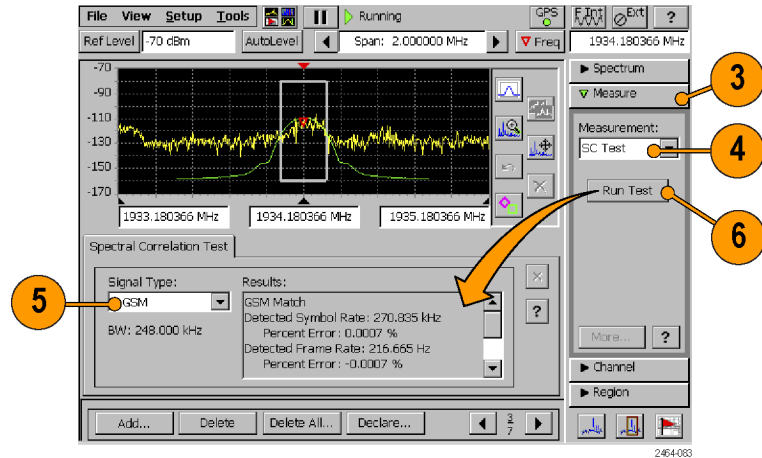
Measure Signal Spectral Correlation.

1. Tap the **Signal Classification** button.
2. Select or define a region.



2464-060

3. Tap the **Measure** drawer button.
4. Tap the **Measurement** list and select **SC Test**.
5. Tap the **Signal Type** field and select a signal type that best matches the signal based on the region span and measurement frequency (the instrument marks best matches with an asterisk). The BW (bandwidth) value shown below the Signal Type field is a typical bandwidth of the selected signal type.
6. Tap the **Run Test** button. The instrument analyzes the signal and displays results in the **Results** field.

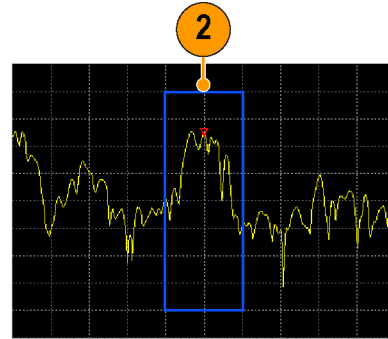
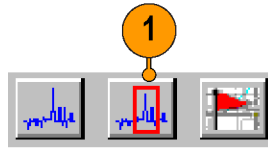


NOTE. The **Run Test** button is disabled if the instrument is not running (paused state), the selected signal type does not support spectral correlation analysis, or there is no active (selected) region.

Tap the **Spectral Correlation** tab help button to show information on the parameter fields and interpreting the test results.

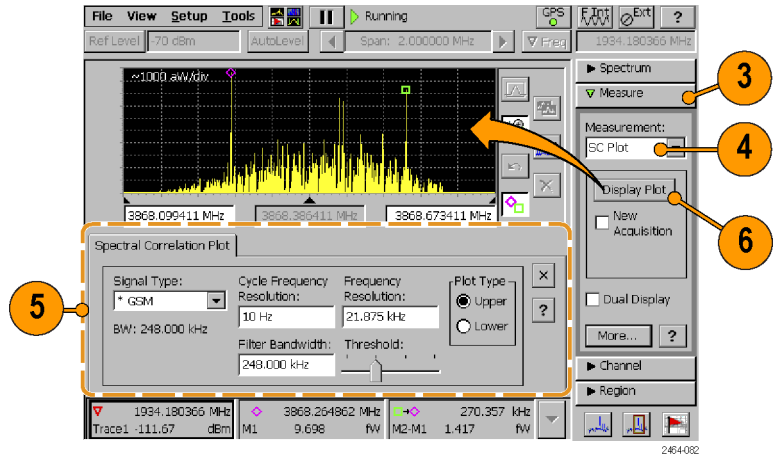
Plot Signal Spectral Correlation. The Spectral Correlation Plot measurement provides a visual study of a spectral correlation analysis applied to a signal of interest. The plot shows peak values at discrete cycle frequencies. You can measure absolute and relative locations of these cycle frequencies which often are uniquely representative of a specific signal type.

1. Tap the **Signal Classification** button.
2. Select or define a region.



2454-000

3. Tap on the **Measure** drawer button.
4. Tap the **Measurement** list and select **SC Plot**.
5. Use the **Spectral Correlation Plot** tab fields to set the measurement parameters. Tap the **Help** button for online help about the Spectral Correlation Plot parameters.
6. Tap the **Display Plot** button to display the SC plot.

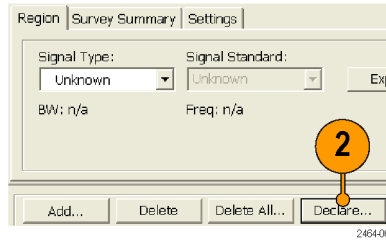


NOTE. The **Display Plot** button is disabled if the instrument is running (paused state) or there is no active (selected) region.

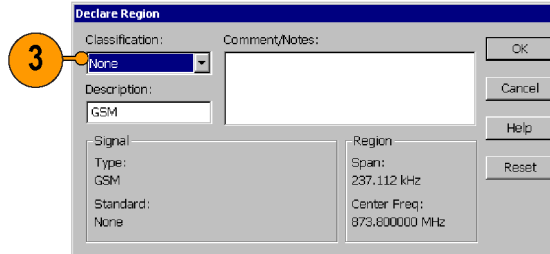
Declare a Region (Classification)

Declaring a region lets you assign a classification category to the region and add additional notes about the region or signal.

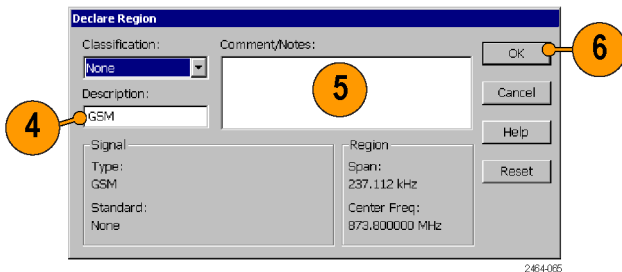
1. Select a region.
2. Tap the **Declare** button.



3. Tap the **Classification** list and select an appropriate classification. Assigning a classification type also assigns a color to the region box to let you quickly identify the classification of a declared region.



4. Tap the **Description** field to enter a brief description up to 14 characters long. The default value for this field is the signal type as set in the Region tab, but you can change the default value if desired. To enter characters, use the WindowsCE Inputs Panel on-screen keyboard control or a keyboard connected to the instrument PS2 port. (See page 27, *Parameter Entry Controls*.)
5. Tap the **Comments/Notes** field and enter descriptive details. You can enter a maximum of 255 characters.
6. Tap **OK** to close the dialog box and assign the declaration to the region.

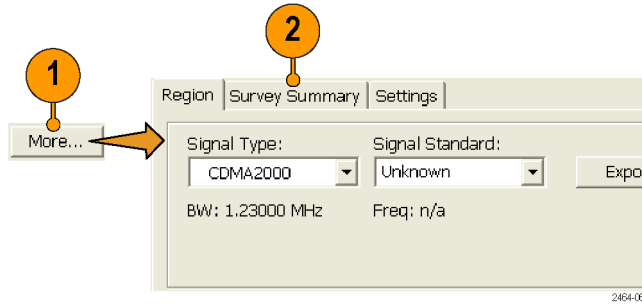


NOTE. Once a region is classified, you need to reclassify it to **None** to make any changes to that region declaration. Use the **Declare** button, or the **Classification** field in the **Region** drawer, to change the region classification.

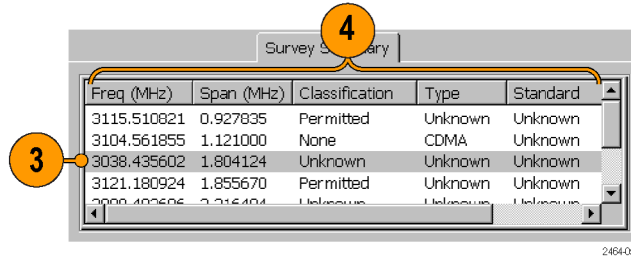
The Survey Summary

The Survey Summary list shows all defined (declared or undeclared) regions, and lets you quickly select and display specific regions.

1. Tap the **More** button in the **Region** drawer to open the Region settings tabs.
2. Tap the **Survey Summary** tab.



3. Tap on an entry in the list to select and display that region.
4. Tap on any of the column headings to sort the list entries by the values in that column, in ascending order.



Save and Load Region Surveys

A region survey is the set of all defined regions on the current signal, as listed in the Survey Summary tab. You can save region surveys to a file, and then load a region survey to merge with or replace your current region definitions.

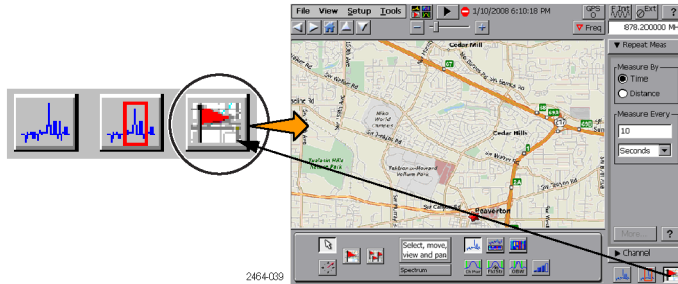
- **File > Save Survey**: saves all defined regions to a system-default file name and location. This function saves the region definitions only.
- **File > Save Survey As**: saves all defined regions to a specified file name and location. This function saves the region definitions only.
- **File > Load Survey**: loads a region survey from a file. Follow the on-screen instructions to replace or merge your current region definitions with those from the file.
- **File > Load Survey from Results**: loads region definitions that are part of a saved signal classification results file (File > Save Results). Follow the on-screen instructions to replace or merge your current region definitions with those from the file.

iMap Measurement Mapping Mode

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.

To start the iMap tool, tap the **iMap** button. When you open the iMap tool for the first time, the screen displays the message **Empty map**. Otherwise, iMap displays the last-loaded map.



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 the built-in GPS receiver 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.

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. The instrument uses grid maps, along with an active GPS receiver, to place measurements on a map at your current geophysical position. Grid maps require specialized PC software to create or can be purchased from map-creating companies. The instrument can load both 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.

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 instrument 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.

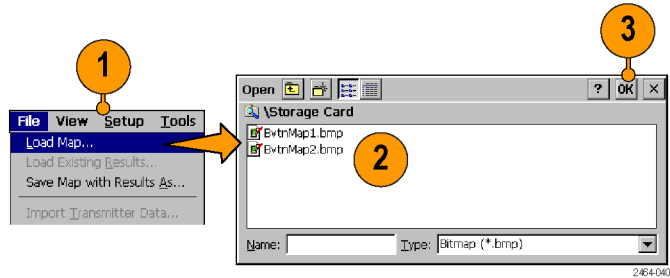
Image Maps. Image maps do not have any geophysical latitude and longitude references embedded in the map file. An image map is a graphical image, such as a scanned building floor plan or aerial photograph, to which you can attach measurements at the point that you tap the screen.

Converting Files to Maps. The iMap Converter, a program that is downloadable from the Tektronix Web site, lets you convert and save image files (BMP, JPEG, GIF, TIFF or PNG file) into GSF format image map files, convert image maps to grid maps, and create grid maps from Google Earth or Microsoft MapPoint applications. (See page 70, *The iMap Converter Program*.)

Loading a Map

You need to load a map before you can use the iMap tool. If a map was loaded in a previous session, then that map remains loaded until you load a new map file.

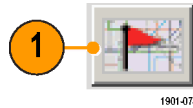
1. With iMap open, select **File > Load Map**.
2. Navigate to and select the map file to load (Bitmap, GSF, MIF, or ZIP (map with results) format).
3. Tap **OK**. The iMap application loads the map on the screen.



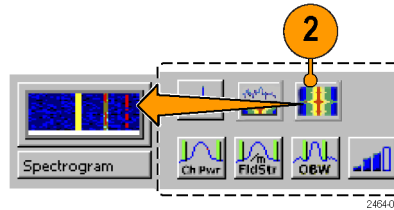
Mapping a Measurement

The following procedure requires that you have already set up the measurement. You must have also loaded a map file. (See page 58, *Loading a Map*.)

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

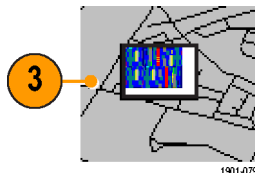


2. Tap an iMap measurement button. Available measurements depend on the current signal standard. The selected measurement is displayed in the Measurement Thumbnail area.

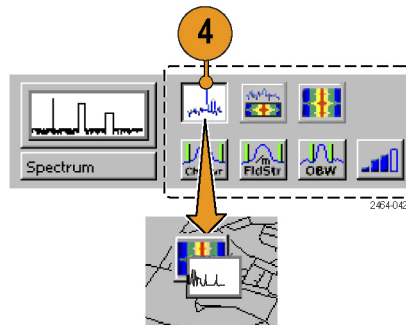


3. Tap the map:

- If a GPS receiver is active, and you are using a grid map, a single measurement is placed at the current GPS 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.



5. To move an icon, tap the **Select** button and then tap and drag the icon to a new position. If the measurement was part of a stack of measurements (such as created by logging), then iMap moves the topmost icon in the stack. If the icon is moved to a new stack of measurements, then the icon is placed in the stack in time-of-measurement order.



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.

NOTE. You can move measurement icons on an image map, or on a grid map with the GPS receiver inactive. Attempting to move an icon on a grid map with an active GPS receiver causes iMap to drag the map and its measurement icons to a new position on the screen; the measurement icons are not moved.

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

iMap Measurement Icons

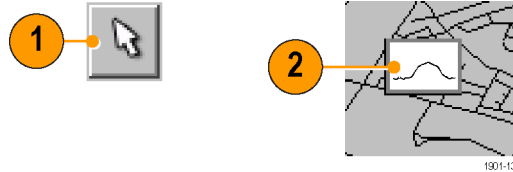
The iMap application uses icons on the map to represent a measurement taken at that location. There are two types of measurement icons: large and flag. The large icon displays the type of measurement that they represent. The flag icon is a simple small flag, and is used only in logging (multiple) measurement mode to indicate measurement placement. See the online help topic *iMap Measurement Map Icon Types* for more information.

You can perform various actions on measurement icons, including viewing the measurement results of an icon, moving the icon, deleting an icon, and attaching a measurement direction arrow to an icon. See the following sections, and the online help topic *View Map Measurements*, for more information.

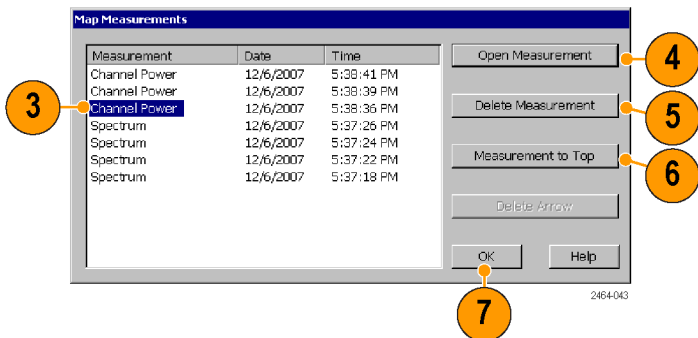
Viewing and Deleting Icon Measurements

To view or delete the measurement results associated with an iMap measurement icon:

1. Tap the iMap **Select** mode button.
2. Tap a measurement icon to open the **Map Measurements** dialog box.



3. Tap the measurement of interest in the list.
4. Tap **Open Measurement** to open the measurement screen for the selected measurement. Tap the iMap button to return to the iMap screen.
5. Tap the **Delete Measurement** button to delete the selected measurement. If there are multiple measurements to delete, repeatedly select and tap **Delete**.
6. Tap **Measurement to Top** to move a selected measurement to the top of the list.
7. Tap **OK** to close the dialog box.



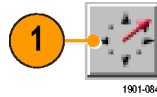
NOTE. You can also double-tap on a measurement icon to open the measurement window for that measurement. If there are multiple measurements at a location, double-tapping an icon displays the results for the measurement icon that is at the top of the list.

To delete all the measurement icons from a map, select **File > Clear All Measurements**.

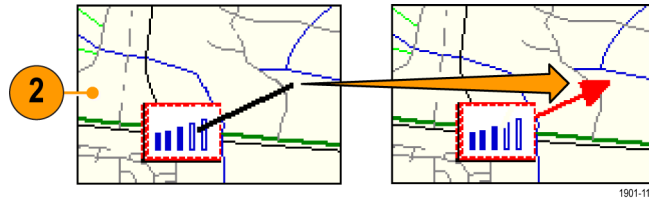
Draw a Measurement Direction Arrow

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.

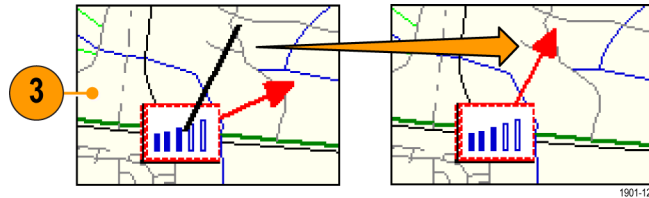
1. Tap the **Measurement Direction** button.



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.

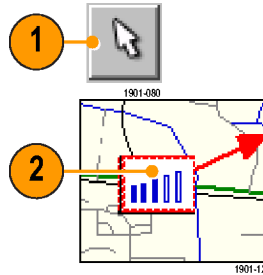


3. To change the arrow direction, draw a new line. iMap replaces the existing arrow with the new direction arrow.

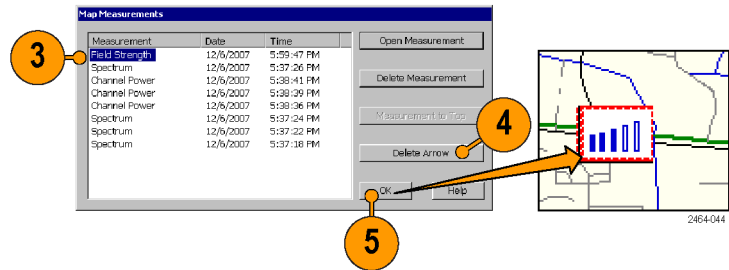


Delete a Measurement Direction Arrow.

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 **Delete Arrow** button.
5. Tap **OK**. iMap closes the dialog box and deletes the direction arrow.

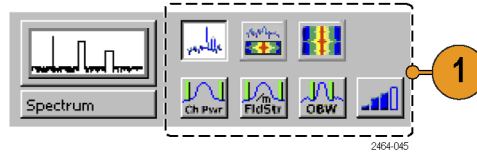


Logging iMap Measurements (Automatic Measurements)

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).

NOTE. The iMap tool maps only completed measurement results. If the specified time interval is less than that required to take a measurement, iMap ignores the specified time interval and maps results as soon as the measurement acquisition is done. For example, if the instrument requires 20 seconds to take a measurement, but the time interval is set to 10 seconds, then the instrument maps results every 20 seconds.

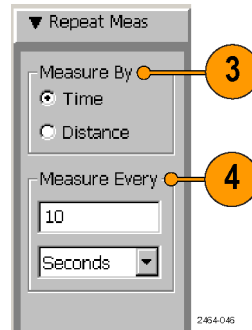
1. Tap a measurement button.



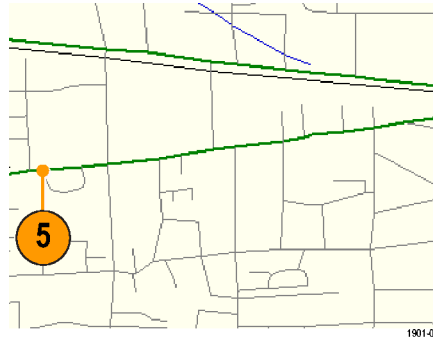
2. Tap the **Log Measurements** button.



3. Tap a button in the **Measure By** area to set the type of measurement interval (time interval or distance between measurement positions). Distance is only available when the GPS is active and acquiring accurate position data.
4. Tap a field in the **Measure Every** area to set the measurement interval.

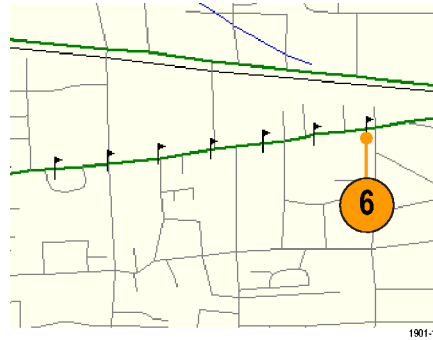


5. Tap the map to start logging measurements:
 - For grid maps with an active GPS receiver, tap the map at any point. The instrument adds measurement flags to the map at the current GPS position.
 - For image maps or for grid maps without an active GPS receiver, tap the map at the measurement starting 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. The instrument stops mapping measurements.
- 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 on a straight line between the start and stop map points.



7. Tap the **Single Measurement** or the **Select** button to exit the logging measurements mode.



NOTE. The iMap Log measurements function automatically sets the map view measurements mode to **Measurement Flags** during logging measurement acquisition. 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.

You cannot place a measurement icon on any area of the map that is covered by a message banner.

The iMap Converter Program

Tektronix provides a map file conversion program called iMap Converter that you can download from the Tektronix Web site. iMap Converter lets you convert graphical image files or map files for use with the instrument iMap tool. Types of images or files that you can convert include:

- BMP, JPEG, GIF, TIFF and PNG graphical images (map images, building floor plans, aerial photographs)
- Industry standard MapInfo Interchange Format (MIF), ArcInfo Shape (.shp), USGS Digital Line Graph (.opt) geophysical coordinate maps

Other iMap Converter features include:

- Easily capture images from Google Earth or Microsoft MapPoint to create geophysical (coordinate) map files for use with GPS measurement mapping
- Manually assign geophysical coordinates (latitude/longitude) to image files, such as building floor plans or screen capture map images, to create a grid map for use with GPS measurement plotting
- Combine multiple coordinate map files into a single large map file

To install the iMap Converter program on a PC:

1. Go to the Tektronix Web site (www.tektronix.com).
2. Click **Software Downloads** on the left side of the screen to open the Software Downloads Web page.
3. Enter **imapconverter** (single word) in the **Search by keyword** field and click **Go**.
4. Select the iMap Converter link to download the software. Follow the installation instructions on the download page.
5. To open the iMap Converter tool on the PC, select **Start > Programs > Tektronix > iMapConverter**.

6. Click the iMap Converter **Help** button for information on how to use the tool to convert files, add coordinates to an image file, or create maps from Google Earth or Microsoft MapPoint.

NOTE. *Bitmap files that are converted to GSF-format load faster on the instrument 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.*

NOTE. *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.*

Specifications

This section lists the electrical, environmental, and physical specifications for the H600 RFHawk. All specifications are guaranteed unless labeled “typical.” Typical specifications are provided for your convenience and are not guaranteed.

Table 1: General Performance Characteristics

Characteristic	Description
RF Input	
Operating Frequency Range	10 kHz – 6.2 GHz Operating Range for some features may be restricted. If so, the restricted range is defined with the relevant feature.
Maximum Operating Input Level	+20 dBm peak envelope power This is the maximum input level at which the instrument will meet its performance specifications. For a signal without any amplitude variation, peak envelope power = rms.
Maximum Input Power without Damage	50 W rms below 3.2 GHz 15 W rms between 3.2 GHz and 6.2 GHz
Internal Timebase	
Error	± 0.5 PPM from 0 °C to 50 °C ± 1.0 PPM aging/year Twenty minute warm-up period required to meet accuracy specification

Table 1: General Performance Characteristics (cont.)

External Reference Input	
Impedance	1500 ohms
Frequency Range	1 MHz up to 20 MHz \pm 1 PPM in 1 MHz steps
Input Level Range	-15 dBm to +15 dBm, 1 MHz to 15 MHz -10 dBm to +15 dBm, 16 MHz to 20 MHz dBm levels assume 50 ohm source

Table 2: Spectrum Analyzer Characteristics

Characteristic	Description
Center Frequency	
Range	10 kHz to 6.2 GHz, preamp off 10 MHz to 6.2 GHz, preamp on
Setting Resolution	1 Hz
Span	
Range	1 kHz to 6.2 GHz
Setting Resolution	1 Hz

Resolution Bandwidth

Range	10 Hz to 3 MHz (Manual RBW) 10 Hz to 1 MHz (Auto RBW)
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Setting Resolution	1 Hz
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Spectral Purity

Displayed Average Noise Level, Preamp On	-153 dBm, 10 MHz to 2 GHz, 10 Hz RBW -152 dBm, 2 GHz to 4 GHz, 10 Hz RBW -151 dBm, 4 to 5 GHz, 10 Hz RBW -145 dBm, 5 to 6.2 GHz, 10 Hz RBW Reference Level \leq (DANL + 90 dB)
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Phase Noise	\leq -95 dBc/Hz @ 10 kHz offset \leq -95 dBc/Hz @ 20 kHz offset \leq -95 dBc/Hz @ 30 kHz offset \leq -97 dBc/Hz @ 100 kHz offset \leq -110 dBc/Hz @ 1 MHz offset
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Residual Spurious, Preamp Off	\leq -90 dBm, 0 dBm attenuator setting Exception frequencies: 9 MHz to 19 MHz center frequency 3464 MHz center frequency 4592 MHz center frequency 5374 MHz to 5378 MHz center frequency 6160 MHz center frequency
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Residual Spurious, Preamp On	≤ -105 dBm, 0 dBm attenuator setting Exception frequencies: 9 MHz to 19 MHz center frequency 5374 MHz to 5378 MHz center frequency
Third Order IMD	≤ -70 dBc for two tones at or below the reference level, preamp off, all gain settings Auto-coupled
Second Harmonic	≤ -60 dBc for a single tone at or below the reference level, preamp off, all gain settings Auto-coupled
Input Related Spurious	≤ -70 dBc except for $F_{in} = 2.282$ GHz \pm 20 MHz The reference for 'dBc' for this specification is the total power of all signals present at the input of the instrument regardless of the current span
Input Related Spurious, exception frequencies, typical	≤ -55 dBc except for $F_{in} = 2.282$ GHz \pm 20 MHz The reference for "dBc" for this specification is the total power of all signals present at the input of the instrument regardless of the current span
Third Order Intercept	$\geq +7$ dBm, 0 dB Input Attenuation, Preamp Off
Spectral Display Amplitude	
Reference Level Range	+20 dBm to -160 dBm
Marker Power Accuracy	± 1.75 dB, -50 dBm \leq input \leq +20 dBm, preamp off ± 3.0 dB, -80 dBm \leq input $<$ -50 dBm, preamp on, above 10 MHz ± 3.75 dB, -120 dBm \leq input $<$ -80 dBm, preamp on, above 10 MHz Use peak detector for CW-like signals; use average detector for wideband (signal \gg RBW) Accuracy guaranteed for CW signals and span set to 20 MHz or less

Display

Display Modes	<p>Normal - updates display with each new result</p> <p>Max Hold - updates displayed point only if new point > old</p> <p>Min Hold - updates displayed point only if new point < old</p> <p>Max/Min Hold - displays a vertical bar between Max Hold and Min Hold</p> <p>Average - displays average of N (specified by user) acquisitions</p> <p>Average is calculated as follows:</p> <p>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 result is added to the stored values, and a new average is calculated from the stored values</p> <p>If the number of results is less than N, then all of the results are averaged together</p>
Number of Averages	$1 \leq N \leq 200$

Table 3: DPX Measurements Processing Characteristics

Characteristic	Description
Spectrum Processing Rate, nominal	10,000 per second (span independent)
Min Signal Duration for 100% Probability of Intercept, typical	125 μ s
Span Range	20 kHz to 20 MHz

Table 4: General Purpose RF Measurements Characteristics

Characteristic	Description
General Purpose RF Channel Power Measurement	
Measurement Bandwidth Range	1 kHz - 20 MHz
Accuracy	<p>≤1.2 dB; +20 dBm to -60 dBm; Resolution BW < 100 kHz +20 dBm to -40 dBm; Resolution BW ≥ 100 kHz 1 MHz to 3.2 GHz , preamp off</p> <p>≤2 .4 dB; -60 dBm to -75 dBm; Resolution BW < 100 kHz -40 dBm to -55 dBm; Resolution BW ≥ 100 kHz 10 MHz to 3.2 GHz , preamp on</p> <p>≤1.8 dB; +20 dBm to -50 dBm; Resolution BW < 100 kHz +20 dBm to -40 dBm; Resolution BW ≥ 100 kHz 3.2 GHz to 6.2 GHz , preamp off</p> <p>≤3 dB; -50 dBm to -75 dBm; Resolution BW < 100 kHz -40 dBm to -55 dBm; Resolution BW ≥ 100 kHz 3.2 GHz to 6.2 GHz , preamp on</p> <p>Specifications apply for default control settings (Auto RBW, Auto Level)</p>
Occupied Bandwidth Measurement	
Percent Power Inclusion Range	50% - 100%

Table 4: General Purpose RF Measurements Characteristics (cont.)

RF Field Strength	
Channel Bandwidth Range	Same as Channel Power
Accuracy	Same as Channel Power

Table 5: Signal Analysis and Monitoring Characteristics

Characteristic	Description
AM Demodulation	Provides an audio output signal after AM demodulation of the user-selected signal.
Measurement Frequency	As previously selected
Minimum Input Signal Level, Typical	-100 dBm
Audio Measurement Bandwidth	8 kHz
FM Demodulation	Provides an audio output signal after FM demodulation of the user-selected signal.
Measurement Frequency	As previously selected
Minimum Signal Level, Typical	-100 dBm

Table 5: Signal Analysis and Monitoring Characteristics (cont.)

Maximum Signal Deviation	Up to 100 kHz
Audio Measurement Bandwidth	8 kHz, 15 kHz, 75 kHz, or 200 kHz
Maximum Audio Output Bandwidth	15 kHz
Signal Strength Indicator	Provides both an audio tone and a visual display that are related to the strength of the user selected signal
Input Signal Level	-120 dBm, minimum
Measurement Frequency	As previously selected
Measurement Bandwidth	Up to 20 MHz, dependent upon span and RBW setting
Tone Type	Variable beep rate or variable frequency
Update Rate, Typical	10 per second

Table 6: Environmental characteristics

Characteristic	Description
Temperature	Operating: 0 °C to +50 °C specified performance, -10 °C to +50 °C, typical Nonoperating: -40 °C to +60 °C The temperature specs above are modified with the following options installed: Li-Ion Batteries: Charge 0 °C to +45 °C, Storage -20 °C to +60 °C
Humidity	Operating and Nonoperating: 5% to 95% relative humidity (RH) at up to +30 °C, 5% to 45% RH above +30 °C up to +50 °C, noncondensing
Altitude	Operating: Up to 4,600 meters (15,092 feet) Nonoperating: Up to 12,192 meters (40,000 feet)

Table 7: Physical characteristics

Characteristic	Description
Dimensions	Height: 25.5 cm. (10.0 in) Width: 33 cm. (13 in) Depth: 12.5 cm. (4.8 in)
Weight	6.0 kg (13.25 lbs): instrument and 1 battery

Table 8: Miscellaneous characteristics

Characteristic	Description
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.

Certifications and Compliances

EC Declaration of Conformity – EMC

Meets intent of Directive 2004/108/EC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326:1997. EMC requirements for Class A electrical equipment for measurement, control, and laboratory use. ^{1, 2, 3, 4}

- IEC 61000-4-2:1999. Electrostatic discharge immunity (Performance criterion C)
- IEC 61000-4-3:2002. RF electromagnetic field immunity (Performance criterion A) ⁵
- IEC 61000-4-4:2004. Electrical fast transient / burst immunity (Performance criterion B)
- IEC 61000-4-5:2005. Power line surge immunity (Performance criterion B)
- IEC 61000-4-6:2003. Conducted RF immunity (Performance criterion A) ⁵
- IEC 61000-4-11:2004. Voltage dips and interruptions immunity (Performance criterion B)

EN 61000-3-2:2000. AC power line harmonic emissions

EN 61000-3-3:1995. Voltage changes, fluctuations, and flicker

European Contact.

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Western Road
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United Kingdom

- 1 This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.
- 2 Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.
- 3 To ensure compliance with the EMC standards listed here, high quality shielded interface cables should be used.
- 4 Minimum Immunity test requirement.
- 5 Performance Criteria: Residual spurious signals can increase to -70 dBm with exposure to the disturbance levels of this test.

Australia / New Zealand Declaration of Conformity – EMC

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- EN 61326:1997. EMC requirements for electrical equipment for measurement, control, and laboratory use.

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