

RFT-1000

# RF Tools

Advanced software tools for  
RF Installation and Maintenance

## Add new capabilities to your 892x RF Communications Test Set

Supports most 8920A, 8920B, 8921A, 8924C units

Rev A.04.60

*Interference Monitoring and Signal Strength  
logging to 6GHz now supported on the N1996A  
CSA spectrum analyser*

- Cable Fault Location
- Interference Monitor
- Antenna Analysis
- Screen Capture
- Return Loss
- Insertion Loss
- Signal Strength
- Diplexer tune-up
- GPS connectivity



### Applications:

Field Installation & Maintenance  
Repeater Site Measurements  
Workshop Maintenance and Repair  
Documenting and Report Printing  
Interference Monitoring & Spectrum Management

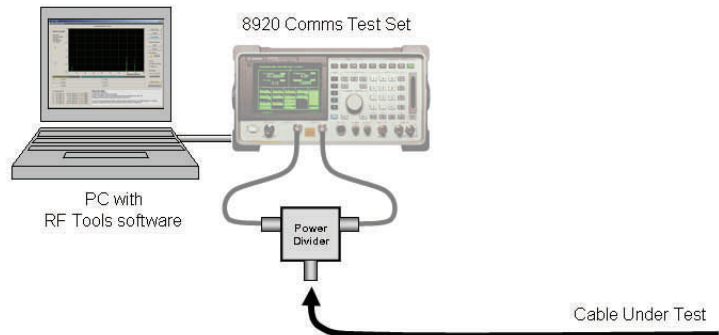
# Cable Fault Location (TDR)

## Features

RF Tools provides a direct readout of Return Loss, VSWR and distance (feet or metres), as well as the ability to save and recall your instrument settings and trace data for later recall and comparison. A comprehensive cable database is provided for storing details of Location, Cable ID and Operator Name for each measured trace, plus each trace is automatically time and date stamped for easy reference. When returning to a site, previously used settings and stored traces can be recalled ensuring repeatable measurements and accurate indication of cable degradation.

## Cable Types

Most standard 50Ω cable types can be selected from a popup menu; a Custom Cable setting allows you to specify your own values for Vr (relative velocity) and Loss (dB/100m) if required. This is important as cable manufacturers frequently specify different values



for these parameters for nominally the same cable type.

## Markers

Six markers automatically track the highest peaks on the trace and give direct readout of return loss, distance (feet or metres) and VSWR. Two additional User Markers are provided that can be positioned manually on the measured trace, the memory trace, or split across both traces and give direct readout of distance, delta distance,

return loss and delta return loss.

## Documenting Results

The main measurement screen can be saved (JPG or BMP file format). In addition, detailed printed reports are available when recalling saved measurements from the Cable Database. This means that you can save all your measurements to the PC when out on site, and later you can recall and print them out without needing to have the instrument connected.

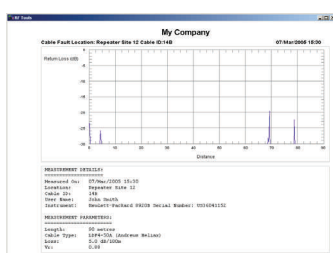
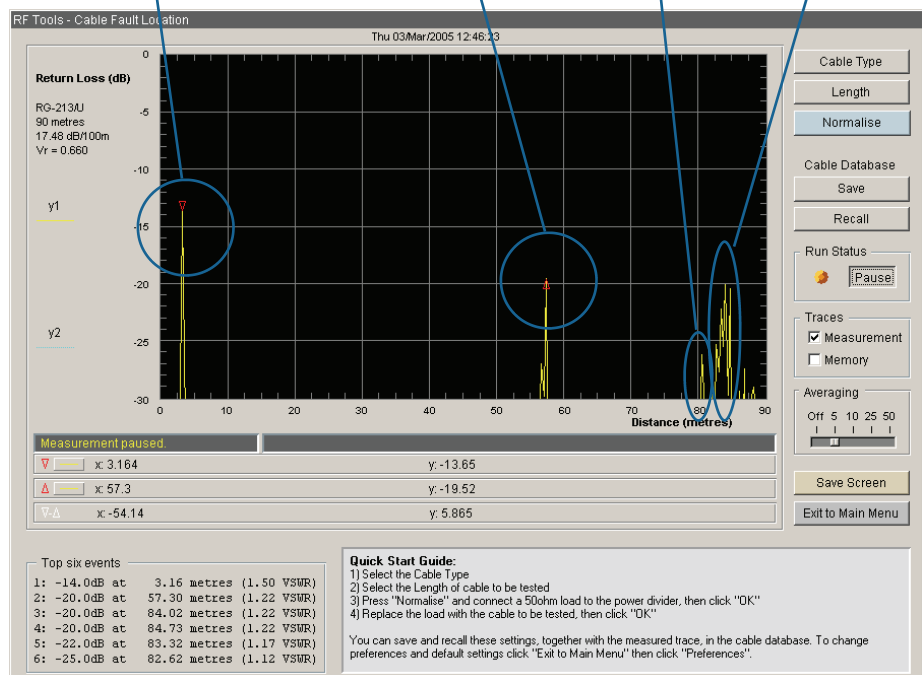
**RF Tools is a PC software application that economically transforms your 892x into a multi-purpose RF analyser.**

*N-type bulkhead connector in patch panel, distance 3.16m, return loss 13.7dB*

*N-type joiner, distance 57.3m, return loss 19.5dB*

*Balun*

*Antenna*



## Interference Monitor

- **Unattended monitoring & recording of frequency spectrum**
- **Zone alarms alert you of interferers and intruders**
- **Identify occupied/unused frequencies for spectrum management**
- **Fast playback of recorded spectrum data**
- **3GHz and 6GHz operation with Agilent CSA spectrum analysers**
- **GPS connection supported - logs coordinates for each trace**

*Interference Monitor* logs and records spectrum traces from the spectrum analyser to your PC's hard disk. The live data can be viewed while recording and displayed as either a traditional spectrum analyser display, or as a waterfall display as shown below. Each trace is time and date stamped.

Frequency range can be changed "on the fly" by the operator and these changes are stored with each trace, allowing real time zooming in and out of the spectrum whilst recording. Reference level can also be adjusted while recording to increase/decrease sensitivity. The amount of data recorded is limited by the available hard disk space. As a guide, 1 hour of recording time using an 892x generates a file size of approximately 30MB although actual figures will vary.

### Alarm Zones

Two user definable alarm zones can be set, each comprising start and stop frequencies and a threshold level (dBm). If part of the spectrum trace falls within one or both of these zones (marked in red on the screen) the software tags that particular trace with either Alarm 1, Alarm 2 or both. This makes the identification of alarm conditions during playback very easy. Statistics such as alarm count and percentage of sweeps are displayed, giving an indication of occupancy.

### File Playback

All traces recorded during a Live Capture can be played back for later review. Operator changes to frequency range, reference level and zone alarms

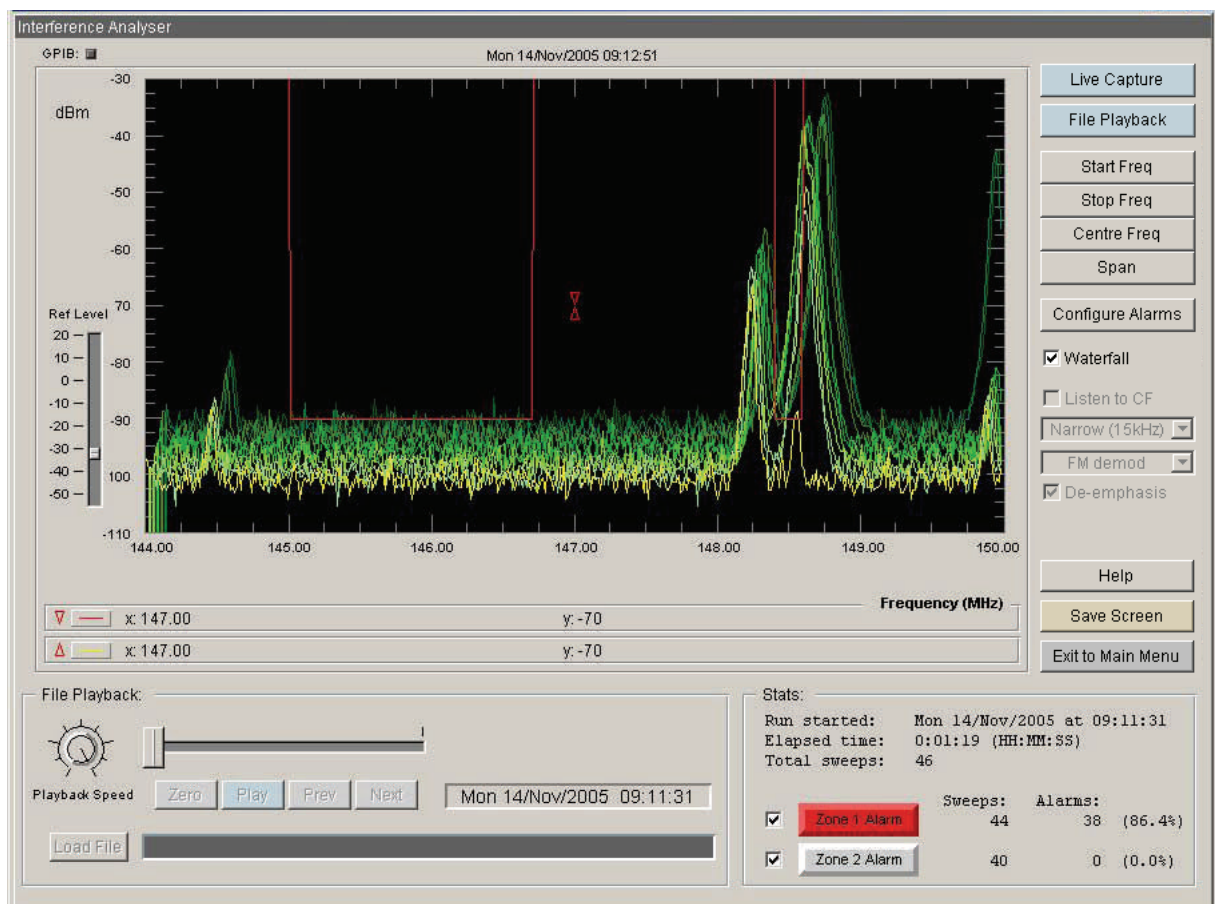
are played back as they occurred during the original capture period. The recorded data can be played back at high speed; this is ideal for situations where a long capture period (such as during unattended monitoring) needs to be played back and analysed in a short space of time.

The operator can quickly locate those traces where an alarm condition occurred and skip over periods of inactivity. Recorded data can be viewed as a traditional spectrum analyser trace or as a spectrogram. The on screen display can be captured and saved as a JPG image for documentation purposes.

### CF Listen

Provided the Span is 1MHz or less, clicking "CF Listen" activates a choice of AM or FM demodulation so that any signal at the centre frequency of the screen can be listened to through the 8920's internal loudspeaker.

*A user-supplied antenna & cable are required for the Interference Monitor.*



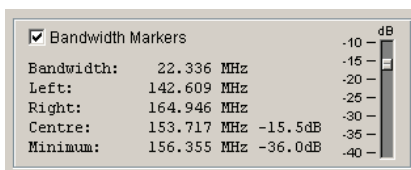
## Antenna / Return Loss Analyser

### Swept Return Loss

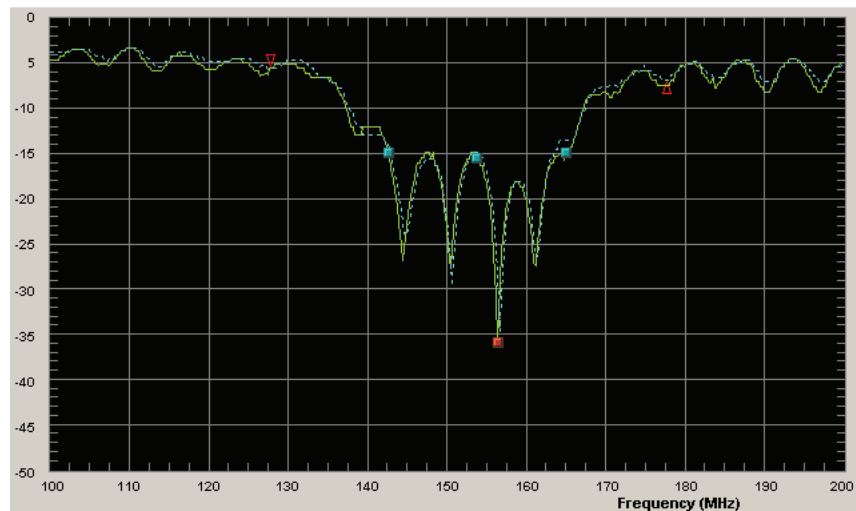
RF Tools measures Return Loss (dB) of 50Ω devices using your 892x and a directional bridge. Applications include sweeping antennas, filters, amplifiers and any other 50Ω devices to verify the quality of their match relative to 50Ω. Unlike thru-line wattmeters and SWR meters which only measure at spot frequencies, RF Tools makes a swept measurement of return loss plotted against frequency.

### Markers

Automatic “bandwidth” markers can be activated to identify the points of minimum return loss, the user-selectable bandwidth (typically 15 or 20dB), and the centre frequency between the band edges. Values are displayed in Return Loss (dB). Two additional user-markers are provided that allow the values at other trace



Bandwidth marker values



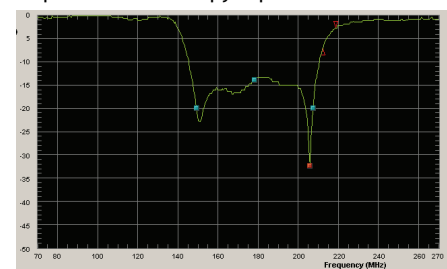
Return Loss of a 150MHz folded dipole antenna showing current and previously stored traces

points to be measured.

### Documentation

The screen image can be saved as a JPG or BMP, or stored to the Save/ Recall database for later retrieval together with a record of all the current measurement settings, operator name, date and time etc. Previous measurements can be recalled from the database to compare

with current measured values and to produce a hardcopy report.



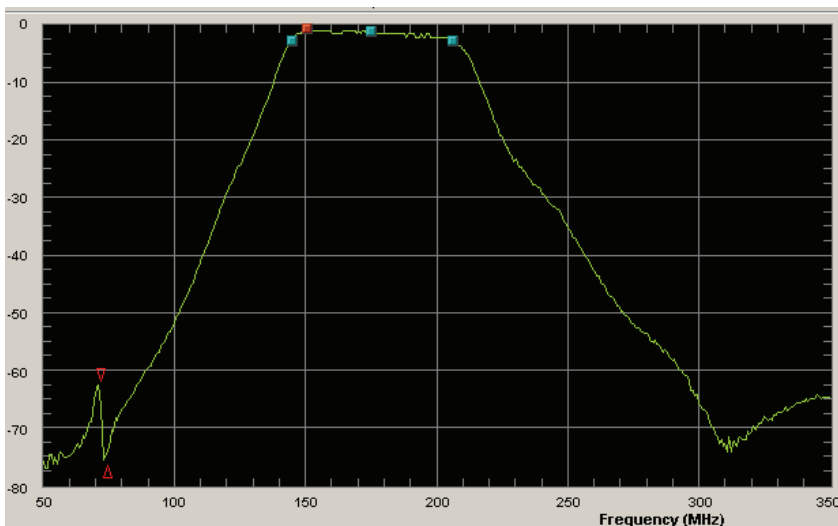
Return Loss of a diplexer

## Filter / Insertion Loss Analyser

### Swept Insertion Loss

Similar to the return loss analyser, RF Tools directly measures insertion loss (dB) of your device. Typical applica-

tions include verifying the performance of filters, diplexers, cables and other RF devices where a swept measurement of their frequency response is required.



### Markers

Automatic “bandwidth” markers can be activated to identify the points of minimum insertion loss, the user-selectable bandwidth (typically the 3dB points in the case of a filter), and the centre frequency between the band edges. Two additional user-markers are provided to measure values at other trace points.

### Documentation

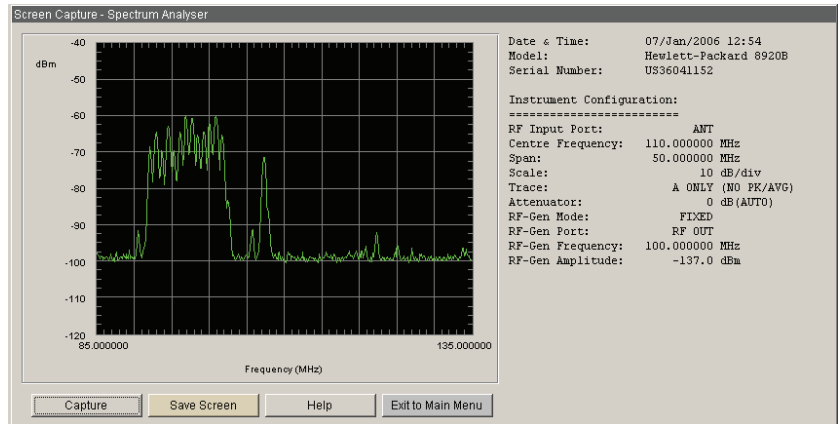
The screen image can be saved as a JPG or BMP, or saved to the Save/ Recall database for later recall together with a record of all the current measurement settings. Previous measurements can be recalled from the database to compare with current measured values and to produce a hardcopy report.

# 892x Screen Capture

## Features

RF Tools includes a simple but useful capability to capture screen images during manual measurements. The 892x has no screen capture function built-in, making documentation during manual measurements difficult.

RF tools includes the ability to capture the Spectrum Analyser screen (shown here) and the Oscilloscope screen. All related settings are also captured and displayed next to the screen image. The image can be saved to your PC as a JPG file, for inclusion in documentation and reports.



## Signal Strength

The signal strength (dBm) of up to 10 RF channels can be logged to a file. Measured results are stored in .csv file format and can be opened in most common spreadsheets or database programmes, allowing easy conversion to units such as dBµV, or to dBµV/m if using a calibrated antenna. 3GHz and 6GHz operation available with Agilent CSA spectrum analysers.

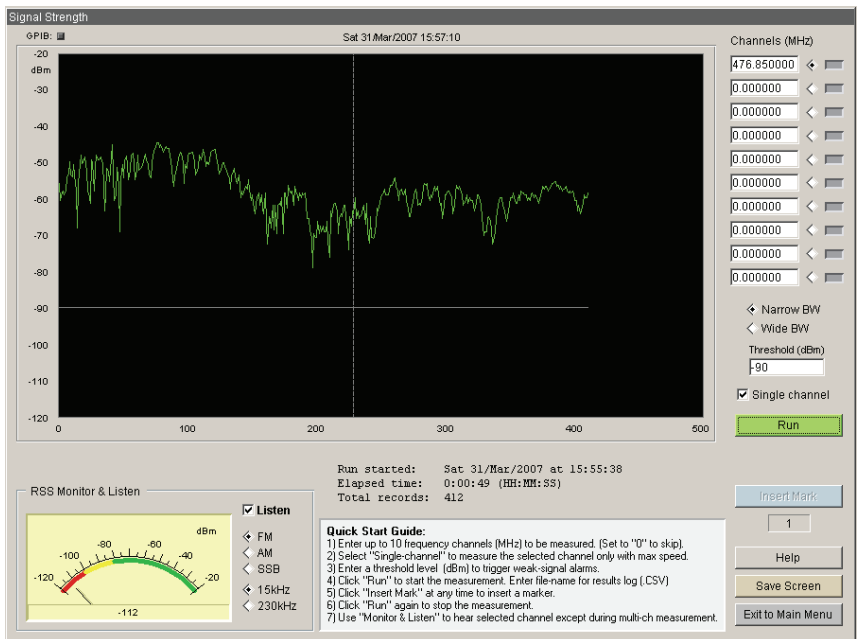
## Operating modes

Single-channel mode offers the fastest measurement speed (typically around 5 readings/sec); multi-channel mode (up to 10 channels) is slower due to the time taken to change frequency and settling time. A choice of two IF bandwidths is available - "Narrow" suits most 2-way radio systems, or "Wide" for wide-band transmissions such as those from broadcast stations.

"Insert Mark" allows the user to add a marker at any time during logging. These are typically used to indicate key locations such as "top of the hill" or "entering the tunnel". A threshold value can be set (dBm) which logs an alarm event each time the received signal strength falls below this level. A separate alarm event is recorded in the .csv file for each channel being measured.

## RSS Monitor & Listen

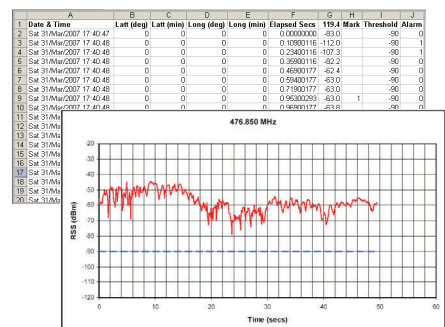
While logging is stopped, a useful feature is provided whereby the



selected channel's RSS (Received Signal Strength) can be monitored on the analogue-style meter and demodulated and heard through the 8920's internal loudspeaker.

## GPS position

Positional information can optionally be recorded from a user-supplied GPS that communicates NMEA data via RS-232 (serial). GPS coordinates are recorded in the .csv file next to each measurement record.



Typical results table and graph as might be created by the operator in a spreadsheet.

## Configuration Guide

### What you need...

#### ...to Use RF Tools with an 892x

#### Supported 892x Configurations:

Table 1	Options required:	Firmware:
8920A	Options 002 and 003	Rev. A.14.07 and above
8920A	Options 002 and 103	Rev. A.14.07 and above
8920A	Options 102 and 003	Rev. A.14.07 and above
8920A	Options 102 and 103	Rev. A.14.07 and above
8921A	Any	Rev. A.14.07 and above
8920B	Option 102	Any
8924C	Any	Rev. A.06.00 and above

Table 1 shows supported configurations. Additional options will not adversely affect the operation of RF Tools.

#### PC Minimum Requirements:

The following lists the minimum requirements for the PC; higher performance PCs are strongly recommended.

- 266 MHz Pentium II or higher; > 128MB RAM
- Windows® 2000(SP4), or Windows XP™(SP2)
- Hard disk free space: 200 MB minimum; CD-ROM drive; Monitor resolution 1024x768 or greater
- One available USB Port
- One Agilent™ 82357A or 82357B USB-to-GPIB interface cable

#### RF Cables & Accessories:

Table 2 shows which accessories are required for each task or measurement. If you intend to supply your own RF Accessories, please note that most 3-resistor power dividers or combiners can be used for Cable Fault Location measurements. 2-resistor power splitters are not the same and are not suitable. All RF accessories should be high-performance, instrument grade devices covering the full frequency range of the 892x (minimum 30MHz to 1GHz). Measurement performance is entirely dependent on the quality and specifications of these devices and of your 892x.

Table 2	Licensed 892x + 82357A/B	Licensed CSA + Ethernet cable	Bridge and Short	Power Divider & Termination	Attenuators (for improved match)	Thru adapter (user-supplied)	Antenna
Review & Print test results	-	-	-	-	-	-	-
Interference Monitor	Yes	Yes	-	-	-	-	Yes
Signal Strength	Yes	Yes	-	-	-	-	Yes
Return Loss measurements	Yes	Not supported	Yes	-	Optional	-	-
Insertion Loss measurements	Yes	Not supported	-	-	Optional	Yes	-
Cable Fault Location	Yes	Not supported	-	Yes	Optional	-	-
Screen Capture	Yes	Not supported	-	-	-	-	-

### What you need...

#### ...to Use RF Tools with the N1996A CSA

For frequencies above 1GHz, the Interference Monitor and Signal Strength modules of RF Tools support the Agilent™ N1996A CSA spectrum analyser via an Ethernet connection, ideal for bench and mobile monitoring up to 3GHz or 6GHz. A lower cost license (RFT-1000-CSA) is available for CSA owners. All CSA configurations are supported. PC requirements are the same except that the connection to the CSA is via a standard Ethernet cable (the 82357A/B is not required).

## Software Licenses

The licensing of RF Tools has specifically been designed to cater for the requirements of a large radio workshop where multiple 892x or CSA instruments may be used by many RF technicians.

RF Tools licensing is very simple. One license is required for each instrument. Each license is locked to the Model Number and Serial Number of a specific 892x or CSA instrument, and not to any particular PC. The RF Tools software can be installed free of charge on as many PCs as you like, and multiple license keys can be installed onto every PC. This means that any RF Technician can take any licensed instrument and use it with any PC - there is no requirement to match a specific instrument with any particular PC; especially useful in a large workshop situation. Best of all, measurement results can be viewed and printed from any PC, regardless of whether an instrument is connected; this allows admin staff to review and collate measurement results without tying up an instrument.

RF Tools can be installed on as many PCs as you like for the purpose of viewing and printing previously stored measurement results. A licensed 892x or CSA must be physically connected to the PC running RF Tools to make new measurements. Each time you purchase an RF Tools license you must provide the model number and serial number of a specific 892x or CSA, as the license key supplied is locked to that specific instrument and will not work with any other unit. Please note that license keys are neither transferable nor refundable under any circumstances.

## Ordering Information

### RF Tools...

Order online at [www.measurement.net.au](http://www.measurement.net.au)

RFT-1000	RF Tools software and Operating Manual on CD-ROM plus one license key locked to one 892x. (Model number and serial number of the 892x must be provided at time of ordering so that a valid license key can be issued. License keys are non-transferable and non-refundable)
RFT-1000-CSA	RF Tools software and Operating Manual on CD-ROM plus one license key locked to one N1996A CSA. Only the Interference Monitor and Signal Strength modules are supported with the CSA. (Model number and serial number of the CSA must be provided at time of ordering so that a valid license key can be issued. License keys are non-transferable and non-refundable)
RFT-1000-002	RF Tools Operating Manual (hardcopy)
RFT-KIT1	Complete kit comprising: <ul style="list-style-type: none"> <li>– RFT-1000 RF Tools software and Operating Manual on CD-ROM plus one license key locked to one 892x. (Model number and serial number of the 892x must be provided at time of ordering so that a valid license key can be issued. License keys are non-transferable and non-refundable)</li> <li>– Agilent Technologies™ 82357B GPIB-USB interface cable. (Note - this is the only interface cable supported by the RF Tools software)</li> <li>– RF Tools Operating Manual (hardcopy)</li> <li>– RFT Accessories Kit comprising: Eagle Microwave return-loss bridge, power divider, precision 50Ω termination, precision short, two custom coaxial cables, two attenuators, all in a durable plastic case.</li> </ul>

### Accessories...

Order online at [www.measurement.net.au](http://www.measurement.net.au)

82357B	Agilent Technologies™ 82357B GPIB-USB interface cable. (Note - this and the older 82357A are the only interface cables supported by RF Tools)
BKA-8920	Eagle Microwave RF Accessories Kit comprising: Microwave return-loss bridge, power divider, precision 50Ω termination, precision short, two custom coaxial cables, two attenuators, all in a durable plastic case.
HPD123NF	Eagle Microwave RF Power Divider, dc to 3GHz, Type-N (f)
RLB251NF	Eagle Microwave Return Loss Bridge, 0.04MHz to 150MHz, Type-N (f)
RLB150N4A	Eagle Microwave Return Loss Bridge, 5MHz to 2GHz, Type-N (f)
RLB150N5A	Eagle Microwave Return Loss Bridge, 5MHz to 3GHz, Type-N (f)
RFT050NM2	Eagle Microwave Precision 50Ω termination, dc to 3GHz, Type-N (m)
RFT000NM1	Eagle Microwave Precision Short, dc to 6GHz, Type-N (m)



Hardcopy Operating Manual, Installer CD-ROM and RFT Accessories Kit

**Upgrades:**

Software upgrades may be available from time to time. A charge may be made depending on the nature of the upgrade.

**Support:**

Support is provided by your supplier, or by emailing Measurement Innovation directly at:

*rftools@measurement.net.au*

**Further Information:**

Contact the organisation shown below, or visit the Measurement Innovation website: [www.measurement.net.au](http://www.measurement.net.au).

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