

DSI-450

EMI Test Receiver

Product Brochure



Version 0.2.00
April 2008

 ***Dynamic Sciences International, Inc.***

System Description

The DSI-450 EMI Test Receiver is a fully compliant test system. The powerfully integrated receiver technology provides the user with the combined computational strength of the on-board computer, high speed data acquisition, enhanced spectrum analyzer display, a SCPI interface, and DSI's EMI Test software. The DSI-450 is an all in one multifunctional resource that provides fast and accurate test and reports. The system operates through the use of Windows "screens". These screens provide a powerful human interface to facilitate full utilization of the system's capabilities. There is a set of primary screens; from these, secondary screens and "dialog boxes" are activated. When the system is turned-on, the first screen to appear is the SpecAn screen; the user can from any number of functions

Features

Frequency Ranges of Operation ...1 KHz to 4.0 GHz

Receiver Measurement Accuracy ... state-of-the-art receiver technology

EMI Test Suite ...fully compliant to CISPR 16-1

Multiple detection modes ...peak, quasi peak, average, RMS

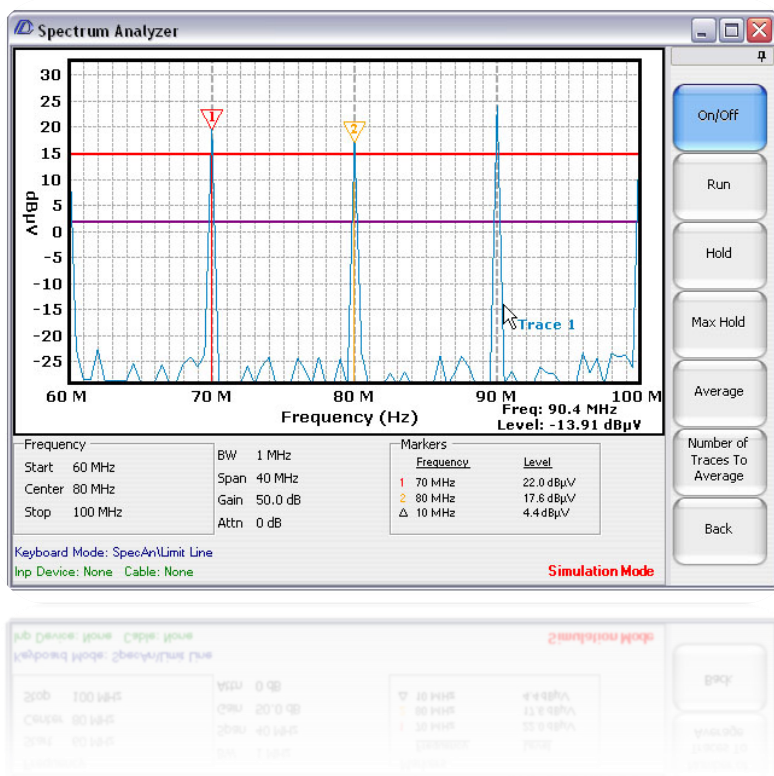
Powerful embedded PC ...processor to handle complex algorithms

Display ...integrated 8.5" TFT color screen

GUI ...intuitive user-friendly interface

SpecAn Mode

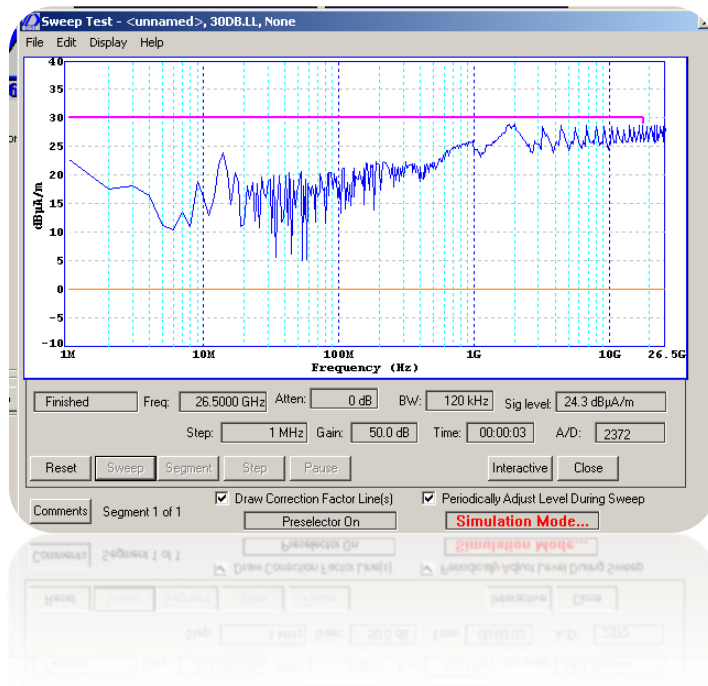
The DSI-450 unit provides the user with a compact and versatile spectrum analyzer capability in the SpecAn mode. In the Spectrum Analyzer mode the System is transformed into a free running analyzer. This platform has the capability to perform the basic functions: setting to a center frequency, adjusting gain, attenuation, frequency span and bandwidth parameters seen in the picture below.



Two on screen markers and delta markers are clearly presented with the db, dBm, dBmV levels being refreshed on each scan. In Spectrum Analyzer mode user interface is facilitated via the front panel keyboard, up/down buttons and rotary dial, allowing for the selection and entry of desired parameters. Limit lines can be called up and displayed on the screen.

Sweep Testing

The **DSI-450** system can be used for a variety of measurement tasks. The example shows how a sweep test is performed. Illustrating the many techniques and processes available performed for each test.

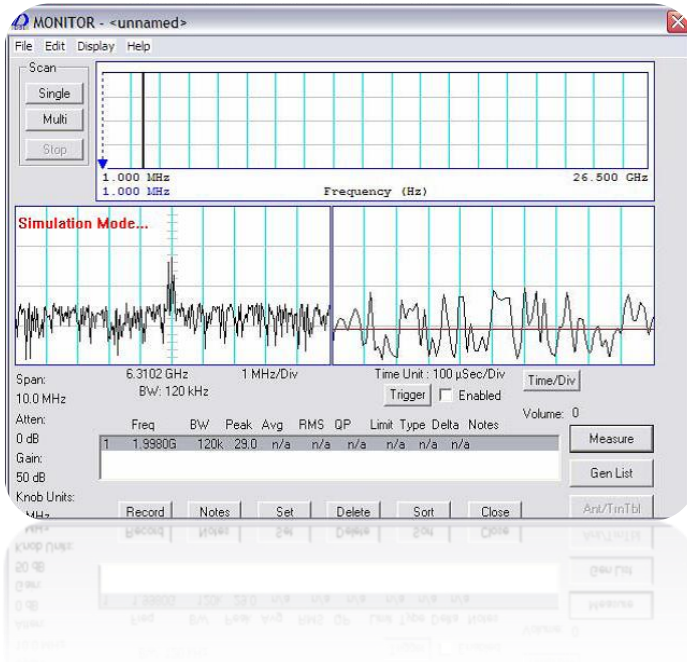


Sweep Test Screen

1. Configures the system
2. Defines sensors and hard-copy equipment
3. Sets up the test by establishing sweep test parameters and limit lines
4. Performs the sweep test
5. Interrupts the sweep to interactively investigate signals
6. Manually controls the receiver to further investigate signals and uses data-log feature to record information
7. Completes the sweep test
8. Prepares hard-copy results (The Main Screen is the starting point for the process.)

Monitor Mode

The top screen displays a scan of the spectrum with relative amplitude values, from which points of interest can be accessed, for a detailed quantitative analysis. The bottom left screen



displays selected portions zoomed in from the scan from the top screen. The right hand bottom screen displays the time domain plot of the amplitude of the signal at the center of the left bottom screen. A selection can be made of the options to display all the limit line crossings, the first number of harmonics of a specified frequency such as a clock, or a number of the largest signals recorded during the sweep. Once the selection has been made by clicking the dot port next to the selection, clicking **OK** will activate the display. As an example, all the measurement points exceeding the limit are displayed on selecting **Limit Line Crossings** (the number is limited to 300 crossings). When this option is

selected, a sub window opens, requesting the desired offset from the limit line from which to record the signals which exceed it. This option is required when margin of safety below the limit is required, or a given uncertainty for the test is set as an offset value.

The major elements of this display are:

Data Log: shown at the bottom center of the screen may be imported from an automatically generated file or entries made by double clicking on points on the fast sweep. Each entry contains receiver, sensor, mast and turntable settings for the measurement taken at that frequency.

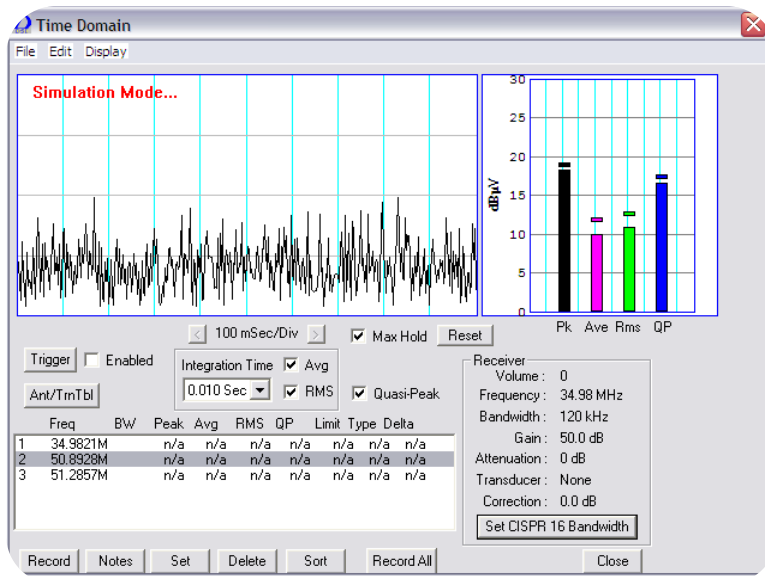
Fast Scan Display: This panel shown on the top center of the screen displays a fast scan of any selected frequency range. The panel may display one scan or continuously repeated scans.

Spectral Display: The left center panel shows the frequency spectrum in the vicinity of the tuned frequency, with a span selected by the operator.

Time Domain Display: The right center panel shows an oscilloscope type display of detector signal. Variable time-base and trigger controls are available.

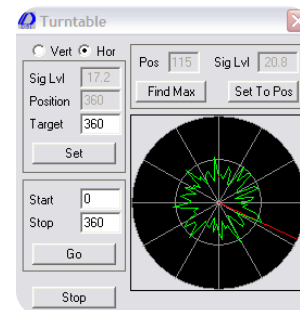
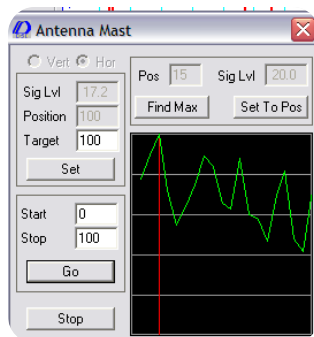
Measure Screen:

The Time Domain display seen is activated by selecting Measure on the Monitor screen it permits selection of any combination of Quasi Peak, Average, RMS detectors for measurement, display and recording. The measurements are displayed and recorded in units determined by the transducer definition. Limit lines can also be shown and the display will automatically re-scale when signal levels change to maintain maximum resolution.



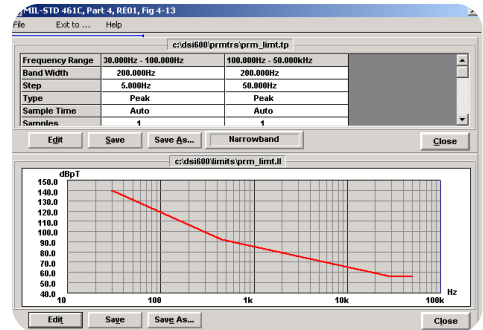
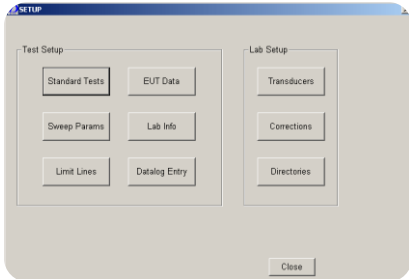
Antenna Mast and Turntable Controller:

In the Measure Screen, the DSI-450 automatically controls an antenna mast and turntable. Drivers for commercially manufactured models are available in the system software and may be selected during system configuration. When prompted, maximum emission points will be displayed.



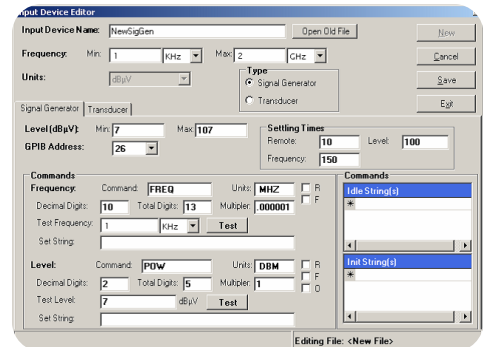
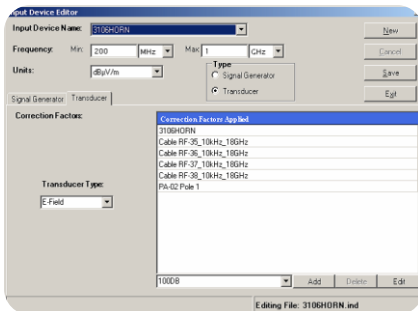
Setup Screen:

Click on the Main screen's **Setup** button. The **Setup** screen appears. Creation of a test involves specification of frequency range, sensor(s), bandwidth(s), step size, number of samples/steps, etc. Limits must be applied to a standard test and often custom parameters are introduced. The operator may select from a set of standards CISPR, FCC, ANSI, DO-160, EN, MIL-STD or user defined tests and will be prompted to enter information regarding the unit tested and conditions of the test.

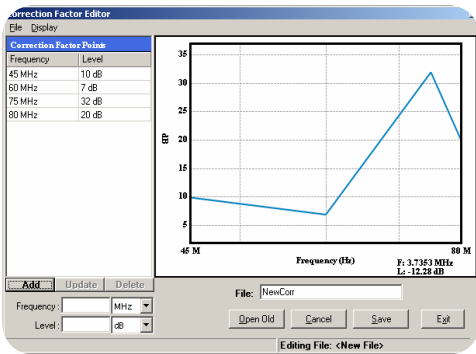


Transducers

Clicking on **Input Devices** allows for the user to edit the **Transducer List**. All existing transducers are shown and can be edited. To add a new transducer click on **Add** and the **Edit Transducer** dialog will appear.



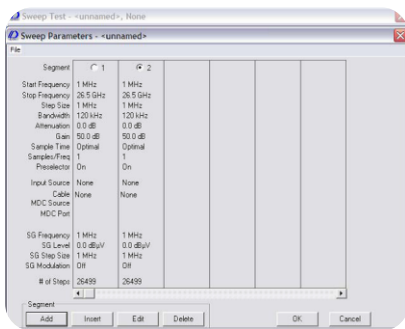
Correction Factors



Creating correction factor is completed by clicking on the “**New**” button under the graph. The “**File**” dropdown list box will change into a text box that allows the user to enter a name for the new file. The “**New**” button will also be changed into the “**Open Old**” button which allows correction factor files from previous versions to be converted to the current format.

Sweep Test Parameters

When **Sweep Parameters** is selected the **Edit Sweep Parameters** dialog will appear. The sweep



can be conducted in any number of segments (including a single segment). Each vertical column represents a segment of the sweep. More segments can be added by clicking on the Segment **Add** button, and segments can be inserted or deleted. A previously created set of parameters can be recalled using the **File** pull-down and selecting **Open**. The test files all have the extension ".stp" or ".tp". Clicking on **New** brings up the default set of parameters. These can be edited to create the desired test conditions.

Limit Lines

Limit lines for a user defined sweep test are prepared by clicking on the **Limit Line** button on the Setup screen. The **Edit Limit Line** dialog appears. The process for their creation and editing is identical to that described previously for Correction Factors, except that files are automatically saved with an ".ll" extension.

Interactive Mode

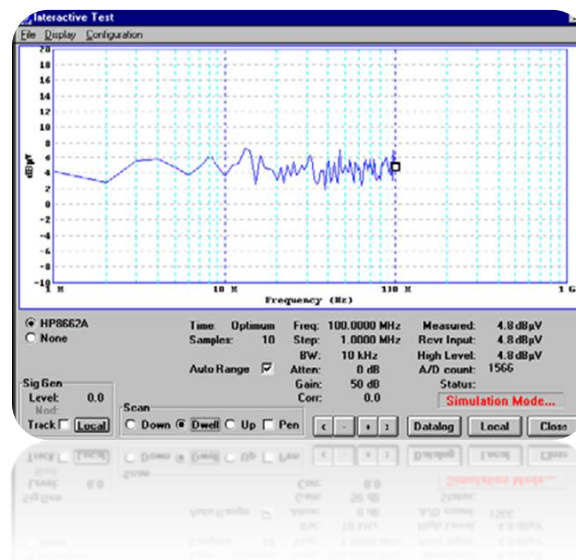
Interactive Mode is initiated by clicking on the **Interactive** button during a sweep test, or directly from the Main screen, similar to the sweep screen, though its receiver controls are active. A square cursor provides the receiver's tuned frequency and the signal amplitude. The frequency can be changed; the frequency can be set by typing a new value. The frequency may also be adjusted by single clicking on the frequency box to highlight it. The step size can be changed by selecting the value; the arrows make decade adjustments, while the + and - buttons change the reading by a factor of 2. Bandwidth, attenuation, gain, can be adjusted in a similar fashion. The spectrum can be scanned using the controls at the lower left. The "Up" and "Down" define the direction of the scan, while "Dwell" holds at the current frequency. The "Pen Down" causes the data to be plotted on the screen. In the lower right corner of the screen the receiver Status is displayed, as follows:

FROL Front-end overload

FRUL Front-end underload

BKOL Back-end (detector) overload

LOCK Synthesizer is not locked

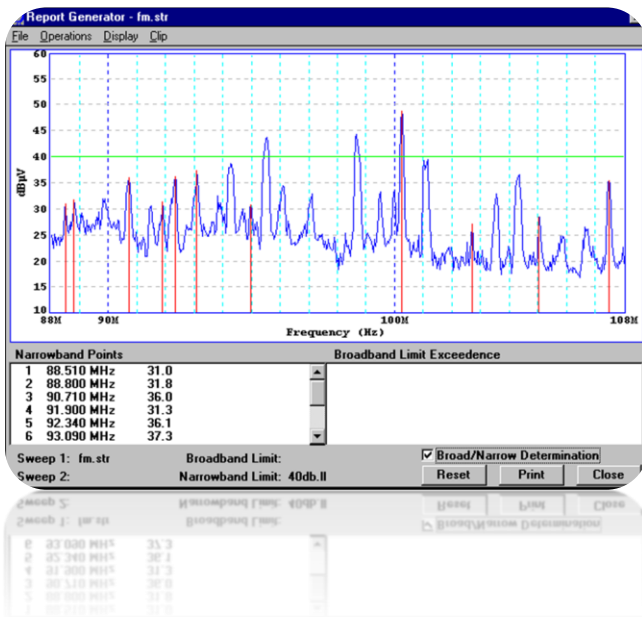


Interactive Mode

A powerful feature of the **Interactive mode** is the ability to re-scale the graph range. Pull-down Display, and select Change Plot Parameters. Enter the start and stop frequencies on the screen for the desired range. If the receiver is currently tuned outside of the new range, the system will automatically re-tune the receiver to put it in the specified range.

Broad/ Narrowband Determination

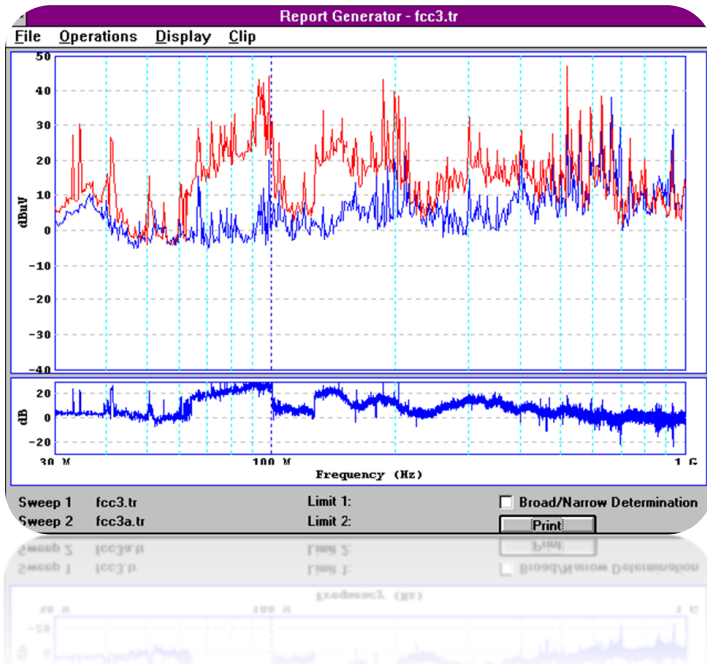
Clicking on the **Broad/Narrowband Determination** box changes the display to indicate the characteristics of signals in the plot. All of the narrowband signals are marked on the plot and a list is generated. Broadband and narrowband limit lines can be opened; when this is done the narrowband exceedances are noted on the list and a separate broadband list is created.



Limit Exceedence Screen

Tabular Reports

In addition to graphical reports, parameter summaries, data log files, limit line exceedances, and the narrowband list can be printed by first using the **File** pull-down and then clicking on **Open Data-log** to select the file. Select **Print** and click on the appropriate box in the dialog.



Report Screen

Printing

Various print options are provided by **Print**. Printing is initiated using the Print button on the screen or by using the **File** pull-down menu. The **Print** dialog has different report types available, and the output can be directed to a printer, plotter, or file.

Stack Reports

The **Stack Reports** mode, selected from the Main Screen, permits background outputting of hard-copy results. The **Hardcopy Output** screen appears when this mode is selected; this screen allows selection of test result files from the default directory, other hard disk locations, or from the floppy drive. Controls are included for selection of the number of copies, orientation (portrait or landscape), and the order, which the outputs are.

DSI-450 Specifications

Receiver

Application: DSI-450

Frequency Range 1 kHz to 4 GHz

SOFTWARE

Operating System: Windows XP/VISTA

Frequency Resolution .1 Hz

Internal Reference Frequency 100 MHz
OCXO

Aging per year (after 30 days continuous operation) $10^{-6} + 1$ PPM/year $+0.05$ PPM 0°C to 60°C

Temperature drift ($+5^{\circ}\text{C}$ to $+45^{\circ}\text{C}$)

$5 \cdot 10^{-8}$, 0°C to 60°C

Frequency display (Receiver mode) 8 digit

Frequency display response referred to 1 GHz
 <50 kHz ± 0.5 dB
 50 kHz to 2 GHz ± 4 dB

Marker resolution 1 Hz

Spectral purity, SSB phase noise IF=500 MHz, (RBW=1 Hz)

10 kHz -90 dBc

100 kHz, span>100 kHz -90 dBc

Residual FM, RBW=1 kHz, Sweep time=100 mS <-120 dBm

Sweep (Analyzer Mode)

Selectable Sweep time in frequency domain, span >10 Hz

Automatically Set by the BW and selectable

EMI Bandwidths 6 dB Bandwidths
200 Hz, 9kHz, 120 kHz

EMI Bandwidths, pulse 1 MHz

Bandwidth accuracy, <100 kHz
10%

Bandwidth accuracy, 300 kHz to 3 MHz
10%

Shape factor 60 dB:3 dB, <100 kHz
4:1

Shape factor 60 dB:3 dB, 300 kHz to 3 MHz
4:1

Video Bandwidth, Analyzer Mode
 $>$ selected IF BW/2

FFT FILTERS

6 dB band widths 10 Hz, 20 Hz, 50 Hz

Bandwidth accuracy $<.1$ %

Shape factor 60 dB:3 dB 4:1

IF FILTERS

Bandwidth accuracy 10 %

RBW 6dB Filters, Hz 100,200, 250,300, 400, 500,640, 800

RBW 6 dB Filters, kHz 1, 1.3, 1.6, 2, 2.5, 3, 4, 5, 6.4, 8, 9, 10, 13, 16, 20, 30, 100, 120, 500

RBW 6 dB Filters, MHz 1

Internal Preselector

Selectable, on and off switch

125 kHz-280 kHz
280 kHz-450 kHz
450 kHz-720 kHz
720 kHz-1.2 MHz
1.2 MHz-2 MHz
2 MHz-3.7 MHz
3.7 MHz-5.9 MHz
5.9 MHz-10.9 MHz
10.9 MHz-16.5 MHz
15 MHz-1.0 GHz

Tunable Tracking Bandpass filter

1.1 GHz-4.0 GHz

LO Radiation from Input Port

1 KHz -2 GHz <-90 dBm
2 GHz – 4 GHz <-80 dBm

Impulse Overshoot

<2% for BW < 20 kHz
<10% for BW < 120 kHz

Display Range

>30 dB Linear
>70 dB Logarithmic

Max Input DC Voltage

AC coupled

50 V

Max Input CW RF Power

RF Attenuation 0 dB

1 W

Inter-Modulation

1 dB Compression of Input Mixer $f > 15$ Mhz,
RF Attention 0 dB Preselection -17dBm

Third Order Intercept, Level -65 dBm

Displayed Average Noise Level (DANL) (sensitivity)

RF attenuation 0 dB, S/N=0 dB, RBW=10 Hz,
VBW=1 Hz, span=0 Hz, 50 Ohm termination.

Without pre-selection, AC coupled

1 KHz-20 kHz: -152 dBm

20 kHz-600 MHz: -155 dBm

600 MHz-4 GHz: -152 dBm

Displayed Average Noise Level (DANL)

RF attenuation 0 dB, Normalized to RBW=1
Hz. **Without Preamplifier**

1 KHz-9 kHz: -55 dBuV

9 kHz-200 MHz: -58 dBuV

200 MHz-4 GHz: -55 dBuV

Immunity to Interference

Image Frequency >80 dB

Intermediate Frequency >80 dB

Level Display Resolution:

Digital: 0 dB

Analog: 0.1 dB

Dynamic Readout:150 dB

Uncertainty of attenuator settings, 0 to 70 dB, referenced to 10 dB RF Attenuation

+/-0.5 dB

Units of Level Display: dBm, dBuV, dBuA, dBuV/m, dBuA/m, dBmV, dBpT

Simultaneous Detectors: Average, Quasi Peak, RMS, Peak

Dynamic Range (1 dB Compression Point Equivalent Input Noise Density)

1 KHz-20 kHz: >150 dB

20 kHz-600 MHz: >153 dB

600 MHz-2 GHz: >150 dB

2 GHz-4 GHz: >148 dB

Noise Figure

1 KHz-20 kHz: <12 dB

20 kHz-600 MHz: <9 dB

600 MHz-2 GHz: <12 dB

2 GHz-4 GHz: <20 dB

Video Linear Dynamic Range

>50 dB

Video Output Level (50Ω)

0 to 4 V

Signal Monitor at 21.4 MHz, 20 MHz Bandwidth -107 dBm to 10 dBm

Detectors: AM

Screen:

TFT, 640 X 480

Linear Level Display Range:

>30 dB

Number of Tandem (one after another)

Traces: 20

Trace Detectors, in the Measure Mode:

Peak, Quasi Peak, Average, RMS

Trace Functions Number of Measurement

Points: 1,000,000 per Segment Out of 20 Segments possible

Measurement Accuracy (S/N>10dB):

+/- 2 dB

Correction Factors:

Preloaded/ User Defined

Quasi Peak Indication:

+/- 2 dB

Dwell Time:

Preset/Adjustable

Demodulation/Detection Modes:

AM

Audio Output:

>3Vp-p, 20 Hz to 20 kHz

Connectors and Controllers

Front Panel

TFT, 640x480

IF Out BNC Female

3.5 mm mini-Jack

Input Connector N Type

Rear Panel

Connectors BNC female (Signal Monitor, Video, IF Out)
IEEE-GPIB -488.2
2 USB Interfaces
2 Ethernet
Mouse, Keyboard
Connector for external monitor (VGA)
AC Supply Connector 69 to 258 VAC
Fuse 15A Chasis GND
Remote Controller - IEEE-GPIB -488.2

Mass Memory

Data Storage: 40 GB hard disc, 7200 RPM

Storage Temperature Range: -20°C to +50°C

Climatic Loading (IEC 60068-2-30:2002-02):
0% to 80% non condensing

Power and Safety

AC Supply: 96 to 258 VAC, 47 to 400 Hz,

Power Consumption: 300 W

Safety: UL

Test Marks: CE, UL

Recommended Calibration Interval:
Operation with Internal Reference 1 Year

Mechanical/Environmental

Weight: 45 lbs (21 kg) **Total System Weight**
Cooling: Built-in low velocity fan
Mounting: Rack Mount
Temperature Range: + 10 to + 40°C
Storage Conditions:-20 to 50°C
Humidity Range: 0% to 80%

Internal PC

Processor: Pentium 4 or better

CPU Speed: 32 bit or better

RAM: 2 GB or better

Hard-disk: Removable: 80 GB (min)

CD ROM: 48 X (min)

Documentation

Receiver Technical Manual
Receiver User Manual
Certificate of Calibration
Warranty Certificate
Certificate of Conformance
Compliance & Software Licenses

Optional Equipment

19" Rack Mount Case with Shock Mounts:
Portable Antenna Kit DC to 1 GHz
Antenna 1 GHz to 4.0 GHz
Line Impedance Stabilization Network (LISN)
Microsoft Office
DC to 4 GHz N - N (Male to Male) Cable
[\(available in various cables lengths\)](#)

© Dynamic Sciences International, Inc. 2008
Printed in the USA, April 23,2008

www.dynamicsciences.com

6130 Variel Avenue
Woodland Hills, CA 91367

Tel: 818-226-6262

Fax: 818-226-6247

Email: market@dynamicsciences.com

