System Sweep and Signal Analysis

- *Continuously Referenced, Non-Interfering Sweep Frequency Response Measurement*
- *5 MHz to 1 GHz Frequency Range*
- *Easy to Read Graphic Signal Level Measurement; High Resolution LCD (320 x 240 dot matrix)*
- *Durable, Water Resistant Receiver Can Be Used in the Rain*
- *Excellent Level Accuracy over a Wide Temperature Range*
- *Broad Scope of Measurement Capabilities: Signal Level, Tilt, Scan, C/N (in-Service), Hum (In-Service), Depth of Video Modulation, In-Channel Response, Sweepless Sweep®*
- *Spectrum Analyzer Display*
- *Automated 24 Hour FCC Proof Measurements*

Wavetek's Stealth System Sweep performs essential cable TV system preventive maintenance tests with accuracy and ease. Signal levels, hum, C/N, and frequency response can be quickly tested without subscriber interference. In no time, technicians are up and running Stealth's full range of tests with unprecedented speed.

The Stealth Receiver 3SR updates in less than 1 second for up to 200 points of response data. This record-breaking speed virtually eliminates the "rubber screw driver" effect caused by delayed response information.

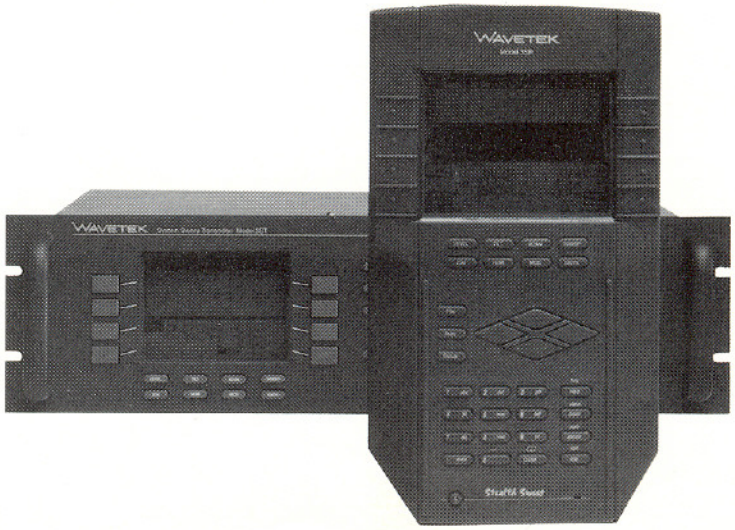
Frequency response is tested by injecting a sweep signal in vacant spectrum areas, and monitoring cable system carrier levels in occupied spectrum areas. In addition to generating the sweep test signal, the Model 3ST Sweep Transmitter continuously monitors the system carriers. While monitoring these carriers, the 3ST immediately sends any headend level variations to the Stealth Receiver 3SR. Sweep response measurements won't be effected by signal levels changing in the headend.

The Model 3SR Stealth Receiver, in addition to its sweep reception duties, conducts a battery of signal level measurements, including a full scan of the cable spectrum to 1 GHz. A proprietary digital signal processing (DSP) technique is used to measure hum and carrier to noise on modulated carriers.

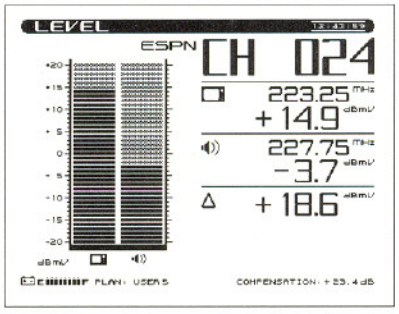
The Model 3ST Stealth Transmitter has all of the measurement capability of the Stealth Receiver, so the Headend Technician can keep an eye on headend levels.

Comprehensive Level Display

The streamlined, hand-held Model 3SR Receiver shows measurement data in both graphical and numerical form. When tuned to a specific channel, a comprehensive set of information is provided: tuned channel, video frequency and level,



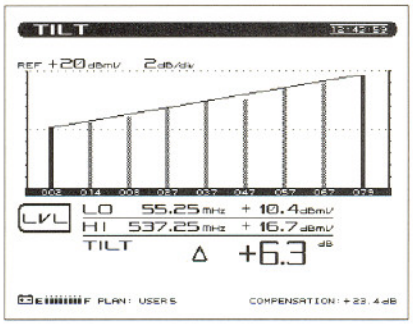
audio frequency and level, the difference between video and audio carrier levels, and the battery charge condition.



The Models 3SR and 3ST automatically learn the system channel plan through a special setup procedure. Individual channels can be described with special characteristics, including video to audio carrier frequency offset, presence of dual sound or NICAM audio, and even programming content. For dual sound and NICAM channels the absolute levels and the differences between video and audio carrier levels are shown for both audio carriers.

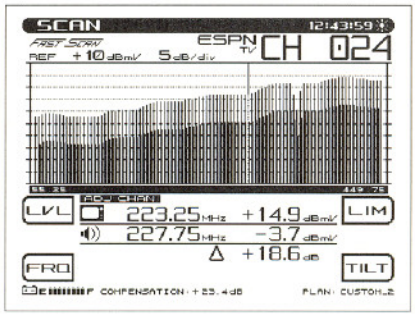
Informative Tilt Display

Before initiating a sweep, at a specific amplifier test point, the Technician typically balances the pilot levels. The "tilt" mode simplifies this step by displaying a bar graph with up to nine different user selected video carrier levels represented. The levels of high and low pilots are shown, along with the difference between these carrier levels. From this mode, the operator can quickly switch to sweep by pressing the "sweep" key.



Channel Scan Mode

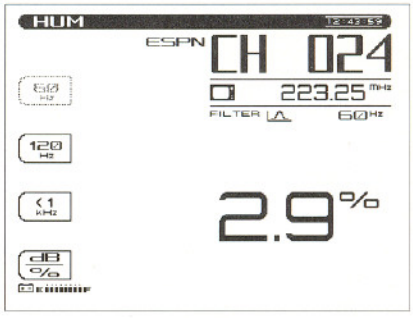
To get a quick look at absolute carrier levels, the "scan" mode is used. In this mode a bar graph showing all carrier levels is displayed. A marker selects which of the carrier's level is displayed on the bottom of the screen. As mentioned previously, pressing the "level" key quickly changes the mode to show more detailed measurement information about the marked channel.



A "scan limits" feature enables a quick go/no-go test based on user defined limits for minimum video carrier levels, maximum and minimum difference between video and audio carrier levels, maximum level difference between adjacent video carriers, and maximum level difference over the entire band. This allows the operator to quickly check to make sure the subscriber drop is within FCC specifications before initiating the 24 hour test.

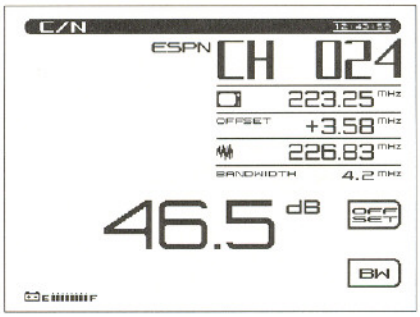
In-Service Hum Measurement

To make a hum measurement, simply press the "hum" key. The hum modulation of the last tuned channel will be displayed in either % or dB as selected by the operator. Soft keys allow the operator to select 60, 120 (50 or 100 for PAL systems) or <1,000 Hz filters for this measurement to help in troubleshooting. Stealth's hum measurement technique permits testing modulated carriers.



In-Service C/N Measurement

To make a C/N measurement, simply press the "C/N" key. The C/N ratio of the last tuned channel will be displayed, along with the noise measurement frequency and bandwidth. The C/N measurement bandwidth and the frequency offset for the noise measurement may be controlled from the measurement screen. The Stealth System Sweep automatically searches for a quiet line in the vertical interval and makes the noise measurement during that line. Preselection is not required for up to 78 channels at a +10 dBmV input level.

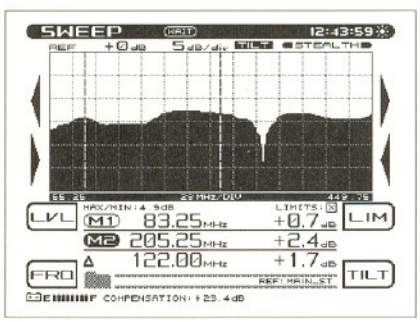


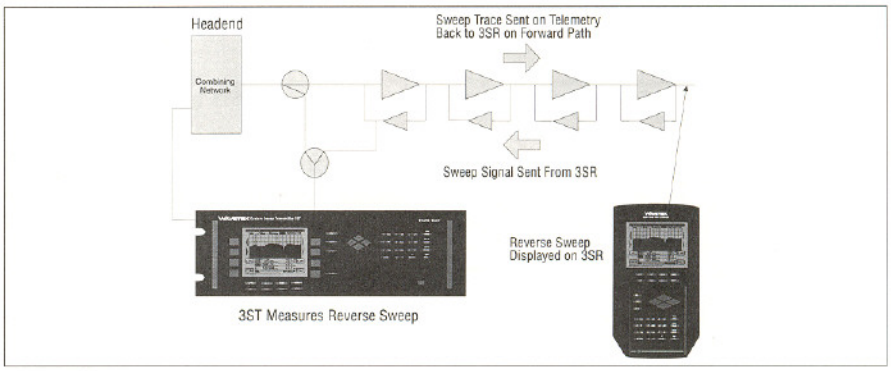
Sweep Display

The Stealth sweep method is fast, accurate, and non-interfering. The levels are measured and stored at a reference point (headend, hub site, or first amplifier) and then compared on a sweep display at subsequent test points.

Dynamic nonvolatile memory enables the storage of at least 50 sweep traces for later viewing or at least 16 references may be stored, enabling the operator to test the response from any specific point in the system (bridger, fiber node, splitter, etc.).

A tilt compensation feature enables consistent measurement accuracy when specified tilt changes in the system, eliminating the need to store a new reference.





Stealth Reverse Sweep Diagram

Reverse Sweep Option

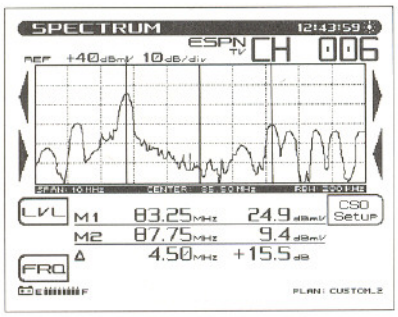
The Stealth Reverse Sweep Option solves reverse alignment and test problems by incorporating a comprehensive reverse sweep test capability into the same equipment that performs the forward sweep. This means no extra rack space is required, as it uses the forward sweep transmitter to receive the reverse sweep. One hand-held instrument in the field does both the forward and reverse sweep tasks, eliminating the need to carry multiple boxes. The reverse option has the capability to sweep return with up to 250 kHz resolution, ensuring that no response problems are overlooked.

Stealth Reverse Sweep Concept

With the reverse sweep option, a transmitter is built into the hand-held sweep receiver. No additional transmitter is required. The headend sweep transmitter (3ST) is set up to receive the reverse sweep sent from the field. When a reverse sweep is activated from a field test point, the headend transmitter receives the telemetry signal that indicates which receiver is sending the sweep, what frequencies to sweep, and timing information. The headend transmitter measures the sweep, and sends the results, along with the serial number of the sending receiver via its telemetry signal to the the field. The field receiver with the tagged serial number then displays the sweep response as measured in the headend on its LCD. The Reverse Sweep will not affect the usage of forward sweep by other receivers.

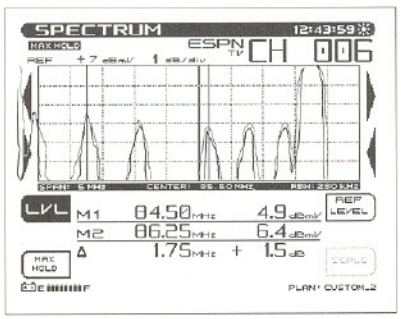
Spectrum Analyzer Display

Stealth's spectrum analyzer display provides a view of the system spectrum with variable spans from 3 MHz to 50 MHz and a dynamic range of better that 60 dB. The "max hold" function ensures that the highest signal over multiple sweeps is displayed. The Spectrum Analyzer display can even make FCC in-channel response measurements. And composite second order and composite third order intermodulation distortion tests are simplified with user prompted automated measurement processes. Preselection is required for accuracy in this measurement.

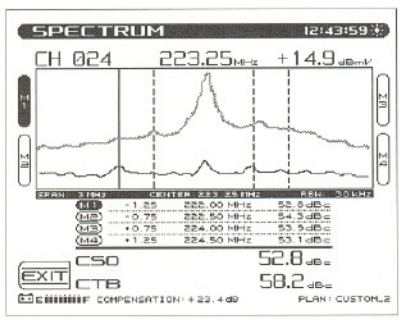


FCC In-Channel Response

A full field multi-burst can be used to test in-channel response using the spectrum display's "max hold" feature and fine scale resolution.



CTB And CSO Display



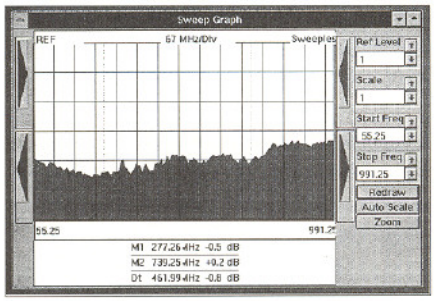
Automated 24 Hour FCC Tests

Automated tests for FCC 24 hour tests are easy to perform with the Stealth. Tests of all of the video and audio carrier levels, along with the difference in levels can be made immediately or at timed intervals, with the instrument sleeping between tests to conserve battery life. Test results may be reviewed on the LCD display before printing or downloading to a PC.

StealthWare Data Analysis Software

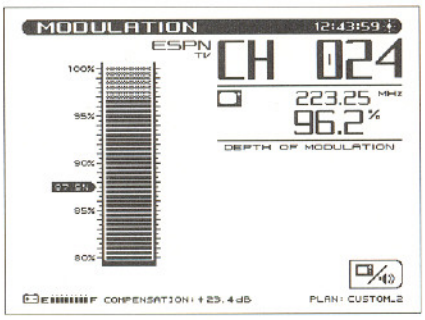
Information stored in the Stealth may be uploaded to a PC using Wavetek's StealthWare, a Windows™ data collection and management software package. This PC software is a database management tool, enabling sorts by location, time, temperature or channel.

In addition, actual Stealth Scan, Sweep, and Spectrum screens can be stored and displayed on the PC monitor. The user has full analysis control of the displayed screen, just as if he were viewing it on the Stealth itself. And because it's a Windows program, traces can be cut and pasted into another Windows word processor or spreadsheet application.



Video Depth of Modulation

The video depth of Modulation screen provides percent modulation in both graphical and precise numeric format. This feature on the model 3ST makes it easy for the headend technician to do a quick check-up on modulation depth, without having to set up special equipment.



Specifications

Frequency

Range: 5 to 1,000 MHz
Accuracy: ±10 ppm at 25°C; ±10 ppm drift over temp.; ±3 ppm/year aging
Resolution Bandwidths: 30 and 280 kHz (30 kHz for CTB/CSO only)
Tuning Resolutions: 10 kHz
Sweep Resolution: 250 kHz maximum

Level Measurement

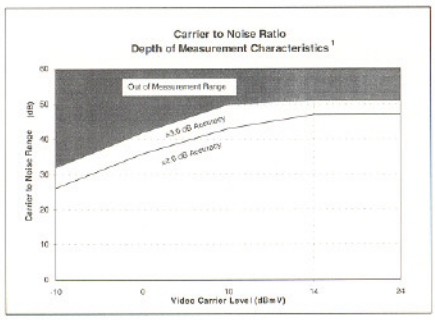
Range: -40 to +60 dBmV
Resolution: 0.1 dB
Accuracy: ±1.0 dB from -20 to +50°C [1,2]

Hum Measurement

Carrier level must be ≥ -5 dBmV.
Non-scrambled channels only.
Range: 0 to 10%
Resolution: < 0.2%
Accuracy: ±0.7%

Carrier to Noise Measurement

Non-scrambled channels only. No preselection required for 78 channels at +10 dBmV input level.
Range: 52 dB maximum
Resolution: 0.5 dB



Stealth Sweep and Reverse Sweep

WAVETEK®

Frequency Response

Frequency Range: 5 to 1,000 MHz (Forward or Reverse)
Sweep Rate: ≈1 second for 600 MHz Sweep, no scrambled channels
Accuracy: ±0.5 dB, normalized (dependent on stability of referenced carriers)
Display Scaling and Range: 1, 2, 5, and 10 dB/division; 6 vertical divisions
Sweep Scan: User definable from 5 to 1,000 MHz
Reference Storage: At least 16, including Forward, Reverse, or Sweepless
Sweep Trace Storage: At least 50, including Forward, Reverse, or Sweepless
Reverse Option Transmitter Output Level: +10 to +40 dBmV, settable in 2 dB increments

Transmitter

Frequency Range: 5 to 1,000 MHz
Level Range: +10 to +40 dBmV; settable in 2 dB increments
Spectral Purity: Hars -30 dBc; Spurs -35 dBc

Telemetry

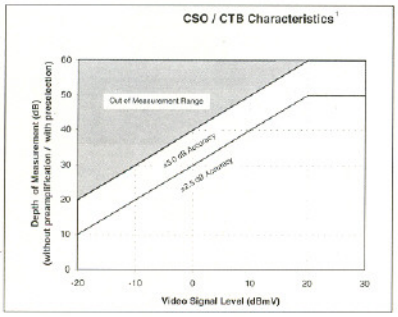
Frequency: User defined, 5 to 1,000 MHz
Modulation: FSK 100 kHz deviation
Spectrum Required: ≈1 MHz recommended

Spectrum Mode

Spans: 3, 5, 10, 20, and 50 MHz (0.5, 1, 2, and 5 MHz/div)
Sweep Rates: 2 seconds (50 & 5 MHz)
Display Scaling and Range: 0.5, 1, 2, 5, and 10 dB/division; 6 vertical divisions
Spurious Free Dynamic Range: 60 dB [1]

Intermodulation Distortion

Range: 60 dB maximum
Resolution: 1dB



Depth of Modulation

Assumes presence of white reference on any VITS line. Non-scrambled channels only.
Range: 80 to 100%
Resolution: < 0.5% at 85%

Serial Interface

RS232; Epson, IBM Printers

General

Log Linearity: ±0.5 dB [1]
Flatness: ±0.5 dB [3]
Dimensions:
3SR Receiver:
15.2 cm (W) x 25.4 cm (H) x 5.1 cm (D)
6" (W) x 10" (H) x 2" (D)
3ST Transmitter:
48.3 cm (W) x 13.3 cm (H) x 35.6 cm (D)
19" (W) x 5.25" (H) x 14" (D)
Weight:
3SR Receiver: 1.95 kg (4.3 lbs.)
3ST Transmitter: 6.8 kg (15 lbs.)
3SR w/Reverse Sweep Option: 2.2 kg (4.9 lbs.)
Operating Temperature Range:
3SR Receiver: -20 to +50°C; 0 to 120°F
3ST Transmitter: 0 to +50°C; .32 to 120°F
3SR w/Reverse Sweep Option: -20 to +47°C; -4 to +117°F

Powering

Model 3SR Battery Life:
2.5 hours continuous (absolute worst case), replaceable battery cartridge
Model 3SR w/Reverse Option Battery Life:
1.75 hours continuous (absolute worst case)
Model 3SR Charge Time:
4 hours fast charge; 30 hour slow charge (with unit operating)
Model 3ST:
47 to 63 Hz ~ 100 VA; 100 to 265 VAC

Ordering Information

Model 3SR Receiver Includes soft carrying case, battery charger/adapter (charges battery installed on instrument), two spare type "F" input connectors, and operating manual.
Model 3ST Transmitter Includes line cord, channel plan transfer cable, and operating manual.

Options

3SRV Reverse Sweep Option (for Model 3SR)
Enables sweep in both forward and reverse directions. Includes NS-6 summing network interface for bidirectional test prints.

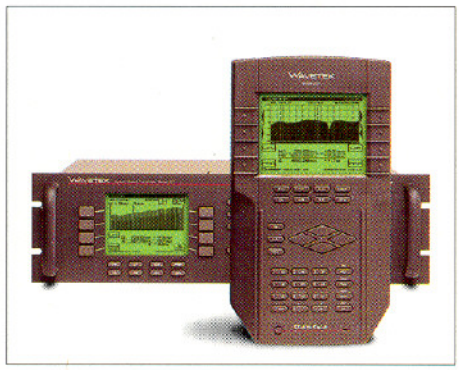
Optional Accessories

Stealth Battery Cartridge
Field replaceable spare battery cartridge for Stealth SAM or Stealth 3SR Receiver.
CBC-1
Cigarette lighter adapter that charges battery in unit - can be used along with SBC-1 to charge spare battery cartridge in vehicle.
SBC-1
Charger for 1 spare battery cartridge.
SBC-6
Charger for up to 6 spare battery cartridges.
SIP-1 Printer
Stealth Ink-jet Printer Package includes Kodak Diconix Serial ink-jet printer and cables required for proper connection.
1217-50-0151
Stealth serial printer cable (provided with SIP-1).
NS-6
Summing network interface for bidirectional test prints (included with 3SR Reverse Option).
PP-75
Precision Preselector For Carrier-To-Noise And Intermodulation Distortion Testing (55 to 440 MHz).
PP-55-110
Tunable Precision Preselector (55 to 110 MHz).
PP-110-220
Tunable Precision Preselector (110 to 220 MHz).
PP-220-440
Tunable Precision Preselector (220 to 440 MHz).
PP-440-880
Tunable Precision Preselector (440 to 880 MHz).
7201
Tunable Precision Preselector (31 to 62 MHz).
7202
Tunable Precision Preselector (62 to 125 MHz).
7203
Tunable Precision Preselector (125 to 250 MHz).
7204
Tunable Precision Preselector (250 to 500 MHz).

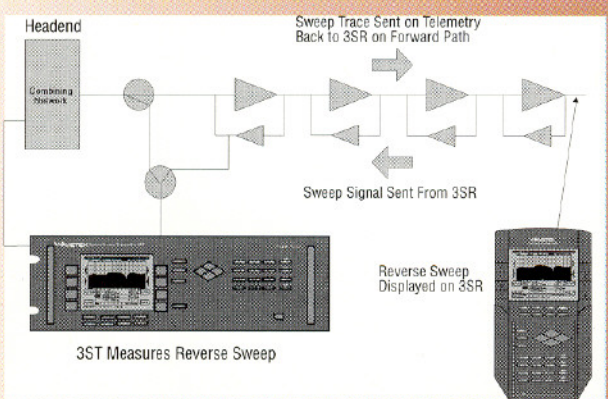
[1] Typical Specifications
[2] Relative to 25°C
[3] @ 25 °C, @ 20 dBmV
Specifications are subject to change without notice
Printed in the U.S.A. on recycled paper

Reverse Sweep Option for Models 3SR and 3ST

One Technician and the Hand-Held Stealth... Who's happier? A cable technician trying to do his job while lugging around 30 lbs. of cumbersome sweep and SLM equipment, or a man performing the same job with Wavetek's hand-held Stealth Model 3SR Receiver? Weighing less than 5 lbs., the Stealth Model 3SR has taken away the burdensome collection of additional equipment with its streamlined design, power-packed features, and amazing portability. So, happiness couldn't come in a smaller package. Still tackling forward sweep and signal level meter applications, the hand-held Stealth 3SR Receiver is bound to make technicians even happier with its new direction in life – *Reverse Sweep.*



Two Paths to Follow... Adding the new Reverse Sweep Option to Wavetek's portable Stealth 3SR Receiver enables it to receive *and* transmit sweep for fast and accurate measurement of both the forward and reverse paths. Eliminating the need for extra equipment, as well as additional rack space at the headend, the Reverse Option's built-in transmitter activates a reverse sweep from a field test point by communicating with the rack-mounted Stealth 3ST Transmitter. Receiving the telemetry signal, the headend 3ST identifies the 3SR unit, the frequencies being swept, and the timing information. The headend transmitter measures the sweep and sends the results with other pertinent data via its telemetry signal to the receiver in the field. The field 3SR Receiver then displays the headend sweep response on its high resolution LCD display.



Either Way You Go... Forward or Reverse, the Stealth System Sweep is headed in the right direction. For more information, call today...**1-800-622-5515.**

Wavetek...makers of quality test equipment for over 30 years.

Stealth Reverse Sweep Option Specifications

Frequency Response
Frequency Range: 5 to 1,000 MHz (Forward or Reverse)
Sweep Trace Storage: At least 50, including Forward, Reverse, or Sweepless
Transmitter Output Level: +10 to +40 dBmV, settable in 2 dB increments

Telemetry
Frequency: User defined, 5 to 1,000 MHz
Modulation: FSK 100 kHz deviation
Spectrum Required: ≈1 MHz recommended

General
Dimensions: 15.2 cm (W) x 25.4 cm (H) x 5.1 cm (D)
6" (W) x 10" (H) x 2" (D)
Weight: 2.2 kg (4.9 lbs.)
Operating Temperature Range: -20 to +47°C; -4 to +117°F

Powering
Battery Life: 1.75 hours continuous (absolute worst case)

3SR Reverse Sweep Option includes a NS-6 summing network interface for bidirectional test prints. Call 1-800-622-5515 for more details.

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