

Signal Analysis Meter

- ◆ 1 GHz Frequency Range
- ◆ Easy to Read Graphic Signal Level Measurement; High Resolution LCD (320 x 240 dot matrix)
- ◆ 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
- ◆ Durable, Water Resistant Package can be Used in the Rain
- ◆ Excellent Level Accuracy over a Wide Temperature Range

Wavetek's SAM 4040, a next generation signal analysis meter, is more like a hand-held broad-band communication service monitor, with a broad scope of practical test capabilities. It performs essential cable TV system preventive maintenance tests with accuracy and ease. Signal levels, hum, and C/N can be quickly tested without interrupting subscribers' reception. In no time, technicians are up and running the full range of tests with unprecedented speed.

The hand-held, lightweight, rugged, and water resistant SAM 4040 utilizes down-sized electronics including surface mount components and multilayer PC boards. The measurement information is clearly displayed on a high resolution (320 X 240) LCD.

The SAM 4040 is the first signal level meter available with Wavetek's trademarked Sweepless Sweep®, in which active system carriers are measured and compared to a stored reference to determine system frequency response.

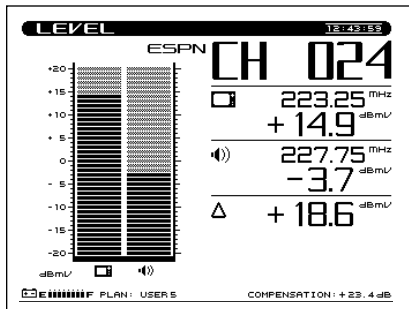
In addition to its sweep reception capabilities, the SAM 4040 performs a battery of signal level measurements, including a full scan of the cable spectrum to 1 GHz, and a built-in spectrum analyzer with spans from 3 to 50 MHz. A proprietary digital signal processing (DSP) technique is used to measure hum and carrier-to-noise on modulated (unscrambled) carriers.



SAM 4040

Comprehensive Level Display

The streamlined, hand-held SAM 4040 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 SAM 4040 automatically learns 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.

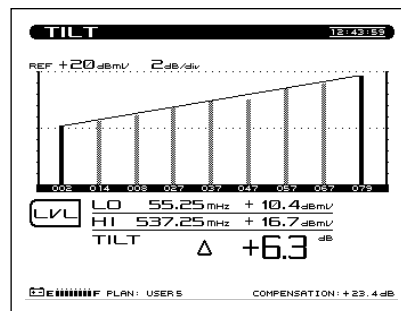
Digital QAM Carrier Level Measurement

This option permits accurate average power measurements of digitally modulated (16 and 64 QAM) carriers. The user simply specifies that the channel is a "digital carrier" type in the channel plan, and then indicates the bandwidth of the carrier to be measured. When a digital channel is selected,

the instrument automatically switches to an RMS detection mode, makes and processes the measurement, and displays the result on the LCD. The levels are displayed in similar fashion to "single" carrier types. These screens may be printed directly, and the levels may be stored and printed or uploaded to a PC as part of an Autotest.

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.

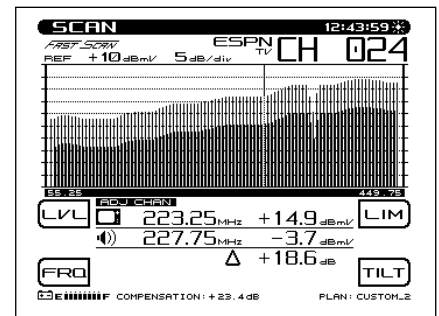


Channel Scan Mode

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 carriers' levels is displayed on the bottom of the screen. Pressing the "level" key quickly changes the mode to show more

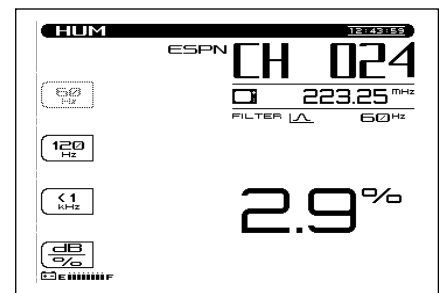
detailed measurement information about the marked channel.

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

For 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, or <1,000 Hz filters for NTSC systems and 50, 100, or <1,000 Hz filters for PAL systems to help in troubleshooting. Stealth's hum measurement technique permits testing on modulated carriers.



In-Service C/N Measurement

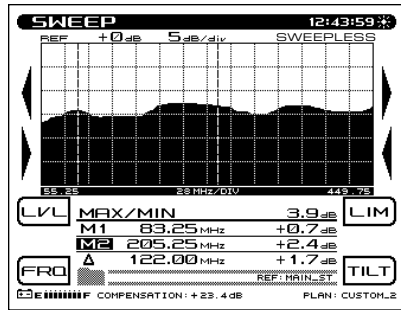
For a C/N measurement, simply press the “C/N” key. The C/N ratio of the tuned channel will be displayed, along with the noise measurement frequency and bandwidth. The C/N measurement bandwidth and the frequency offset for the noise measurement may be controlled from the measurement screen. The SAM 4040 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.



Sweepless Sweep Display

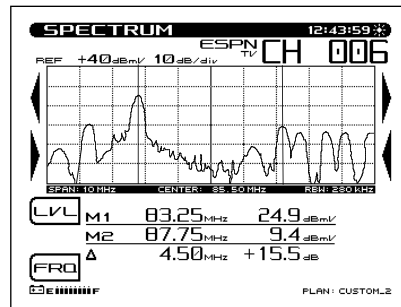
The SAM 4040 is the first SAM with Sweepless Sweep®, which provides a passive sweep method based on comparative measurements of system signals. The levels are measured and stored at a reference point (headend, hub site, or first amplifier) and then compared on a sweep display at subsequent test points.

Dynamic nonvolatile memory enables the storage of at least 50 sweep traces for later viewing or printing, and 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.).



Spectrum Analyzer Display

SAM 4040’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 than 60 dB. The “Max Hold” function ensures that the highest signal over multiple sweeps is displayed. Even the FCC in-channel response measurement can be made with the spectrum analyzer display.



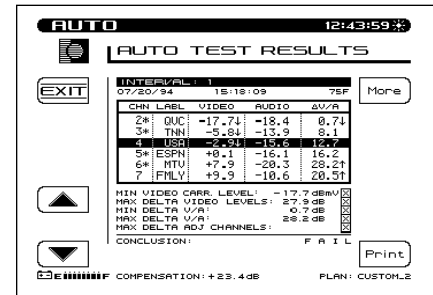
Extensive Auto Test Capability

Automated tests can be scheduled to perform either FCC compliance tests, or they can be initiated immediately in order to log performance at individual nodes, amplifiers, or other test points.

A wide range of tests can be performed automatically, including signal levels, C/N, hum and depth of modulation. Providing unprecedented flexibility, the SAM 4040 enables the operator to designate which tests to perform on which channels. Because tests

are non-intrusive, it’s no problem to test all parameters on all channels.

After a test is performed, results can be displayed on the screen with a pass/fail indication on a variety of limits. Limits can be set for FCC or other government standards, or to system preferences. Data taken during any automated test, or sequence of automated tests, can be viewed with a pass/fail indication for each of the limits, and the operator can scroll through the stored data to look at specific measurement results. Automated test results can be printed directly to a printer or uploaded to a PC using StealthWare to store and manage the data or format reports.

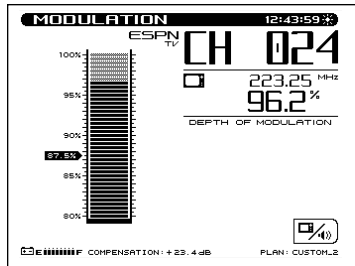


Data Analysis and Management With StealthWare

Any stored Stealth measurement information can be uploaded to a PC using StealthWare, a Windows™ based data management package. Stored sweep, scan, or spectrum screens can be viewed on the PC and analyzed with marker movement and readout information just as on the actual unit. StealthWare allows the operator to build channel plans and edit site locations which can then be downloaded to multiple Stealth instruments. Additionally, channel plans can be uploaded to the PC, modified in StealthWare, and then downloaded back to the Stealth instrument.

Video Depth of Modulation

Another first for SAMs is the Video Depth of Modulation test, in which the percent of modulation is displayed in both graphical and precise numeric format.



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: 280 kHz
Tuning Resolutions: 10 kHz
Sweep Resolution: 250 kHz maximum

Level Measurement

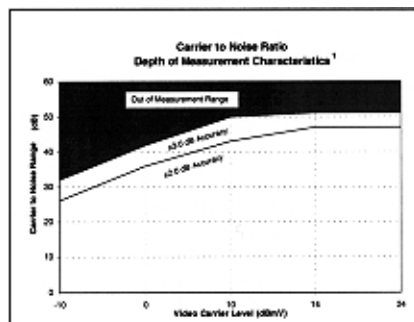
Range: -40 to +60 dBmV
Resolution: 0.1 dB
Accuracy: ± 1.0 dB from -20 to +50°C^{1,2}
16/64 QAM Digital Carrier Power Measurement Option: ± 1.8 dB @ 25°C

Hum Measurement

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

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



Frequency Response

Sweep Rate: ≈ 1 second
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 Span: User definable from 5 to 1,000 MHz (limited to cable system's active occupied bandwidth)
Reference Storage: At least 16
Sweep Trace Storage: At least 50

Spectrum Mode

Spans: 3, 5, 10, 20, and 50 MHz
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 dB¹

Depth of Modulation

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

Serial Interface

RS232; Epson, IBM printers

General

Log Linearity: ± 0.5 dB¹
Flatness: ± 0.5 dB³
Dimensions: 15.2 cm (W) x 25.4 cm (H) x 5.1 cm (D)
 6" (W) x 10" (H) x 2" (D)
Weight: 1.95 kg (4.3 lbs.)
Operating Temperature Range: -20 to +50°C; 0 to 120°F

Powering

Battery Life: 2.5 hours continuous (absolute worst case), replaceable battery cartridge
Charge Time: 4 hours fast charge; 30 hour slow charge (with unit operating)

Ordering Information

SAM 4040 Includes soft carrying case, battery charger/adaptor (charges battery installed on instrument), two spare type "F" input connectors, and operating manual.

Options

4040 DIG: Digital Carrier Level Measurement Option
StealthWare
 Windows™ compatible Data Management Package for Stealth Products.

Optional Accessories

Stealth Battery Cartridge
 Field replaceable spare battery cartridge for SAM 4040 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.
P-Stealth: Stealth portable serial thermal fusion printer kit (Citizen PN60). Includes cables and adapters required for printing.
1217-50-0159: Stealth serial printer cable (included with P-Stealth)
1217-50-0149: Channel plan transfer cable
3010-12-0050: Soft carrying case (included with Model SAM 4040)
4010-00-0105: Charger/Adapter 120VAC to 18VDC
1019-00-0437: Charger/Adapter 220VAC to 18VDC

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¹ Typical Specifications ² Relative to 25°C ³ @ 25°C, @ 20 dBmV
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