SAM 4040D™ – PRELIMINARY

WAVETEK

Advanced HFC Signal Analysis Meter

- *See bursty noise, TDMA signals, transients as short as 5 µs*
- *Designed to work with high-loss test points available in today's amplifiers*
- *Advanced TDMA digital measurements: level, signal/noise, time-domain display*
- *Five hour continuous use battery life (battery and charger compatible with older Stealth units)*
- *Existing SAM 4040s can be upgraded to SAM 4040D functionality*

The new SAM 4040D includes all of the same test capabilities of the Wavetek SAM 4040, but now more features are packed into the same lightweight, durable package. The new 4040D offers a faster spectrum analyzer display, TDMA measurements, and a new long-life battery.

Find Ingress Fast

One of the biggest problems with two-way networks is ingress. Even though a network may meet leakage guidelines, lower frequency RF signals can still leak into the cable; this is ingress. The portable, durable SAM 4040D's fast, sensitive spectrum display makes finding ingress in the field quicker and easier.

Wavetek's SAM 4040D is equipped with a new impulse noise detector and more powerful spectrum analysis modes. These allow technicians to see noise spikes as fast as 5 µs and track them down.

Measure TDMA or Continuous Digital Signals

Wavetek's SAM 4040D also offers a complete set of digital signal measurements:

1) Power level measurements can be made on TDMA ('bursted') channels (cable modems and most return path signals), as well as continuous carrier channels (digital video and most forward path signals).

2) Time-domain displays give more information about TDMA channels. Packets of data from a cable modem can be seen and examined. Users can verify that all modems are being received at the same level, see 'collisions', or get a quick idea of network traffic levels from any point in the field.

3) **In-service in-channel** D/U (desired/undesired) measurements for TDMA signals. Now, without taking modems out of service, users can measure the level of interference in the

actual channel being used.

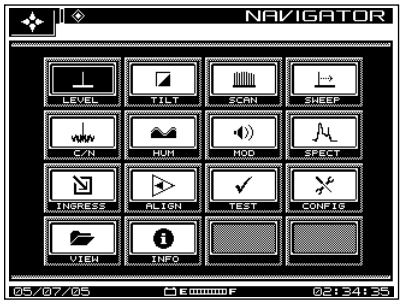
4) digiCheck™ continuous carrier power level measurement is still available. By 'slicing' the desired channel and measuring across the entire spectrum, tilt, spectrum shaping, and other problems are all detected accurately.

With these capabilities, the SAM 4040D offers the most comprehensive digital measurement package in any SLM.

The Same Tough Stealth Package

All of these new features are in the same package that propelled the current 4040 Signal Analysis Meter, and other Stealth instruments, to become the industry leader in field maintenance and sweep test.

- *Lightweight*– At 4.9 lbs., the SAM 4040D is half the weight of most competitors.
- *Easy-to-carry*– The SAM 4040D's weight and size mean it can be held in one-hand and easily carried. You may not even want to use the shoulderstrap.
- *Water resistant*– The SAM 4040D is ready for field use no matter what the weather conditions.
- *High resolution display*– The 320x240 dot matrix LCD provides high-resolution displays of all measurements.
- *Easy-to-use*– The SAM 4040D provides a simple user interface that is now common on all Wavetek's SLM, leakage, SAM and sweep meters. This means less training time and more time for troubleshooting.



SAM 4040D's new Navigator screen makes finding measurement modes easy.

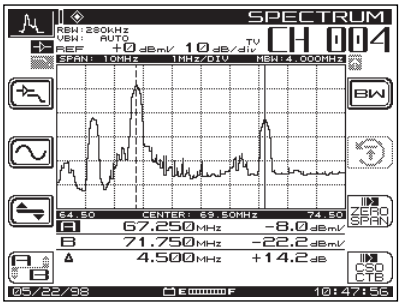
Comprehensive Spectrum Analyzer Display

Five times faster than the original SAM 4040, when you press SPECT, the spectrum update is as fast as 750 ms per sweep. You can zoom in and out with rapid button presses to isolate ingress problems or view TDMA signals.

More important is the ability to catch transients and noise. The SAM 4040D detects signals as fast as 5 µs—in both zero span, and continuous modes. A built-in preamp and 50 MHz low-pass filter allow you to track down smaller signals, even through high-loss test points.

The SAM 4040D's expanded SPECTRUM mode provides the tools needed to find 'difficult' problems.

- Programmable 'dwell' time allows the meter to stay on each frequency longer and catch more ingress.
- Peak hold in spectrum mode saves transient spikes instead of overwriting them with the next trace.
- CSO/CTB mode for automatically making intermodulation measurements.

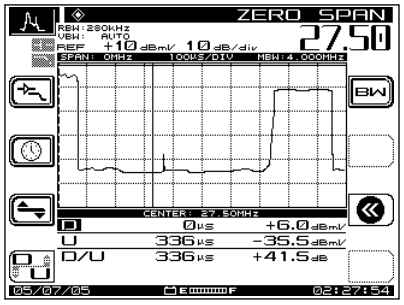


Sample Spectrum Display

Wavetek's New Zero-Span Display

While tracking down ingress, a spectrum Zero-span mode allows the user to 'camp' on a given frequency and see a signal as it comes and goes.

The SAM 4040D also measures and analyzes digital TDMA channels. First, you can observe the power level of a packet/message. Move the cursor onto the packet, and the SAM 4040D indicates the level. In addition, desired/undesired levels are displayed in real time. Moving the cursor to an empty time slot produces an automatic desired/undesired (carrier to noise) measurement. Adjustable resolution and video bandwidths can be used to tailor zero-span displays to show what the user wants. Adjustable measurement bandwidth automatically calculates full channel power in zero-span mode.



Zero span mode provides accurate TDMA measurements.

Sweepless Sweep® Provides Frequency Response without a Sweep Transmitter

Wavetek's trademarked Sweepless Sweep® passively provides frequency response information about a network by measuring active carriers. The SAM 4040D stores the levels of all active carriers at one reference point in the network, and then can compare the relative levels to another one of the same network. Just like a referenced sweep, but without the need for a transmitter!

Extensive Suite of Troubleshooting and Proof-of-Performance Measurements

Carrier/noise, hum, and depth of modulation are all measured in-service and in-channel on analog (unscrambled) video channels. The SAM 4040D's sophisticated digital signal processing algorithms provide the most accurate information possible without creating any service outage. No other meter offers this much information to aid troubleshooting without creating a service interruption to take readings.

The SAM 4040D shows levels in both bargraph and numeric form. When tuned to a specific channel, a comprehensive set of information is provided: tuned channel, video frequency and level, audio frequency and level, as well as the difference between the two.

Auto-Test Takes the Pain Out of Proof-of-Performance

Level, C/N, hum, and depth of modulation measurements can be automated in an 'Auto Test' program. These tests can be done in real-time at the user's request. An internal timer allows the scheduling of a complete set of '24-hour' test measurements. This allows many of the FCC proof-of-performance tests to be completed in one quick procedure.

Tests to be run for each individual channel in the channel plan can be specified by the user. All measurements can be checked against limits to create a pass/fail display that summarizes the entire test. These test results can be viewed in the field to ensure that the data collected is correct for the required report and can be printed directly to a serial printer, or uploaded to a computer for further analysis/printing.

PC Data Logging and Analysis Software

StealthWare allows users to upload databases and measurement screens from the field for later analysis and comparison on a PC. These files also can be used as documentation of alignment work done by contractors or technicians.

StealthWare can be used to edit channel plans on a PC. Channel plans can also be uploaded from an instrument for review.

High-Capacity Memory for Field Documentation

The SAM 4040D offers a large, non-volatile memory for storing the results of measurements taken in the field. Well over 100 files can be stored in the unit before uploading (see specifications for an example of capacity). All files are stored in a common 'pool' of memory, so storing fewer of one file type allows for storing more of another.

All files are stored as databases of the readings, not 'pictures' of a screen display. This allows viewing parameters (such as sweep frequency limits or scales) to be changed when the file is later viewed. It also provides data for StealthWare to compare files during later study.

New NiMH Battery Extends Usage

A new extended life battery is provided on all SAM 4040D units. It provides five hours of continuous use on a single charge (even in worst case – with backlight on).

An expandable bag allows the SAM 4040D to use either extended life batteries, or old standard Stealth batteries, if desired.

Upgradeability

The SAM 4040D's design allows for easy upgradeability while in the field. Your investment in Wavetek test equipment is protected. When future versions of the SAM 4040D are available, easy upgrade procedures are provided. And, the entire procedure can be completed in less than five minutes.

Operational Specifications

Level Measurement

Range: -40 to +60 dBmV
Resolution: 0.1 dB
Accuracy: +/- 1.0 dB from -20 to +50°C [1,2]
Signal types: single carrier, video (single or dual audio), audio
Additional uncertainty: +/- 1.8 dB for digital (QAM, QPR, QPSK, VSB, CAP-16), TDMA (zero-span spectrum mode)

Tilt Measurement

Up to 9 pilot carriers or video channels
Hi-Lo △ Resolution: 0.1dB

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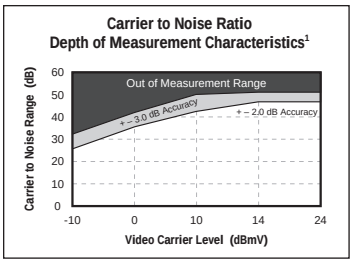
Scan Mode
All video, audio, pilot carrier, and digital channel levels displayed.

Sweep Mode
Frequency range: 5-1000 MHz
Display span: user definable
Display scale/range: 6 vertical divisions
1, 2, 5, or 10 dB/division
Stability: +/- 0.5 dB, normalized (dependant on stability of referenced carriers)

Carrier to Noise Measurement
Non-scrambled channels only.
No preselection required for 78 channels at +10 dBmV input level.
Resolution: < 0.5 dB
Range: 52 dB maximum[1]



Hum Measurement
(carrier > 0 dBmV) Non-scrambled channels only
Range: 0 to 10%
Resolution: <0.2%
Accuracy: +/- 0.7%

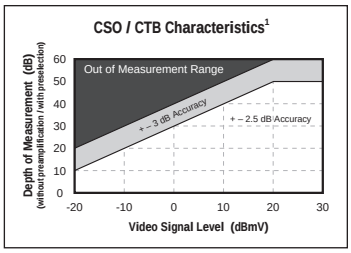
Depth of Modulation
Assumes presence of white reference on any VITS line.
Non-scrambled channels only.
Range: 80 to 100%
Resolution: <0.5% at 85%
Audio demodulation of AM and FM carriers

Spectrum Mode
Spans:
3, 5, 10, 20, and 50 MHz
(750 ms to 1.75 depending on span)
Sweep Rates:
~1 second updates with spans of 50, 20 , 10 & 5 MHz
~1.7 second updates with 3 MHz span
Display Scaling and Range:
0.5, 1, 2, 5, and 10 dB/div.
6 vertical divisions
Dwell: programmable 0-25 ms
Spurious-Free Dynamic Range: 60 dB [1]

Sensitivity:
-40 to +60 dBmV w/o preamp
-50 to +50 dBmV w/ preamp
-55 to +50 dBmV typical for f<50 MHz.

Zero-Span Mode
Video BW: >1MHz, 100 kHz, 10 kHz, 100 Hz
Resolution BW: 280 kHz, 30 kHz
Measurement BW compensation:
programmable 1 khz-99 MHz
Pulse measurement accuracy:
nominal level in 10 µs
+/- 2 dB from nominal in 5 µs (>1 MHz VBW, 280 kHz RBW)
Sweep times:
100 µs to 20 s (1,2,5 settings)

Intermodulation Distortion (CSO/CTB)
Range: 60 dB maximum
Resolution: 0.4 dB



Frequency
Range: 5 to 1,000 MHz
Accuracy: @ 25°C +/- 10 ppm
Drift Over Temp +/- 10 ppm
Aging +/- 3 ppm/year
Resolution Bandwidths: 30, 280 kHz, 2 MHz
Tuning Resolution: 10 kHz

Data Storage
Files stored: autotests, scan, Sweepless Sweep®, spectrum mode (regular with max hold, zero-span or CSO/CTB), tilt, channel plans;
Allocated on demand.
Storage capability:
(simultaneous- more of one file type can be 'traded' for less of another)
(typical 78-channel plan)
(all files stored as database, not screen picture)
8 channel plans
100 sweep references/traces
60 spectrum displays
20 autotests

Serial Interface
Serial, RS232; Epson, IBM Printers

General
Log Linearity: +/- 0.5 dB[1]
Flatness: +/- 0.5 dB[3]
Dimensions: 6"x11"x3.5"
Weight: 2.3 kg (4.9 lbs.)
Operating Temperature Range:
-20 to +50°C; -4 to 122°F

Power Sources
Battery:
12V /3.5A-hr replaceable
6 hours cont. use on a single charge
Charger:
Input: 90-265VAC, 47-63 Hz
Aux out: 16V @ 750 mA
Charge: 15V @ 750 mA

1) Typical Specifications
2) Relative to 25°C
3) @25°C and +20 dBmV

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