SDA-4040D

Stealth Digital Analyzer



2007 FROST & SULLIVAN
Global Communications Test & Measurement Company of the Year Award

Key Features

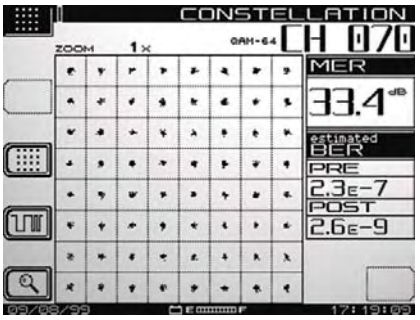
- **Offers unmatched measurement performance in a single instrument**
- **Enables easy preparation of networks for interactive services with a 5 to 1000-MHz fast, sensitive spectrum analyzer**
- **Provides zero span measurement of power and carrier-to-noise ratios**
- **Enables analysis and quality measurements of digital TV and cable modem signals with optional QAM analysis**
- **Ensures full in-service proof of performance with automated tests**
- **Reduces testing and troubleshooting times for network analysis and qualification**
- **Rugged, weather-resistant, and lightweight**

With today's varied networks, a solution that can handle cable modems, digital TV and maintain the analog spectrum is essential. Putting that solution into a single, rugged instrument will enable technicians to use it in the most demanding of situations, whenever it is needed.

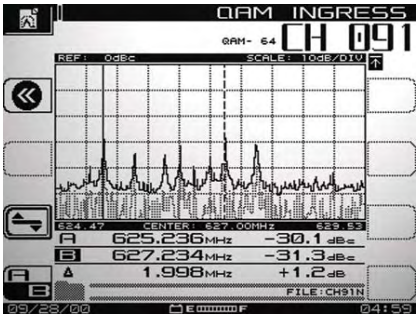
The JDSU SDA-4040D Stealth Digital Analyzer is just such a solution. Detecting and eliminating return path noise is accomplished with a fast spectrum analyzer (detects signals down to a 5 µs duration), and the industry-unique JDSU PathTrak™ Field View option. A zero span spectrum provides accurate, in-service power and carrier-to-noise measurements of cable modems.

The new QAM View digital analysis option adds forward path digital signal testing that includes constellation, pre/post FEC BER, MER, and an exclusive QAM ingress feature that reveals noise under an active carrier. Of course, analog signal measurements are addressed with standard features like RF level, fast-scan, tilt, in-service C/N and HUM, and FCC and CENELEC compliant autotesting.

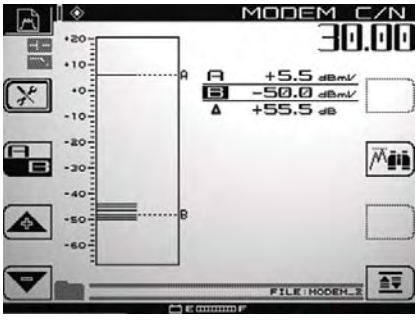
The SDA-4040D is an ideal solution for any network. Priced competitively to ensure that on-site technicians are fully equipped with the equipment they need, the SDA-4040D will ensure rapid and accurate analysis of network turn-up or in-service testing for fastest return on revenue.



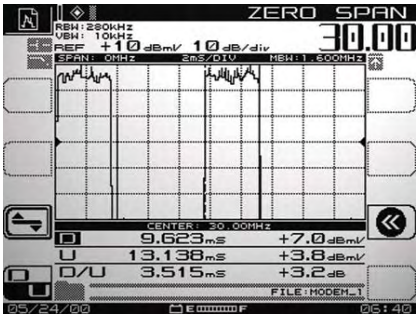
Constellation display with MER and pre/post FEC BER



QAM ingress feature shows noise/ingress under an active carrier



Single button, in-service C/N measurements on TDMA return path cable modem signals (DOCSIS, EuroDOC-SIS, EuroModem)



Zero span/time domain expert mode, showing the TDMA bursty return path cable modem power ramp of 3.5 ms

The Spectrum mode has the speed and versatility to effectively troubleshoot difficult system problems

JDSU single-instrument solutions

The SDA-4040D Stealth Digital Analyzer delivers a single-instrument, "One-Box" solution to help deploy and maintain quality video and data services in the HFC network. With the same durability and measurement accuracy as its proven SAM predecessor, the SDA-4040D is designed with the speed, spectrum, and advanced QAM analysis to test both traditional analog video and the latest digital formats. The versatile combination of standard features and available options enables the meter to be customized, or upgraded to the SDA-5000, to meet virtually any system requirements.

Analog testing

- Nonintrusive Sweepless Sweep
- RF level, fast scan, tilt
- In-service carrier-to-noise, hum, depth of modulation
- Fast spectrum display with CTB/CSO
- Automatic/24-hour testing (FCC and CENELEC compliant)

Return path testing

- PathTrak Field View option pinpoints return path noise
- Zero-Span Spectrum mode
- DOCSIS/DAVIC-compatible cable modem analysis

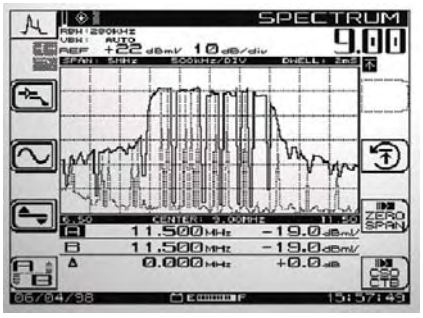
Advanced digital testing

- digiCheck average power
- QAM View digital analysis option with modulation error ratio (MER), pre/post FEC BER, constellation, and exclusive noise/ingress under the carrier measurement

Preparing the network for digital services

For measurement and analysis of digital TV and forward modem signals, the new QAM View option provides a full complement of digital quality measurements. Included is a 64/256 QAM constellation display with zoom, average digital power level, bit error rate (BER), 21 to 35 dB modulation error ratio (MER) and noise margin "cliff effect" parameter. An equalizer display shows equalizer stress and distance to fault.

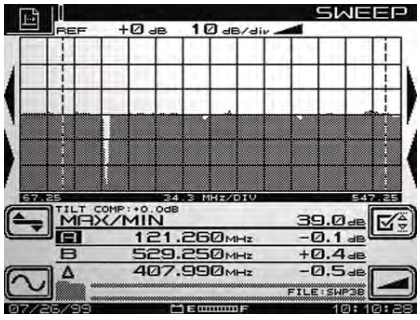
In addition, an exclusive QAM Ingress Noise mode enables technicians to see ingress/noise under an active digital carrier. This tool is invaluable for detecting forward path ingress otherwise hidden by conventional spectrum views.



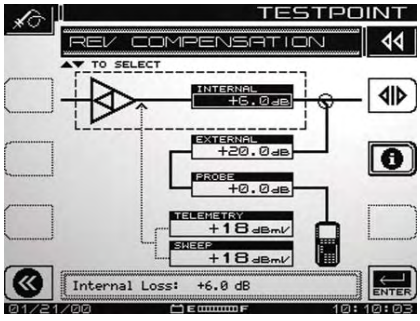
Reverse digital modem signal



PathTrak Field View option compares headend node spectrum with field testpoint spectrum



Sweepless Sweep display



Graphical reverse testpoint compensation

In-service cable modem analyzer

For bursty digital signals such as TDMA technologies used on cable modems for reverse services, the SDA-4040D offers two choices. The first is a one-button cable modem analyzer and the second uses advanced zero span capabilities to make the measurement. The one-button cable modem analyzer quickly shows carrier-to-noise measurements, while the zero span option utilizes a time domain display to enable power measurements while the modem is in service. Both methods are compatible with global cable modem standards.

Making accurate digital average power measurements is addressed with the digiCheck measurement function. The digiCheck feature is compatible with most non-bursty digital modulations in use today (that is, 16, 32, 64, and 256 QAM, QPR, QPSK, VSB, and CAP16).

Analog and digital signal limits

Analog signal threshold limits have always been a technician's favorite feature of JDSU instruments. Automatic limit checks provide a quick go/no-go status for audio and video levels. The SDA Series extends this capability with a dedicated digital limit set that can be applied exclusively to the forward digital carriers defined in a channel plan. By assigning separate analog and digital limits, test time is reduced, since no calculation is necessary to determine if analog and digital level relationships are within system specifications. Analog and digital limit capabilities are available in both the Scan and Autotest modes.

Tilt measurement

Tilt is the easiest and most efficient tool for balancing amplifiers. For cable plants requiring multiple tilt measurements, such as comparing today's tilt measurement with a historical record, and then making an additional measurement for a new wider channel plan, the technician simply uses markers to indicate the tilt channels that define the new limits.

Intermodulation distortion

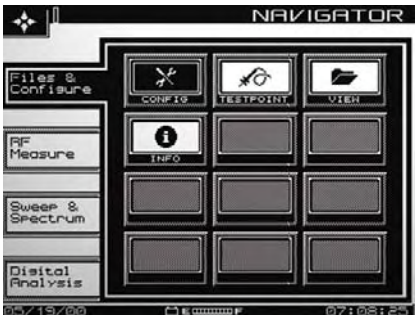
Intermodulation distortion (CSO/CTB) can be automatically measured using the CTB/CSO mode from the spectrum analyzer. CTB/CSO distortions produced by intermodulation of analog TV carriers can degrade the signal quality of QAM modulated signals used by digital video and cable modems.

Scan measurement

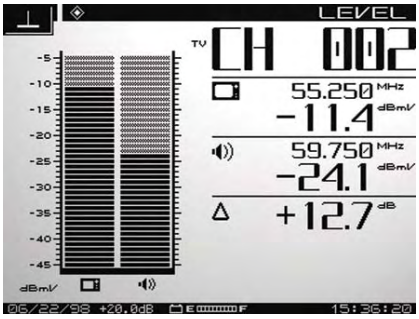
Scan mode provides a quick graphical view of the entire channel plan with bars representing the video level for each channel. Both video and audio may be displayed.

Carrier-to-noise measurement: in-service

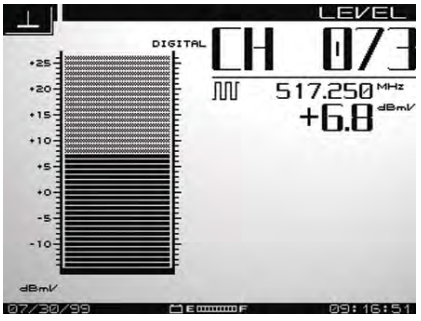
Carrier-to-noise measurement (on non-scrambled channels) is just as easy, and there is no need to remove modulation from the video carrier. No tunable preselector filter is needed.



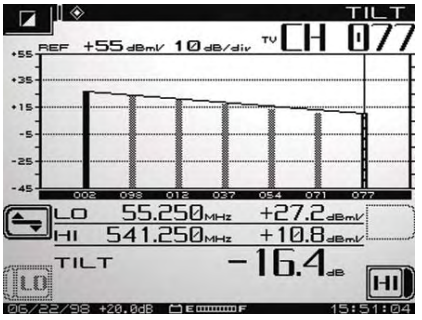
The Navigator user interface, common on all JDSU SDA meters



The single-channel level display shows both video and audio levels (either single or dual sound/NICAM) and the difference between the two



Digital channel average power measurements can be made using the digiCheck™ feature



Tilt mode performs automatic tilt calculations between any two of nine designated carriers

Hum measurement: in-service

Measuring hum on a channel (non-scrambled) is as simple as pressing the "HUM" key and since the instrument is battery powered, the measurement is independent of ground loops, therefore isolated from the line (mains). Hum reveals itself as either single (60 Hz) or double (120 Hz) horizontal bars across the video screen. The level of either can be measured.

Modulation measurement

Includes NTSC, PAL, and SECAM formats. Demodulation of the audio is done for both AM and FM. FM is used to hear audio distortion on the FM radio channels or the sound of the TV program. AM is used to recognize short-wave interference signals in the reverse band.

Extensive automated test capability

Automated tests can be scheduled to perform either 24-hour FCC compliance tests, or initiated immediately to log performance at individual nodes, amplifiers or other testpoints. A wide range of tests can be performed automatically, including signal levels, C/N, hum and depth of modulation. The operator designates which tests to perform on which channels. Because these tests are non-intrusive, it is easy to test all parameters on all channels at any time.

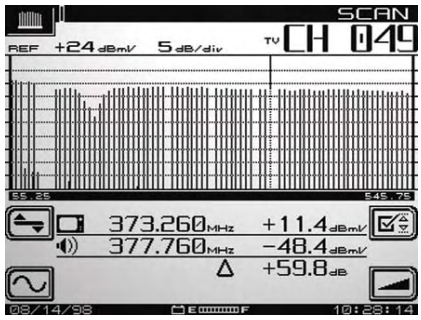
After a test is performed, the results can be displayed on the SDA screen. A pass/fail indication can be set on a variety of limits for FCC/CENELEC or other government standards, or to system preferences. Data taken during any automated test, or sequence of automated tests, can be viewed immediately with a pass/fail indication for each of the limits. Specific stored measurement results may be viewed on demand. Automated test results can be printed directly to a serial printer or uploaded to a PC using StealthWare to store and include in custom reports.

Data analysis with StealthWare

Any stored SDA measurement information can be uploaded to a PC using StealthWare, a Microsoft® 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 in just the same way as on the actual instrument. A sweep graph overlay function enables comparison of multiple RF response variations over time. StealthWare also allows the operator to build channel plans and edit site locations, which can be downloaded to multiple SDA instruments. Additionally, channel plans can be uploaded to the PC, modified in StealthWare, and then downloaded back to the SDA instrument.

Upgrading the SDA-4040D to the SDA-5000

The JDSU upgrade program is designed to protect customers' investment in test equipment. As system requirements change, the SDA-4040D can be upgraded to the SDA-5000 for forward and reverse sweep capabilities at any of JDSU worldwide service centers, and model SAM-4040D owners can upgrade to the SDA-4040D with an in-the-field firmware change only.



Limit checks can be instantly viewed after identifying channel of interest with a marker in Scan mode display

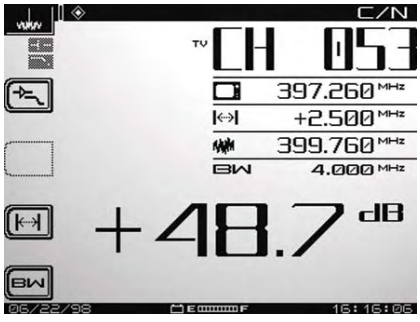
JDSU Basic Service packages

To ensure the highest levels of support for SDA purchasers, JDSU offers the Basic Service for instrument package. Designed to provide the foundation for maximizing the features and usage of SDA equipment, JDSU's Basic Service package offers the following degrees of service and support only JDSU can provide. This includes:

– An extended warranty of up to five years

– Annual calibration fully traceableto meet NIST standards

These core services provide the foundation for a longer product life, help you realize greater meter functionality and maximize your JDSU investment. Ask your sales representative or call the JDSU Customer Care Center for more information.



In-service carrier-to-noise

Technology training

JDSU provides a comprehensive Cable Networks technology training program designed to help you and your teams understand the changing needs of today's advanced networks.

Training seminars include:

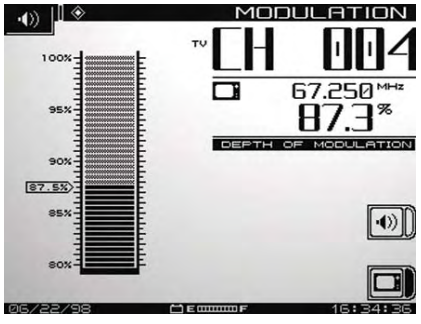
– HFC basics

– Sweep and balance forward and return

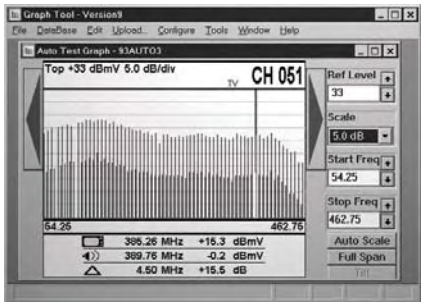
– Sweep 101 "Bootcamp"



In-service "HUM" (PAL and NTSC compatible)

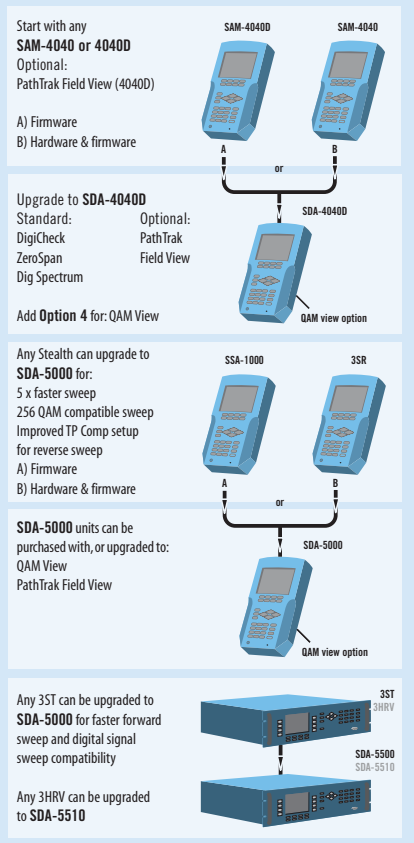


Depth of modulation



The detailed scan graph offers user-adjustable marker, scale reference level and tilt for maximum signal evaluation

Specifications



Stealth to SDA series – product upgrade/replacement guide

Stealth model	*SDA replacement*
3SR	SDA-5000
3SR + 3SRV option	SDA-5000 with Option 1
3SR + 3SRT option	SDA-5000 with Option 2
3ST	SDA-5500
3HRV	SDA-5510
SSA-1000	SDA-5000 with Option 2 (firmware only)
SAM 4040	SDA-4040D
SAM-4040D	SDA-4040D (firmware only)

General

Display	320 x 240 dot matrix LCD, selectable back light
Dimensions	6 x 11 x 3.5 in (15.2 x 27.9 x 8.9 cm)
Weight	5.1 lb (2.3 kg)
Temperature range operating	–4 to 117°F (–20 to +47°C)

Power sources

Battery	Extended-life replaceable nickel metal hydride, 12V/3.5A-hr 4 hours cont. use on a single charge

Frequency

Range	5 to 1,000 MHz
Accuracy	±10 ppm at 25°C; ±10 ppm drift over temperature; ±3 ppm/year aging
Resolution bandwidths	30, 280 kHz and 2MHz (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)
Log linearity	±0.5 dB(1)
Flatness	±0.5 dB(3)
Signal types	CW, single carrier, video (single or dual audio/NICAM), audio, digital
Uncertainty for digital carrier	additional ±0.5 dB (digital types 16/32/64/256) QAM, QPR, QPSK, VSB, CAP-16, DVB/ACTS and TDMA using Zero Span Spectrum mode) at 280 kHz RBW

Carrier-to-noise(4)

In-service measurement. Non-scrambled channels only. No preselection required for 78 channels or less. Best dynamic range at +10 dBmV or higher input.

Range	≥ 52 dB(1)
Resolution	< 0.5 dB

Hum measurement

In-service 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. Audio demodulation of AM and FM carriers

Range	80 to 100%
Resolution	< 0.5% at 85%
Audio demodulation	AM and FM carriers

Tilt measurement

Up to nine pilot carriers or video channels with tilt and level measurements on the highest and lowest.

Hi-Lo Δ Resolution	0.1dB

Scan mode

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

Sweepless Sweep mode

Frequency range	5-1000 MHz
Display span	User definable
Display scale/range	6 vertical divisions 1, 2, 5, or 10 dB/division
Sweep pulse occupied bandwidth	30 kHz
Stability	±0.5 dB, normalized (dependent on stability of referenced carriers)
Sweep rate	~1 second (78 Channels, including scrambled and digital signal types)
Channel plan templates (user editable)	China-1; China-2; France; HDTP-NL; Ireland; Japan; Jerold; Jerold-HRC; Jerold-IRC; NCTA; NCTA-HRC; NCTA-SUB; NCTA-IRC; NTSC-Broadcast; OIRT-D/K; PL-B/G; PAL-UK

Spectrum mode

Spans	3, 5, 10, 20, and 50 MHz (0.3, 0.5, 1, 2, and 5 MHz/div.)
Sweep rates	~1 second updates with spans of 50, 20, 10 and 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(3)
Sensitivity without preamp	–40 dBmV 5 to 550 MHz –35 dBmV 550 to 1000 MHz
Sensitivity with preamp	–50 dBmV 5 to 550 MHz –45 dBmV 550 to 1000 MHz
Max. level with preamp	+50 dBmV

Specifications

Zero Span mode

Video BW	>1 MHz, 100 kHz, 10 kHz, 100 Hz
Resolution BW	2 MHz, 280 kHz, 30 kHz
Measurement BW Compensation	programmable 1 kHz to 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(5)	≥ 60 dB
Resolution	0.1 dB

Data storage

Files types that can be stored: Sweepless Sweep, autotests, tilt graphs, channel plans, and scan graphs. Spectrum graphs (normal, normal with max hold, and CSO/CTB) can also be stored. Memory space is allocated on demand. All files stored as data, not as screen picture. Typical mix of files for 78-channel plan, 8 channel plans; 16 sweep references, 80 sweep traces; 40 scan files, 20 spectrum displays; 20 autotests

Serial interface

RS232; Epson, IBM, Seiko, and Diconix printers

Input configuration

Connector type	75 Ω Type F Female (Optional 75 Ω Type BNC Female)
Maximum sustained voltage	100 VAC, 140 VDC

PathTrak field view (OPT 3 required)

Update rate	2x/second (remote trace) ~1x/second (local trace)
Display scaling	5/1/2/5/10/20dB/div.
Selectable nodes	14 (selectable via PathTrak HCU)

View option (OPT 4)

The QAM View option can be factory installed in any new or existing SDA Series instrument. The specifications and features are in addition to the standard measurement features of the SDA Series. When ordering, please specify OPT 4A for 8MHz, DVB-C, ITU-T J.83 Annex A, or OPT 4B for 6MHz, DVS-031, ITU-T J.83 Annex B.

Modulation type	64/256 QAM, DVB-C, ITU-T J.83 Annex A (OPT 4A) 64/256 QAM, DVS-031, ITU-T J.83 Annex B (OPT 4B)
Channel bandwidth	8 MHz (OPT 4A); 6 MHz (OPT 4B)
Measurable input range (lock range)	
64 QAM	−20 to +50 dBmV (typical)
256 QAM	−15 to +50 dBmV (typical)
Frequency tuning	
50 to 860 MHz (Digital QAM mode)	
Resolution	50 kHz
BER (bit error ratio)	
64 QAM Pre-FEC/OPTs 4A and 4B	10^{-4} to 10^{-9}
64 QAM Post-FEC/OPTs 4A and 4B	10^{-4} to 10^{-9}
256 QAM Pre-FEC/OPT 4A and 4B	10^{-4} to 10^{-9}
256 QAM Post-FEC/OPT 4A and 4B	10^{-4} to 10^{-9}
MER (modulation error ratio)	
64 QAM/Option 4A	22 to 35 dB
Accuracy	±2.0 dB (typical, see chart below)
64 QAM/Option 4B	21 to 35 dB
Accuracy	±1.5 dB
256 QAM/Option 4A	28 to 35 dB
Accuracy	±2.0 dB (typical, see chart below)
256 QAM/Option 4B	28 to 35 dB
Accuracy	±1.5 dB
EVM (error vector magnitude)	
64 QAM/Option 4A	1.2% to 5.2%
Accuracy	±0.5% (1.2% to 2.0%) ±1.0% (2.1% to 4.0%) ±1.4% (4.1% to 5.2%)
64 QAM/Option 4B	1.2% to 5.8%
Accuracy	±0.5% (1.2% to 2.5%) ±1.1% (2.6% to 5.8%)
256 QAM/Option 4A	1.1% to 2.5%
Accuracy	±0.6%
256 QAM/Option 4B	1.1% to 2.5%
Accuracy	±0.5%
QAM level measurement	
Signal types	64 QAM, 256 QAM
Range	−20 to +45 dBmV
Accuracy	±1.0 dB
Flatness	±0.5 dB
Linearity	±1.0 dB
Temperature	±0.5 dB (typical)
Measurable QAM ingress	
64 QAM	−25 to −40 dBc
256 QAM	−30 to −40 dBc
Accuracy	±3.0 dB

Graphic display

Digital summary (including MER/EVM, Pre/Post FEC BER, Equalizer Stress, Carrier Offset, Symbol Rate) with limit/margin test results, QAM level. IQ constellation with zoom. Adaptive Equalizer Display (8 feed forward/24 feedback), Frequency Response, Group Delay. Ingress/Noise Under the Carrier.

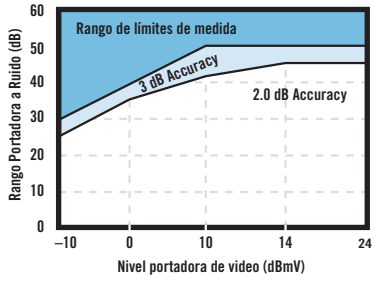
Power source

Note: Option powered from SDA Series nickel metal hydride battery. Operating time is specified for continuous use in QAM View mode. Option includes high output charger.

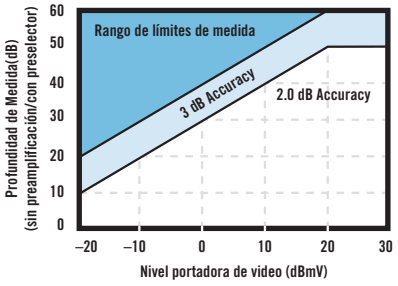
Charge time	~4 hours
Operating time	2.5 hours continuous use (typical)
Universal AC charger/adapter	
Input	100-250 VAC, 50-60 Hz, 0.5 A
Output	Charge 15 V at 750 ma
Physical dimensions	
(total SDA-5000 size with OPT 4)	6 x 10.5 x 4.25 in (15.2 x 26.7 x 10.8 cm)
Weight	Approx. 7.7 lb (3.5 kg)
Operating temperature range	−4 to 113°F (−20 to 45°C)

Notes

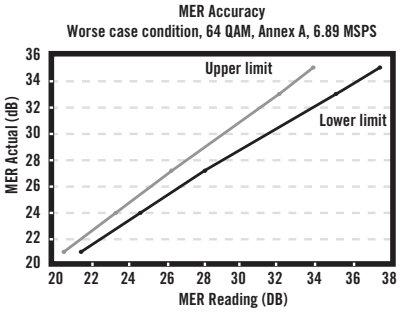
(1) Typical specifications
(2) Relative to 25°C
(3) At 25°C and +20 dBmV
(4)



(5)



Specifications



Ordering information

Model SDA-4040D

1010-00-0471

Digital/Analog HFC Analyzer

Includes: Extended-life nickel metal hydride battery, universal charger/AC adapter, canvas carrying case and operator's manual.

Options

1019-00-1290

SDA-OPT3A — PathTrak Field View interoperation for model SDA-4040D (requires PathTrak HCU)

QAM View

SDA-OPT4A/B — QAM View digital analysis including 64/256 Constellation, MER, Pre/Post FEC BER, and exclusive QAM ingress under the carrier feature. Please specify OPT version 4A or 4B when Ordering (see below part numbers)

1019-00-1287

SDA-OPT4A — 64/256 QAM, DVB-C, ITU-T J.83 Annex A (8 MHz)

1019-00-1288

SDA-OPT4B — 64/256 QAM, DVS-031, ITU-T J.83 Annex B (6 MHz)

1019-00-1288

SDA-OPT5 — BNC connectors replace standard F type connectors

1010-00-0340

StealthWare — Windows™-compatible data management software for all SDA, Stealth, MicroStealth, and CLI products

SDA-4040D QAM Pack

SDA 4040D — Stealth Digital Analyzer Package including QAM View Option SDA-OPT4/B

1013-00-0006

SDA 4040D with SDA-OPT4A (8MHz)

1013-00-0005

SDA 4040D with SDA-OPT4B (6MHz)

Optional accessories

1019-00-1298

SDA-CASE1 — Replacement soft carrying case for all SDA instruments without QAM View option installed. Compatible with standard and extended life batteries

1019-00-1369

SDA-QAMCASE — Replacement soft carrying case for all SDA instruments with QAM View option installed

1019-00-1190

SDA-NIMH — Spare extended life battery

1019-00-1195

SDA-NIMCA — Universal charger/AC adapter for extended-life nickel metal hydride battery

1012-00-0057

SDA-NIMK — Extended life battery kit. Includes extended life battery, universal charger/AC adapter, and soft carrying case (SDA-CASE1) (for upgrading units without QAM View Option)

1019-00-1329

CBC-2 — In-vehicle charger for SDA NiMH extended life battery only utilizing standard 12V DC automotive accessory port

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