

# 8821Q-R

## Spectrum Analyzer

- Increases Productivity by Providing a Complete Set of Spectrum Analysis Tests in One Instrument
- Intuitive User Interface Shortens Learning Curve
- Full-Featured, High-Performance, Remote Operation
- Automated FCC Proof Testing Simplifies Reporting



### **Comprehensive signal analysis**

This portable analyzer can be used anywhere in the cable network for analyzing RF signals with a comprehensive scope of measurements.

From analysis of digitally modulated signals to tests of distortion and noise parameters in the field, this spectrum analyzer is an industry workhorse. The analyzer is specifically focused on the cable TV industry with application specific test features.

### **Head-end and field applications**

Cable operators typically use spectrum analyzers in the head-end, and as a tool for in-depth testing and troubleshooting. They are also used for FCC proof of performance tests. The 8821Q-R™ meets the precision testing needs of the customer, with a familiar look and feel.

**Engineer/head-end technician** - This person is responsible for ensuring that the signal quality is as good as possible. The signal quality will be naturally degraded by the network as it makes its way to the subscriber. It is

important for the engineer or head-end technician to be able to test all types of signals with a wide variety of analysis/measurement techniques to give them every advantage in alignment and troubleshooting.

**SR Tech** - This person is called in when lower-tier technicians are unable to find the source of a problem. Frequently, the same person is responsible for proof-of-performance testing because they have experience, familiarity with the tests, and equipment and can efficiently perform the tests.

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## Spectrum Analyzer

### SPECIFICATIONS

#### Frequency

<b>Range</b>	1 MHz to 1 GHz
<b>Resolution Bandwidth</b>	1 kHz to 3 MHz in 1-3-10 sequence
<b>Accuracy</b>	±15%
<b>Video Bandwidths</b>	10 Hz to 1 MHz in 1-3-10 sequence
<b>Frequency Reference</b>	<b>Aging:</b> ±1 PPM per year
<b>Frequency Reference</b>	<b>Temperature stability:</b> ±2 PPM @ 0° to 50° C (32° to 122° F)
<b>Phase Noise</b>	>90 dBc/Hz @ ±10 kHz
<b>Frequency Counter</b>	<b>Accuracy:</b> ±2 PPM, ±1 count <b>Resolution:</b> 1 Hz

#### Frequency Span

<b>Range</b>	0 Hz, 200 Hz to 1.0 GHz
<b>Sweep Time Range</b>	20 µsec to 500 sec (span = 0 Hz) 30 msec to 500 sec (span > 0 Hz)
<b>Sweep Trigger</b>	Free run, single, video, TV

#### Analog Channel Measurements (Visual and aural carrier levels)

<b>Channel plans</b>	NTSC, PAL and custom
<b>File Transfer</b>	LAN and USB
<b>High Speed Channel Scan</b>	50 channels ≈ 1 minute
<b>Multi-Channel Mode</b>	Variable, up to 8 channels
<b>Single Channel Mode</b>	With spectrum display
<b>Tuning Range</b>	5 MHz to 1.0 GHz
<b>TV Channel Amplitude Range</b>	-40 dBmV to +65 dBmV, ± 1.0 dB for S/N > 30 dB
<b>Visual/Aural Delta Amplitude</b>	±1.0 dB for S/N > 30 dB

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## Spectrum Analyzer

### Amplitude

<b>Response Flatness</b>	±1.0 dB (1 MHz to 1.0 GHz)
<b>Level Accuracy</b>	±1.0 dB @ 20° C (68° F)
<b>Impedance at RF Input</b>	75 Ω
<b>Input return loss</b>	>14 dB (>10 dB attenuation)
<b>Maximum safe input</b>	+68 dBmV, 100 VDC
<b>DANL</b>	<b>Without preamp:</b> < -95 dBmV/Hz <b>With preamp (typical)</b> < -115 dBmV/Hz
<b>Noise figure</b>	14 dB
<b>2nd Harmonic Distortion</b>	< -68 dBc for +29 dBmV tone at input mixer
<b>3rd Order Distortion</b>	< -68 dBc for (2) +29 dBmV tones at input mixer
<b>Residual Responses</b>	< -55 dBmV
<b>Vertical Scale</b>	0.1 to 1.0 dB/div in 0.1 dB steps; 1 to 40 dB/div in 1 dB steps
<b>Input Attenuator</b>	0 to 55 dB in 5 dB steps
<b>Internal Calibrator</b>	150 MHz at +28.7 dBmV, ± 0.5 dB

### TV Visual Frequency

<b>Accuracy</b>	±2 PPM
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### FM Deviation

<b>Range</b>	100 kHz
<b>Accuracy</b>	±2 kHz, 1 to 80 kHz ±3 kHz to 100 kHz

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## Spectrum Analyzer

### Hum Modulation

<b>Modes</b>	CW or modulated
<b>Range</b>	1% to 20%
<b>Accuracy</b>	$\pm 0.5\%$ from 1 to 5%; $\pm 1\%$ from 5 to 20%

### Cross Modulation

<b>Range</b>	-45 dB to -65 dB
<b>Accuracy</b>	$\pm 0.5\%$ from 1 to 5% $\pm 1\%$ from 5 to 20%

### Depth of Modulation

<b>AM Range</b>	40% to 95%
<b>Accuracy</b>	$\pm 1.5\%$ (C/N > 40 dB)
<b>Signal Type</b>	Use VITS line with white reference

### In-Channel Response

<b>Signal Type</b>	Multi-burst or GCR VITS signal
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### Carrier-to-Composite Noise

<b>Optimum Input Range</b>	> +5 dBmV
<b>Maximum C/N</b>	55 dB with $\pm 2$ dB accuracy; 60 dB with $\pm 3$ dB accuracy

### CSO/CTB

<b>Optimum Input Range</b>	> +5 dBmV
<b>Maximum</b>	63 dBc with $\pm 1.5$ dB accuracy 70 dBc with $\pm 4.0$ dB accuracy

### Cross-Modulation

<b>Range</b>	60 dB, usable to 65 dB
<b>Resolution</b>	0.1 dB
<b>Accuracy</b>	$\pm 2.0$ dB for xmod. < 40 dB, C/N > 40 dB: $\pm 2.6$ dB for xmod. < 50 dB, C/N > 40 dB: $\pm 4.6$ dB for xmod. < 60 dB, C/N > 40 dB

### DIGITAL CHANNEL MEASUREMENTS

#### Average Channel Power

<b>Amplitude Range</b>	-30 to +60 dBmV
<b>Accuracy</b>	±1.0 dB
<b>Channel Bandwidth Range</b>	200 kHz to 200 MHz

#### Digital Modulation

<b>Modulation Format</b>	QPSK, 16, 32, 64, 128, 256 QAM ITU-T J.83 annex A, B, and C
<b>Symbol Rates</b>	1 to 7 MSPS
<b>Interleave Capability</b>	Up to 128 x 4 in annex B 12 x 17 in annex A and C
<b>Constellation Display</b>	Full constellation with zoom
<b>Adaptive Equalizer Display</b>	8 FFE taps, 24 DFE taps

#### Modulation Error Ratio (MER)

<b>Range</b>	22 to 40 dB
<b>Accuracy</b>	±0.5 dB 22 to 30 dB ±1.0 dB 30 to 35 dB ±1.8 dB 35 to 40 dB

#### Error Vector Magnitude (EVM)

<b>Range</b>	0.65% to 4.1%
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#### Bit Error Ratio (BER) (Before and after R-S decoding)

<b>User-Selectable Time Period</b>	$1.0 \times 10^{-9}$ to $2.0 \times 10^{-3}$
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## Spectrum Analyzer

### MISCELLANEOUS SPECIFICATIONS

#### Display

Display Type	TFT active matrix color VGA LCD
Display Size (Width)	6.4" (163 mm)

#### Power

Battery Type	14.4 V @ 6 Ah Lithium-ion
Run Time	>2.5 hours
Charge Time	<6.0 hours
Charger Type	External AC adapter

#### Mechanical

Dimensions (H x W x D)	(6.3" x 13.4" x 13.8") 160mm x 340mm x 350mm
Weight	19.8 lbs (9 Kg)

#### Environmental

Operating Temperature	0° to 50° C (32° to 122° F)
Storage Temperature	-20° to +55° C (-4° to +131° F)

### INCLUDES THE FOLLOWING:

8821Q-R spectrum analyzer

**P/N 2011094001**

Battery charger

Lithium-ion battery

F-type to F-type connector

F-type to BNC connector

BNC calibration cable

RJ-45 network cable

RJ-45 network crossover cable

512 MB USB flash drive

User's manual (for 8821Q-R and Q-Lab™ software)

Carrying case with wheels

### OPTIONAL ACCESSORIES:

F-type push-on adaptors

**P/N 0200622000**

I-Stop test probe

**P/N 2010838001**

I/O-15 precision test cable

**P/N 2071527048**

VF-4 tunable bandpass filter

**P/N 2010537006**

VF-5 tunable bandpass filter

**P/N 2010725006**

AM-1000 preamplifier

**P/N 2070760000**