

Tektronix

SignalScout™ RFM151 Cable TV RF Analyzer



Digital Channel RF Measurement Suite Includes Average Power Level Plus Noise/Distortion Measurement

Exclusive Ingress Monitor Mode Records Ingress Violations of up to 32 User-defined Frequency and Level Windows

Enhanced Spectrum Mode Increases Ability to Capture Low-level and Bursty Signals

AM and FM Demodulators with Speaker Helps Identify Ingress Sources

User-changeable Battery Pack with Optional External Charger for Uninterrupted Use

CSS151 Control and Analysis Software Includes Ingress/Spectrum Analysis Capability and Report Generation

The Tektronix SignalScout™ RFM151 is a high-performance RF measurement field tool tailored for analog/digital Cable TV networks. It is designed to meet the demanding requirements of cable television technicians performing troubleshooting and maintenance operations anywhere in the network. The RFM151 provides all of the basic signal level mea-

surement capabilities, and it also adds new spectrum analysis, ingress, and digital channel RF measurement capabilities not available in comparable products!

Digital Channel Average Power

The RFM151's stepped integration method efficiently and accurately delivers the true average power of QAM, QPR, QPSK, or VSB digital channels (see Figure 1).

ital systems. Use it to set digital modulator levels referenced to the analog carriers.

Digital In-Channel Noise

With analog signals, carrier-to-noise ratios are important to picture quality. A similar measurement for digital signals is the Desired-to-Undesired Signal Ratio. This is an in-channel (out of service) average power-to-noise measurement that includes noise, as well as distortion signals, such as ingress and analog system-generated CSO and CTB.

Enhanced Spectral Analysis

The RFM151's Spectrum Mode is an easy-to-use spectrum analysis tool that allows technicians to troubleshoot most problems before calling for more advanced equipment. Spectrum Mode Features include:

Unlike single-point measure and calculate methods, the stepped integration technique takes into account signal abnormalities such as un-flatness.

The Peak Analog-to-Digital Average Power Level Difference measurement makes short work of verifying power loading in mixed analog and dig-

DVB
Digital Video
Broadcasting

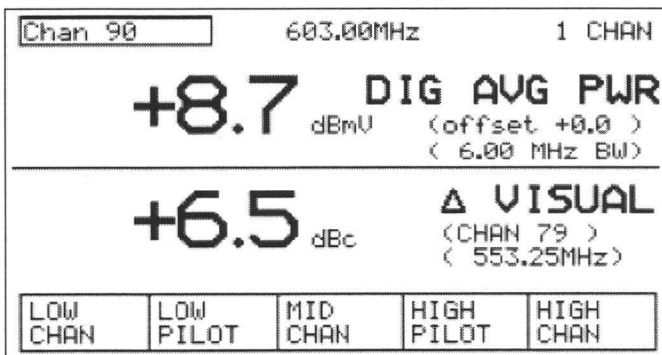


Figure 1. RFM151 Digital Average Power display showing the Peak Analog to Digital Average Power measurement.

- AM and FM demodulators
- Dual markers
- Noise marker
- Window Sweep™
- Max hold
- Preamp control
- Peak/average detection

Combination AM/FM demodulators with amplifier and speaker, are available both in Meter Mode and Spectrum Mode. These detectors help the technician identify both wanted signals, such as aural carriers, and unwanted signals, such as a two-way radio transmission, and other ingress.

The General Purpose Spectrum Mode offers a choice of no markers, dual frequency-amplitude markers with Δ readout, or noise markers (in dB/Hz) with selectable normalized bandwidth. Other features of spectrum mode include: Window Sweep which reduces the amount of swept display, increasing the display update rate to show rapidly changing signals; Max Hold, to show only the highest value of the displayed spectrum; Selectable Peak or

Average detection modes, and a preamp for making low-level readings.

Ingress Troubleshooting

The RFM151 is the technician's best friend when it comes to troubleshooting ingress problems. Exclusive circuitry minimizes forward-path signals overloading the RFM151's input when measuring return-path traffic. This means that low-level ingress measurements can be taken in common path locations – such as a tap or seizure screw. Add to this the quick scan rate of Window Sweep, max hold, peak detect, demodulation, field strength, and preamp controls and the RFM151 is able to measure return-path bursty signals and low-level ingress down to -65 dBmV (-5 dB μ V) to help locate the source (see Figure 2).

Ingress Monitoring

Another unique RFM151 feature is the Ingress Monitor Mode which allows up to 32 frequency windows to be defined within the displayed spectrum, each with its own level threshold (see Figure 3).

When a signal violates the threshold, the instrument either stops and shows the display, stores the violation in memory, or continues. Violations can be stored as frequency/amplitude/time data, or complete spectrum displays with time stamps. Sweep delays

can be set from 2 to 60 minutes in one-minute intervals allowing unattended monitoring.

Level Measurement

The SignalScout provides five different level displays: Single Channel, 5-channel, Pilots, All Channels, and Meter. These display modes can show either analog or digital channel information.

The 5-channel display mode provides both a numerical reading and a bargraph display. This is great for doing system-at-a-glance measurements and looking at tilt.

The Pilots display mode shows both bargraph and numeric displays of any two frequencies used for setting the AGC in the plant.

Measurement Modes

The RFM151 also performs the following measurements: Carrier-to-Noise, Hum, FM Deviation, and Field Strength. Carrier-to-Noise can be configured for either In-Service (using the guard band) or Out-of-Service (with a user-settable frequency offset). Both measurements are normalized to the proper bandwidth for the system (4 MHz for NTSC and 5 MHz for PAL).

The Relative Field Strength mode allows the user to select a frequency between 5 and 1080 MHz and use an optional antenna to locate the signal of interest. Field Strength Mode is useful for finding leaks in the cable

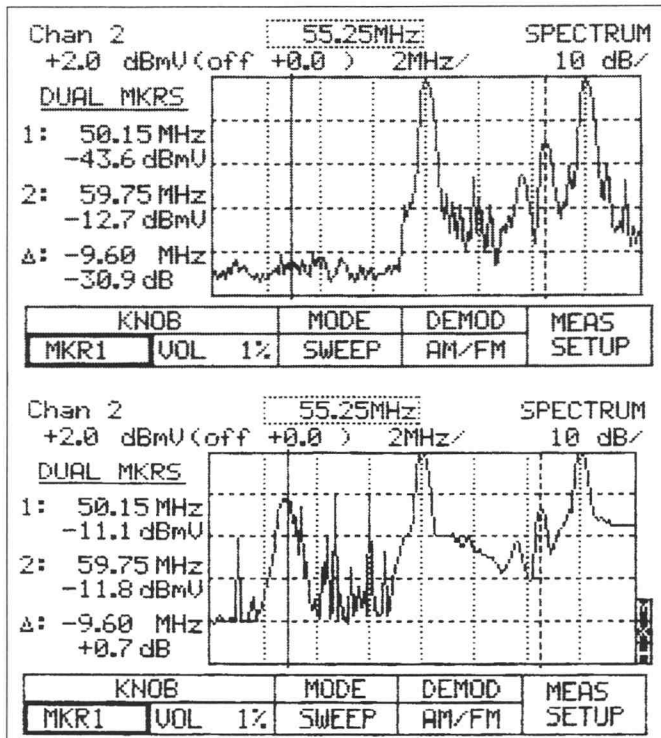


Figure 2. Spectrum display with Max Hold off shows no ingress problem (top). The same spectrum with Max Hold on captures the ingress signal (bottom).

INGRESS LIMITS MENU				5 LIMITS 1 ACTIVE
START	STOP	THRESHOLD	TYPE	
5.00MHz	50.00MHz	-40.0dBmV	OFF	
5.00MHz	10.00MHz	-40.0dBmV	OFF	
15.00MHz	25.00MHz	-60.0dBmV	MAX	
30.00MHz	40.00MHz	-38.0dBmV	OFF	
9.00MHz	40.00MHz	-50.0dBmV	OFF	

NEW LIMIT	EDIT LIMIT	CLONE LIMIT	DEL	DEL ALL

Figure 3. Ingress Limits Menu defines threshold windows for capturing ingress violations.

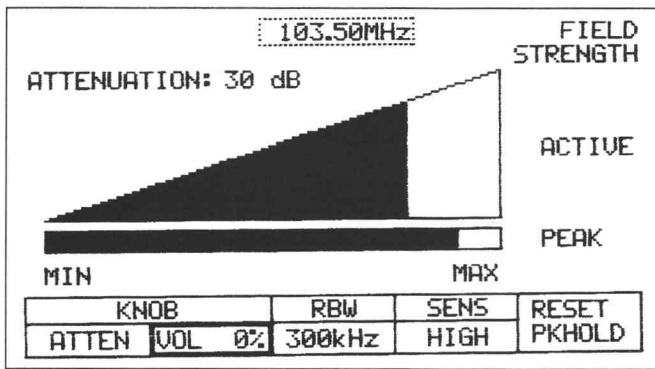


Figure 4. Relative Field Strength display tunes to any frequency to help find ingress sources and leaks.

plant and locating the sources (see Figure 4).

Worldwide Compatibility

The RFM151 works on any world television standard and all common transmission standards. It automatically measures the average power of a NICAM sound carrier. Just enter the correct frequency into the second aural carrier slot and the RFM151 does the rest.

Customized Settings – Time-Saving Measurement Sequences

The RFM151 and CSS151 Software form a powerful tool tailored to an individual cable system. By creating automatic test sequences using the CSS151 software, test time and errors are reduced. Tests can be setup to run at

fixed time intervals using the interval timer in the RFM151, or under technician control. These sequences can be used for the FCC required tests including the 24-Hour test, or just for routine maintenance.

Report Generation

Data in the worksheet can be printed directly, or processed into concise reports for hard copy files. Reports include a

Status Report that shows how well the system is performing with regard to level differences between adjacent channels and minimum and maximum level differences. Another report shows the visual carrier level and visual-to-aural carrier difference over four six-hour time periods for monitoring system performance over time and temperature. Both reports can be printed with up to six lines of header text for displaying additional information.

Three Year Warranty

RFM151 performance is backed by a Tektronix warranty covering parts and labor for three years. Accessories for the RFM151 are covered for a period of 90 days. Warranty specifics can be obtained from Tektronix or its subsidiaries.

SignalScout™ RFM151 Characteristics

RF INPUT

Input Impedance – 75 Ω (nominal).
Connector Type – Male type F with precision female-to-female F coupler.

FREQUENCY

Range – 5 to 1080 MHz.
Accuracy – ± 5 kHz or $\pm 10^{-5}$ of tuned frequency, whichever is greater.

ANALOG AND DIGITAL LEVEL MEASUREMENTS

Sensitivity – -35 to 60 dBmV (+25 to +120 dB μ V).
Repeatability – ± 0.5 dB.
Accuracy – See Chart 1.

DIGITAL TO ANALOG CARRIER DIFFERENCE

Analog Channel Select Mode – Automatic or user selectable.
Accuracy – ± 2 dB.

IN BAND CARRIER TO NOISE

Measurement Location – User selectable.
Accuracy – ± 2 dB.
Range – Up to 51 dB with carrier amplitude > 5 dBmV, modulation removed.

GUARD BAND CARRIER TO NOISE

Measurement Location – Guard band (≈ 1.25 MHz below the visual carrier).
Accuracy – ± 2 dB.
Range – Up to 47 dB with carrier amplitude > 0 dBmV.

DESIRED TO UNDESIRABLE

Measurement Location – In channel (Out of Service).
Accuracy – $\pm 2\%$.
Range – See Chart 2.

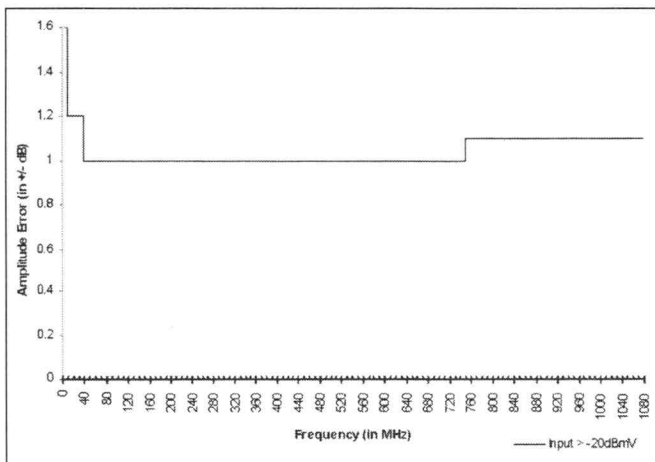


Chart 1. Analog/digital amplitude accuracy.

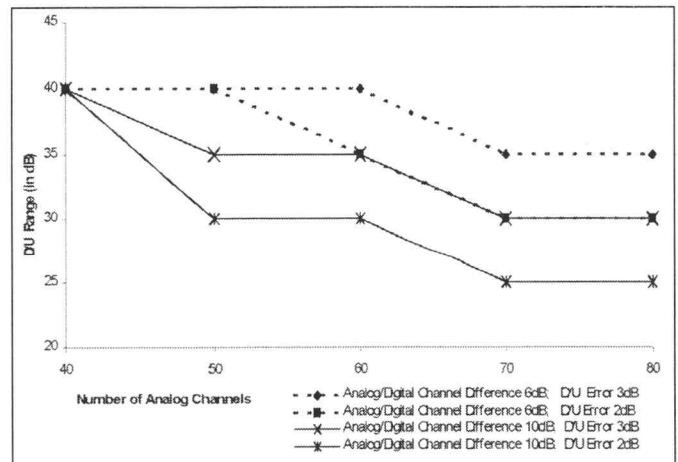


Chart 2. Desired to undesired measurement.

HUM**Fundamental Frequency** – 50/60 Hz, user-selectable frequency.**Range** – 0 to 5%.**Accuracy** – $\pm 1\%$.**FM DEVIATION****Accuracy** – $\pm 10\%$ of peak deviation or ± 2 kHz whichever is greater.**SPECTRUM MODES****Modes** –

General Purpose (Dual/Noise/No markers). Demod (AM, FM detectors, speaker). Ingress Monitor (up to 32 user-defined thresholds within a displayed spectrum).

Common Specifications –

Frequency Range: 5 to 1080 MHz. Span/Division: 4 MHz, 2 MHz, 1 MHz, 400 kHz, 200 kHz.

Resolution Bandwidth:

Span ≥ 1 MHz: 300 kHz.Span < 1 MHz: 30 kHz.Sensitivity: -60 dBmV (-65 dBmV typical).

Spurious Free Dynamic Range:

20 to 1080 MHz: ≥ -50 dBc.5 to 20 MHz: ≤ -40 dBc.

Detection Mode: Peak or Average.

Vertical Scales: 2, 5, 10, 15 dB/Div.

Other Controls: Preamp, Max Hold.

General Characteristics**ENVIRONMENTAL****Temperature** –Operating: 0 to $+50^\circ\text{C}$ ($+32$ to $+122^\circ\text{F}$).Non-operating: -20 to $+60^\circ\text{C}$ (-4 to $+140^\circ\text{F}$).**Humidity** –Operating: 5 to 95% from 0 to $+50^\circ\text{C}$.**Altitude** –

Operating: Up to 15,000 ft. (4,550 m).

Non-operating: Up to 40,000 ft. (12,192 m).

PHYSICAL

Dimensions	mm	in.
Height	200	8
Width	285	11.2
Depth	114	4.5
Weight	kg	lb.
Net	3.86	8.5

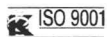
POWER**DC Input Range** – $+10$ to $+15$ VDC.**Power Requirement** – 10 W maximum.**Battery Type** – User replaceable.**Battery Life** – 2.75 Hr.**WARRANTY**

Three year parts and labor.

Ordering Information**RFM151 SignalScout™ Cable TV RF Analyzer****Includes:** Instruction Manual (070-9959-00), Quick Reference Card (070-9960-00), 120 VAC Power Pack (119-4855-00), Precision Female-Female Type F Adapter (103-0301-00), RS232C DB-9-Male-Female Cable, Padded Carrying Case (016-1642-00), Vehicle Power Adapter (119-4860-00), CSS151 Software (070-9959-00).**RFM151 OPTIONS****Option C3** – Three years of Calibration Services.**Option C5** – Five years of Calibration Services.**Option R5** – Repair warranty extended to five years.**INTERNATIONAL POWER SUPPLY OPTIONS****Option A1** – Universal Euro 220 VAC.**Option A2** – UK 240 VAC.**Option A3** – Australian 240 VAC.**Option A6** – Japan 120 VAC.**RFM151 RECOMMENDED ACCESSORIES****Replaceable Battery Pack** – RFMBAT.**External Battery Charger for RFMBAT** – RFMCHG.**Strand Hook Adapter** – RFMSHA.**Sniffer Antenna** – RFMANT.**Thermal Printer** – HC411.**Precision BNC-to-F Series Adapter** – 103-0310-00.**For further information, contact Tektronix:**

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