844A

FM Stereo Modulation Monitor/Analyzer

FEATURES AND BENEFITS

- Three major sub-systems in one package:
- Frequency Synthesized RF Pre-selector, 87.5-108 MHz
- Baseband Demodulator
- Stereo Demodulator
- Complete Stereo Measurements:
- L + R, L - R, Pilot, 38 kHz, L, R
- SNR, AM Noise, Multipath
- Built-in Frequency-Synthesized Markers for Modulation Calibration
- 1 % Modulation Accuracy
- Bessel Null Calibration not required
- Exclusive Peak Modulation Duration Differentiator (P.M.D.D.) and Accumulator Circuit Separates Transients from True Peak Modulations
- Carrier & Pilot Frequency Measurement via Front Panel Connector
- Measure FM Transmitter Frequency off-air
- Frequency Digital Tuned
- Monitor and Compare Multiple Stations

GENERAL DESCRIPTION

The Model 844A Stereo Modulation Monitor/Analyzer was designed to ensure the optimum operation of FM Transmitters and to maximize an FM station's modulation level.

The Model 844A can be used for off-air monitoring of FM modulation levels of an FM broadcast transmitter or for making proof-of-performance measurements. To accommodate all U.S. and International broadcast standards, the 844A Monitor features a frequency-synthesized RF pre-selector tuned in 50 kHz steps.

A precision baseband demodulator, PLL stereo channel decoder, linear phase filters and full metering facilities are provided for modulation level monitoring and proof-of-performance measurements. Audio outputs are provided for both monitoring and external distortion measurements. The 844A has an input for a low level RF feed from a receiving antenna, as well as a high level RF input from a transmission line coupler.

COMPLETE STEREO MEASUREMENTS

The 844A makes complete measurements of positive and negative total modulation, right channel modulation, left channel modulation stereo separation, main and sub-channel crosstalk, L + R, L - R, 38 kHz carrier suppression and 19 kHz injection level. All measurements can be made with a front panel test meter with an 80 dB range.

PRECISION PLL STEREO DEMODULATOR

The 844A provides very accurate stereo separation measurements. The 38 kHz carrier is regenerated by a phase-locked-loop (PLL) from the 19 kHz pilot carrier. This technique ensures accuracy and long-term stability of the phase relationship between the transmitter's 19 kHz pilot and the 844A's 38 kHz subcarrier and, therefore, provides accurate stereo demodulation characteristics. This also eliminates the need for phase adjustment during proof-of-performance measurements.

SIMULTANEOUS L & R MONITORING

Two separate meters permit simultaneous monitoring of both Left and Right channel program modulation. A third meter always provides total modulation level indication. The Left meter also acts as a suitable selectable Test meter.

VERY LOW T.H.D. & SNR

The 844A utilizes a pulse-counting FM discriminator to provide ultra linear FM demodulation. Consequently, the total harmonic distortion is less than 0.1%, and the signal-to-noise ratio is better than 80 dB. (90 dB optional)

INPUT FOR RF AND COMPOSITE BASEBAND

Both high level and low level RF input are provided to allow direct feed from an antenna or from a transmission line coupler. The high level input is protected by a built-in 40 dB attenuator. The performance of a stereo generator or composite stereo output from a STL receiver can be checked or measured by using the Composite Input of the 844A

MODULATION CALIBRATOR

A frequency synthesized circuit generates two frequency markers at ± 75 kHz from the center frequency of the FM carrier. These are used for calibrating the modulation meters and peak flashers to 100%. The stability and accuracy of the markers remain stable, well within 1% accuracy regardless of temperature changes or crystal aging. Therefore, it eliminates the need of calibrating the Model 844A by the Bessel Null method with a separate FM signal source and precise audio oscillator.

AUTOMATIC IF BANDWIDTH SELECTION

The appropriate IF bandwidth is automatically switched when changing between off-air monitoring and transmitter measurement modes. It provides infinite bandwidth for proof-of-performance measurements at the transmitter site in order to accurately measure the performance of the FM transmitter.

TRUE PEAK MODULATION DETECTOR

The 844A includes the TFT's exclusive Peak Modulation Duration Differentiator (P.M.D.D.) circuit. This circuit is incorporated into the peak modulation detector to identify true modulation peaks and to distinguish them from other peak signals caused by transient overshoot and multipath distortion. Only true peaks that exceed the user pre-set amplitude and duration between 0.1 to 0.9 µsec will trigger the P.M.D.D. peak flashers (simultaneous positive and negative modulation). A digital counter displays the number of peaks accumulated per minute.

ADJUSTABLE PEAK FLASHERS

LED Peak Flashers, for both plus and minus modulation, may be adjusted by front panel digital switches over a broad range: 50% to 199%.

BUILT-IN VOLTMETER & ATTENUATOR

For low-level modulation and noise measurements, a switchable attenuator in 10 dB steps is built-in for a total display range of 80 dB. Only a distortion analyzer and an audio generator are needed to perform a complete transmitter proof-of-performance.

TWO-STATION COMPARISON

Because the 844A is equipped with two sets of digital tuning switches, selection can precisely and readily be made for any two FM stations. This feature gives a quick, easy way to check on how modulation compares with other stations in the area.

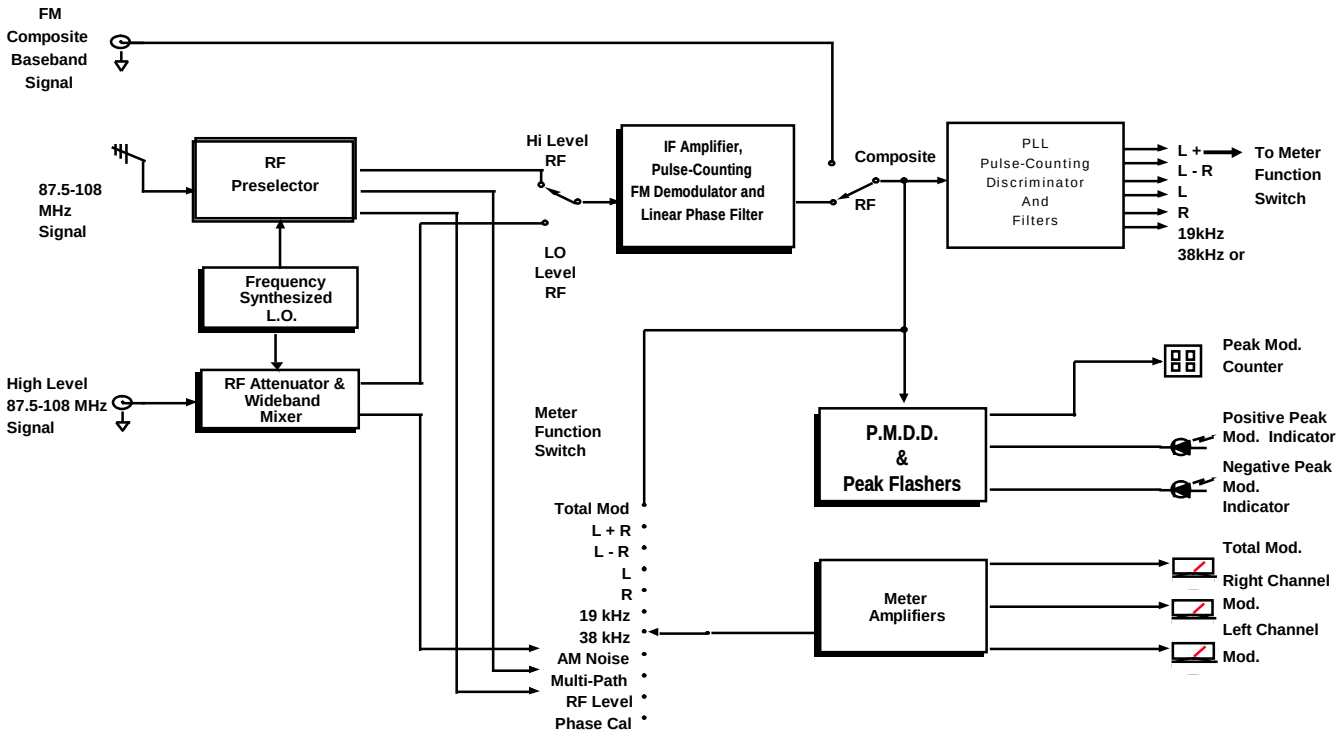
AM NOISE MEASUREMENTS

A convenient front panel switch allows use of the 844A for direct measurement of synchronous and non-synchronous AM modulation on the FM carrier. The dynamic range of this measurement is 80 dB from 100% modulation.

SWITCHABLE DE-EMPHASIS

When measuring AM or low-level noise and modulation, a 75 µsec de-emphasis circuit can be easily switched into the meter circuit. Other de-emphasis time constants are available on request.

Model 844A FM Stereo Modulation Monitor/Analyzer Functional Block Diagram



BUILT-IN MULTIPATH DETECTOR

When monitoring a broadcast station off-air, multipath interference can be read on the Test meter so that the monitor's receiving antenna can be adjusted for minimum multipath interference.

BUILT-IN ALARM CIRCUITS

Incorporated in the 844A is an Absence of Modulation and Carrier Fail Alarm. The Absence of Modulation Alarm is triggered when the composite modulation level drops below 30%. The duration of this period is user-adjustable between 2 seconds and 1 minute. The Carrier Fail Alarm is triggered when the RF carrier drops below 25% of its normal power

CARRIER AND PILOT FREQUENCY MEASUREMENT

A front panel BNC connector is provided for interfacing with an external frequency counter for off-air transmitter carrier frequency and pilot frequency measurement.

FRONT PANEL SIGNAL OUTPUTS

BNC connectors are provided on the front panel for monitoring the signals selected by the Test switch. The signals can be fed to external test equipment such as an oscilloscope or distortion analyzer. For example, the phase relationship of the Left and Right channels can be observed with the use of these front panel connections.

SCA MONITOR ADD-ON

A composite signal output is provided for the Model 845.

RBDS/MBS MEASUREMENT OPTION

This option substitutes a 57 kHz capability for the standard 38 kHz measurement. Injection level of RDS, RBDS, and MBS subcarrier can be made directly on the front panel of the Model 844A without the addition of an external monitoring device.

ORDERING INFORMATION

Description	TFT P/N
Model 844A	5116-844A
Opt. 02, Spare Parts Kit	7100-4184
57 kHz RDS Injection Level Measurement	7100-4255
Remote Meter and Peak Modulation Flasher Panel	5116-0804
Opt. 04 90 dB SNR high level, single frequency (fixed)	7100-4344
Opt. 05 90 dB SNR high level, single freq. adjustable)	7100-4345
Model 845, 3 Channel SCA Monitor	5116-0845

SPECIFICATIONS

Input Section

Frequency Range (High Level).....87.5-108 MHz, Frequency Synthesized, tunable in 50 kHz steps

RF Input Voltage.....1-10 Volts RMS

Antenna Input .....100 µV to 10 mV, 75 Ohms BNC

Tuning .....Two 4-digit switches and A/B bushbutton

AGC Range.....60 dB

Composite.....3.5 Vp-p, 1K Ohms, BNC, adjustable

Modulation Meter, Total

Deviation for 100% Indication .....±75 kHz, Peak-to-Peak

Meter Range.....0 to 133% Modulation

AC Voltmeter Range.....0 to -50 dB in 10 dB steps

Accuracy (5 kHz Tone).....±2% At all modulation levels

Frequency Response.....±0.1 dB, typical, from 50 Hz to 75 kHz, ±0.5 dB from 30 Hz to 120 kHz

Modulation Meter, Right

Right Channel Modulation.....Indicates and measures left channel modulation

Frequency Response.....±0.35 dB, 50 Hz to 15 kHz

Modulation Meter, Left/Test

Left Channel Modulation.....Indicates and measures left channel modulation

Right Channel Modulation.....Same as right modulation meter

Total Modulation .....Same as total modulation meter

L + R.....±0.35 dB, 50 Hz to 15 kHz

L - R.....±0.35 dB, 23 kHz to 53 kHz

Pilot Level & 38 kHz Level.....Measures to -60 dB

Phase Calibration.....Used to optimize stereo measurement

AM Noise.....Measures synchronous and asynchronous AM noise on high level input to 75 dB below 100% modulation

Multipath Indicator .....Indication used to optimize antenna orientation for minimum multipath distortion

Peak Modulation Indicators

Deviation for 100% indication....±75 kHz

Peak Level .....Set by front panel 3-digit switch in 1% step from 50% to 199% on both positive and negative peaks

Accuracy (5 kHz Tone).....±1% at 100% modulation

Frequency Response.....±2%, 40 Hz to 120 kHz

Response Time Accuracy.....Adjustable, 10 cycles of 10 kHz or faster

Peak Counter.....Register number of true peaks of over modulation per minute

Modulation Calibration

Built-in frequency synthesized frequency makers for meter and peak flasher calibration of 100% modulation (±75 kHz). Accuracy, ±0.5%.

Outputs, Front & Rear Panels

Main Channel

(75 µsec de-emphasis)..... 5 Volts RMS into 5K Ohms at 400 Hz

Signal-to-Noise Ratio *..... 75 dB at 400 Hz with de-emphasis (90 dB optional)

Harmonic Distortion*..... 0.1% Max, (de-emphasis) (0.01% optional)

Intermodulation Distortion*..... 0.1% Max, per SMPTE standard

Balance Audio Output Level..... 0dB, 600 Ohms

Balanced Audio
Frequency Response* ..... ±0.5 dB, 30 Hz to 120 kHz (±0.01 dB optional)

Composite Output/ for

SCA monitor ..... 1 Volt RMS into 600 Ohms

Pilot Carrier (19 kHz) ..... 250 mV RMS into 660 Ohms

Composite..... 5 Volts, 10 k Ohms at 100% modulation

Connectors ..... BNC

Meter Outputs..... Main meter selected signal available on front panel

Carrier-Fail Alarm..... Open-collector output capable of sinking 50 ma at 30 VDC when RF carrier drops below 50% of normal value

Absence-of-modulation Alarm.. Open-collector output capable of sinking 50 ma at 30 VDC when composite signal drops below 30% modulation for a period of time between 2 seconds and 1 minute, internally adjustable

* High level RF Input

Stereo Separation and crosstalk

Separation:

(L to R) or (R to L)..... 60 dB typical, 55 dB minimum, 50 Hz to 15 kHz

Crosstalk:
(L + R) or (L - R), or
(L - R) to (L + R) ..... 65 dB minimum

Crosstalk:
SCA to (L + R) or,
SCA to (L - R)..... 70 dB minimum

Pilot Carrier:
Measurement Level Accuracy.. ±0.5% from 6% to 12% injection

Mechanical and Environmental

Input Power..... 115/230 VAC, ±10%, 50 to 400 Hz, 40 Watts Max

Operating Temperature..... 0°C to +50°C (+32°F to +122°F)

Size and Net Weight..... 7” (17.78 cm) H x 19” (48.26 cm) W x 15” (38.10 cm) D, 18.5 lbs (8.4 Kg) net

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