ifr COMMUNICATIONS SERVICE MONITOR

The FM/AM-1200S
with built-in Spectrum Analyzer

The FM/AM-1200S and FM/AM-1200A are multi-function, microprocessor controlled Communications Service Monitors designed to meet the requirements of most radio maintenance applications throughout the RF frequency range of 250 kHz to 1 GHz. Fully portable, both monitors deliver features and special functions never before available with any service monitor in their price range.

Future capabilities are attainable through the installation of programmable, read-only, memory integrated circuits and/or optional plug-in modules. The "PROMS" can contain optional programs, making the FM/AM-1200S and FM/AM-1200A truly versatile instruments now and when increased future capabilities are required.

The FM/AM-1200A performs the same functions and offers all the same features and options as the FM/AM-1200S with the exception of the Spectrum Analyzer.

Standard Features Include:

- FM signal generator
- AM signal generator
- 2 µV receiver for AM, FM, and SSB
- RF frequency error meter with 1 Hz resolution*
- Audio frequency error meter with 0.1 Hz resolution*
- Deviation/modulation meter*
- Duplex generator
- RF wattmeter — fully protected generator output to 150 watts*
- Relative signal strength meter*
- SINAD/distortion meter*
- Audio function generator with DCS *(Digital Coded Squelch)* encode and decode
- Tone pulse dialing (variable)
- Pulse (IMTS)
- 1 kHz audio generator
- Oscilloscope
- Spectrum analyzer
- RS 232 interface bus

Standard Special Functions Include:

- Generator/receiver scan
- RF memory
- Tone memory
- Programmable display intensity

Optional Features Include:

- Internal/rechargeable 5 APH battery for portable operation
- 0.2 PPM TCXO
- 0.05 PPM oven oscillator (simulcast paging)
- High output amplifier
- Microphone
- 30 dB attenuator
- Telescoping antenna
- DVM and DTMF Decode

*Both Analog and Digital

Performance...Quality...Dependability...
when you consider your alternatives, the FM/AM-1200S and FM/AM-1200A stand alone.

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FM/AM-1200S and FM/AM-1200A

performance specifications

RF SIGNAL GENERATOR

Frequency Range: 250 kHz to 999.9999 MHz in 100 Hz increments

Frequency Accuracy: *See Master Oscillator*

Residual FM: < 100 Hz RMS (post detection 300 Hz to 3 kHz)

RF Output Power: – 127 dBm to – 20 dBm (10 dB steps with 11 dB range vernier) into 50Ω

RF Output Accuracy: ± 2.5 dB

Variable Generate: When in the "locked" position, the generator is phase-locked to the Master Oscillator. When switched from the "locked" position, the generator may be varied ± 10 kHz.

Internal Modulation: *See Function Generator*

External Modulation:

Frequency Response: **FM:** 2 Hz to 30 kHz (DC when in variable generate)

AM: 10 Hz to 10 kHz (30% maximum modulation above 5 kHz)

Modulation Sensitivity: **FM:** 0.1 VRMS/kHz – 0%, + 30%
AM: 0.01 VRMS/% – 0%, + 30%

Distortion: **FM:** < 1% to 20 kHz deviation
AM: < 10% to 60% modulation

Input Impedance: Greater than 600Ω nominal

Microphone Input: Generator can be switched on by an external microphone. The FM/AM-1200 has internal pre-amp with speech limiting.

DUPLEX GENERATOR

Frequency Range: ± 49.99 MHz from receive frequency in 10 kHz steps

Frequency Resolution: 2.5 kHz

Frequency Accuracy: *See Master Oscillator*

Output Levels:

Duplex Port: **HIGH:** – 15 dBm ± 10 dB
LOW: – 50 dBm ± 10 dB (protected to 0.25 watts without damage)

Transmission Port: – 85 dBm ± 10 dB fixed level

RECEIVE/MONITOR

Frequency Range: 100 kHz to 999.9999 MHz in 100 Hz increments

Sensitivity: 2 µV (typical, FM NAR, 1 MHz to 1000 MHz)

Selectivity: (at 3 dB)

Mode	Receiver Bandwidth	Audio Bandwidth
FM WIDE	200 kHz	80 kHz
FM MID	200 kHz	8 kHz
FM NAR	15 kHz	8 kHz
SSB	6 kHz	8 kHz
AM NAR	6 kHz	8 kHz
AM NORM	15 kHz	8 kHz

RECEIVE/MONITOR (con't)

Adjacent Channel Rejection:

Receiver Bandwidth	40 dB DOWN at
200 kHz	± 300 kHz
15 kHz	± 27 kHz
6 kHz	± 12 kHz

Demodulation Output:

Impedance: 600Ω

Output Level: *(Measured into an open circuit)*
FM: 60 mVRMS/kHz nominal
AM: 5 mVRMS/% nominal

Receiver Antenna:

Input Protection: 0.25 watts maximum *(without damage)*

POWER METER

Range: 0 to 15 and 0 to 150 watts peak or average responding

Accuracy: 1 to 600 MHz ± 7% of reading ± 3% of full scale
600 to 1000 MHz ± 20% of reading ± 3% of full scale

Input Power: 50 watts continuous
150 watts, one minute "ON" five minutes "OFF"

FREQUENCY ERROR METER

RF Accuracy: ± Master Oscillator, ± 3% of full scale

RF Ranges: ± 10 kHz, ± 3 kHz, ± 1 kHz, ± 300 Hz, ± 100 Hz, ± 30 Hz full scale

Audio Counter:

Frequency Range: 10 Hz to 12 kHz

Accuracy: ± 0.01% ± 3% of full scale

Ranges: ± 300 Hz, ± 30 Hz, ± 3 Hz full scale

MODULATION METER

Type: Maximum of positive or negative peak (AM and FM)

FM Deviation:

Accuracy: ± 5% of reading ± 3% of full scale for a 1 kHz tone

Ranges: 2 kHz, 6 kHz, 20 kHz, 60 kHz, full scale

AM % Modulation:

Accuracy: ± 5% of reading ± 3% of full scale for a 1 kHz tone

Ranges: 60%, 200% full scale

SINAD DISTORTION METER

SINAD: 3 to 20 dB at 1 kHz

Accuracy: ± 1 dB at 12 dB SINAD

Input Level: 0.25 VRMS to 2 VRMS (10 VRMS maximum)

Impedance: 10 K Ω nominal

Distortion Range: 0 to 20% at 1 kHz ± 1% at 10% distortion

FUNCTION GENERATOR

Operating Modes:

Internal:	Modulation/Tone out level controlled by 1 kHz and/or variable tone controls
Speaker:	Tone applied directly to speaker with volume controlled by 1 kHz and/or variable tone controls
External and Internal:	External modulation input is summed directly with tones and applied to monitor
Tone Accuracy:	
Fixed:	*Same as Master Oscillator*
Variable:	±0.01%
Tone Distortion:	(at 2.5 VRMS output)
Fixed:	< 0.5%
Variable: (sine)	< 2% (10 Hz to 100 Hz) < 0.7% typical (100 Hz to 30 kHz). Some frequencies have a maximum distortion of less than 1.5% as measured on a typical null type distortion analyzer.
Tone Output Level:	0 to 2.5 VRMS minimum, either tone into 150Ω load
Variable:	10 Hz to 30 kHz in 0.1 Hz increments
Functions:	Sine, square, ramp, triangle, pulse (IMTS), DTMF, tone sequence, variable tone pulse dialing and digitally coded squelch

OSCILLOSCOPE

Display Size:	6.4cm (2.5") wide, 5.1cm (2") high
Vertical Bandwidth:	DC to 1 MHz (at 3 dB bandwidth)
External Vertical:	
Input Ranges:	10 mV, 100 mV, 1V, 10V per division
Horizontal Sweep:	
Rate:	10 mSec, 1 mSec, 100 µSec, 10 µSec per division 1 µSec per division *(FM/AM-1200A only)*

SPECTRUM ANALYZER*

Log Scale: Within ±2 dB linearity from −30 dBm to −90 dBm indication

Dynamic Range: 70 dB (−30 to −100)

Modes:

Scan Width	Bandwidth
1 MHz/DIV	30 kHz
500 kHz/DIV	30 kHz
200 kHz/DIV	30 kHz
100 kHz/DIV	30 kHz
50 kHz/DIV	30 kHz
20 kHz/DIV	3 kHz
10 kHz/DIV	3 kHz
5 kHz/DIV	3 kHz
2 kHz/DIV	300 Hz
1 kHz/DIV	300 Hz

The receiver is fixed on the center frequency for monitoring while the analyzer scans as specified.

**Only pertinent to FM/AM-1200S*

MASTER OSCILLATOR

Standard TCXO:

Accuracy:	0.5 PPM (0-50°C)
Aging:	3 PPM first year, 1 PPM per year

Optional TCXO: *(Option 01)*

Accuracy:	0.2 PPM (0-50°C)
Aging:	0.5 PPM per year

Optional Oven: *(Option 02)*

Accuracy:	0.05 PPM (0-50°C)
Aging:	0.25 PPM per year

GENERATE AMPLIFIER *(optional)*

Gain:	30 ±2 dB typical, 250 kHz to 1000 MHz
Test Set Output with Amplifier Installed:	Variable to +10 dBm, FM and CW Variable to +4 dBm, AM

GENERAL CHARACTERISTICS

Dimensions:	33.3cm (13.1") wide, 18.5cm (7.3") high, 44.5cm (17.5") deep
Weight:	14.4 kg (32 lbs.) without options
Temperature Range:	0 to 50°C
Power Requirements:	**Line:** 105 to 130/210 to 260 VAC 50 to 400 Hz at 60 watts typical **Ext. DC:** 12 to 30 VDC nominal 3.5 AMPS at 12V typical 1.5 AMPS at 28V typical

NEW OPTION

DVM (Digital Voltmeter):

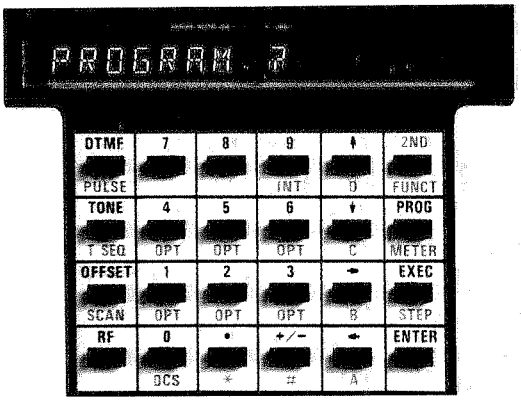
AC volts:	Frequency Range:	45 Hz to 10 KHz
	Voltage Range:	0 to 100 VRMS
	Accuracy:	±10%
DC volts:	Voltage Range:	0 to 100V
	Accuracy:	±10%
DTMF Decode:	Deviation:	1 kHz minimum
	Mark time:	50 Ms minimum
	Space time:	50 Ms minimum

Service Facilities IFR service centers are located in London, England; Paris, France; Mississauga, Ontario, Canada; Tokyo, Japan; Melbourne, Victoria, Australia; Wellington, New Zealand; Johannesburg, Cape Town and Durban, South Africa; Seoul, Korea; São Paulo, Brazil; Taipei, Taiwan, ROC; and our plant in Wichita, Kansas. Units sent to service centers for repair are given high priority for quick return to the owner. Calibration service is also provided at our service centers.

Metrology We offer our customers a complete calibration check service on their test sets. Standards used in our Metrology Lab are NBS traceable. IFR is a member of the National Conference of Standards Laboratories.

Warranty IFR Service Monitors are covered by a limited two-year warranty against defective parts and workmanship. (Optional equipment carries a 30 day warranty, batteries carry a 90 day warranty.)

The FM/AM-1200S and FM/AM-1200A deliver fe
available with any service monitor in their pric



DISPLAY

The FM/AM-1200S* includes an internal nonvolatile memory capability which uses a vacuum fluorescent display (VFD) to extend the monitoring and automatic testing capabilities of the test set. All displayed items are accessed using the front panel keyboard and associated controls. Available displays include: frequency, frequency error, modulation, RF power, SINAD, distortion, signal strength, battery test, duplex offset, DTMF, pulse, tone, tone sequence, RF scan, DCS *(Digital Coded Squelch)*, program and execute.

The program key is used to program up to sixteen different preset inputs, per selected function, into the nonvolatile memory of the FM/AM-1200S and FM/AM-1200A.

SIGNAL GENERATOR

The FM/AM-1200S signal generator is capable of generating modulated or unmodulated carrier signals within a range of 250 kHz to 999.9999 MHz *(in 100 Hz steps)*, at the output level which is continuously variable from −20** to −127 dBm. The generator carrier signal may be AM or FM modulated by internal modulation signals originating from the FM/AM-1200S audio function generator or by external sources applied through front panel modulation input connectors. The signal generator may also be voice modulated and keyed through the front panel microphone input connector.

All of the above described modulation sources, or any combination thereof, may be simultaneously applied to the carrier signal. During signal generator operation, signals being generated can be monitored by the FM/AM-1200S receiver and its associated monitoring devices.

*** Greater output can be attained with the optional FM/AM-1200S and FM/AM-1200A generator amplifier.*

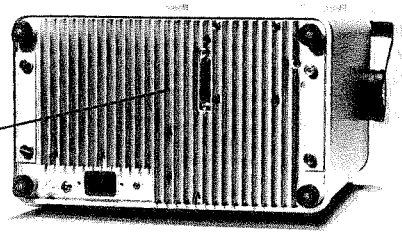
RECEIVER

The FM/AM-1200S receiver is a sensitive 2 μV triple conversion superheterodyne receiver, capable of monitoring AM, FM, and SSB communications signals within a range of 250 kHz to 999.9999 MHz, in 100 Hz steps. Signals may be received "off-the-air" using an external antenna or by direct cable connection through the front panel TRANS/RECEIVER connector.

Associated receiver monitoring circuits include a frequency error meter, modulation meter, power meter, SINAD meter, signal strength meter, frequency error and demodulated audio counters, spectrum analyzer and a 1 MHz oscilloscope.

***NOTE: All references to FM/AM-1200S are also applicable to FM/AM-1200A except the FM/AM-1200S includes built-in Spectrum Analyzer.**

RS 232 bus interface is included — standard with the FM/AM-1200S and FM/AM-1200A



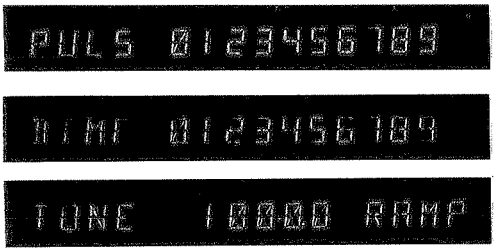
ures and special functions never before range...

DUPLEX CAPABILITIES

In the duplex mode, the FM/AM-1200S has the capability of generating a fixed output level, and receiving signals simultaneously. While the receiver section of the FM/AM-1200S is monitoring incoming signals transmitted by the UUT, or via antenna, the FM/AM-1200S signal generator is simultaneously generating signals to stimulate the receiver section of the UUT. The frequency of the generated signal from the FM/AM-1200S can be offset up to ±49.99 MHz from the received frequency of the UUT, in 10 kHz steps.

Three methods of duplex testing are available to the FM/AM-1200S user, depending on the UUT and its associated systems:

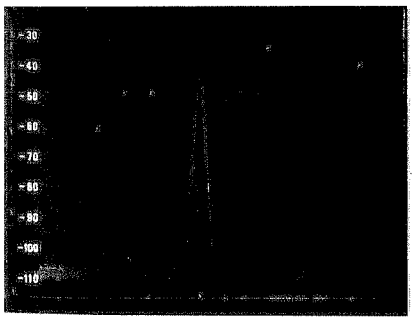
1. Duplex testing using separate transmit/receive lines
2. Duplex testing using one common receive/transmit line
3. "Off-the-air" duplex testing



PROGRAMMABLE AUDIO FUNCTION GENERATOR

The FM/AM-1200S has two independently controlled tone generators *(one variable and one fixed)*. The variable tone generator is capable of generating sine, ramp, square, or triangle modulation signals with the frequency range of 10 Hz to 30 kHz. Other special features of the FM/AM-1200S audio function generator include: tone sequence, DTMF, pulse (IMTS), tone pulse dialing (variable) and DCS *(Digital Coded Squelch)*, encode and decode capabilities.*

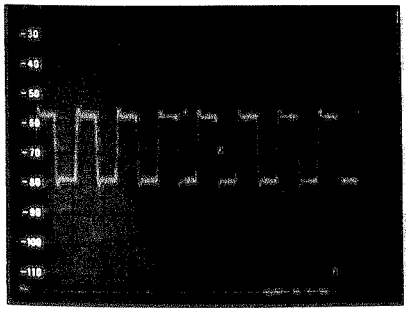
**Future capabilities to the FM/AM-1200S and FM/AM-1200A audio function generator are attainable through the installation of optional "PROMS" and/or optional plug-in modules.*



SPECTRUM ANALYZER *(FM/AM-1200S only)*

Incorporated in the FM/AM-1200S is a versatile 1 to 1000 MHz spectrum analyzer which includes a minimum scan position of 1 kHz per division with a 300 Hz bandwidth. The FM/AM-1200S spectrum analyzer has 10 calibrated dispersion selections with bandwidths automatically selected with the analyzer dispersion setting. The center of the analyzer is always phase-locked to the receiver center frequency, making it possible to positively identify displayed signals at a glance.

The FM/AM-1200S receiver remains fully functional during spectrum analyzer operation.



OSCILLOSCOPE

The FM/AM-1200S and FM/AM-1200A incorporate an internal DC to 1 MHz oscilloscope, capable of monitoring the instantaneous modulation characteristics of FM or AM modulated carriers. The oscilloscope will display the demodulated FM signal, in the FM mode and the demodulated AM audio in the AM mode, enabling the operator to check the signal for limiting and other forms of distortion. The residual position of the oscilloscope's vertical control, allows the operator to display the residual distortion or noise of the UUT, as received at the FM/AM-1200S SINAD input connector.