APPENDIX A : FM/AM-1500 SPECIFICATIONS

A-1 RF SIGNAL GENERATOR

Frequency Range:	100 kHz to 999.9999 MHz in 100 Hz increments.
Frequency Accuracy	(See TCXO Master Oscillator)
Residual FM:	50 Hz RMS (typical 30 Hz RMS) (Post detection 50-300 Hz)
RF Output Power:	0 dBm to -128 dBm continuously adjustable into 50Ω. (No range changing)
Accuracy:	±2 dB, -10 to -80 dBm ±2.5 dB, -80 to -128 dBm (-80 to -120 on IEEE version)
Attenuator Dial:	One continuous dial with μV and dBm.
Modulation:	FM: 2 Hz to 50 kHz rate at 0 to ±25 kHz deviation. For external inputs DC to 30 kHz rate. (DC, if generator lock control is in the variable position). Flat to ±2 dB DC to 30 kHz 3 Vp-p ±2 Vp-p produce ±15 kHz deviation AM: 10 Hz to 5 kHz rate at 0-90% 6 kHz to 30 kHz rate at 0-30% 3 Vp-p ±1 Vp-p produces 90% modulation External Mod impedance 600

NOTE

FM1, FM2, FM3 and FM4 are all FM modulation. SSB, AM1, and AM2 are AM modulation. SSB has no function other than AM in the generator mode.

Freq. Shift with Modulation:	When the generator is in the "lock" position, the center frequency is phase-locked to the system clock.

A-1 RF SIGNAL GENERATOR (Cont'd)

Modulation Distortion:	The FM modulation distortion plus noise at ±25 kHz deviation is less than 2% from 200 Hz to 20 kHz.
Generator Freq. Control:	When in the "locked" position, the generator is phase-locked to the master clock. When switched off from the "locked" position, the generator may be varied ±10 kHz. The FM modulation input is DC coupled for this unlocked function. (Internal or external modulation.)
Microphone Input:	Generator can be switched on by an external microphone. It has internal preamp with adjustable level.
SSB Noise:	90 dBc/Hz at ±20 kHz from carrier.
Deviation Accuracy of Processor controlled audio levels:	±5% from 20 Hz to 5 kHz and ±10% from 5 kHz to 20 kHz.
Generator Spurious:	
Harmonics:	> -25 dBc
Non Harmonics:	> -70 dBc
Typically:	> -60 dBc
In-Band, typically:	> -70 dBc

A-2 DUPLEX GENERATOR

Freq Range:	±49.99 MHz from receive frequency (as indicated on front panel (LCD) in 10 kHz increments.
Freq Accuracy:	See TXCO Master Oscillator.
Output Level:	
DUPLEX Connector:	0 dBm to -128 dBm continuously adjustable into 50Ω. (No range changing.)

TRANS Connector:	40 dB (±3 dB) below Attenuator Setting for Attenuator Settings from -10 to -80 dBm. 40 dB (±3.5 dB) below Attenuator Setting for Attenuator Settings from -80 to -128 dBm.

A-3 RECEIVER/MONITOR

Frequency Range:	300 kHz to 999.9999 MHz.
Resolution:	100 Hz
10 dB Sinad Sensitivity (typical):	2 µV (1 MHz to 1 GHz). Sensitivity reduced below 1 MHz (for 15 kHz RF bandwidth and 8 kHz post detection bandwidth)
Selectivity: (3 dB):	6 kHz; SSB and AM_1, 15 kHz; AM_2 and FM_1, 200 kHz, FM_2, FM_3 and FM_4 FM_1 and FM_2 has post demodulation bandwidth of 8 kHz. FM_3 has a post demodulation bandwidth of 20 kHz. FM_4 has a post demodulation bandwidth of 80 kHz. FM_1 has a demodulation flatness of ±2 dB referenced to 1 kHz from 10 Hz to 20 kHz. AM, and SSB have an RF bandwidth of 6 kHz and post detection bandwidth of 8 kHz. AM_2 has an RF bandwidth of 15 kHz and a post detection bandwidth of 8 kHz.
Antenna Attenuator:	Selectable 0, -20 dB, and -40 dB (±2 dB each)
Quieting:	Deviation measurements can be made down to 0.1 kHz in post detection bandwidth of 8 kHz.
Adjacent Channel Rejection:	>25 dB at ±25 kHz (when in 15 kHz RF bandwidth) >40 dB at ±50 kHz (when in 15 kHz RF bandwidth)
Beat Frequency Oscillator (BFO):	Fixed at center frequency.
Demodulation Output Level: (600Ω Load)	AM: 100% = 0.5 Vp-p nominal (selectable by modulation switch) FM: ±10 kHz deviation = 1.0 Vp-p nominal

A-3 RECEIVER/MONITOR (Cont'd)

Demodulation Output Level Impedance:	600 ohms
Receiver Antenna Input Protection:	0.25 Watts maximum level without damage
FM Demodulation Noise + Distortion:	Less than 2% at ±25 kHz deviation for modulation frequencies from 300 Hz to 20 kHz with a receiver input level of -50 dBm. (RF bandwidth = 200 kHz, post detection bandwidth = 80 kHz)
Image Rejection:	+ 1.4 MHz, 50 dB + 21.4 MHz, 50 dB + 238.6 MHz, 50 dB + 2500 MHz ±10 MHz, 5 dB
Deviation Monitor Meter: (max peak either polarity)	Scales: 2 kHz, 6 kHz, 20 kHz, 60 kHz Accuracy ±5% full scale for modulation frequencies of 30 Hz to 10 kHz at a signal level of -50 dBm.
AM Modulation Digital Display: (max peak, positive or negative)	0.1% resolution on 20% and 60% ranges, 1% on 200% and 600% ranges. Accuracy 5% reading ±2 counts at received signal of -50 dBm for modulation frequencies 300 Hz to 10 kHz. (10% to 90% depth)
Digital Deviation Display (CRT):	Range is 0.00 to 60.0 kHz Accuracy is ±3% at these two points: 1. 6 kHz rate at ±2 kHz with 8 kHz post detection BW. 2. 10 kHz rate at ±8 kHz with 20 kHz post detection BW.
AM Modulation Monitor Meter:	Scales 0-20%, 0-60%, 0-200% Accuracy ±7% of reading, ±5% full scale.

A-4 SPECTRUM ANALYZER

Inputs:	Transmitter:	Transmitter under test when power exceeds 0.1 watt. A 100 watt signal produces a top graticule reading. (marked -30 dBm)
	Antenna Jack:	The log scale is marked for dBm for this input when the antenna attenuator is set for "0". The signal can be attenuated by 20 dB or 40 dB by the antenna attenuator switch.
Log Scale:		Within ±2 dB linearity from -30 dBm to -90 dBm indication. Switchable between 2 dB/DIV and 10 dB/DIV.
Dynamic Range:		70 dB, additional 40 dB selectable by input attenuator.

Modes:

Full Scan:	1 MHz to 1000 MHz; 650 kHz bandwidth
10 MHz/DIV:	Center frequency as selected; 650 kHz bandwidth
5 MHz/DIV:	Center frequency as selected; 650 kHz bandwidth
2 MHz/DIV:	Center frequency as selected; 650 kHz bandwidth
*1 MHz/DIV:	Center frequency as selected; 30 kHz bandwidth
*0.5 MHz/DIV:	Center frequency as selected; 30 kHz bandwidth
*0.2 MHz/DIV:	Center frequency as selected; 30 kHz bandwidth
*0.1 MHz/DIV:	Center frequency as selected; 30 kHz bandwidth
*20 kHz/DIV:	Center frequency as selected; 3 kHz bandwidth
*10 kHz/DIV:	Center frequency as selected; 3 kHz bandwidth
*2 kHz/DIV:	Center frequency as selected; 300 Hz bandwidth
*1 kHz/DIV:	Center frequency as selected; 300 Hz bandwidth

* The receiver is fixed on the center frequency for monitoring while the analyzer scans as specified. On wider scans, the receiver and monitor portion are not usable.

A-5 TRACKING GENERATOR

Frequency Range:	1.0 MHz to 1000 MHz as selected by the frequency control.
Output Level:	Same as RF generator; 0 dBm to -128 dBm.
Sweep Mode:	The oscilloscope is switchable to external vertical input when in the tracking generate mode.

A-6 OSCILLOSCOPE

Display Size:	2" x 2½"
Vertical Bandwidth:	DC to 1 MHz (at 3 dB bandwidth)
External Vertical Input Ranges:	10 mV, 100 mV, 1 V, 10 V per division
Horizontal Sweep Rate:	10 mSec, 1 mSec, 100 µSec, 10 µSec per division

A-7 AUDIO GENERATORS

Operating Modes:	Internal: Variable frequency generators, one or both.
	External plus Internal: Any external tone(s) plus either or both internal tones simultaneously.
Frequency Range:	Variable from 2 Hz to 30 kHz.
Accuracy:	0.01%
Resolution:	0.1 Hz; 2 Hz to 9999.9 Hz; 1 Hz, 10.000 kHz to 30 kHz.
Output Level:	Variable from 0 to 2.5 VRMS minimum either tone into 150Ω.
Distortion:	<2% (10 Hz to 100 Hz) <0.7% typical 100 Hz to 30 kHz Some frequencies have a measured distortion of less than 1.5% as measured on a typical null type distortion analyzer.

Output Distribution:	Each tone selectable OFF or into either AM or FM modulator when not under processor sequence control. Each tone level variable through "Tones Out" jack regardless of selection of "FM", "AM" or "OFF" by the manual switches.
Speaker:	Selectable from receiver or same signal as "Tone Out" jack.

A-8 FREQUENCY ERROR METER MEASUREMENT CAPABILITY

RF Signals

Sensitivity:	Typically 1.5 µV above 1 MHz (sensitivity is reduced below 1 MHz)
Ranges:	±30 Hz, ±100 Hz, ±300 Hz, ±1 kHz, ±3 kHz, ±10 kHz
Resolution:	±1 Hz on the ±30 Hz and ±100 Hz ranges

Demodulated Audio Signals

Ranges:	±3 Hz, ±30 Hz, ±300 Hz as referenced to frequency of Tone Generator #1.
Resolution:	±0.1 Hz on ±3 Hz scale
Frequency Range:	20 Hz to 10 kHz

A-9 DEMODULATED AUDIO FREQUENCY COUNTER

Range:	10 Hz to 20 kHz
Resolution:	1 Hz
Accuracy:	±2 counts

A-10 INTERNAL SINAD METER

Input:	0.5 to 10 VRMS
Frequency:	1 kHz
Range:	0 to 20 dB
Accuracy:	±1.5 dB at 12 dB reading

A-11 POWER MONITOR

Frequency Range:	1 MHz to 1000.00 MHz (wideband detector circuit)
Power Ranges:	0 to 15 and 0 to 150 Watts
Accuracy:	1 to 600 MHz, ±7% of reading ±3% of full scale.
	600 to 1000 MHz ±17% of reading ±3% of full scale.
	821 MHz to 896 MHz ±7% reading, ±3% of full scale
Input Power:	50 watts continuous 150 watts until "over temp" lamp illuminates

Changeover from generate to monitor mode occurs at nominally 100 mW input level to the TRANS/-40 dB DUPLEX connector.

A-12 TXCO MASTER OSCILLATOR

Accuracy:	5×10^{-7} = 0.00005% (typically 2×10^{-7}). Greater accuracy is attainable with front panel adjustment.
Aging Stability:	2 to 3 PPM during first year ... 1 PPM per year thereafter.
EXT. Clock:	BNC Connector for EXT 10 MHz STD.
Optional Oven:	
Accuracy:	0.05 PPM (0-50° C)
Aging:	0.25 PPM per year

A-13 PHYSICAL CHARACTERISTICS

Dimensions:	12.5" wide, 9" high, 19.5" deep (31.8 cm W, 22.9 cm H, 49.5 cm D)
Weight:	46 lbs. (20.9 kg)
Temperature Range:	0° to 50° C

A-14 POWER

Conveniently portable. Self-contained battery automatically recharges when AC line is connected. Operates on 106 to 266 VAC without switching, 50-400 Hz, 85 watts, or 11 to 18 VDC. Typical DC currents 6.0 A at 12 V.