

1-8 METERS

Dependent

The COM-120A provides metering capability in the three Operation Modes. These meters may be in Receive Operation, Generate Operation or both. These meters are available for Simplex and Duplex Operation. These meters may be represented directly on the Mode Operation Screen as numeric readout or as a bar meter and numeric readout. Although a meter may be available in both Receive and Generate Operation, available inputs may differ. Dependent Meters for each Operation Mode are identified below:

<u>Receive Operation</u>	<u>Generate Operation</u>
SINAD	SINAD
Distortion	Distortion
FM Deviation	Audio Level
AM Modulation	
Phase Modulation	
RF Power	
Received Level	
RF Frequency Error	
Audio Counter	

Independent

The COM-120A provides metering capability independent of the Operation Modes. These meters include:

SINAD	Distortion
Audio Counter	Digital Voltmeter

1-9 OPTIONS

Option 01 - Internal Battery

Provides self-contained dc power when external ac or dc power is unavailable.

Option 02 - 0.01 OCXO

Replaces the standard TCXO as system time base. Provides 0.01×10^6 accuracy.

Option 03 - 30 kHz IF Filter

Provides additional band limiting between 15 kHz and 300 kHz offered in standard set. Required for AMPS Mobile Station Test (Option 15).

Option 04 - Variable Audio Generator 2

Replaces standard fixed 1 kHz Audio Generator with variable frequency Audio Generator.

Option 05 - Generate Amplifier

Internal RF Amplifier providing 26 dB gain for additional RF output.

Option 07 - Data Generator/Bit Error Rate (BER) Meter

Provides testing for digital characteristics of transceivers.

Option 08 - SSB Receive Filter

Provides ability to monitor SSB signals.

Option 09 - RCC Signaling

Provides 10 PS, 20 PS, MTS, IMTS and Tone Remote Control signaling.

Option 11 - Audio/Digital Signaling

Provides encode/decode capabilities for the following formats.

CCIR	CCIRH	CCIRH4
EEA	EIA	NATEL
ZVEI	DZVEI	DDZVEI
EURO	5/6 Tone	POCSAG

Option 12 - Tracking Generator

Provides internal Tracking Generator for use with Spectrum Analyzer

Option 13 - IEEE 488 (GPIB) Interface

Provides parallel GPIB interface for remote operation.

Option 14 - CLEARCHANNEL LTR[®]

Simulates the CLEARCHANNEL LTR[®] repeater system. CLEARCHANNEL LTR[®] is a registered trademark of E. F. Johnson.

Option 15 - AMPS Mobile Station Test

Auto and manual test to verify operation of AMPS mobiles, transportables and portables.

1-10 COM-120A PRODUCT SPECIFICATIONS

NOTE: A warm-up time of 5 minutes is required for the following performance requirements.

RF measurements are referenced to 50 Ω .

Accuracy and Resolution stated in percent are referenced to measured or selected value unless otherwise stated.

Where resolution exceeds accuracy, resolution takes precedence.

Specifications and features are subject to change without notice.

RF SIGNAL GENERATOR

Frequency

Range:	250.0 kHz to 999.9999 MHz
Resolution:	100 Hz
Accuracy:	Same as Master Oscillator

Output (T/R and AUX RF Connectors)

Range (T/R):	-130 to -20.0 dBm (Simplex Mode) -130 to -40.0 dBm (Duplex Mode)
Range (AUX):	-130 to -13 dBm
Resolution:	0.1 dB
Accuracy:	± 2.0 dB, -20.0 to ≥ -90.0 dBm, ≤ 400 MHz, ± 2.5 dB, otherwise
VSWR:	<1.15:1 (0.25 to ≤ 100 MHz) <1.23:1 (>100 to ≤ 400 MHz) <1.38:1 (>400 MHz)

Spectral Purity

Residual FM:	<20 Hz (rms, 0.3 to 3.0 kHz Bandwidth)
Residual AM:	<0.5% (rms, 0.3 to 3.0 kHz Bandwidth)
Harmonics:	<-26 dBc
Non Harmonics:	<-50 dBc (≤ 1000 MHz) <-40 dBc (>1000 MHz)

Input Protection (T/R)	Up to 200 W
(AUX)	Up to 0.25 W

MODULATION

Frequency Modulation

Range:	100 Hz to 100.0 kHz (peak)
Resolution:	100 Hz (<20 kHz deviation) 500 Hz (≥20 kHz deviation)
Rate:	10.0 Hz to 20 kHz, ≤40 kbps for digital data.
Accuracy:	<5% + resolution + residual, (1 kHz rate) (GEN 1, GEN 2, EXT MOD) <10% + resolution + residual, (DATA GEN) <15% + resolution + residual, (DTMF GEN)
Distortion:	<2.0% (1 kHz sine wave, 10 kHz deviation, 0.3 to 3.0 kHz Bandwidth)
EXT MOD Sensitivity:	2 kHz/V _{pk} ±10% (FM Narrow) 10 kHz/V _{pk} ±10% (FM Wide)

Amplitude Modulation

Range:	1% to 99%
Resolution:	1%
Rate:	100 Hz to 10 kHz
Accuracy:	<5% + resolution + residual, (30% - 90% Modulation) (GEN 1, GEN 2, EXT MOD) <10% + resolution + residual, (DATA GEN) <15% + resolution + residual, (DTMF GEN)
Distortion:	<2.0% (1 kHz sine wave, 0.3 to 3.0 Bandwidth)
EXT MOD Sensitivity:	10%/V _{pk} ±10%

Phase Modulation

Range:	0.1 to 10.0 radians (peak)
Resolution:	0.1 radians
Rate:	100 Hz to 6 kHz
Accuracy:	<5% + resolution + residual, (1 kHz rate) (GEN 1, GEN 2, EXT MOD) <15% + resolution + residual, (DTMF GEN)
EXT MOD Sensitivity:	2 rad/V _{pk} ±10%

AUDIO/DATA GENERATORS

A.F. GENERATOR #1

Frequency Range:	5.0 Hz to 20.0 kHz (sine wave only) 5.0 Hz to 10.0 kHz (other wave shapes)
Frequency Resolution:	0.1 Hz
Frequency Accuracy:	Same as Master Oscillator ± 0.1 Hz.
Output Range (High Lvl):	0.01 to 2.5 V _{pk} (into 150 Ω)
Output Resolution (High Lvl):	0.01 V _{pk}
Output Accuracy (High Lvl):	$\pm 3\%$ of rated output ± 5 mV _{pk} (≤ 10 kHz, ≥ 0.03 V) $\pm 7\%$ of rated output ± 5 mV _{pk} (> 10 kHz, ≥ 0.03 V)
Output Range (Low Lvl):	0.1 to 25 mV _{pk} (into 150 Ω)
Output Resolution (Low Lvl):	0.1 mV
Output Accuracy (Low Lvl):	$\pm 3\%$ of rated output ± 0.25 mV _{pk} (≤ 10 kHz, ≥ 1 mV) $\pm 7\%$ of rated output ± 0.25 mV _{pk} (> 10 kHz, ≥ 1 mV)
THD:	$< 0.7\%$ (1 kHz sine wave, 2.5 V _{pk} , 150 Ω Load) $< 1.0\%$ (all other frequencies)
Wave Shape:	Sine, Square, Triangle, Ramp

A.F. GENERATOR #2

Frequency Range:	1 kHz (sine wave)
Frequency Accuracy:	± 0.2 Hz
Output Range (High Lvl):	0.01 to 2.5 V _{pk} (into 150 Ω)
Output Resolution (High Lvl):	0.01 V _{pk}
Output Accuracy (High Lvl):	$\pm 3\%$ of rated output ± 5 mV _{pk}
Output Range (Low Lvl):	0.1 to 25 mV _{pk} (into 150 Ω)
Output Resolution (Low Lvl):	0.1 mV
Output Accuracy (Low Lvl):	$\pm 4\%$ of rated output ± 0.25 mV _{pk}

DTMF GENERATOR

Digits:	≤ 16
Mark/Space Timing:	25 to 999 ms
Mark/Space Timing Resolution:	1 ms

Output Range (High Lvl):	0.01 to 2.5 V _{pk} (into 150 Ω)
Output Resolution (High Lvl)	0.01V _{pk}
Output Accuracy (High Lvl):	±10% of rated output ±5 mV _{pk}
Output Range (Low Lvl):	0.1 to 25 mV _{pk} (into 150 Ω)
Output Resolution (Low Lvl)	0.1 mV
Output Accuracy (Low Lvl):	±10% of rated output ±0.2 mV _{pk}
Modes:	Continuous, Single Shot

RECEIVER

Frequency							
Range:	250 kHz to 999.9999 MHz						
Resolution:	100 Hz						
Sensitivity:	≤2 μV (10.0 dB SINAD, 1.0 kHz Tone, 3.3 kHz Deviation 15 kHz IF BW, C-Message weighted filter, 10 kHz FM deviation meter range. 15 ≤ t (amb) ≤ 35° C						
Antenna Input Protection:	10 W (5 sec with alarm)						
Selectivity:	300 kHz, 15 kHz						
Adjacent Channel Rejection:	<table> <tbody> <tr> <td>RX BW (3.0 dB)</td> <td>>30.0 dB Down</td> </tr> <tr> <td>300 kHz</td> <td>±485 kHz</td> </tr> <tr> <td>15 kHz</td> <td>±52 kHz</td> </tr> </tbody> </table>	RX BW (3.0 dB)	>30.0 dB Down	300 kHz	±485 kHz	15 kHz	±52 kHz
RX BW (3.0 dB)	>30.0 dB Down						
300 kHz	±485 kHz						
15 kHz	±52 kHz						

Demodulation Output

AM:	1.13 V _{rms} ±0.06 V _{rms} (80% modulation)
FM:	0.20 V _{pk} /kHz ±10% (10 kHz range) 0.10 V _{pk} /kHz ±10% (20 kHz range) 0.04 V _{pk} /kHz ±10% (50 kHz range) 0.02 V _{pk} /kHz ±10% (100 kHz range)
ΦM:	0.2 V/Rad ±10%

RF FREQUENCY ERROR METER

Frequency	
Meter Range:	0 to ±100.0 kHz
Meter Accuracy	Same as Master Oscillator ±2 counts

Meter Resolution:

1 Hz (1 sec gate time)
10 Hz (0.1 sec gate time)

RF Level:

0 to 53 dBm (T/R Connector)
-60 to 0 dBm (ANTENNA Connector)

AF FREQUENCY COUNTER

Frequency

Range:

10.0 Hz to 20.0 kHz

Accuracy:

Same as Master Oscillator ± 1 count

Resolution (1 sec gate time)

0.1 Hz (10 to 500 Hz)
1 Hz (>500 Hz to 20 kHz)

(10 sec gate time)

0.1 Hz

Input Signal Level:

≥ 90 mV_{pp} (SCOPE/DVM Input, 50 mV range, any waveform)
 ≥ 450 mV_{pp} (AUDIO/DATA IN, any waveform)

FM DEVIATION METER

Deviation

Range:

$\leq \pm 100$ kHz (peak)

Resolution:

1% of full scale.

Accuracy:

$\pm 5.0\%$ of full scale ± 50 Hz ± 1 count + source residual
(500 Hz to 100 kHz deviation)

Modulation Rate:

10 Hz to 20 kHz

Carrier Range:

250.0 kHz to 999.9999 MHz

Carrier Level:

0 to 53 dBm (T/R Connector)
-60 to 0 dBm (ANTENNA Connector)

Φ M METER

Phase

Range:

0.1 rad to 10 rad (peak)

Resolution:

0.01 rad (1 and 2 radian ranges)
0.1 rad (5 and 10 radian ranges)

Accuracy:

$\pm 5.0\%$ full scale ± 0.1 rad ± 1 count + source residual
(300 Hz to 6 kHz rate)

Modulation Rate:

100.0 Hz to 6.0 kHz

Carrier Range: 250.0 kHz to 999.9999 MHz
Carrier Level: 0 to 53 dBm (T/R Connector)
-60 to 0 dBm (ANTENNA Connector)

AM MODULATION METER

Modulation

Range: 1% to 100%
Resolution: 0.1%
Accuracy: $\pm 5.0\%$ full scale ± 1 count + source residual
(30 to 90% depth)
Modulation Rate: 50.0 Hz to 10.0 kHz
Carrier Range: 250.0 kHz to 999.9999 MHz
Carrier Level: 0 to 53 dBm (T/R Connector)
-60 to 0 dBm (ANTENNA Connector)
AGC Attack Time: 50 ms

RF POWER METER

Frequency Range: 1.500 to 999.9999 MHz
Input Level
T/R Connector: 2 mW to 200.0 W
Ranges: 2.0 mW to 200.0 W Full Scale (1 2 5 sequence)
Resolution: 1% of full scale or 0.1 mW
Accuracy: $\pm 10\% \pm 0.1$ mW \pm one count (15° to 35° C)
 $\pm 10\% \pm 0.1$ mW \pm one count (>200 mW, <15° C, >35° C)
VSWR: 1.15:1 (0.25 to 100 MHz)
1.23:1 (100 to 400 MHz)
1.38:1 (>400 MHz to 999.9999 MHz)
Operating Conditions: 50 W continuous (50.0° C)
100 W (90 sec/3 min, 50.0° C)
150 W (30 sec/3 min, 50.0° C)
200 W (15 sec/3 min, 50.0° C)
Alarms: Audible and visual
(if applied power exceeds 200 W in the 200 W range or
power term module temperature exceeds 105° C)

RECEIVE LEVEL METER

Frequency Range: 250 kHz to 999.9999 MHz
Input Range: -101 to -30 dBm (15 kHz IF BW)
-80 to -30 dBm (300 kHz IF BW)
Accuracy: ± 3 dB

DISTORTION METER

Range: 1% to 20.0%
Resolution: 0.1%
Accuracy: $\pm 0.5\%$ Distortion ± 1 count (1.0% to 10.0%)
 $\pm 2.0\%$ Distortion ± 1 count, (>10.0% to 20.0%)
Signal Frequency: 1.0 kHz
Signal Level: 0.03 to 200 Vrms (SCOPE/DVM input)
0.15 to 15 Vrms (AUDIO/DATA input)

SINAD METER

Range: 3 to 30 dB
Resolution: 0.1 dB
Accuracy: ± 1.0 dB ± 1 count (at 12 dB)
Signal Frequency: 1 kHz
Signal Level: 0.03 to 200 Vrms (SCOPE/DVM input)
0.15 to 15 Vrms (AUDIO/DATA input)

DIGITAL VOLTMETER

Range (DC): 10 mV to 200 Vdc (SCOPE/DVM input)
(AC): 10 mV to 200 Vrms (SCOPE/DVM input)
150 mV to 15 Vrms (AUDIO/DATA input)
Meter Ranges: 50 mV to 200 V (1-2-5 sequence)
Resolution: 3.5 digit
Accuracy: $\pm 5\%$ full scale ± 5 mV ± 1 count (SCOPE/DVM input)
 $\pm 7\%$ full scale ± 5 mV ± 1 count (AUDIO/DATA input)
Frequency: DC, 50 Hz to 20 kHz
Input Impedance: 1 M Ω (SCOPE/DVM input)
100 K Ω (AUDIO/DATA input)

OSCILLOSCOPE

Vertical Bandwidth (3 dB):	50 kHz
Input	
Ranges:	10 mV to 50 V/Div (1-2-5 sequence)
Max Input Voltage:	200 V
Accuracy:	±5% of full scale
Resolution:	1% of full scale
Coupling:	DC, AC and GND
Horizontal Sweep	
Rate:	100 μ s/Div to 100 ms/Div (1-2-5 sequence)
Accuracy:	±1% of full scale
Impedance:	1 M Ω

SPECTRUM ANALYZER

Operational Modes	Normal, Split Screen
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Frequency Span

Modes	Scan Width	Resolution Bandwidth
	1 MHz/Div	300 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
	Zero Scan	30 kHz

Accuracy	±5% of Span Width
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Level

Display:	Log, 2 and 10 dB/Div
Vertical Resolution:	1 dB
Range (Dynamic)	60 dB
Bandwidth Switching Error	<2 dB

Input Attenuator: 0 and 30 dB

RS-232 Connector

MASTER OSCILLATOR

TCXO

POWER REQUIREMENTS

GENERAL CHARACTERISTICS

Weight: 42 lbs

1 15/1 16 Blank