COM-120B
Communications Service Monitor

The industry standard for fast, effective analog wireless testing, including high performance spectrum analysis, AMPS, EDACS and advanced paging test features


- Split Screen digitized full scan spectrum analyzer to 1 GHz
- EasyCom© software allows simplified testing of land mobile transceivers
- EasySpan© automated test software allows you to display and capture spectrum analyzer and tracking generator sweep information
- LIVE-REF and REF-LIVE comparisons for spectrum analyzer display
- Digitized full scan oscilloscope to 50 kHz
- Enhanced PCMCIA for easy data analysis
- Optional AutoCell-NT automated cellular base station test software
- High speed EDACS data capture capabilities with up to 50 user defined set-ups
- Full paging test for analog paging formats and advanced digital paging with the AC510 option
- Optional independent tracking generator
- 200 W power measurement capability
- RS-232 control interface with optional IEEE-488 (GPIB)

Fast Effective Wireless Test Solutions

The COM-120B has become an industry recognized standard in Communication Service Monitors. A tough, portable monitor with a full performance spectrum analyzer and digital oscilloscope, the COM-120B combines over 20 instruments into one unit, the versatile COM-120B offers a cost effective alternative to higher cost test sets.

Unique Split Screen Spectrum Analyzer

The COM-120B offers a split screen dual display spectrum analyzer. This feature allows you to view two signals or the same signal in two different ranges simultaneously. In addition, the spectrum analyzer can be viewed along with the RF Generator or RF Receiver screens giving you full control over testing details at one glance.
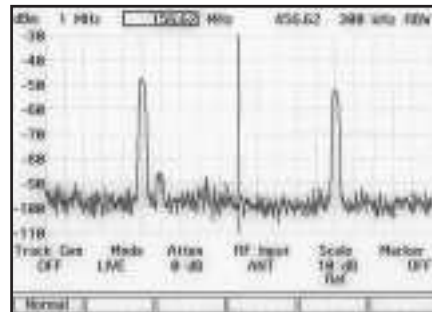
Split screen spectrum analyzer gives you more flexibility

RF Solutions

For RF testing professionals, the fully independent generator and receiver functions yield truer signal tracing, expanded analyzer capabilities and cross band duplex testing. In addition, the

COM-120B boasts an impressive set of standard features:

- Digitized oscilloscope
- RF and Auxiliary RF Generator
- 2 µV receiver sensitivity
- Frequency Selective RF Counter
- RF Frequency Error Meter
- FM Deviation Meter
- ΦM Deviation Meter
- AF Frequency Counter
- AM Modulation Meter
- RF Power Meter
- RF Level Meter
- Distortion Meter
- SINAD Meter with 0 - 55 dB range
- LIVE-REF and REF-LIVE on the Spectrum Analyzer and Oscilloscope, Average, peak hold and min hold can be displayed independently
- The FM and ΦM Deviation Meters allow toggling of the deviation meter from the standard mode to the ± peak mode. The measurement shows the + and - peak deviation as two separate readings

EDACS and LTR Testing

The EDACS™ option provides a comprehensive system test for both repeaters and terminals.

The EDACS™ option also incorporates:

- High speed data capture which reads EDACS data as soon as the COM-120B's DSP decodes valid EDACS messages.
- Individual Call System All-Call decodes a dual message on the inbound control channel.
- Support for Narrow-band (900) MHz testing.
- User definable frequencies as channels.

COM-120B

- Expanded storage capability that allows users to store and recall up to 50 EDACS™ system test set-ups.

The CLEARCHANNEL LTR™ trunking option allows the COM-120B to be configured to simulate LTR repeater systems. The test set can perform system encode/decode functions as well as Home and Next repeater access procedures.

Clear Channel LTR Menu

Full Paging Support

The standard COM-120B performs encode/decode of 2-tone and sequential tone testing, as well as tone squelch, DCS and DTMF. The flexibility of the COM-120B is enhanced with optional analog/digital signaling. This feature allows you to test the following formats:

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

Adding the AC510 option enables the COM-120B to encode advanced digital paging formats including Flex™, Golay Sequential Code (GSC) and NEC D3.

Analog Cellular Solutions

The COM-120B may be configured with an optional AMPS Mobile Station testing feature which is designed to verify proper operation of AMPS handsets and mobiles. Flexible testing includes both automatic and manual test functions.
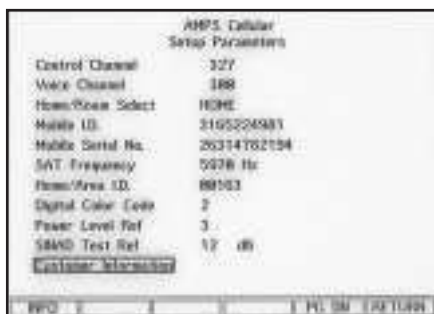
Analog AMPS Capabilities

Complex Testing Made Simple

Even with its impressive list of testing capabilities, the COM-120B retains the simplicity that has earned the respect of thousands of dedicated users. A modem capability turns the COM-120B into a remote controlled instrument. Tests can now be initiated remotely by simply plugging in a modem.

For more specialized testing, the COM-120B programmable test function may be used to create custom test applications. Using the COM-120B's TMAC programming language, complex tests can be reduced to simple "one-touch" test procedures.

And with its intuitive internal/external data file storage and retrieval system, complex testing is simple and efficient. This system allows users to create user-defined tests and customized results logs. It also gives you the flexibility to store data internally or download test results to a PC.

RS-232 or IEEE-488 (GPIB) Remote Testing Ability

Fully automated or remote testing abilities in a stand alone or multiple instrument environment can be realized with the standard RS-232 interface or with the IEEE-488 (Option 13) interface.

Power Tests from 2 mW to 200 Watts

The COM-120B provides low level measurements with high power protection for measuring off air signals as well as direct base station power measurements up to 200 Watts. The antenna input is protected to 10 Watts with a built in alarm to notify you if you are in an overload condition.

Software Options Simplify Testing

For those requiring automated test capability, several applications software packages are available:

EasyCom-B (AC1022)

Simplifies routine performance testing of land mobile transceivers.

AutoCell - NT (AC1037)

Provides automated testing and calibration of Northern Telecom, Novatel and GE analog cellular base stations.

EasySpan (AC1009W)

Can store, display and manipulate spectrum analyzer and tracking generator sweep information to a PC running windows.

All IFR software can be down loaded using the PCMCIA memory card or through the RS-232 interface using a PC controller. The COM-120B is compatible with popular accessories from other manufacturers including the Optoelectronics Super Scout and the STI 9100 series mobile signal analysis and data acquisition system.

Specification

RF Signal Generator

Frequency Range
250 kHz to 999.9999 MHz

Resolution
100 Hz

Accuracy
Same as Master Oscillator

Output Level

(T/R and AUX Connectors)

Range (T/R)
-130 to -20 dBm (Simplex mode)
-130 to -40 dBm (Duplex mode)

Range (AUX)
-130 to +13 dBm

Resolution
0.1 dB

Accuracy
± 2 dB (>-90.1 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 to 1 GHz)

Spectral Purity

Residual FM
<20 Hz RMS (0.3 to 3 kHz BW)

Residual AM
<0.5% RMS (0.3 to 3 kHz BW)

Harmonics
<-26 dBc

Non-Harmonics
<-45 dBc (below 1 GHz)
<-40 dBc (above 1 GHz)

Input Protection

(T/R)
50 W CW continuous
100 W CW (90 sec - 3 min cycle)
150 W CW (30 sec - 3 min cycle)
200 W CW (15 sec - 3 min cycle)

Frequency Modulation

RF Frequency Range
250 kHz to 999.9999 MHz

Deviation Range
100 Hz to 100 kHz

Deviation Resolution
10 Hz (0.01 kHz to 2.55 kHz)
50 Hz (2.60 kHz to 12.75 kHz)
100 Hz (12.8 kHz to 25.5 kHz)
500 Hz (26.0 kHz to 100.0 kHz)

Rate
10 Hz to 20 kHz (FSK rates up to 40 kbps)

Accuracy
±5% + residual FM + resolution (1 kHz rate, GEN1, GEN2, EXT MOD)
±10% + residual FM + resolution (DATA GEN)
±15% + residual FM + resolution (DTMF GEN)

Distortion
<2% (1 kHz sine wave, 10 kHz deviation, 0.3 to 3 kHz BW)

EXT MOD Sensitivity
2 kHz/Vpk ±15% (FM Narrow)
10 kHz/Vpk ±15% (FM Wide)

Amplitude Modulation

RF Frequency Range
250 kHz to 999.9999 MHz

AM Depth Range
30% to 90%

Resolution
0.5 %

Rate
100 Hz to 10 kHz

Accuracy
±5% + residual AM + resolution (1 kHz rate, RF Level <0 dBm)
±15% + residual AM + resolution (RF Level <0 dBm)

Distortion
<2% (30% to 90% modulation, 1 kHz rate, 0.3 to 3 kHz BW)

EXT MOD Sensitivity
5% to 15% per Vpk

Phase Modulation

RF Frequency Range
250 kHz to 999.9999 MHz

Modulation Range
0.1 to 10 radians peak

Resolution
0.1 radian (2.6 to 10.0 rad)
0.01 radian (below 2.55 rad)

Rate
100 Hz to 6 kHz

Accuracy
±5% + residual PM + resolution (1 kHz rate)
±15% + residual PM + resolution (DTMF GEN)

EXT MOD Sensitivity
2 rad/Vpk ±15%

Audio Data Generators

AF GENERATOR #1

Frequency Range
5 Hz to 20 kHz (sinewave only)
5 Hz to 10 kHz (other waveshapes)

Frequency Resolution
0.1 Hz

Frequency Accuracy
Same as timebase ±0.1 Hz

Output Range (High Lvl)
0.01 Vpk to 2.5 Vpk (into 150 Ω)

Output Resolution (High Lvl)
0.01 Vpk

Output Accuracy (High Lvl)
±3% full range ±5 mVpk (≤10 kHz, ≥0.03 Vpk)
±7% full range ±5 mVpk (>10 kHz, ≥0.03 Vpk)

Output Range (Low Lvl)
1 mVpk to 250 mVpk (into 150 Ω)

Output Resolution (Low Lvl)
1 mV

Output Accuracy (Low Lvl)
±4% full range ±0.25 mVpk (≤10 kHz, .03 Vpk < level ≥ 1 mVpk)
±7% full range ±0.25 mVpk (>10 kHz, 0.03 Vpk < level ≥1 mVpk)

THD
<0.7% (1 kHz sinewave, 2.5 Vpk, 150 Ω load)
<1% sinewave (all other frequencies/levels)

Waveshapes
Sine, Ramp, Square, Triangle

AF GENERATOR #2

Frequency Range
5 Hz to 20 kHz (sinewave only)
5 Hz to 10 kHz (other waveshapes)

Frequency Accuracy
±0.2 Hz

Output Range (High Lvl)
0.01 Vpk to 2.5 Vpk (into 150 Ω)

Output Resolution (High Lvl)
0.01 Vpk

Output Accuracy (High Lvl)
±3% full range ±5 mVpk (≥ 0.03 Vpk)

Output Range (Low Lvl)
1 mVpk to 250 mVpk (into 150 Ω)

Output Resolution (Low Lvl)
1 mV

Output Accuracy (Low Lvl)
±4% full range ±0.25 mVpk
(0.03 Vpk < level ≥1 mVpk)

THD
0.7% (2.50 V peak, into 150 Ω)

DTMF Generator

Output Range (High Lvl)
0.01 Vpk to 2.5 Vpk (into 150 Ω)

Output Resolution (High Lvl)
0.01 Vpk

Output Accuracy (High Lvl)
±10% full range ±5 mVpk (≥30 mV)

Output Range (Low Lvl)
0.1 mVpk to 25 mVpk (into 150 Ω)

Output Resolution (Low Lvl)
1 mVpk

Output Accuracy (Low Lvl)
±10% full range ±0.25 mVpk (1 mV to 30 mV)

Modes
Continuous, single shot

Digits
16 (0-9, *, #, A, B, C, D)

Mark/Space Timing
25 to 999 msec

Mark/Space Timing Resolution
1 msec

Mark/Space Timing Accuracy
±20%

Receiver

Range
250 kHz to 999.9999 MHz

Resolution
100 Hz

Tunable Range
Tunable from 0 Hz to 1.0 GHz
(characteristics below 250 kHz are not specified)

Sensitivity
2 μV (10 dB SINAD, >2 MHz, 1 kHz tone, 3.3 kHz deviation, 15 kHz IF BW, C-Message weighted filter, 10 kHz FM deviation meter range, 15 to 35°C
<2.5 μV otherwise

Antenna Input Protection
10 W CW (5 sec with alarm)

Selectivity
300 kHz
15 kHz
30 kHz

Adjacent Channel Rejection

IF Bandwidth (3 dB)	Selectivity
300 kHz	>30 dB Down
15 kHz	±485 kHz
	±15 kHz

Demodulation Output (<50 Ω)
FM: 0.20 Vpk/kHz ±10% (10 kHz range)
0.10 Vpk/kHz ±10% (20 kHz range)
0.04 Vpk/kHz ±10% (50 kHz range)
0.02 Vpk/kHz ±10% (100 kHz range)
AM: 1.13 ±0.06 V RMS (80% modulation)
ΦM: 0.2 Vpk/rad ±10%

Selective RF Counter

Frequency Range
250 kHz to 999.9999 MHz (The received frequency must be within the IF bandpass of the COM-120B)

Tunable Range
0 Hz to 999.9999 MHz (characteristics below 250 kHz are not specified)

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

Accuracy
Same as Master Oscillator ±2 Hz

RF Level (Input Range)
0 to +53 dBm (T/R connector)
-60 to 0 dBm (ANT connector)

RF Frequency Error

Meter Range
0 Hz to 100 kHz

Meter Accuracy
Same as Master Oscillator ±2 counts

Meter Resolution
1 Hz (10 sec gate time)
10 Hz (1 sec gate time)

RF Frequency Range
250 kHz to 999.999999 MHz (The received frequency must be within the IF bandpass of the COM-120B)

RF Level
0 to +53 dBm (T/R connector)
-60 to 0 dBm (ANT connector)

AF Frequency Counter

Frequency Range
10 Hz to 20 kHz

Accuracy
Same as Master Oscillator ± 1 count

Resolution
0.1 Hz (1 sec gate time, 10 Hz to 500 Hz)
1 Hz (1 sec gate time, 500 Hz to 20 kHz)
0.1 Hz, (10 sec gate time)

Input Signal Level
SCOPE/DMV Input:
90 mVp-p (50 mV range, any waveform)

AUDIO/DATA Input
450 mVp-p (any waveform)

Frequency Modulation Meter

Ranges
2 kHz, 5kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz full scale

Resolution
10 Hz (2,5 & 10 kHz range)
100 Hz (20, 50, and 100 kHz Ranges)

Accuracy
±5% full scale ± 50 Hz ± 1 digit + source residual FM (300 kHz IF BW, 1 kHz tone, 5 kHz deviation, C-Message weighted filter)

Modulation Rate
0 to 20 kHz

Carrier Range
250 kHz to 999.9999 MHz (The received frequency must be within the IF bandpass)

Carrier Level
0 to +53 dBm (T/R connector)
-60 to 0 dBm (ANT connector)

ΦM Meter

Ranges
1 rad, 2 rad, 5 rad, 10 rad peak full scale

Resolution
0.01 rad (1 and 2 radian scales)
0.1 rad (5 and 10 radian scales)

Accuracy
±5% of full scale ±0.1 rad ±1 digit + source residual PM (300 kHz IF BW, 1.0 kHz tone, 1.0 rad deviation, C-Message weighted)

Modulation Rate
100 Hz to 6 kHz

Carrier Range
250 kHz to 999.9999 MHz (The received frequency must be within the IF bandpass)

Carrier Level
0 to +53 dBm (T/R connector)
-60 to 0 dBm (ANT connector)

AM Modulation Meter

Range
1% to 100%

Resolution
0.1%

Accuracy
±5% of full scale ±1 digit +source residual AM (300 kHz IF BW, 1 kHz tone, 50% AM depth, C-Message weighted filter)

Modulation Rate
50 Hz to 10 kHz

Carrier Range
250 kHz to 999.9999 MHz (The received frequency must be within the IF bandpass of the COM-120B)

Carrier Level
0 to +53 dBm (T/R connector)
-60 to 0 dBm (ANT connector)

AGC Attack Time
50 msec maximum

RF Power Meter

Meter Ranges
2 mW to 200 W in a 1-2-5 sequence

Resolution
1 % of full scale or 0.1 mW whichever is greater

Accuracy
±10% ±0.1 mW ±1 digit (>200 mW, 15 to 36°C)
±15% ±0.1 mW ±1 digit (<200 mW below 15°C and above 35°C)

Frequency Range
1.5 MHz to 999.9999 MHz

RF Level Range
2 mW to 200 W average power

Usable Level
0.2 mW to 200 W average power (characteristics below 2 mW not specified)

Operating Conditions
50 Watts CW continuous (50°C)
100 Watts CW (90 sec/3 min, 50°C)
150 Watts CW (30 sec/3 min, 50°C)
200 Watts CW (15 sec/3 min, 50°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)

Alarms
Audible and visual (if applied power exceeds 200 W

COM-120B

in the 200 W range or the COM-120B's power term module temperature exceeds 105°C)

Receive Level Meter

Range
-101 to -30 dBm (15 kHz IF BW)
-80 to -30 dBm (300 kHz IF BW)

Accuracy
±3 dB

Frequency Range
250 kHz to 999.9999 MHz (The received frequency must be within the IF bandpass of the COM-120B)

Distortion Meter

Range
1 % to 20%

Resolution
0.1 %

Accuracy
±0.5% distortion ±1 digit (1 to 10%)
±2% distortion ±1 digit (>10% to 20%)

Signal Frequency
1 kHz sine wave

Signal Level
0.03 to 200 VRMS (SCOPE/DVM input)
0.15 to 15 VRMS (AUDIO/DATA IN)

SINAD Meter

Range
3 to 30 dB

Resolution
0.1 dB

Accuracy
±1 dB ±1 digit (at 12 dB SINAD)

Signal Frequency
1 kHz sine wave

Signal Level
0.03 to 200 VRMS (SCOPE/DVM input)
0.15 to 15 VRMS (AUDIO/DATA IN)

Digital Voltmeter

Ranges
50 mV to 200 V in a 1-2-5 sequence

Range (DC)
10 mV to 200 VDC (SCOPE/DVM input)

Range (AC)
10 mV to 200 V RMS (SCOPE/DVM input)
150 mV to 15 V RMS (AUDIO/DATA IN)

Resolution
3 ½ digit

Accuracy
±5% full scale ±5 mV ±1 digit
(SCOPE/DVM input)
±7% full scale ±5 mV ±1 digit
(AUDIO/DATA IN)

Frequency
DC, 50 Hz to 20 kHz

Input Impedance
1 MΩ, unbalanced (SCOPE/DVM/SINAD IN)
100 kΩ, unbalanced (AUDIO/DATA IN)

Oscilloscope

Bandwidth (3 dB)
50 kHz

VERTICAL

Ranges
10 mV to 50 V per division (1-2-5 sequence)

Max Input
200 RMS

Accuracy
5% full scale

Resolution
1 % full scale, 256 data points, 8 major divisions

Coupling
DC, AC and GND

HORIZONTAL

Ranges
100 µs to 200 ms per division
(1-2-5 sequence)

Accuracy
1 % full scale, 500 data points, 10 major divisions

Resolution
1 % full scale

Input Impedance
1 MΩ, unbalanced (nominal)

Spectrum Analyzer

Center Frequency
250 kHz to 999.9999 MHz

Tunable Range
0 Hz to 999.9999 MHz (characteristics below 250 kHz are not specified)

Resolution
100 Hz

FREQUENCY SPAN

Ranges
1 kHz to 100 MHz per division in a
1-2-5 sequency and zero span

Accuracy
±5% of span width

Operational Modes
Normal, Split Screen

Frequency Span Modes

Scan Width	RBW
100 MHz/div	3 MHz
50 MHz	3 MHz
20 MHz	3 MHz
10 MHz	3 MHz
5 MHz	300 kHz
2 MHz	300 kHz
1 MHz	300 kHz
500 kHz	30 kHz
200 kHz	30 kHz
100 kHz	30 kHz
50 kHz	30 kHz
20 kHz	3 kHz
10 kHz	3 kHz
5 kHz	3 kHz
2 kHz	300 Hz
1 kHz	300 Hz
0 kHz	30 kHz

LEVEL

Display
Log, 2 and 10 dB per division

Vertical Resolution
1 dB

Dynamic Range
60 dB

Bandwidth Switching Error
<3 dB

Log Linearity
±2 dB (referenced to -40 dBm, 15 to 35°C)
±3 dB (referenced to - 40 dBm, 0 to 15°C and 35 to 50°C)

Input Attenuator
0, 30 dB (ANT connector)

RS-232C

Operations Mode
Off, PC (input/output)

Baud Rate
100, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400

Stop Bits
1,2

Parity
Odd, Even, None

Handshake
None, Xon/Xoff, CTS/RTS

Master Oscillator

TCXO

Frequency
10 MHz

Uncertainty
±0.1 ppm

Temperature Stability
±0.2 ppm (0 to 50°C)

Ageing Rate
±0.5 ppm/year

Power Requirements

Line Voltage
90 to 130 VAC (50 to 400 Hz)
180 to 265 VAC (50 to 60 Hz)

DC Input
12 to 30 VDC

Power Consumption
AC 180 W maximum
AC 110 W typical
DC 150 W maximum
DC 90 W typical

General Characteristics

Operating Temperatures
0 to 50°C

Dimensions
400 mm (15.75 in) W, 190 mm (7.5 in) H,
429 mm (16.875 in) D (without bail handle and front panel cover)
440 mm (17.32 in) W, 190 mm (7.5 in) H,
537 mm (21.125 in) D (with bail handle and front panel cover)

Weight
17.3 kg (38.5 lb) (without options, lid, accessories)

Versions and Accessories

When ordering please quote the full ordering number information.

Ordering Numbers	Versions
120B-3	COM-120B Service monitor; 30 kHz IF Filter
120B-3-C	120B-3 with Certificate of Calibration
120B-3T	120B-3, 0.01 ppm OCXO time base
120B-3T-C	120B-3, 0.01 ppm OCXO time base with Certificate of Calibration
120B-8	COM-120B, SSB Receive filter
120B-8-C	120B-8 with Certificate of Calibration
120B-8T	120-B-8 with 0.01 ppm OCXO time base
120B-8T-C	120B-8 with 0.01 ppm OCXO time base with Certificate of Calibration
	Accessories
AC 510	Paging encoder (FLEX)
AC0600	Maintenance manual
AC1009W	EasySpan for Windows (Waveform Transfer Software)
AC1022	EasyCom-B
AC1023	Applications library
AC1025	EasySweep (req AC3012)
AC1037	Autocell-NT (req 120E or 120F)
AC1201	Telescopic antenna
AC3001	Internal rechargeable battery
AC3007	Data generator/BER meter
AC3009	RCC Signaling
AC3011	Digital/Analog Sampling
AC3012	Tracking generator
AC3013	IEEE-488
AC3014	CLEAR CHANNEL LTR
AC3015	AMPS Mobile station test (req 120E or 120F)
AC3016	EDACS
AC4101	Return loss bridge (5 MHz to 1 GHz)
AC8645	Microphone
AC9161	MPT-1327 Trunking
AC9162	7.5 kHz IF Filter
AC9925	Soft padded carrying case

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