



## 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*



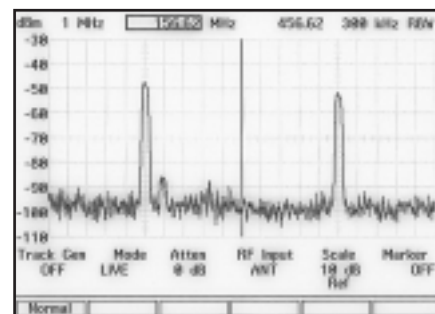
- Split Screen digitized full scan spectrum analyzer to 1 GHz
- EasyCom® software allows simplified testing of land mobile transceivers
- EasySpan® automated test software allows you to display and capture spectrum analyzer and tracking generator sweep information
- LIVE-REF and REF-LIVE comparisons 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  $\mu$ V receiver sensitivity
- Frequency Selective RF Counter
- RF Frequency Error Meter
- FM Deviation Meter
- $\Phi$ M 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  $\Phi$ M Deviation Meters allow toggling of the deviation meter from the standard mode to the  $\pm$  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.

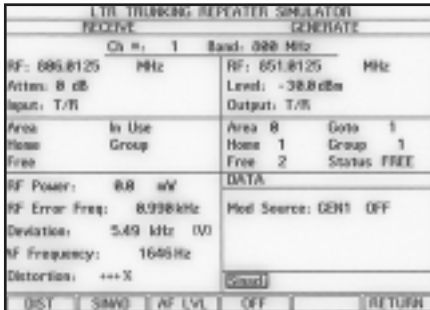
The EDACS™ option also incorporates:

- 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

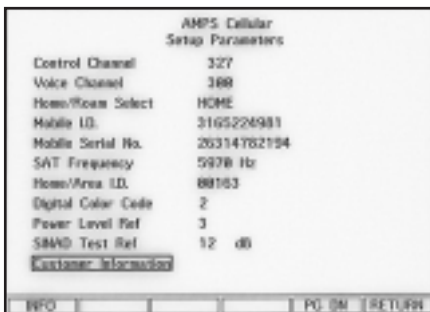
The standard COM-120B performs encode/decode of 2-tone and sequential tone testing, as well as tone squelch, DCS and DTMF. The flexibility of the COM-120B is enhanced with optional analog/digital signaling. This feature allows you to test the following formats:

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 1.3) 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	Selectivity
(3 dB)	>30 dB Down
300 kHz	±485 kHz
15 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 sequence 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

120B-3

120B-3-C

120B-3T

120B-3T-C

120B-8

120B-8-C

120B-8T

120B-8T-C

#### Versions

COM-120B Service monitor; 30 kHz IF Filter  
120B-3 with Certificate of Calibration  
120B-3, 0.01 ppm OCXO time base  
120B-3, 0.01 ppm OCXO time base with Certificate of Calibration  
COM-120B, SSB Receive filter  
120B-8 with Certificate of Calibration  
120B-8 with 0.01 ppm OCXO time base  
120B-8 with 0.01 ppm OCXO time base with Certificate of Calibration

#### Accessories

Paging encoder (FLEX)  
Maintenance manual  
EasySpan for Windows (Waveform Transfer Software)  
EasyCom-B  
Applications library  
EasySweep (req AC3012)  
Autocell-NT (req 120E or 120F)  
Telescopic antenna  
Internal rechargeable battery  
Data generator/BER meter  
RCC Signaling  
Digital/Analog Sampling  
Tracking generator  
IEEE-488  
CLEAR CHANNEL LTR  
AMPS Mobile station test (req 120E or 120F)  
EDACS  
Return loss bridge (5 MHz to 1 GHz)  
Microphone  
MPT-1327 Trunking  
7.5 kHz IF Filter  
Soft padded carrying case

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