3920B Series

Analog and Digital Radio Test Platform

Data Sheet

The most important thing we build is trust

Featuring Improved RF Signal Generator Phase Noise Performance

The 3920B. The most advanced radio test solution from Cobham for engineering, production and field service applications. The 3920B features an improvement to the RF signal generator phase noise specification of -110 dBc/Hz at 10 kHz offset. The instrument provides a comprehensive range of general purpose analog measurement facilities as well as advanced digital test options. The 3920B includes many standard features as well as a host of optional test capabilities and digital personalities.

The 3920B standard features include:

- 1 GHz frequency range
- High performance FM/AM/SSB analog duplex test capabilities
- Sensitive receiver with built-in pre-amp for off air measurements
- Color coded pass/fail results
- -140 dBm (typical) DANL spectrum analyzer with 8 markers
- Dual-Channel oscilloscope to 4 MHz
- Full audio analysis for AF level, frequency, SINAD and distortion measurements
- Three high accuracy audio modulators/function generators
- Three high accuracy audio baseband generators
- Tone encode and decode functionality including DTMF, DCS, tone remote, 2-tone sequential, and 5/6-tone
- GPIB, Ethernet, USB and RS-232 interfaces
- HP/Agilent 8920B remote emulation

The 3920B also includes many optional features including:

- 2.7 GHz frequency range extension
- Harmonics and spurious measurements
- Tracking generator
- Audio spectrum analyzer and audio tracking generator (used for analog simulcast alignment)
- IQ generator for use with IQCreator®
- P25 conventional operation with advanced parametric/protocol analysis
- P25 trunking operation
- LSM generate and receive analysis
- P25 Phase II TDMA physical layer transmitter and receiver testing
- Off Air Monitor for P25 message logging – protocol analysis tool
- P25 AES encryption
- SmartZone™ and SMARTNET™ trunking
- DMR (MOTOTRBO™) mobile and repeater tests
- TETRA mobile, base station and DMO tests
- HPD (High Performance Data) base and mobile simulation
- NXDN™, dPMR and ARIB T98

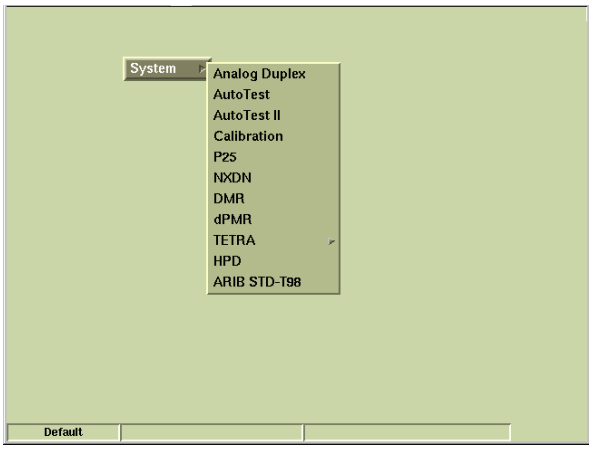
3920B Series Analog and Digital Radio Test Platform

Automatic test and alignment options include:

- Motorola ASTRO®, ASTRO® 25 and APX™ Series radios
- EF Johnson ES and VP600 Series radios
- BK DPHX5102X and KNG Series radios
- TIA/EIA-603 FM land mobile radio test software
- MOTOTRBO radios
- Harris P7300, P5500 and XG-75 Series
- Kenwood P25 TK-5X10, 5X20 and NXDN Series radios
- DMR Repeaters

The one test set for all your narrowbanding test needs!

With the largest selection of digital radio options of any radio test set, the 3920B will meet all of your narrowbanding test needs, both now and in the future. The software defined digital architecture of the 3920B provides for future technology enhancements as new digital technology becomes available. You can easily perform software updates in the field, making additions of new software features and options as simple as plugging in a USB flash memory drive.



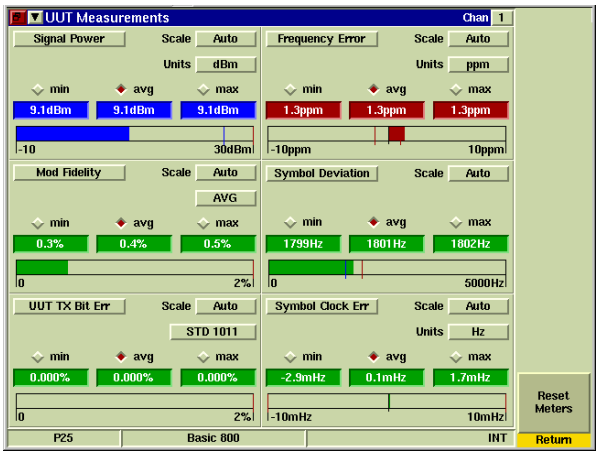
Menu of Radio Test Systems in the 3920B

Ease of Use

Combining the power of an onboard PC with a 30 GB hard-drive and Linux OS, the 3920B can support USB mouse and keyboard interface for very easy operation as well as almost unlimited save/recall setups, saving time and effort. Multiple methods of controlling the 3920B include the front panel keys, using a mouse and keyboard, or through a VNC application on your PC, touch-screen tablet or mobile phone.

Ease of Test

To make you more productive, the 3920B is not only simple to use but has features that makes testing a radio quick and repeatable. The 3920B features easy-to-read meters with Pass/Fail color coding for instant Go/NoGo testing. With these easy-to-configure meters, you can set up unique Pass/Fail parameters for each radio type that you are testing. When used with the save/recall locations, this allows for instant recall of the test parameters, so semi-technical or non-technical individuals can simply key the radio and test. The meters will display "Green" for good, "Red" for high and "Blue" for low. A quick glance and the operator will know that the radio is within established test parameters.



P25 UUT Measurements Tile Maximized, Showing Green, Red and Blue Indications

High Performance

Measurement speed is directly related to processing power and internal communications. The 3920B digital architecture utilizes a mixture of powerful digital signal processors and programmable logic. Coupled to the use of a compact PCI backplane capable of delivering peak rates of >100 MB, this ensures that the instrument has the power to acquire, synchronize and process data, producing measurement results to the user with the minimum of delay.

Accurate Testing

Time Base: With a 0.01 ppm OCXO frequency standard, the 3920B provides ultra-reliable RF frequency measurements. For even more stability, the 3920B provides an external frequency reference input.

Generator: Level accuracy is important in determining today's receiver performance in design, manufacturing and field service environments. With a 1 dB (0.6 dB typical) level accuracy on the RF output ports, the 3920B provides consistent results in testing receiver parameters.

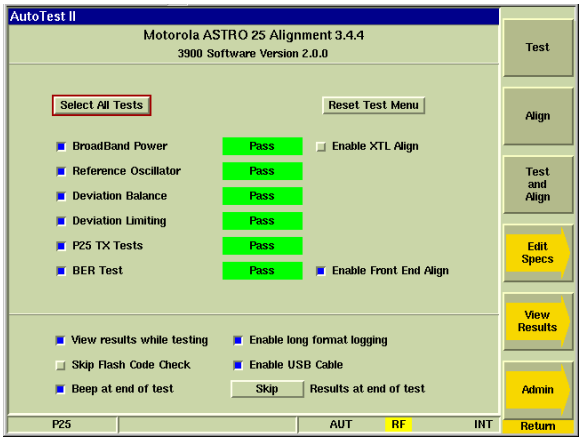
Receiver: For sensitive measurement, e.g. off-air analysis, a low power input is provided via the antenna input port. This low level input gives the user the ability to measure an off the air signal as low as -100 dBm or -115 dBm with the internal pre-amp selected. Direct input of signal power of up to 125 W is supported, making the 3920B compatible with virtually all practical requirements for mobile terminal and base station test.

Audio: With high accuracy audio generators from 1 mV to 8 V rms, the 3920B provides level accuracy to ±1% of the setting. The audio generator frequency ranges from 20 Hz to 40 kHz and 0.1 Hz resolution

provides solid audio performance for audio testing. The AF Counter features full range from 20 Hz to 20 kHz.

Automatic Testing

The Auto-Test II environment provides you with the capability to turn the 3920B into a stand alone ATE test environment. With the built-in PC running your test script, or one of our available automatic test and alignment applications, the 3920B can be conformed to your exact testing needs. Available with the Auto-Test II option for the 3920B are a selection of applications covering many of the latest digital radios. With these applications, you can automatically test and align the transmitter/receiver of a radio in as little as 5 minutes.



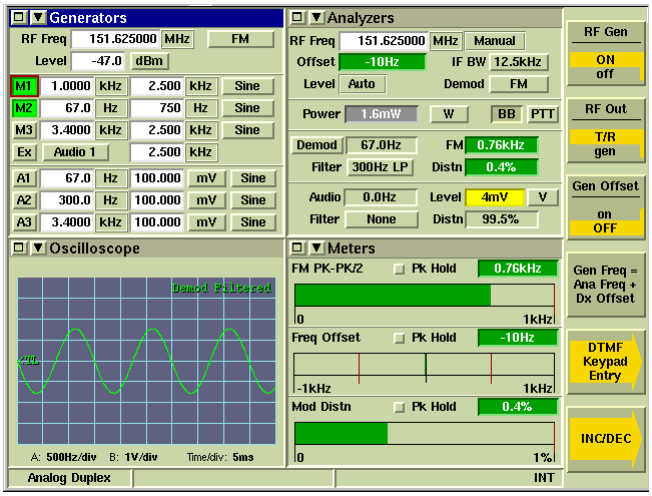
Motorola ASTRO 25 Radio Alignment

More automatic test and alignment options are being added all the time. For the latest selection of scripts for the 3920B, go to www.aeroflex.com/3920 and click on the 3920 Radio Test Set Scripts link in the Product Directory.

3920B STANDARD FEATURES

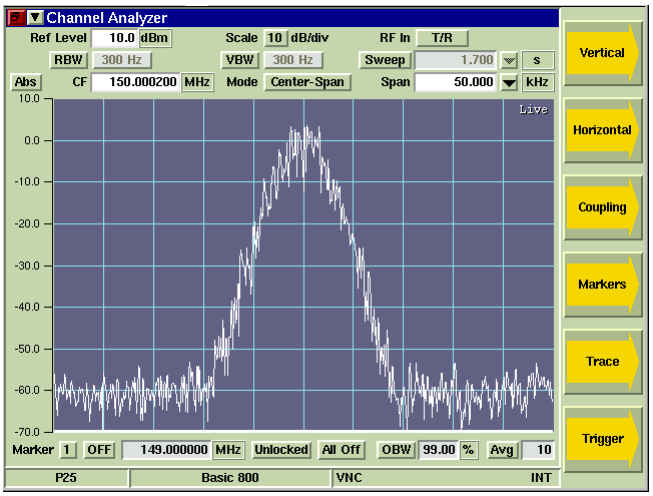
FM/AM/SSB Analog Duplex operation: The 3920B features advanced RF testing capabilities for FM/AM/SSB radio transmitters and receivers. The features for analog duplex testing are:

- 1 GHz frequency range for transmitter and receiver (2.7 GHz optional)
- Three Modulation sources
- Three Audio sources
- DTMF encode and decode
- DCS encode and decode
- 2-tone sequential and tone remote encode and decode
- Tone sequential encode operation that includes up to 40 tones, user defined pause, tone frequency shift, all standard tone sequential codes and two USER defined sequential codes
- Tone sequential decode that can decode according to standard tone protocols or according to user defined tone protocol
- Channel analyzer that can simultaneous display the RF spectrum while demodulating received signal
- Meters for measuring RF Power, Modulation, Frequency Offset, Distortion, Audio level, SINAD, SNR, and Hum and Noise
- Dual Channel 4 MHz Oscilloscope



Analog Duplex Screen

Full span spectrum analyzer: View signals from 1 MHz to 1 GHz with the 3920B or to a full 2.7 GHz with the frequency extended option. With a DANL of -140 dBm (300 Hz RBW with pre-amp enabled), the 3920B provides high performance spectrum analysis. This full band analyzer provides plenty of range to view harmonics and other spurious emissions in and out of band.



Spectrum Analyzer

Digital Multimeter: Now standard for the 3920B is the Digital Multimeter. The Digital Multimeter comes with three new ports on the front panel used for measuring AC/DC volts, AC/DC amps and OHMS.

Remote Control: The 3920B supports remote control via GPIB for automated test system control. A VXI pnp VISA driver allows easy test system integration of the 3920B. In addition to a native 3920B command

set, the 3920B also supports commands for the HP/Agilent 8920B that allows migration from the 8920B to the 3920B extremely easy.

Remote Operation: Use of the 3920B Ethernet connection permits remote operation from anywhere in the world making it possible to download new software or remotely interrogate instrument status. With an internal VNC server, users can install VNC software on their PC or Tablet PC and remotely operate the front panel of the 3920B from virtually anywhere on the planet. All that is needed is the ability to access the unit's IP address.

OPTIONAL TEST CAPABILITIES

Site Monitoring Application (390XOPT051)

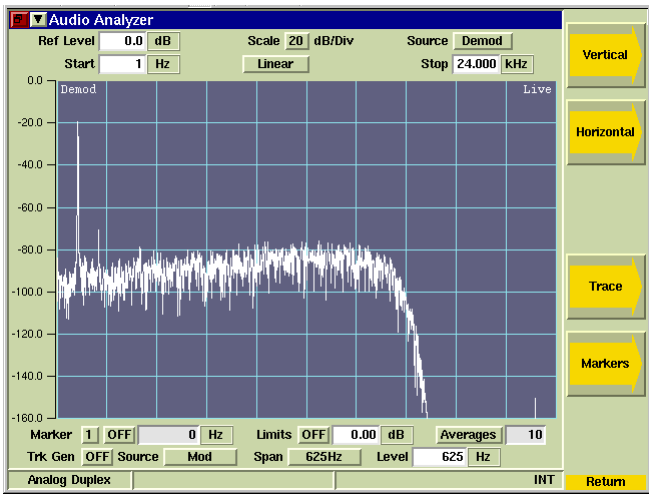
The 3920B brings impressive new capabilities to site monitoring applications. With option 392XOPT051, the user now has the ability to leave the 3920B on-site, while the unit provides automated data logging of the site's effective receiver sensitivity. When connected to a good documented receiver (a "golden" radio), the 3920B will automatically calculate the Effective Receiver Sensitivity (ERS) at a predetermined interval (example: every 10 seconds) over a specified time (example: log ERS for 72 hours). As these measurements are taken, a min/average/max SINAD is displayed, and the data is logged to the 3920B's internal hard-drive. Spectral information is also optionally logged with each measurement to help locate and track sources of interference. This gives the system engineer a valuable tool in determining site location performance and system RF boundaries.

IQ Gen Modulation (390XOPT054)

IQCreator is an Aeroflex developed PC based software utility that gives the user the ability to develop their own waveforms to use as the modulation source. Since the waveforms are defined by I and Q, virtually any type of complex digital modulation format can be created. With the IQ Gen Modulation option, once the IQ waveform is created, it can easily be uploaded to the 3920B and used as the modulation source in the Analog Duplex System.

Audio Analyzer (390XOPT055)

With 390XOPT055, the 3920B provides audio spectral analysis of the recovered audio signal, either from the audio inputs or from the demodulated RF signal. This feature allows users to view frequency amplitude in relation to other audio frequencies and to isolate problems such as noise in audio circuits. With a frequency range of 1 Hz to 24 kHz, the audio analyzer covers more than the full audio frequency range of mobiles and hand-helds. In addition, there are two markers, plus a peak hold and average function. The user can also capture traces that can be stored and then recalled later for use as a comparison with a live trace. A tracking generator option (390XOPT210) is also available as an add-on to the audio analyzer.



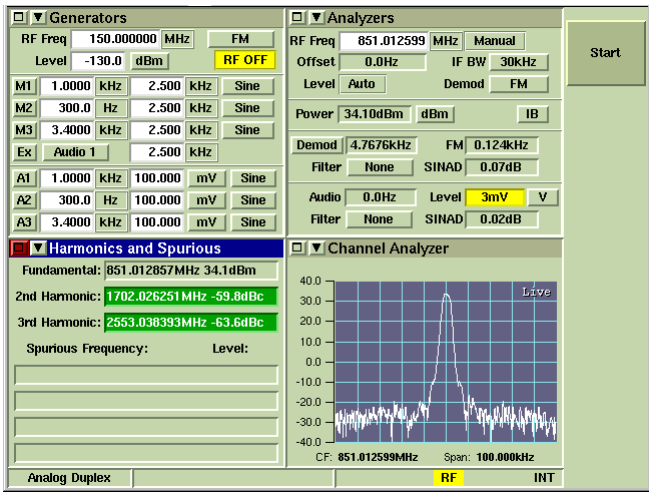
Audio Analyzer

2.7 GHz Frequency Range (392XOPT058)

The 3920B comes standard with a generate and receive frequency range of 10 MHz (100 kHz usable) to 1.05 GHz. This option will extend the range to 2.7 GHz.

Harmonics and Spurious (390XOPT060)

The ability to quickly and accurately measure the harmonics and spurious of the transmitter of a radio is the function of 390XOPT060. The fundamental frequency is automatically detected and measured, and the second and third harmonics are measured and compared. In addition, the spurious signals that are higher than the configured level are identified and displayed. The frequency and level of the fundamental, as well as the harmonics and spurs, are then displayed. This option makes finding the harmonics and spurious transmitter very simple. Simply connect the transmitter of the radio to the 3920B, key the radio and press Start.



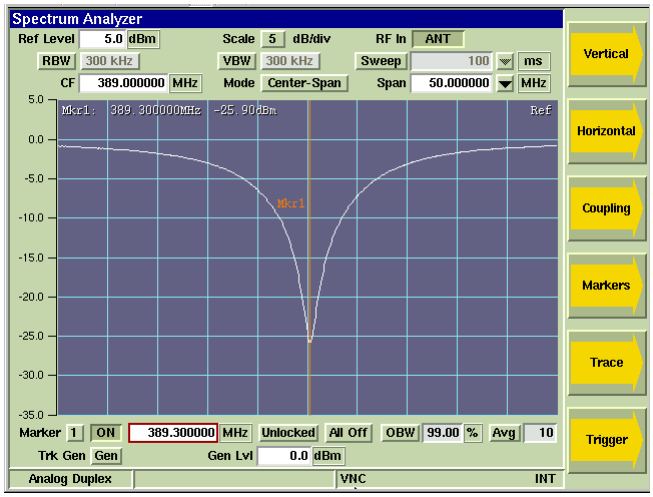
Harmonics and Spurious

3920B Series Analog and Digital Radio Test Platform

COBHAM

Tracking Generator (390XOPT061)

A full featured spectrum analyzer is standard on all 3920Bs. Available as an option to the spectrum analyzer, the 3920B tracking generator allows the user to look at the response of a duplexer, filter bank or other RF device on the spectrum analyzer. This option greatly simplifies the often laborious process of checking or changing the tuning of a duplexer. When used with the optional return loss bridge (AC4105), the spectrum analyzer/tracking generator can measure the return loss of an antenna or cable.



Spectrum Analyzer with Tracking Generator

Power Between Markers (390XOPT064)

Also available as an option, the power between markers option provides a measurement of the amount of power between the spectrum analyzer markers. With this feature, the user can set the position of two markers on the spectrum analyzer and then measure the amount of power in the bandwidth selected with those markers. This will enable the user to determine the amount of power in an adjacent channel or in the center channel.

POCSAG (390XOPT067)

The user can now test and verify the operation of both POCSAG transmitters and receivers. When this option is enabled, there are two new tiles available from the tile drop down arrows. This adds the following capability:

POCSAG Encode

- Send Alphanumeric or Numeric POCSAG formatted pages
- Select any rate from 400 to 4800 Hz
- Select deviation from 0 to 50,000 Hz
- Select Normal or Inverted for polarity
- Pick from a selection of canned messages or create a custom message
- Select RIC (Radio Identification Code) of encoded message, or send to a range of RIC's

POCSAG Decode

- Select Decode Format - either Automatic, Alphanumeric or Numeric
- Select Decode Filter - decode all messages or only messages to a user selectable RIC
- Select Normal or Inverted Polarity for decoding
- Displays deviation and rate of decoded message
- Displays the RIC and the type bits (two bits) of the decoded messages as well as the message

Chinese GUI (390XOPT090)

This option enables the selection of either Chinese or English as the language for the graphical user interface for the Analog Duplex system. When enabled, a selection is added to the utilities screen that allows the user to choose between English or Chinese character display in the audio Analog Duplex system.

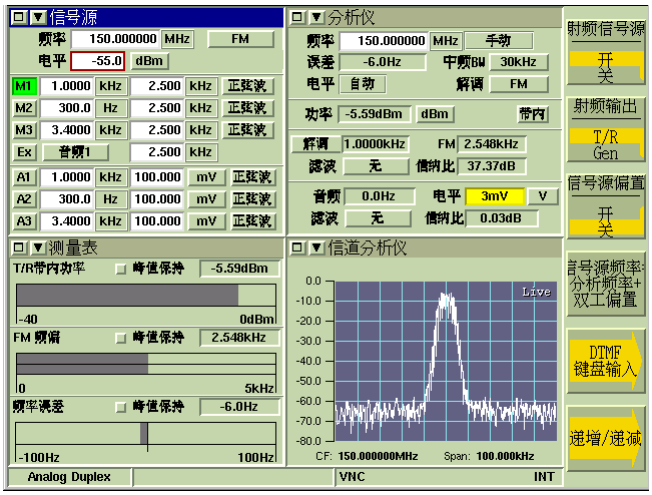


Illustration of Chinese GUI

OPTIONAL SYSTEM PERSONALITIES

In addition to the Analog Duplex system, the 3920B can support a number of optional test systems or personalities, installed concurrently. Personalities include:

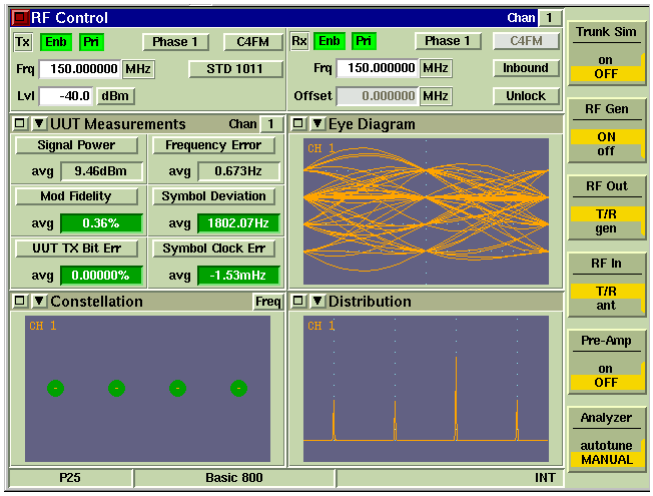
- TETRA digital trunked radio systems for mobile station and base station testing
- TETRA direct mode testing
- APCO P25 conventional and trunked radios
- APCO P25 Phase II TDMA
- SmartZone and SMARTNET
- DMR (Digital Mobile Radio)
- NXDN

- HPD (High Performance Data)
- dPMR (digital Private Mobile Radio)
- ARIB T98 (Digital Convenience Radio Equipment For Simplified Service)

P25 CONVENTIONAL OPERATION (390XOPT200)

The 3920B P25 Conventional Option provides test features for testing P25 radios and systems. Featured is the ability to transmit P25 C4FM standard waveforms and analyze P25 received waveforms. The analysis of the received waveforms consists of the ability to perform RF and modulation parametric tests. The vocoder enables the user to perform, transmit and receive audio testing. Included in this option is the capability to:

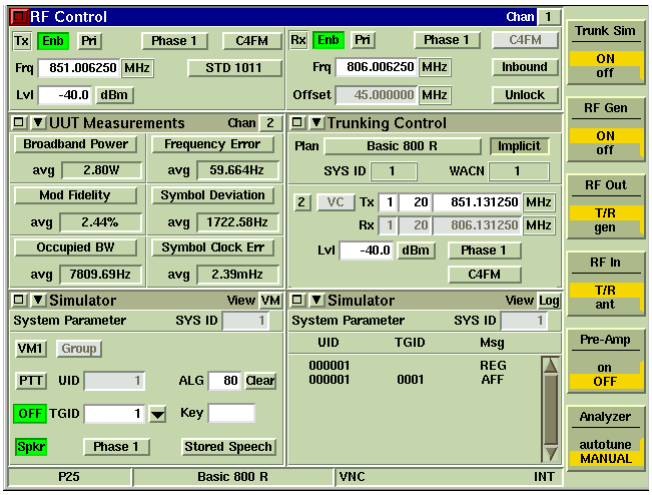
- Measure C4FM modulation fidelity and symbol deviation
- Measure power, frequency error and TX BER
- Measure symbol clock error
- Measure RX BER
- Display eye diagram of C4FM demodulation
- Display constellation plot of C4FM symbols
- Display C4FM symbol deviation distribution plot
- Transmit full TIA/EIA-102 test patterns (STD1011, CAL, SILENCE, STD511, etc.) as specified by TIA- EIA-102.CAAA-C
- Transmit and receive live audio using the vocoder
- Transmit stored speech patterns
- Decode voice channel header and link control messages
- Encode link control messages
- Perform DES encryption



P25 Conventional

P25 Trunking Operation VHF/UHF/700/800 MHz (390XOPT201)

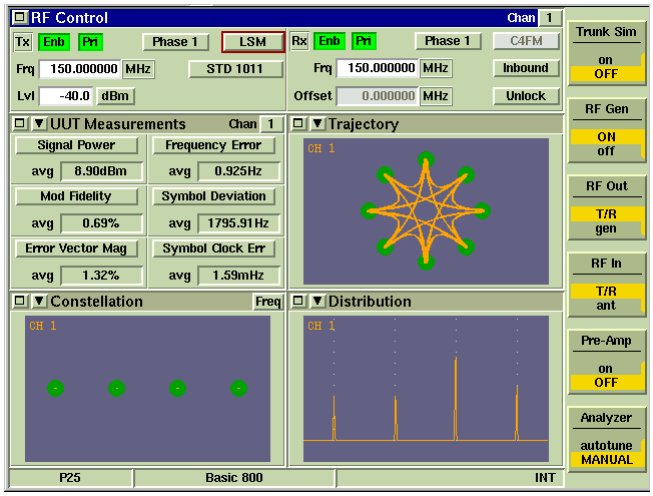
To further enhance P25 operation, the addition of the P25 trunking option allows simulation of a P25 control channel in any frequency band. Channel plans may be configured to test virtually any P25 trunked system. A simulator tile logs the messages sent by the radio under test and allows the 3920B to simulate a virtual mobile, configured to talk to the radio under test. This option enables the user to originate a group call to the radio under test or make a group call from the radio under test to the 3920B. In addition, the user can have multiple radios register and affiliate with the 3920B and then originate calls from one radio to the other radios.



P25 Trunking Simulation

LSM Generate and Receive/Analysis (390XOPT204)

In addition to the standard P25 modulation, also available on the 3920B, is the capability to generate and receive Linear Simulcast Modulation (LSM). This option, available as an extension of P25 conventional operation, enables measurements that are specific to LSM. It also adds a graphical analysis of the demodulated LSM signal that is normally only found in vector signal analyzers. Since LSM is a complex type modulation, this plot shows the inphase versus quadrature phase (I versus Q) of the demodulated LSM signal. In addition, this option adds Error Vector Magnitude to the selection of measurements available from the UUT Measurements tile.



LSM Signal Analysis Screen

P25 Control Channel Logger Option (390XOPT206)

This option provides the user a tool to perform advanced protocol analysis on both control channel and voice channel data. With this option, the user can log P25 data by streaming the received data in real time from the Ethernet port to a PC. This data is logged in an XML format so that the user can easily view the data using a text editor or use an external program to perform further analysis on the data. This data can be logged at three different levels ranging from the raw data symbols up through decoded data. The data is time-stamped on a frame by frame basis. In addition to being able to log data, the user can also send data to the 3920B to be transmitted, making the 3920B into a completely user defined data modem for P25.

SmartZone and SMARTNET (390XOPT207)

This option provides support for Motorola Astro SmartZone and SMARTNET systems, including support for rebanded channels in the 800 MHz band.

KVL Keyloader Option (390XOPT209)

This option provides an interface to the KVL Keyloader enabling the user to be able to directly enter keys into the 3920B using a KVL-3000+.

Analog Simulcast Option (390XOPT210)

This option is an extension to the Audio Analyzer option and acts as a tracking generator for the audio analyzer. This feature is designed primarily for use in characterizing the performance of Motorola Analog Simulcast systems and enables detailed alignment of the 0-100 Hz band. In addition, this option allows for extended characterization of audio circuits from 0-10 kHz.

Explicit Mode Trunking (390XOPT212)

The advanced form of frequency channel assignment known as Explicit Messaging is supported by adding option 390XOPT212 to the P25 Trunking Operation VHF/UHF/700/800 MHz option. The explicit mode of operation assigns the actual channel/frequency over the air by providing the exact TX and RX frequency assignments directly to the radio.

Unit to Unit Call (390XOPT213)

This option adds capability of testing the unit to unit call functionality of a mobile station to the P25 trunking option. The user can either originate a unit to unit call from the mobile station or from the test set.

Adjacent Channel Broadcast Message (390XOPT214)

This option adds the adjacent status broadcast message to the control channel messages transmitted by the 3920B. This will enable the user to test the capability of the mobile station to operate correctly in the presence of this message. The purpose of this message is to inform mobile stations of the presence and status of sites adjacent to this particular site.

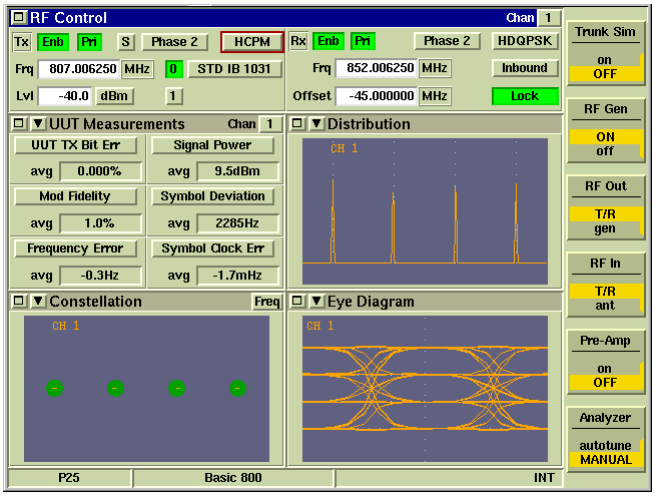
Secondary Control Channel Broadcast Message (390XOPT215)

This option adds the secondary control channel broadcast message to the control channel messages transmitted by the 3920B. This will enable the user to test the capability of the mobile station to operate correctly in the presence of this message. This message is used to inform mobile stations of other control channels or other potential backup control channels at this site.

P25 Phase II Two-Slot TDMA (Time Division Multiple Access) Physical Layer (390XOPT220)

One of the newest features of the 3920B is the capability to test P25 Phase II TDMA operation of both base stations and mobile stations. With this option, the 3920B can measure and analyze the different modulations used for both the outbound and inbound signals used in P25 Phase II. With the modulation for Phase II being completely different from the Phase 1 C4FM modulation, this option is critical for radio technicians, designers, or anyone involved with the roll-out of P25 Phase II systems. Included with this option are the following features:

- H-CPM (inbound modulation) modulation and demodulation
- H-CPM eye diagram, distribution plot, and constellation
- H-DQPSK (outbound modulation) modulation and demodulation
- H-DQPSK eye diagram, distribution plot, and constellation
- Generation of all H-CPM standard patterns
- Generation of all H-DQPSK standard patterns
- UUT measurements for Phase II including modulation fidelity, symbol deviation, symbol clock error, frequency error, power and TX Bit Error



P25 Phase II

Off Air Monitor Software for P25 Message Logging - Protocol Analysis Tool (390XOPT230)

The Cobham 3920B P25 Off Air Monitor (OAM) is used to capture and view APCO P25 messages sent over the air. The OAM can receive and demodulate P25 RF signalling, decode P25 messages and log these messages to a file for later viewing. Both trunked (control and traffic) and conventional channels are supported, allowing network engineers to:

- Verify compliance to P25 standards
- Troubleshoot existing P25 systems
- Analyze third party signalling

This option is a PC application that, uses the data from option 390XOPT206 to perform an advanced decoded display and log of the XML data streams from multiple P25 channels. This provides the user with the data to perform a complete analysis of all channels of a P25 trunked system.

P25 AES Encryption (390XOPT240)

With the addition of this option, the 3920B supports P25 encryption formats and manual key entry for systems that employ DES OFB Type III (included in 390XOPT200) or AES encryption (390XOPT240). These options allow decoding of encrypted voice frames to verify encrypted channel performance. Encryption keys may be loaded manually using either the front panel or external keypad or with option 390XOPT209, keys may be loaded with the Project 25 Key Fill Device (KFD) interface protocol. Additionally, keys may be loaded using KVL ASN mode of operation found in KVL-3000 and older model key loaders from Motorola.

X2-TDMA Test Suite (390XOPT219)

Available for testing X2-TDMA test systems, this option is available through Motorola only.

X2-TDMA Mobile Emulator (390XOPT245)

This option enables the testing of X2-TDMA base stations. This option is available through Motorola only.

P25 Performance Test Triggers (390XOPT260)

In order to perform the P25 Performance Tests required by the TIA 102-CAAA standard, the 3920B has the capability with this option of generating trigger signals. This Sync I/O port on the rear panel of the 3920B is used to source this trigger. The output trigger signal is generated when any of the following occur.

- Switching between the STD SILENCE pattern and the STD 1011 pattern
- Switching between the STD BUSY pattern and the STD 1DLE pattern
- Enabling the STD LDU1 pattern
- Enabling the STD LDU2 pattern
- During trunking simulation at each slot boundary
- During trunking simulation, when a Channel Grant message is transmitted

X2-TDMA Advance Test Suite (390XOPT261)

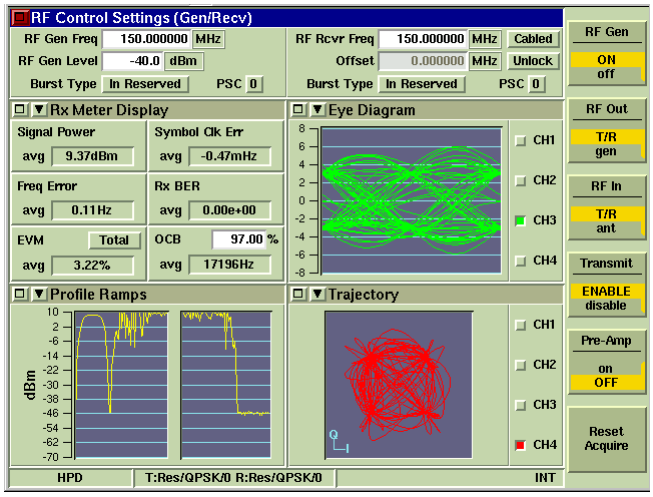
This option combines 390XOPT216 and 390XOPT245.

MOTOROLA HPD TESTING OPTION (390XOPT300)

- Generate/receive HPD signals
- Modulation - 64QAM, 16QAM and QPSK (inbound and outbound)
- Transmitter parameters including signal power, frequency error, EVM
- Symbol clock error, RX BER, burst timing error and occupied bandwidth
- I & Q modulation analysis including constellation and trajectory plots of the data symbols, sync and pilot bits
- Display of Min/Max and average as specified by the number of bursts
- Pass/Fail indication using color code meters

Cobham has developed this test mode for Motorola to address the need for testing their high performance packet data operation on both mobiles and base stations in the 700 and 800 MHz bands. HPD systems operate within the normal 25 kHz mobile radio bandwidth. The 3920B HPD options provide users with the ability to test High Performance Data systems. HPD can be configured for two modes of operation. When configured to operate in BR Mode the test set simulates base radio operation and is used to test the functionality of Motorola HPD Mobile Subscriber Units (MSU). When configured to operate in MSU Mode, the test set simulates Mobile Subscriber Unit operation and is used to test the functionality of Motorola Base Repeaters (BR).

3920B Series Analog and Digital Radio Test Platform



Example of HPD Tiles

Motorola HPD Advanced Analysis Package (390XOPT301)

More advanced features are available with 390XOPT301 including:

- Received Data Stream Logger: Logs the data portion of the HPD signal and displays it in hex.
- RX Time Display: Shows frequency error, power and symbol clock error over time.
- HPD Magnitude/Phase Estimation: Displays magnitude and phase fluctuations of the received signal.
- Eye Diagram and I/Q over time displays
- Power Profile: Shows the power over time and in a burst (TDMA transmission).
- Power Ramps: Shows the power up and power down portion of the TDMA burst.

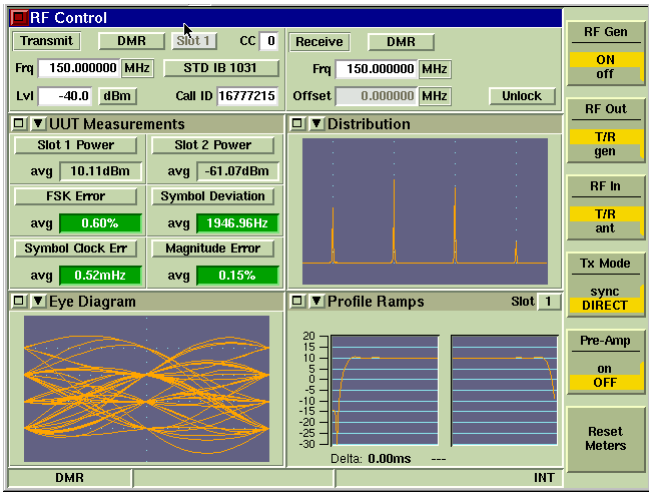
Motorola HPD Testing Suite (390XOPT302)

This option combines 390XOPT300 and 390XOPT301.

DMR (390XOPT400)

Add advanced testing capability to DMR (Digital Mobile Radio) with 390XOPT400. This option enables the Cobham 3920B Digital Radio Test Set to test and align a wide range of DMR repeaters and mobile stations. DMR radio technology is a digital radio format offering advanced communications features specified by the ETSI technical standard ETSI TS 102-361-1. Capabilities of the 3920B include:

- Generate and receive DMR modulated signals
- Measure FSK error and magnitude error
- Measure symbol deviation
- Measure symbol clock error
- Measure slot power
- Distribution plot of symbol deviation
- Eye diagram of FSK demodulation
- Power profile of burst and of burst ramp up/ramp down
- Transmit and receive live audio using the vocoder
- Transmit stored speech patterns
- Test duplex or simplex mobiles
- Wake-up burst for testing repeaters
- Synchronize with repeaters
- BER testing
- Encode color code and call ID
- Decode color code, unit ID and call ID



Example of DMR Tiles

DMR XML Channel Logger Option (390XOPT402)

With this option, the user can now capture and log to a file (on a PC connected to the 3920B through a LAN) the raw data that is transmitted by a mobile station or repeater. The data is formatted using XML, so that it can be decoded with an external program (developed by the user) or viewed with a text editor. This is perfect for the engineer performing development work or the test engineer in the field that needs to capture the data being transmitted by a repeater or subscriber unit. The data is captured by connecting a PC to the 3920B through an Ethernet crossover cable. Using the PC application, (available at www.aeroflex.com/3920) "DMR XML channel logger for 3920," the user can both log DMR XML data and send XML files that can control the data being transmitted by the 3920B.

dPMR (390XOPT420)

dPMR is an ETSI standard specified in ETSI TS 102 658. This option adds advanced testing capabilities that conform to the requirements of this ETSI standard. The transmitter tests include power, frequency error, FSK error, symbol deviation and symbol clock error. This option also provides several graphical screens that provide more insight into the accuracy of the dPMR modulation.

NXDN (390XOPT440)

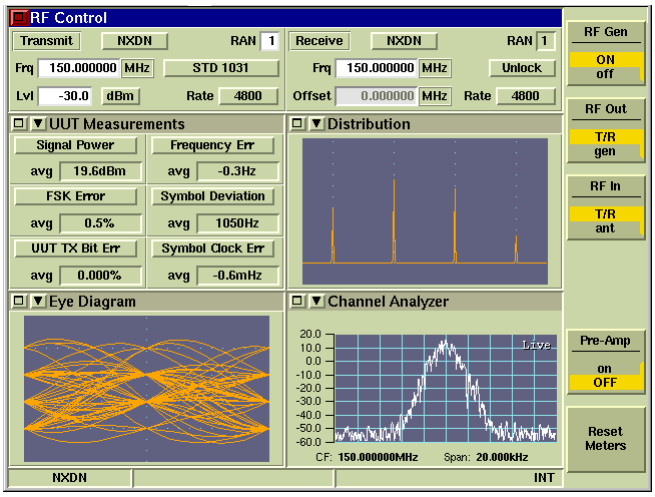
Add advanced testing capability for NXDN with 390XOPT440.

3920B Series Analog and Digital Radio Test Platform

This option enables the Cobham 3920B Digital Radio Test Set to perform a variety of Transmitter and Receiver tests on any NXDN radio. Transmitter measurements include:

- Signal power
- Frequency error
- FSK error
- Symbol deviation
- TX BER
- Symbol clock error

The system supports both 4800 and 9600 baud systems. The 3920B can also analyze the modulation as an eye diagram, symbol distribution plot and a symbol constellation plot. A power over time graph can be used to diagnose power-related issues.



Example of NXDN Tiles

The 3920B NXDN Option supports receiver testing with a variety of signal generation patterns.

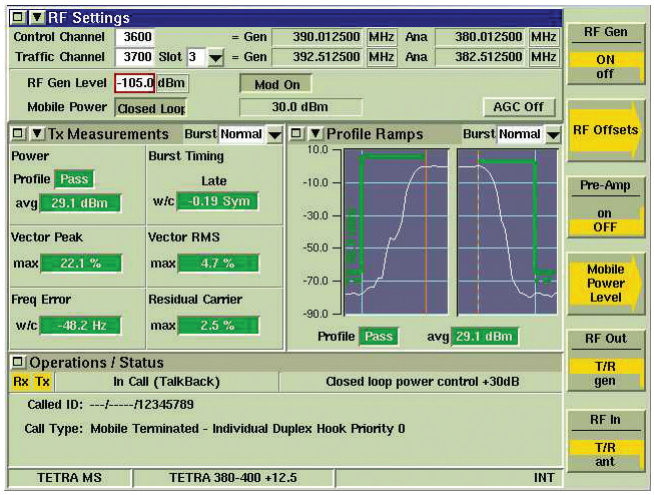
- STD 1031 (1031 Hz pattern)
- STD CAL (1031 Hz pattern with 5% BER)
- STD 511 (PN9 bit sequence)
- STD INTFR (PN15 bit sequence)

ARIB STD T98 (390XOPT460)

The option provides testing for mobile stations that conform to the ARIB T98 standard. This testing is similar to dPMR and NXDN.

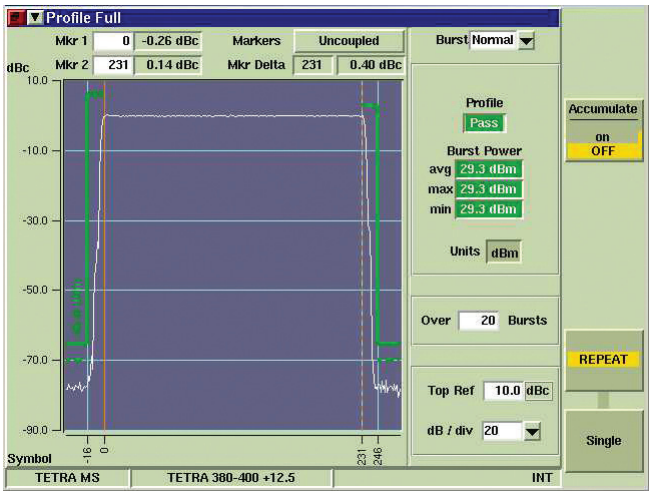
TETRA

- Mobile station testing with test signal T1 (390XOPT110)
- Base station testing with test signal T1 (390XOPT111)
- Generate/analyze TETRA RF signals
- Base station and mobile station testing plus testing with test signal T1
- Transmit parameter measurements including power, frequency error, EVM and burst timing
- TETRA RF power meter and burst power analysis up to 125 W
- Modulation analysis with I/Q constellation and trajectory display
- Receiver Bit Error Rate (BER) and Message Error Rate (MER) measurements
- Pass/Fail indication using color coded meters
- TETRA protocol analyzer/simulator
- Data display mode
- Time stamped protocol history
- Option for testing Direct Mode Operation (DMO)

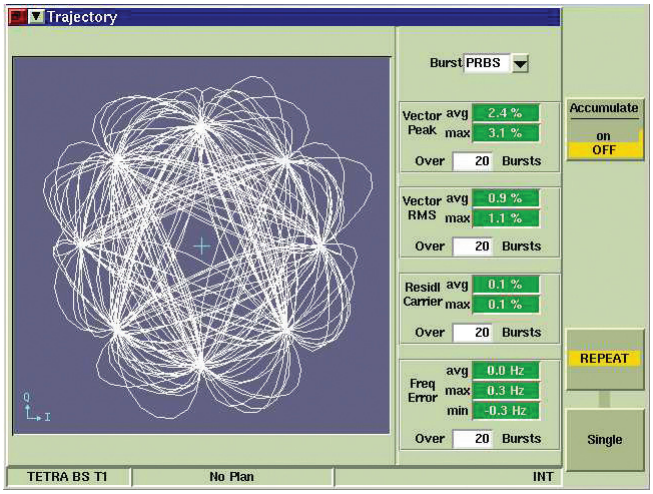


Example of TETRA MS Tiles

For TETRA applications, the 3920B is the successor to the Cobham 2968 TETRA Radio Test Set. The 2968 established industry standard for TETRA R&D, manufacturing, application development and service operations. Building upon the experience gained over many years of TETRA test, the 3920B with the TETRA options provides the world's best solution for testing TETRA radios. TETRA system options provide signalling and physical layer measurement requirements for testing TETRA radio equipment. Measurements are made in accordance with ETSI EN 300 394-1 for on channel transmitter and receiver parameters. Signalling functions support TIP (Tetra Interoperability Profile) compliant TETRA radios, thus ensuring optimum compatibility with TETRA equipment from various suppliers. Whatever the device under test, the TETRA system options have the flexibility to measure the various burst types specified by the TETRA standard including normal bursts, control bursts and synchronization bursts. The 3920B offers high speed measurement capabilities to expedite production testing. As a direct benefit of high power signal processing capacity, TETRA measurements are performed nearly nine times faster than its predecessor.



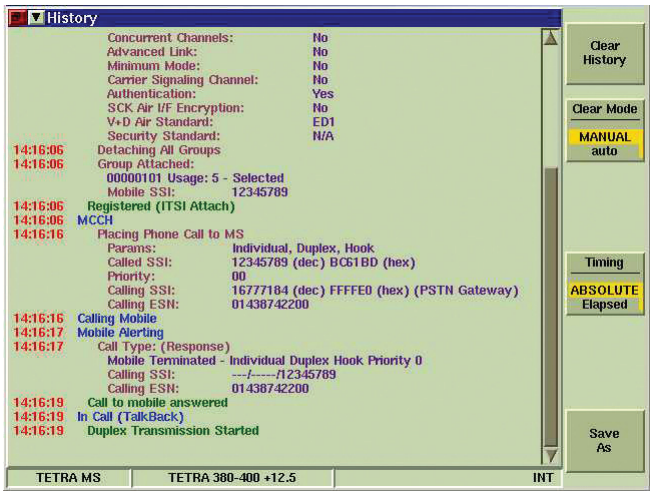
Profile Full Tile Maximized TETRA



Trajectory Tile Maximized

Call Processing Highlights

The 3920B can be freely configured to emulate a TETRA network by selection of the appropriate channel plan, country code, network code, color code, etc. Once configured, registration, group attachment and TETRA call types including group call, private call, emergency call, telephone call and user defined call can all be tested. SDS messages (types 1 to 4 and SDS-TL) can be sent or received. The 3920B TETRA system option displays a range of mobile reported information relating to registration, group attachment, test mode, call type, called party, status messages, text messages and DTMF digits dialed.



Protocol History Maximized Tile

TETRA Test Mode T1 and T1 Loopback

The TETRA MS and TETRA BS options provides various T1 test signals as defined in ETSI EN 300 394-1 for performing manual testing of TETRA base station and mobile stations receivers. The test signal T1 in the MS T1 application provides control information to the mobile to aid testing, e.g. burst type, max, TX power, loopback commands. These T1 test signals can be used by the mobile in a test mode to output received demodulated data to a test interface for external processing of receiver Bit Error Rate (BER). Alternatively, the mobile can be commanded by the test signal T1 to loop back the received data to the 3920B, which can then perform BER/MER/ PUEM measurement. In the BS T1 application, the 3920B also supports T1 loopback BER/MER/PUEM measurements for base stations.

TETRA Test (TT) Protocol Support

The TETRA MS option provides support for the TETRA Test (TT) protocol as defined in ETSI EN 300 394-1. The TT protocol allows the mobile to be tested in a loopback mode whereby the mobiles BER, MER and BER can all be reported.

Audio Testing

Subjective audio testing is supported for simplex and duplex calls. Audio spoken into the mobile's microphone is received and stored by the test set, which then re-transmits the speech so that it is replayed through the mobile's speaker or ear piece with 2 seconds delay added, thus, providing an end-to-end audio quality test.

Direct Mode Functionality (390XOPT112)

The 3920B also supports the testing of Direct Mode Operation. The 3920B can initiate or receive calls from a mobile that is operating in direct mode and then make transmitter measurements such as power, frequency error and modulation accuracy. The operation and graphical displays are very similar to the normal TETRA operation.

TETRA Energy Economy Mode (390XOPT114)

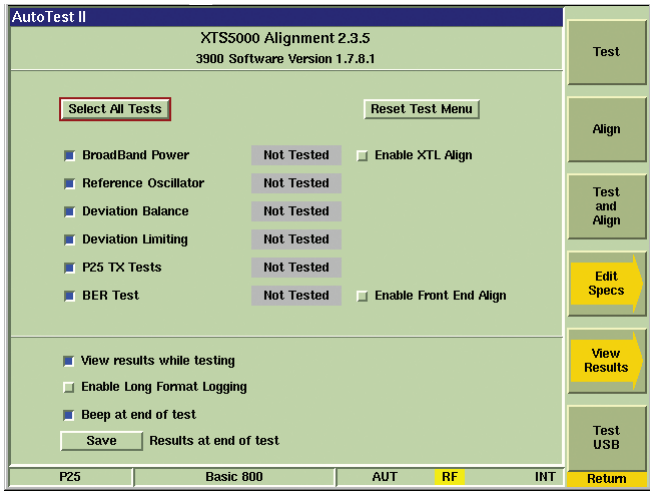
This optional mode of operation provides protocol signalling to

control a mobile's energy economy mode from "Stay alive" through energy groups EG1 (shortest sleep) to EG7 (longest sleep) and is used in conjunction with the comprehensive signalling capabilities already within the TETRA MS option. This operation enables developers, operators and users to configure battery test scenarios to simulate particular operational conditions. It gives them the testing flexibility to characterize the expected battery life performance in its intended operational use on the network.

AUTO-TEST II

Available as an option for the 3920B is the Auto-Test II operation. Providing the ultimate in flexibility, this option gives you the ability to control the operation of 3920B using the TCL scripting language. You control the functions of the 3920B through the use of RCI commands, which are sent as part of the TCL program.

- Develop your own automated tests for any system in the 3920B
- Design your own Graphical User Interface Uses TCL scripting language
- Utilizes the full set of 3920B RCI Commands



Example of Auto-Test II Display

Auto-Test II is also the environment for running the auto alignment options. Auto alignment is available for several manufacturers' radios, and more are being added all the time. The Auto-Test II Programming Environment is available for all of the systems in the 3920B:

- Analog duplex (390XOPT059)
- TETRA (390XOPT115)
- P25 radio systems (390XOPT218)
- HPD radio systems (390XOPT303)
- DMR radio systems (390XOPT401)
- dPMR radio systems (390XOPT421)
- NXDN radio systems (390XOPT441)
- ARIB T98 radio systems (390XOPT461)

AUTO-TEST/ALIGNMENT

Validate radios faster than ever with ease. Connect the test cables, press "Test and Align" and you are free to do more important things. The Auto-Test/Alignment applications are self-contained within the 3920B and automatically perform the functions of radio alignment and verification to ensure optimal radio performance. These applications can test and align radios in as little as 5 minutes.

Alignments	Performance Tests
• Reference oscillator	• P25 modulation fidelity
• Power	• P25 symbol deviation
• Deviation balance	• P25 RX BER
• Front End alignment	

Motorola ASTRO 25 Series Auto-Test/Alignment (390XOPT600)

This package provides support for the following radios: XTS®5000, XTS2500, XTS1500, XTS4000, MT 1500, PM1500™, SSE 5000, ASTRO XTL-5000, ASTRO XTL-2500, ASTRO XTL-1500 and Astro Spectra Plus. Requires 390XOPT200 and 390XOPT218.

Motorola ASTRO Series Auto-Test/Alignment (390XOPT601)

This option (390XOPT600) provides the functionality the following radios: XTS3000, ASTRO Saber, ASTRO Spectra. Requires 390XOPT200 and 390XOPT218.

Motorola ASTRO 25 Series XTL Power Auto-Test/Alignment (390XOPT602)

This option (390XOPT602) adds the capability of full power alignment for the following mobiles. Includes all current bias adjustments, power characterization and current limit settings for the XTL-5000, XTL-2500, XTL-1500 and PM1500. Typical alignment time is less than 4 minutes for a full power characterization alignment. Requires 390XOPT200, 390XOPT218, 390XOPT053, AC24011 and 390XOPT600.

TIA/EIA-603 FM Land Mobile Test (390XOPT603)

This application is self-contained within the 3920B and automatically performs the test functions as prescribed by the EIA/TIA-603 standards for testing any FM Land Mobile Radio. Configure up to 30 channels with independent test customization for each channel.

Motorola APX Series Auto-Test/Alignment (390XOPT604)

This option allows test and alignment of APX Series radios. The application can perform a full alignment on the single or dual band radios. Analog alignments and digital performance tests will ensure the radio has maximum coverage area.

EF Johnson ES Series Auto-Test/Alignment (390XOPT606)

This option adds the capability to complete a fully automatic alignment on EF Johnson P25 radios. The option has the same features as option 390XOPT600, but for EF Johnson P25 radios.

BK DPHX5102X Series Auto-Test/Alignment (390XOPT607)

This option adds the capability to complete a fully automatic alignment on BK DPHX5102X radios.

Kenwood P25 TK-5X10G Series Radio Auto-Test/Alignment (390XOPT608)

This package provides support for the following radios: TK-5210G, TK-5310G, TK-5410, TK-5710BG/HBG, TK-5810BG/HBG, TK-5910B. This option adds the capability to perform a fully automatic test and alignment on Kenwood P25 TK-5X10G Series radios. This option includes all the tests and alignments required by the Kenwood P25 TK-5X10G Series radios including power, frequency, mod balance, deviation, squelch, and many others. To insure optimum P25 operation, this application includes P25 performance testing.

MOTOTRBO Series Auto-Test/Alignment (390XOPT610)

This option adds the capability to complete a fully automatic test and alignment on MOTOTRBO Series radios. This option is compatible with all MOTOTRBO XPR™ Series radios and support for new MOTOTRBO Series radios will be added in the future. This option includes the following tests and alignments:

- Rx Front End Filter
- Rx Rated Volume
- Rx Front End Gain and Atten
- Rx BER
- Tx Ref Oscillator
- Tx Power
- Tx Modulation Balance
- Tx BER
- Tx FSK Error
- Tx Magnitude Error
- Tx Symbol Deviation

Technisonics Type 1 Radio Auto-Test/Alignment (390XOPT614)

This option adds the capability to complete a fully automatic test and alignment on Technisonics Type 1 radios. This option provides the same functionality of the ASTRO Series radio Auto-Test/alignment software, but for the Technisonics Type 1 radios.

Technisonics Type 2 Radio Auto-Test/Alignment (390XOPT615)

This option adds the capability to complete a fully automatic test and alignment on Technisonics Type 2 radios. This option provides the same functionality of the ASTRO 25 Series radio Auto-Test/alignment software, but for the Technisonics Type 2 radios.

TX Tests

- Frequency
- Power
- CTCSS
- Microphone sensitivity
- Modulation limiting
- Audio distortion
- Audio frequency response
- FM hum and noise

RX Tests

- Audio distortion
- Audio sensitivity
- Audio frequency response
- Usable sensitivity
- Displacement bandwidth
- Audio squelch sensitivity
- Audio squelch blocking
- Hum and noise

Test High/Low or both power level settings on any channel with support for a PTT line to auto-key/de-key the transmitter. Single channel test execution is allowed to re-check failed channels. Supports re-test, accept failure or abort on any failed test. Supports store and recall for test configurations and test results. Network or local printer support allows for an immediate hard copy to be obtained.

DMR Repeater Auto-Test (390XOPT626)

With the DMR repeater auto-test, the 3920B can automatically perform the key transmitter and receiver tests for DMR Repeaters. This test does not require the DMR repeater to be in any special test mode but can quickly make these measurements on any channel programmed into the repeater. The user simply indicates the frequencies that the repeater is using from the auto-test setup screen, and then can initiate the test and walk away. The testing is all performed automatically.

3920B Series Analog and Digital Radio Test Platform

39302B PRODUCT SPECIFICATIONS

RF SIGNAL GENERATOR

Frequency

Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1 Hz
Accuracy	Frequency standard ±1 count

Output Level

Range	T/R Port: -130.0 to -30 dBm (-30 dBm max for CW or FM; -35 dBm max for AM modulations; -40 dBm max for complex modulations) Duplex: -130.0 to +10.0 dBm (+10 dBm max for CW or FM; +5 dBm max for AM modulations; 0 dBm max for complex modulation)
Resolution	0.1 dB
Accuracy	1.0 dB for levels >-110 dBm (Typical better than 0.6 dB) 1.5 dB for levels ≤-110 dBm (Typical better than 1.0 dB)

SPECTRAL PURITY

Residual FM	<5 Hz (300 Hz to 3 kHz bandwidth)
Residual AM	<0.1% RMS (300 Hz to 3 kHz bandwidth)
Harmonics	<-25 dBc (Typically -30 dBc, RF level set at +10 dBm)
Non-Harmonics	<-55 dBc (all freq. except Crossovers) <-35 dBc (At 2nd order crossover frequency) (10 MHz to 1 GHz: Crossover = 1400 MHz - Gen freq.) (1 GHz to 2.7 GHz: Crossover = 3400 MHz - Gen freq.) (Tracking Gen: Crossover = 3410.7 MHz - Gen freq.)
Phase Noise	<-110 dBc/Hz @ 10 kHz offset, RF <500 MHz <-106 dBc/Hz @ 10 kHz offset, RF ≤1000 MHz <-95 dBc/Hz @ 10 kHz offset, RF >1000 MHz

MODULATION

Selections	OFF, AM, FM, FM50us, FM75us, FM750us, AM USB, AM LSB, IQGEN
Waveforms	Sine, Square, Triangle, Ramp, DCS, DTMF
THD	<1% (1 kHz rate, 30 to 70% AM, 6 kHz deviation FM, 300 Hz to 3 kHz BW, Sine)

Internal FM

Deviation Range	±0.001 to ±150 kHz, OFF
Accuracy	3% (From ±1 kHz to ±100 kHz deviation, 20 Hz to 15 kHz rate)
Resolution	1 Hz
Deviation Rate	20 Hz to 20 kHz

Internal AM

Modulation Range	0 to 100%
Accuracy	1% (Modulation from 10% to 90% 20 Hz to 15 kHz rate)
Resolution	0.1%
Rate	20 Hz to 20 kHz

Internal SSB

Modulation Selection	Upper SideBand (USB) or Lower SideBand (LSB)
Modulation Range	0 to 100%
Resolution	0.1%
Rate	300 Hz to 20 kHz

External AM/FM/SSB

Audio Inputs	With 1 Vrms, AM/FM/SSB have same characteristics as internal sources, ±10% of indicated setting. (Audio 1 or Audio 2 input from 20 Hz to 15 kHz [300 Hz to 3 kHz SSB] unbalanced). 8 Vrms maximum modulation input level.
Microphone Input	With 50 mVrms, AM/FM/SSB have same characteristics as internal sources, ±10% of indicated setting. (MIC Input from 100 Hz to 15 kHz [300 Hz to 3 kHz SSB]).

Internal IQ Gen

Sample Rate	<1.89 Msamples/sec
Size	<3.8 million samples
Source	File created by IQCreator

RF RECEIVER

RF Receiver

Demod Selections	AM, FM, FM50us, FM75us, FM750us, AM USB, AM LSB
Frequency Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Sensitivity	<-100 dBm (10 dB SINAD, FM, 25 kHz, 1 kHz rate, 6 kHz FM Deviation, 300 Hz to 3.4 kHz AF Filter, Pre-amp OFF) <-113 dBm (10 dB SINAD, FM, 25 kHz, 1 kHz rate, 6 kHz FM Deviation, 300 Hz to 3.4 kHz AF Filter, Pre-amp ON)

Demod Output Level

FM	Nominally 1 Vrms (for deviation ±1/4 of selected BW; 25 kHz BW same output level as 30 kHz BW)
AM	Nominally 2 Vrms (100% AM)

RF MEASUREMENTS

RF Power Meter (Broadband)

Frequency Range	10 MHz to 1.05 GHz (Standard) (Usable from 2 MHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 2 MHz)
Level Range	100 mW to 125 W (Usable from 10 mW)
Resolution	4 digits for W or 0.1 dB
Accuracy	10%, 1 digit
Signal	CW, FM, C4FM, 4FSK

RF Power Meter (Inband)

Frequency Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (Freq Ext Opt) (Usable from 100 kHz)

3920B Series Analog and Digital Radio Test Platform

Level Range	T/R Port: -60 to +51 dBm Lowest reading is receiver BW dependent (Narrower bandwidths can measure lower levels). ANT Port: -100 to +10 dBm Lowest reading is receiver BW dependent (Narrower bandwidths can measure lower levels).
Resolution	0.1 dB
Accuracy	±1 dB (Input level above minimum for selected BW [display not yellow]; typically better than 0.6 dB)
AM Filter BW	6.25, 8.33, 10, 12.5, 25, and 30 kHz
FM Filter BW	6.25, 10, 12.5, 25, 30, 100, and 300 kHz
Signal	CW, FM, AM, C4FM, 4FSK, QPSK, QAM

RF Counter

Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz, Auto-tune) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz, Auto-tune)
Resolution	1 Hz
Accuracy	Frequency standard ±1 count
Level Range for Auto-tune	T/R Port: -10 to +50 dBm (Find level is selectable) ANT Port: -60 to +10 dBm (Find level is selectable)
Signal	CW, FM, AM <70% modulation

RF Error Meter

Range	0 to ±2.5 MHz from receiver frequency (6 MHz IF BW)
Resolution	1 Hz
Accuracy	Frequency standard ±1 count
Level Range	T/R Port: -10 to +50 dBm ANT Port: -60 to +10 dBm
Signal	CW, FM, AM <70% modulation

DEMODULATION MEASUREMENTS

RF Characteristics

Frequency Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Input RF Level	T/R Port: -10 to +50 dBm ANT Port: -80 to +10 dBm

Demod Counter

Range	20 Hz to 20 kHz (1 to 100 kHz FM Deviation, IF BW set appropriately for the received modulation BW) 20 Hz to 10 kHz (30 to 90% AM, IF BW set appropriately for the received modulation BW)
Resolution	0.1 Hz
Accuracy	±50 ppm (±10 ppm typical)
Waveform	Sine or Square

FM Deviation Meter

Range	0 to 150 kHz
Resolution	10 Hz
Accuracy	±3% plus source residual, ±1 count (1 to 150 kHz FM deviation, IF BW set appropriately for the received modulation BW)
FM Rate	20 Hz to 20 kHz (IF BW set appropriately for the received modulation BW)

AM Deviation Meter

Range	0 to 100%
Resolution	0.1%
Accuracy	±3% + source residual, ±1 count (30 to 90% AM, IF BW set appropriately for the received modulation BW)
AM Rate	20 Hz to 15 kHz (IF BW set appropriately for the received modulation BW)

AUDIO AND MODULATION MEASUREMENTS

Audio Input Characteristics for the following meters	AF Counter, AF Level Meter, SINAD Meter, Distortion Meter, Hum and Noise Meter, Signal-to-Noise Meter
Front Panel Audio Inputs	Audio 1 or Audio 2 (unbalanced, chassis reference) Audio 1 and Audio 2 (balanced, 600 Ω differential input)
Audio Input Impedance (Audio 1 and 2)	Hi-Z (>10 kΩ) - Unbalanced input 600 Ω - Unbalanced input (8 Vrms MAX input*) 600 Ω - Balanced input (Audio 1 and 2) *Note - 600 Ω unbalanced will auto-switch to Hi-Z @ 8 Vrms

AF Counter

Range	20 Hz to 20 kHz (usable from 10 Hz)
Resolution	0.1 Hz
Accuracy	±50 ppm max, ±10 ppm typical
Wave shape	Sine or square
Level Range (Audio)	20 mV to 30 Vrms

AF Level Meter

Range	0 to 30 Vrms
Resolution	Volts: 1 mV (input <1 V), 10 mV (input ≥1 V) dBr, dBV, dBm: 0.01 dB
Accuracy	5% (Unbalanced, Hi-Z, 300 to 3 kHz, 0.1 to 30 Vrms)
Frequency Range	20 Hz to 20 kHz

SINAD Meter

Range	0 to 60 dB
Resolution	0.01 dB
Accuracy	±1 dB, ±1 count (SINAD >3 dB, ≤40 dB, 5 kHz LP AF filter
Frequency Range	300 Hz to 5 kHz
Level Range (Audio)	0.1 to 30 Vrms

Distortion Meter

Range	0.0 to 100.0%
Resolution	0.1%
Accuracy	<±0.5% (Distortion 1 to 10%, 5 kHz LP AF Filter) <±1.0% (Distortion 10 to 20%, 5 kHz LP AF Filter)
Frequency Range	300 Hz to 5 kHz
Level Range (Audio)	0.1 to 30 Vrms

Hum and Noise

Range	-100 dB to 0 dB

3920B Series Analog and Digital Radio Test Platform

Resolution	0.01 dB
Accuracy	±1 dB, ±1 count (>-60 dB, ≤-20 dB)
Signal Frequency	300 Hz to 5 kHz
Audio Input Level	0.1 to 30 Vrms
RF Input Level	T/R Port: -10 to +50 dBm ANT Port: -80 to +10 dBm

Signal-to-Noise Ratio

Range	-100 to 0 dB
Resolution	0.01 dB
Accuracy	±1 dB, ±1 count (>-60 dB, ≤-20 dB)
Signal Frequency	300 Hz to 5 kHz
Audio Input Level	0.1 to 30 Vrms
RF Input Level	T/R Port: -10 to +50 dBm ANT Port: -80 to +10 dBm

Modes (For Hum and Noise and Signal-to-Noise Ratio)

Mode	Stimulus	Stimulus Port	Measurement Input	Measurement Port
1	RF Generator	TR/Gen	AF Input	Audio In 1 or 2
2	AF Generator	Fctn Gen Out	RF Receiver	TR/Antenna

Audio Filters (Characteristic Response)

Filter	Type	Ripple	-1 dB	-60 dB
None	No Filter			
300 Hz	Low-Pass	<0.23 dB, above 20 Hz	330 Hz	590 Hz
5 kHz	Low-Pass	<0.02 dB, above 20 Hz	5.5 kHz	6.7 kHz
15 kHz	Low-Pass	<0.01 dB, above 20 Hz	16.1 kHz	17.8 kHz
20 kHz	Low-Pass	<0.01 dB, above 20 Hz	20.4 kHz	21 kHz
0.3 to 3.4 kHz	Band-Pass	<1.7 dB	320 Hz/3.8 kHz	60 Hz/5.2 kHz
0.3 to 5 kHz	Band-Pass	<1.7 dB	320 Hz/5.2 kHz	60 Hz/9.6 kHz
0.3 to 15 kHz	Band-Pass	<1.7 dB	320 Hz/16.1 kHz	60 Hz/19.9 kHz
0.3 to 20 kHz	Band-Pass	<1.7 dB	200 Hz/20.4 kHz	60 Hz/21 kHz
PSOPH C-MSG	Band-Pass	Per C-MSG Spec	Per C-MSG Spec	Per C-MSG Spec
PSOPH CCITT	Band-Pass	Per CCITT Spec	Per CCITT Spec	Per CCITT Spec
300 Hz	High-Pass	<1.7 dB	320 Hz	60 Hz

AUDIO FUNCTION GENERATOR(S)

Wave Shape	Sine, Square, Triangle, Ramp, Digital Coded Squelch, DTMF

Frequency

Range	Sine: 20 Hz to 40 kHz (usable 1 Hz to 40 kHz) Square, Triangle and Ramp: 20 Hz to 4 kHz (usable 1 Hz to 40 kHz)
Resolution	0.1 Hz
Accuracy	±50 ppm, ±10 ppm typical

Level

Range	1 mV to 5 V RMS into a 10 kΩ load
Resolution	0.1 mV
Accuracy	±1% of setting (10 kΩ load)
Impedance	<10 Ω
Spectral Purity	<0.5% (1 kHz, 5 Vrms, 80 kHz BW, 10 kΩ load, Sine) <1.0% (Typical, 20 Hz to 20 kHz, 100 mV to 5 Vrms, 80 kHz BW, 10 kΩ load, Sine)

OSCILLOSCOPE

Display

Traces	2
Trace Types	Live, captured, accumulated
Markers	2
Marker Functions	Time with amplitude, deviation or % depth Delta marker (including 1/Δ t, e.g. Hz)

Vertical

3 dB Bandwidth	16 MHz
Frequency Range	DC to 4 MHz (40 MS/s sampling rate)
Input Range	0 to 100 Vpeak Max, Category II
Scales	2 mV to 20 V/division in a 1, 2, 5 sequence (8 [h] x 10 [w] graticule display)
Accuracy	5% of full scale (DC to 1 MHz) 10% of full scale (1 to 4 MHz)
Resolution	Better than 1% of full scale
Coupling	DC, AC, GND

Horizontal

Sweep Factors	1 µSec to 1 Sec/division in a 1, 2, 5 sequence
Accuracy	>1.5% of full scale
Resolution	>1% of full scale
Input Impedance	1 MΩ, 20 pF

Trigger

Trigger Source	Trace A, Trace B, EXT, (or Trace C with no CH1 or CH2 Input)
Trigger Edge	Rising/falling
Trigger Mode	Auto/normal Continuous/single shot
External Trigger Level	Hi-Z BNC input on the rear panel of the unit Adjustable from -5 to +5 V

DIGITAL MULTIMETER

AC/DC Voltmeter

Full Scale Range	200 mV, 2 V, 20 V, 200 V, 2000 V, Auto (150 VAC RMS, or VDC MAX input, Category II)
Resolution	3-½ digits (2000 counts)
Accuracy	DC ±1% Full Scale ±1 count AC ±5% Full Scale ±1 count
AC Volts Frequency Range	50 Hz to 10 kHz

AC/DC Ammeter

Full Scale Range	200 mA, 2 A, 20 A, Auto (20 A range uses optional shunt connected to Voltmeter)
Maximum Open Circuit Input Voltage	30 Vrms referenced to common or earth ground, Category I
Resolution	3-½ digits (2000 counts)

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Accuracy	±5% Full Scale ±1 count
AC Volts Frequency Range	50 Hz to 10 kHz

Ohmeter

Full Scale Range	200 ohms, 2 kohms, 20 kohms, 200 kohms, 2 Mohms, 20 Mohms, Auto
Maximum Open Circuit Input Voltage	30 Vrms referenced to common or earth ground, Category I
Resolution	3-½ digits (2000 counts)
Accuracy	±5% Full Scale ±1 count

External Current Shunt (Optional)

Rating (Category II)	10 amps, 100 mV 20 amps - ON 1 minute, OFF 4 minutes
Accuracy (18° to 28° C)	DC to 10 kHz: ±0.25%
Temperature Coefficient	0.005%/° C

RF SPECTRUM ANALYZER

Frequency

Range	10 MHz to 1.05 GHz (standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1 Hz
Accuracy	Same as frequency standard

Span

Mode	Start/Stop, Center/Span and Zero Span
Range	Selection list is 2 kHz to Full Span in a 1, 2, 5 sequence, plus Zero Span (Span may be entered numerically down to 1 Hz resolution)
Display Accuracy	Span Accuracy + Frequency Accuracy + 50% of RBW
Span Accuracy	±1% of span width
Marker Accuracy	±1% of span width

Level

Ref Level Range	T/R Port: -50 to +50 dBm ANT Port: -90 to +10 dBm
Vertical Scales	1, 2, 5, 10 dB/division
Reference Level Resolution	0.1 dB
Ref Level Units	dBm
Dynamic Range	70 dB (Antenna, no attenuation, Ref Level -30 dBm, 30 kHz RBW)
Bandwidth Switching Error	±1 dB (After Normalize)
Log Linearity	±1 dB (RBW: 3 kHz, 30 kHz, 60 kHz, 300 kHz, 6 MHz) ±1 dB (300 Hz RBW typical)
Accuracy	±1 dB (Input signal -10 dB from Ref Level, Normalized, preamp off)
Attenuator Selections	0 to 50 dB of attenuation, controlled by changing the Ref Level
3rd Order Intermodulation	-60 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)
Harmonic Spurious	-55 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)
Non-Harmonic Spurious	-60 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)
Displayed Average Noise Level (DANL)	-125 dBm (Typical, 300 Hz RBW, ANT Port terminated, 20 sweep average)

Resolution Bandwidth

RBW Selections	300 Hz, 3 kHz, 30 kHz, 60 kHz, 300 kHz, 6 MHz
RBW 60 dB/3 Filter Shape	>10:1
Selectivity - Filter Shape	60 dB/3 dB ratio better than 10:1
Accuracy	±10% of RBW for 3 kHz, 30 kHz, 60 kHz, 300 kHz -10%/+25% of RBW for 6 MHz ±20% of RBW for 300 Hz
Bandwidth Switching Error	±1 dB

Video Bandwidth

Range	10 Hz to 1 MHz in a 1, 3, 10 sequence, plus NONE

Sweep

Frequency Sweep Time	100 mS to 100 S in a 1, 2, 5 sequence
Zero Span Sweep Time	50 mS to 100 S in a 1, 2, 5 sequence
Sweep Trigger Source	Internal and External
Trigger Modes	Continuous (repeat), single (single-shot)

Function/Feature

Display Modes	Live, average, max hold
Averages	1 to 100

Markers

Track	Frequencies (or time) and amplitudes
Number of Markers	8
Marker Functions	Marker to Peak Marker to Next Right/Left Marker to Minimum Marker to Ref Level Marker to Center Frequency Marker sets Span Marker sets Vertical Scale (Zero Span only)

TRACKING GENERATOR (OPTIONAL)

Tracking Generator Output	Refer to RF SIGNAL GENERATOR section for: -Frequency range and accuracy -Output level range, resolution, and accuracy -Spectral purity
Span and Sweep Time	Same as Spectrum Analyzer
Tracking Generator Controls	Output port selection, RF level, Reference cal

HARMONICS AND SPURIOUS (OPTIONAL)

Harmonic Level

Range	0 to -60 dBc
Resolution	0.1
Accuracy	Same as RF Spectrum Analyzer

Spurious Level

Range	0 to -60 dBc
Resolution	0.1
Accuracy	Same as RF Spectrum Analyzer

AUDIO SPECTRUM ANALYZER (OPTIONAL)

Frequency

Range	Start and Stop Frequency - 0 Hz to 24,000 Hz
Resolution	1 Hz
Accuracy	±50 ppm (±10 ppm Typical)
Span	2 kHz min to 24 kHz max

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COBHAM

Level

Vertical Scales	1, 2, 5, 10, 20 dB per division
Reference Level	0 dB Full Scale (dBr)
Dynamic Range	Greater than 120 dB
Accuracy	±1 dB from 300 Hz to 15 kHz

Markers

Number of Markers	2

FREQUENCY STANDARD I/O

Internal Frequency Standard Output

Frequency	10 MHz (nominal)
Output Level	1 Vpp (nominal) into 50 Ω
Temperature Stability (0 to 50˚ C)	±0.01 ppm
Aging Rate	±0.1 ppm/year after 1 month continuous use
Warm Up Time	Less than 5 min. to ±0.02 ppm

External Frequency Input

Frequency	10 MHz
Input Level	1 to 5 Vpp for sine waves 3.3/5 V TTL for square waves
Connector	BNC socket (10 kΩ Input/50 Ω Output)

INPUT/OUTPUT CONNECTORS

ANT (RF Input)

Connector Type	TNC
Function	Receiver input
Impedance	50 Ω (nominal)
VSWR (with Attenuation ≤10 dB):	Better than 1.44:1 (RF freq. <1.05 GHz) Better than 1.58:1 (RF freq. >1.05 GHz to <2.7 GHz)
Input Protection	10 W with warning above +17 dBm (Remove power immediately when alarm sounds)

Gen (RF Input)

Connector Type	TNC
Function	Generator high-level output
Impedance	50 Ω (nominal)
VSWR (with level <0 dBm):	Better than 1.7:1 (RF freq. <1.05 GHz) Better than 1.9:1 (RF freq. >1.05 GHz to <2.7 GHz)
Input Protection	10 W with warning above +23 dBm (Remove power immediately when alarm sounds)

T/R (RF Input/Output)

Connector Type	Type N
Function	RF power input, generator low-level output
Impedance	50 Ω (nominal)
VSWR	Better than 1.2:1 (RF freq. <1.05 GHz) Better than 1.3:1 (RF freq. >1.05 GHz to <2.7 GHz)
Input Protection	200 W with warning above 135 W or power termination temp >100˚ C. Recommended max of 30 s ON and minimum of 2 min OFF for power levels above 50 W. (Remove power immediately when alarm sounds)

GPIB

Connector Type	24 pin IEEE
Function	IEEE-488.1-1997

Ethernet

Connector Type	8 Position, RF-45 100/10 Mbit/s
Function	10/100 Base-T network connection

RS-232

Connector Type	9-pin, D-sub, Male
Baud Rates	300, 600, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 57.6k, 115,2k
Stop Bits	1 or 2
Parity	Odd, even, none

Video

Connector Type	15-pin, D-sub, VGA
Function	VGA for external monitor

IF Output

Connector Type	BNC
Function	10.7 MHz Receiver IF
Output Level	Proportional to Receive Signal Level

Mic/Accessory

Connector Type	8 position, female DIN
Function	Microphone connection, modulation input, demod output, PTT operation

Parallel Port

Connector Type	25 position, female D-sub
Function	Printer interface

USB

Connector Type	Twin USB standard connection (rear panel) Single USB standard connection (front panel)
Function	IEEE-488.1-1997

Test Port

Connector Type	15 position, female 3 tier D-sub
Function	Programmable I/O and voltage output (optional interface)

Auxiliary IF Input

Connector Type	High-density dual inline
Function	External digital receiver input (optional interface)

AC POWER REQUIREMENTS

Voltage	100 V to 120 VAC @ 60 Hz 220 V to 240 VAC @ 50 Hz
Power Consumption	Nominally 120 W (200 W Max)
Mains Supply Voltage Fluctuations	≤10% of the nominal voltage
Fuse Requirements	3 A, 250 V, Type F

ENVIRONMENTAL/SAFETY

Operating Temperature	0 to 50˚ C (Tested in accordance with MIL-PRF-28800F Class 3)
Warm-up Time	15 minutes
Storage Temperature	-40 to +71˚ C (Tested in accordance with MIL-PRF-28800F Class 3)

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Relative Humidity	80% up to 31° C decreasingly linearly to 50% at 40° C (Tested in accordance with MIL-PRF-28800F Class 3)
Altitude	4,000 m (13,123 ft) (MIL-PRF-28800F Class 3)
Shock and Vibrations	30 G Shock (functional shock) 5-500 Hz random vibrations (Tested in accordance with MIL-PRF-28800F Class 3)
Use	Pollution degree 2
EMC	EN 61329, Class A
Reliability	>8,000 hour calculated MTBF (MIL-HDBK-217F, notice 2)
Safety Standards	UL 61010B-1 EN 61010-1 CSA C22.2 No.61010-1

DIMENSIONS AND WEIGHT

Height	7.75" (19.7 cm)
Width	14" (35.6 cm)
Depth	20.5" (52.0 cm)
Weight	36.8 lbs (16.5 kg)
LCD Display Screen Size	6.4" diagonal (162.6 mm diagonal)

GENERAL CHARACTERISTICS

LCD Display Screen Size	6.4" diagonal 162.6 mm diagonal
Active Area	5.1" (h) x 3.8" (v) 129.6 mm (h) x 97.44 mm (v)
Resolution	640 x 480 pixels
Disk Storage	Internal 30 GByte hard disk available for user storage

OPTIONAL SYSTEMS

P25 (OPTIONAL)

RF SIGNAL GENERATOR

Frequency

Range	10 MHz to 1.05 GHz (standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1 Hz
Accuracy	Frequency standard ±1 count

Output Level

Range	T/R Port: -138.0 to -30.0 dBm for C4FM and H-CPM modulations (-40.0 for all other modulations) GEN Port: -130.0 to +10.0 dBm for C4FM and H-CPM modulations (+0.0 dBm for all other modulations)
Resolution	0.1 dB
Accuracy	1.0 dB for levels >-110 dBm (Typical better than 0.6 dB) 1.5 dB for levels <-110 (Typical better than ±1.0 dB)
Modulation	C4FM, CQPSK, LSM
Test Patterns	STD 1011, STD CAL, STD SILENCE, STD INTFR, STD BUSY, STD IDLE, STD 511 (0.153), STORED SPCH, VOICE, 1011, SILENCE

RF Receiver

Frequency Range	10 MHz to 1.05 GHz (standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1 Hz
Level Range	T/R Port: -10 to +50 dBm ANT Port: -60.0 to +10 dBm (with preamp -63)

P25 MEASUREMENTS

Modulation Fidelity

Range	0 to 20%
Resolution	0.01%
Accuracy	<5.0% of reading (2.5 to 10%)

Symbol Deviation

Range	1500 Hz to 2100 Hz
Resolution	0.1 Hz
Accuracy	±10 Hz (1620 to 1980 Hz)

Symbol Clock Error

Range	±1000 mHz
Resolution	0.01 mHz
Accuracy	1 ppm (±48 mHz)

Frequency Error

Range	±4000 Hz
Resolution	0.01 Hz
Accuracy	Frequency Standard ±1 count

UUT TX/RX Bit Error Rate

Range	0 to 20%
Resolution	0.1%

Signal Power

Range	T/R Port: -60 to +51 dBm ANT Port: -100 to +10 dBm
Resolution	0.1 dB
Accuracy	±1 dB (typically better than ±0.6 dB)

Error Vector Magnitude

Range	0 to 20%
Resolution	0.01%

Carrier Feedthrough

Range	0 to -80.00 dB
Resolution	0.01 dB

GRAPHICAL DISPLAYS

Modulation Fidelity Displays

Constellation	Line graph of the deviation at the symbol point.
Distribution	Graph of the statistical distribution of the deviation at the symbol point. This is a graph of the deviation at the symbol point versus the percentage of occurrence of that deviation.
Eye Diagram	Graph of the demodulated signal versus time, synchronized with the symbol points. The number of symbol periods is selectable. Range is 2 to 16.
Trajectory	Graph of the demodulated signal in the complex domain. This graph shows the Inphase versus the Quadrature phase of the demodulated C4FM, CQPSK, or LSM signal.

PROTOCOL

Data Link

Header	MFID, ALG, KEY, TGID, MI

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Voice Frame	Frame #, NAC, DUID, KEY, ALG, MI, RAW, LCO, Protect, SF, EMG, LSD, STS , STS 2
Conventional Mode Simulation	NAC, Call Type, TGID, UID, Alg ID, Key ID

Phase I Trunking Simulation

System Plans	Basic 800, Basic UHF, Basic VHF, Basic 700, plus multiple user defined
User defined fields	System ID, WACN, RFSS ID, Site ID, Announcement Group Address, Local Registration Area, Service Class, Active Network, Local/Global Affiliation, Group Affiliation, Registration, WGID Mapping, WUID mapping, Protected 16 Channel IDs with Base Frequency, Bandwidth, TX Offset, Channel Spacing
Trunking Control	Base Simulation sets System Plan, Implicit/Explicit mode, Control Channel ID/NUM/Frequency, Control Channel power level, Control Channel modulation, Traffic Channel ID/NUM/Frequency, Traffic Channel power level, Traffic Channel modulation.
Simulator	Call Type, TGID, UID, Alg ID, Key ID
Encryption	Supports DES Encryption (AES available with restrictions)

DMR (OPTIONAL)

RF SIGNAL GENERATOR

Frequency

Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1 Hz
Accuracy	Frequency standard ±1 count

Output Level

Range	T/R Port: -130.0 to -40.0 dBm GEN Port: -130.0 to +0.0 dBm
Resolution	0.1 dB
Accuracy	1.0 dB for levels >-110 dBm (Typical better than 0.6 dB) 1.5 dB for levels <-110 (Typical better than 1.0 dB)
Modulation	4-FSK
Test Patterns	STD IB 1031, STD IB CAL, STD IB 511 (.153), STD OB TSYNC (Repeater IDEL pattern)

RF RECEIVER

Frequency Range

Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1 Hz
Level Range	T/R Port: -10 to +50 dBm ANT Port: -60.0 to +10 dBm (with preamp -63)

DMR MEASUREMENTS

FSK Error

Range	0 to 20%
Resolution	0.01%
Accuracy	<5% of reading (2.5 to 10%)

Symbol Deviation

Range	1500 Hz to 2350 Hz
Resolution	0.1 Hz
Accuracy	±10 Hz (1745 to 2140 Hz)

Symbol Clock Error

Range	±1000 mHz
Resolution	0.01 mHz
Accuracy	1 ppm (-48 to +48 mHz)

Frequency Error

Range	±4000 Hz
Resolution	0.01 Hz
Accuracy	Frequency Standard ±1 count

Magnitude Error

Range	0 to 5%
Resolution	0.01%
Accuracy	<10% of reading (0 to 2%)

UUT TX/RX Bit Error Rate

Range	0 to 20%
Resolution	0.1%

Signal Power/Slot Power

Range	T/R Port: -60 to +51 dBm ANT Port: -100 to +10 dBm
Resolution	0.1 dB
Accuracy	±1 dB (typically better than ±0.6 dB)

PROTOCOL

Decode	Color Code, Call ID, Unit ID
Accuracy	Color Code, Call ID

DPMR (OPTIONAL)

RF SIGNAL GENERATOR

Frequency

Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1 Hz
Accuracy	Frequency standard ±1 count

Output Level

Range	T/R Port: -138.0 to -30.0 dBm for 4FSK GEN Port: -130.0 to +10.0 dBm for 4FSK
Resolution	0.1 dB
Accuracy	1.0 dB for levels >-110 dBm (Typical better than 0.6 dB) 1.5 dB for levels <-110 (Typical better than 1.0 dB)
Modulation	4FSK
Test Patterns	STD 511 (0.153)

RF RECEIVER

Frequency Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1 Hz
Level Range	T/R Port: -10 to +50 dBm ANT Port: -60.0 to +10 dBm (with preamp -63)

dPMR MEASUREMENTS

FSK Error

Range	0 to 20%
Resolution	0.01%
Accuracy	<5.0% of reading (2.5 to 10%)

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COBHAM

Symbol Deviation Meter

Range	875 Hz to 1225 Hz
Resolution	0.1 Hz
Accuracy	±10 Hz (945 to 1155 Hz)

Symbol Clock Error Meter

Range	±1000 mHz
Resolution	0.01 mHz
Accuracy	1 ppm (-24 to +24 mHz)

Frequency Error

Range	±4000 Hz
Resolution	0.01 Hz
Accuracy	Frequency Standard ±1 count

UUT TX BER Meter

Range	0 to 20%
Resolution	0.1%

Signal Power Meter

Range	T/R Port: -60 to +51 dBm ANT Port: -100 to +10 dBm
Resolution	0.1 dB
Accuracy	±1 dB (±0.6 dB typical)

GRAPHICAL DISPLAYS

Modulation & Power Analysis

Constellation	Line graph of the deviation at the symbol point.
Distribution	Graph of the statistical distribution of the deviation at the symbol point. This is a graph of the deviation at the symbol point versus the percentage of occurrence of that deviation.
Eye Diagram	Graph of the demodulated signal versus time, synchronized with the symbol points. The number of symbol periods is selectable. Range is 2 to 16.
Power Over Time	Displays the power measurement of the received signal over a specified period of time; indicating the transmitter's stability.

TETRA

RF SIGNAL GENERATOR

Frequency

Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Resolution	1.0 Hz
Accuracy	Frequency standard ±1 count

Output Level

Range	T/R Port: -130.0 to -40.0 dBm GEN Port: -130.0 to 0 dBm
Resolution	0.1 dB
Accuracy	1.0 dB for levels >-110 dBm (typical better than 0.6 dB) 1.5 dB for levels ≤-110 (typical better than 1.0 dB)

Modulation

Type	π/4 DQPSK, 18 ksymbols/sec, TETRA filter (RRC with ≤0.35)
Accuracy	<3% RMS <6% peak
Residual Carrier Power	<-35 dBc

Test Signals

TETRA MS	Main Control Channel (MCCH) Traffic Channel (TCH/S) containing silence or 1 kHz tone or talk-back, Fast Associated Control Channel (FACCH)
TETRA MS T1	T1 test signals (in accordance with ETSI EN 300 394-1) T1 type 1 (TCH/7.2), T1 type 2 (SCH/F), T1 type 3 (BSCH + SCH/HD), T1 type 4 (TCH/2.4), T1 type 15 (TCH/S), T1 type 17 (TCH/4.8)
TETRA BS T1	T1 test signals (in accordance with ETSI EN 300 394-1) T1 type 7 (TCH/7.2), T1 type 8 (SCH/F), T1 type 9 (STCH + STCH UL), T1 type 10 (TCH/2.4), 18 Frame PRBS, Framed PRBS, Unframed PRBS
TETRA DM	Traffic Channel (TCH/S) containing silence or 1 kHz tone or talk-back

RF RECEIVER

Frequency Range	10 MHz to 1.05 GHz (Standard) (Usable from 100 kHz) 10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)
Level Range	T/R Port: -40 dBm to +40 dBm ANT Port: -80 dBm to 0 dBm
Burst Types	MS: Control Burst (CB), Normal Uplink Burst (NUB) BS: Normal Downlink Burst (TS1+2, TS1, and TS2) Synchronization Burst, PRBS with no training sequence

TETRA MEASUREMENTS

POWER	Average power across the useful part of the burst measured at the symbol points through a TETRA filter
Resolution	0.1 dB
Accuracy	±1.0 dB (±0.6 dB typical)

MODULATION ACCURACY	Modulation accuracy measures the displacement of symbol points from their ideal position
Range	20.0% RMS vector error 40.0% Peak vector error 20.0% Residual carrier
Resolution	0.1%
Accuracy	±0.5% at 10% error

BURST TIMING ERROR	Timing error relative to downlink results available for avg, max, min and worst case for a sample of up to 250 bursts
Range	±510.0 symbols
Resolution	0.01
Accuracy	±0.05 symbols
Timing offset range	±999.99 symbols

Frequency Error

Range	±500.0 Hz
Resolution	0.1 Hz
Accuracy	±15 Hz +frequency standard accuracy
BER Testing (TETRA MS T1 mode)	BER, MER and PUEM
BER Testing (TETRA MS mode)	BER, RBER and MER
BER Testing (TETRA BS T1 mode)	BER, MER and PUEM

GRAPHICAL DISPLAYS

Modulation & Power Analysis

Constellation	Line graph of the deviation at the symbol point.

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Distribution	Graph of the statistical distribution of the deviation at the symbol point. This is a graph of the deviation at the symbol point versus the percentage of occurrence of that deviation.
Eye Diagram	Graph of the demodulated signal versus time, synchronized with the symbol points. The number of symbol periods is selectable. Range is 2 to 16.
Power Over Time	Displays the power measurement of the received signal over a specified period of time; indicating the transmitter's stability.

GRAPHICAL DISPLAYS

POWER PROFILE DISPLAY	Display of power versus time for a complete burst or ramp up/ramp down intervals measured at the symbol points and displayed relative to a TETRA mask (TETRA limits or user defined) with pass/fail indication. Measured through a TETRA filter referenced (0 dB) to average power.
Dynamic Range	70 dB
Vertical Scale	2 dB/div or 0.1 dB/div in 1, 2, 5 steps
Accuracy	±1.0 dB (±0.6 dB typical) at symbol points for levels greater than -10 dB
CONSTELLATION DISPLAY	Polar display of amplitude versus phase at the symbol point measured over all symbols (SN0 ˜ SN max) through a TETRA filter. Also available as a rotated constellation display where all symbol point values are mapped to a single constellation point.
PHASE TRAJECTORY DISPLAY	Polar display of amplitude versus phase continuously measured over the duration (SN0 ˜ SN max) through a TETRA filter.
VECTOR ANALYSIS DISPLAY	Vector error (%), magnitude error (%), and phase error (degrees) measured at symbol points (SN0 ˜ SN max) through a TETRA filter.
Vertical Scaling	Vector error 0.1%/div to 20%/div in 1, 2, 5 steps Phase error ±0.1˚/div to ±20˚/div in 1, 2, 5 steps Magnitude error ±1.0%/div to ±20%/div in 1, 2, 5 steps

TETRA CHANNEL PLANS AND SIGNALLING

Channel Plans	TETRA 380-400 (0 Hz or 12.5 kHz offset) TETRA 410-430 (0 Hz, -6.25 kHz or 12.5 kHz offset) TETRA 450-470 (0 Hz or 12.5 kHz offset) TETRA 805-870 (0 Hz or 12.5 kHz offset) TETRA 870-921 (0 Hz or 12.5 kHz offset) No plan and user defined
System Identify	Mobile Country Code, MCC Mobile Network Code, MNC Base Color Code, BCC Location Area Code, LA
Signalling Functions	Mobile parameter control for SSI, GSSI, power class, receiver class Registration, test mode registration and de-registration Private (individual) call, group call, phone call, emergency call, user defined call (mobile terminated) Call timer and trunking type selection Cell-re-selection (requires two test sets and a power splitter) Short data service Status message and SDS types 1 to 4 call control (simplex calls) Power control and Frequency control Frequency handoff RF loopback control (TT) Display of mobile information Demodulated and channel decoded data Protocol history display Talk back, silence and test tone (1 kHz digitally encoded)

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Number	Description
91164	3920B Analog and Digital Radio Test Platform
Accessories Standard with the 3920B	
Front/Rear Cover	
2 X Adapter (BNC-F to TNC-M)	
Adapter (N-M to BNC-F)	
3900 Series Operation Manual (CD-ROM)	
Antenna (BNC) (450 MHz)	
Antenna (BNC) (800 MHz)	
Antenna (BNC) (150 MHz)	
3900 Series Getting Started Manual	
Warranty Packet, 2 Year	
2 X Fuse, 3 Amp, 250 V	
Power Cord (configuration for use in the UK)	
Power Cord (configuration for use in North America)	
Power Cord (configuration for use in Continental Europe)	
3-Wire (grounded) power cord	
Options	**Description**
83352	390XOPT051 Site Monitoring Application
83353	390XOPT054 IQ Gen Modulation (for IQ Creator waveforms)
83354	390XOPT055 Audio Analyzer
83390	392XOPT058 2.7 GHz Frequency Range Extension Option
83355	390XOPT059 Auto-Test II Analog
83356	390XOPT060 Harmonics & Spurious Measurements

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83357	390XOPT061 Tracking Generator
83358	390XOPT064 Analog Duplex Power Between Markers
92573	390XOPT067 POCSAG
84410	390XOPT090 Chinese GUI
83359	390XOPT110 TETRA MS (Mobile Station Testing)
83360	390XOPT111 TETRA BS (Base Station Testing)
83361	390XOPT112 TETRA DM (Direct Mode Testing)
83362	390XOPT114 TETRA Energy Economy Mode (Requires 390XOPT110)
85543	390XOPT115 Auto-Test II TETRA
83363	390XOPT200 P25 Conventional Operation (with DES OFB Type III)
83364	390XOPT201 P25 Trunking Operation VHF/UHF/700/800 MHz (Requires 390XOPT200)
83365	390XOPT204 LSM Generate and Receive/Analysis (Requires 390XOPT200)
83366	390XOPT206 P25 Control Channel Logger Option (Requires 390XOPT200)
83367	390XOPT207 SmartZone and SMARTNET Option (Requires 390XOPT200)
62377	390XOPT209 KVL Keyloader Option (Requires 390XOPT200)
83368	390XOPT210 Analog Simulcast Option (Requires 390XOPT055)
83369	390XOPT212 Explicit Mode Trunking (Requires 390XOPT200 and 390XOPT201)
83370	390XOPT213 Unit to Unit Call (Requires 390XOPT200, 390XOPT201, and 390XOPT212)
83371	390XOPT214 Adjacent Channel Broadcast Message (Requires 390XOPT200 and 390XOPT201)
83372	390XOPT215 Secondary Control Channel Broadcast Message (Requires 390XOPT200 and 390XOPT201)
83373	390XOPT218 Auto-Test II for P25 Radio Systems (Requires 390XOPT200)
83374	390XOPT219 X2-TDMA Test Suite (Requires 390XOPT200 and 390XOPT201) - (Available through Motorola Only)
90532	390XOPT220 Phase II Two-Slot Time Division Multiple Access Physical Layer (Requires 390XOPT200)
82566	390XOPT230 Off Air Monitor Software for P25 Message Logging - Protocol Analysis Tool (Requires 390XOPT200 and 390XOPT206)
67444	390XOPT240 P25 AES Encryption (Requires 390XOPT200)
83376	390XOPT245 X2-TDMA Mobile Emulator (Requires 390XOPT200, 390XOP201, and 390XOPT219) - (Available through Motorola Only)
83378	390XOPT250 Occupied Bandwidth for P25 (Requires 390XOPT200)
84412	390XOPT260 P25 Performance Test Triggers
83379	390XOPT261 X2-TDMA Advanced Test Suite - Combines 390XOPT219 and 390XOPT245 (Requires 390XOPT200 and 390XOPT201) - (Available through Motorola Only)
83380	390XOPT300 Motorola HPD Testing Option (Available through Motorola Only)
83381	390XOPT301 Motorola HPD Advanced Analysis Package (Available through Motorola Only)
83382	390XOPT302 Motorola HPD Testing Suite Combines 390XOPT300 and 390XOPT301
84423	390XOPT303 Auto-Test II for HPD Radio Systems (Requires 390XOPT300)

83383	390XOPT400 DMR (MOTOTRBO) ETSI 102-361
83384	390XOPT401 Auto-Test II for DMR Radio Systems (Requires 390XOPT400)
84413	390XOPT402 DMR XML Channel Logger Option (Requires 390XOPT400)
84414	390XOPT420 dPMR - ETSI 102-658
84415	390XOPT421 Auto-Test II for dPMR Radio Systems (Requires 390XOPT420)
90533	390XOPT422 dPMR Control Channel Logger Option (Requires 390XOPT420)
84416	390XOPT440 NXDN
84417	390XOPT441 Auto-Test II for NXDN Radio Systems (Requires 390XOPT440)
84418	390XOPT460 ARIB T98
84419	390XOPT461 Auto-Test II for ARIB T98 Radio Systems (Requires 390XOPT460)
83385	390XOPT600 Motorola ASTRO 25 Series Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
83386	390XOPT601 Motorola ASTRO Series Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
84422	390XOPT602 Motorola ASTRO 25 Series XTL Power Auto-Test/Alignment Software (Requires 390XOPT600, 390XOPT200, 390XOPT218, 392XOPT061, and AC24011)
83387	390XOPT603 TIA/EIA-603 Land Mobile Test Software (Requires 390XOPT059)
84421	390XOPT604 Motorola APX Series Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, 390XOPT061, and AC24011)
87372	390XOPT606 EF Johnson ES Series Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
87371	390XOPT607 BK DPHX5102X Series Radio Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
90946	390XOPT608 Kenwood P25 TK-5X10G Series Radio Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
89818	390XOPT610 MOTOTRBO Radio Auto-Test/Alignment Software (Requires 390XOPT400, 390XOPT401, and 390XOPT061)
90676	390XOPT611 Motorola TETRA MS Auto-Test (Requires 390XOPT110 and 390XOPT115; includes 390XOPT054 as standard)
90577	390XOPT614 Technisonics Type 1 Radio Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
90578	390XOPT615 Technisonics Type 2 Radio Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
90966	390XOPT616 Harris P7300, P5500 and XG-75 Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
91955	Harris P7300, P5500, XG75 Series ADVANCED Auto-Test/Alignment Software (Requires 390XOPT616, 390XOPT200, 390XOPT218, and 390XOPT061)
91705	390XOPT626 DMR Repeater Auto-Test Software (Requires 390XOPT400, 390XOPT401, and 390XOPT061)
91956	390XOPT627 KNG Command Series Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)

3920B Series Analog and Digital Radio Test Platform

91959	390XOPT630 Kenwood 5x20 Series Auto-Test/ Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
91960	390XOPT631 Kenwood NXDN Series Auto-Test/ Alignment Software (Requires 390XOPT440, 390XOPT441, and 390XOPT061)
112997	EF Johnson Viking Series Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218, and 390XOPT061)
Accessories for the 3920B	
63936	AC24009 DMM Test Leads for use with 392XOPT053 Category 3 rated
112277	AC24011 10 amp Current Shunt 0.01 Ohm
89243	AC25083 Case, Transit w/Wheels
10225	AC25012 Case, Soft Padded Carrying
67442	AC25013 Kit, 10/20 dB Pads, TNC
67411	AC25014 Scope Probe Kit
10456	AC25023 Front/Rear Cover
AC25027	Adapter (BNC-F to TNC-M)
10228	AC25059 Accessory Pouch
63928	AC25036 DC to AC Converter, 12 VDC to 110-120 VAC
9149	AC25042 Antenna (BNC) (50 MHz)
AC25043	Antenna (BNC) (450 MHz)
AC25044	Antenna (BNC) (800 MHz)
AC25045	Antenna (BNC) (150 MHz)
82556	AC25059 6 dB/150 Watts 1.5 GHz Attenuator
82557	AC25060 10 B/150 Watts 1.5 GHz Attenuator
58520	AC25061 50 ohm 250 Watt 5 GHz Termination
63927	AC25081 Site Survey Software
47293	AC4105 Return Loss Bridge (1.3 GHz)
64009	AC8645 Microphone
83482	CALFB392X Calibration Certificate
90323	5 U Rack Mount Kit
90322	6 U Rack Mount Kit
Extended Standard Warranties for the 3920B	
84349	W390X/203 Extended Warranty 36 Months
89738	W390X/204 Extended Warranty 48 Months
84351	W390X/205 Extended Warranty 60 Months
Extended Standard Warranties with Calibration for the 3920B	
84350	W390X/203C Extended Warranty 36 Months with scheduled calibration
89741	W390X/204C Extended Warranty 48 Months with scheduled calibration
84352	W390X/205C Extended Warranty 60 Months with scheduled calibration

For further information please contact:

Cobham AvComm
10200 W York Street
Wichita, KS 67215
USA
Tel: 1-316-522-4981
Fax: 1-316-524-2623

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