Wireless

3920 Series Analog and Digital Radio Test Platform

AEROFLEX
A passion for performance.

Featuring Advanced P25
Signal Analysis

New Generation PMR Test Platform

- 1 GHz Frequency Range standard
- 2.7 GHz Frequency Range available
- High performance FM/AM/SSB analog duplex features
- Sensitive receiver with built in pre-amp for off air measurements
- Low DANL Spectrum Analyzer with 8 markers
- Tracking generator
- Digital multimeter
- P25 advanced parametric/protocol analysis
- P25 Trunking (All bands)
- SmartNet™/ SmartZone™ Trunking (All Bands)
- DMR (MOTOTRBO™)
- HPD® (High Performance Data) base and mobile simulation
- TETRA mobile, base station and DMO tests
- IQ Generator
- Automatic Alignment Software for XTS-5000
- EIA/TIA-603 Land mobile radio test software
- Color coded Pass/Fail results
- Remote site monitoring application
- GPIB, Ethernet, USB and RS-232 interfaces
- Color display
- Software upgradeable in the field
- HP/Agilent 8920B remote emulation

The 3920 is the latest Radio Test Solution from Aeroflex for engineering, production and field service applications. The instrument provides a comprehensive range of general purpose analog measurement facilities as well as advanced digital test options for P25, TETRA and HPD® systems.

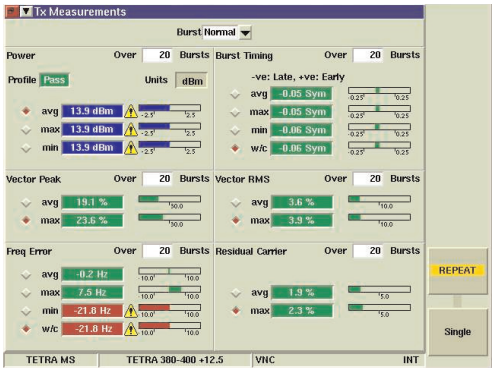
Standard features include:

- Full AM, FM and SSB test capabilities
- 5 MHz channel spectrum analyzer
- Full Span spectrum analyzer to 2.7 GHz (with option 392XOPT058)
- Dual-Channel oscilloscope to 4 MHz
- Full audio analysis for AF level, frequency, SINAD and distortion measurements
- Full RF parametric tests for power, frequency error, deviation (FM) and modulation index (AM)
- Three high accuracy audio modulators/function generators
- Three high accuracy audio baseband generators
- DTMF and DCS generators
- DTMF and DCS decode
- Encode and decode of tone remote, two tone sequential, and 5/6 tone formats
- Variable notch SINAD, distortion and SNR meters
- Color coded Pass/Fail meter functions for fast test capabilities
- Accurate broad band and in band power meters

The digital architecture of the 3920 delivers faster, accurate and more repeatable measurements than any of its predecessors and provides for future technology enhancements as new digital technology becomes available.

Combining the power of an onboard PC with a 30 GB hard-drive and Linux OS, the 3920 also supports USB mouse and keyboard interface for very easy operation as well as almost unlimited save/recall setups, saving time and effort.

The 3920 features easy to read meters with Pass/Fail color coding for instant Go/NoGo testing. With these easy to configure meters, the user can set up unique Pass/Fail parameters for each radio type that is being tested. 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.



Tx Measurements Tile Maximized, Showing Green, Red and Blue Indications

The 3920 provides a flexible platform for almost any application. Each of the modes of operations can be enhanced with optional applications and features. In addition, optional system personalities allow the 3920 to be completely reconfigured "on the fly" to provide advanced tests for analog and digital systems.

High Performance Standard Features:

Wide Frequency Range: The 3920 includes two variants. The 3920 comes standard with continuous frequency coverage from 10 MHz (usable down to 100 kHz) to 1 GHz. Option 392XOPT058 extends the maximum frequency to 2.7 GHz.

Broadband RF Power: Direct input of signal power of up to 125 W is supported, making the 3920 compatible with virtually all practical requirements for mobile terminal and base station test.

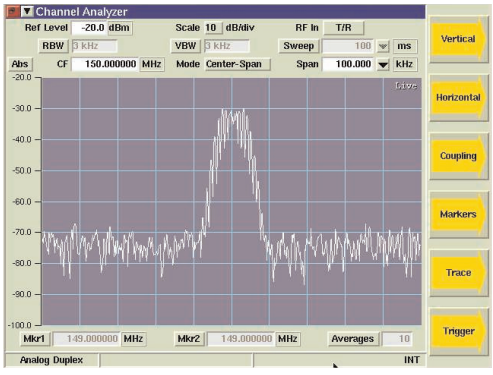
Inband Low Level RF Power Measurements: For sensitive measurement, e.g. off-air analysis, a low power input is provided via the antenna input port. This low level input gives the user the ability to measure an off the air signal as low as -100 dBm or -115 dBm with the internal pre-amp selected.

High Stability Time Base: With a 0.01 ppm OCXO frequency standard, the 3920 provides ultra-reliable RF frequency measurements.

0.6 dB Accurate (Typical) RF Generators: 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 3920 provides consistent results in testing receiver parameters.

Full Span Spectrum Analyzer: View signals from 1 MHz to 1 GHz standard with the 3920 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 3920 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.

Channel Analyzer: The channel analyzer makes it possible to monitor a 5 MHz spectral window around the carrier while simultaneously demodulating the signal. This allows the spectrum around the carrier to be analyzed while the device under test is participating in a call.



Channel Analyzer Tile Maximized

Dual-Channel 4 MHz Oscilloscope: High performance base band analysis of audio and digital signals can be performed easily and accurately.

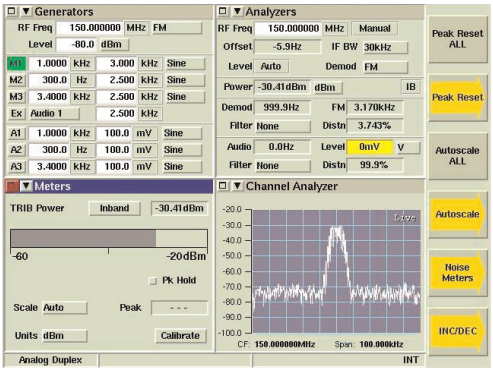
High Performance Audio Features: With high accuracy audio generators from 1 mV to 8 V rms, the 3920 provides level accuracy to ±1% of the setting. The audio generator frequency ranges from 20 Hz to 40 kHz with 50 ppm accuracy (10 ppm typical) and 0.1 Hz resolution provides solid audio performance for audio testing. The AF Counter features full range from 20 Hz to 20 kHz .

Speed: Measurement speed is directly related to processing power and internal communications. The 3920 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 Mbytes/s, 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.

Input and Output Capability: The 3920 provides a high degree of connectivity. Instrument remote control for automated testing is provided using GPIB and supports connection to a remote server via Ethernet. Connection of printers and other peripherals is supported including keyboard, mouse and external monitor connection to provide expansion of the instrument user interface. Triggering and synchronization interfaces are provided for measurement, along with configurable single-port and dual-port duplex RF input/output and analog audio/modulation I/O.

Ease of Use: Whether using the 3920 manually, remotely or in Auto-Test II mode, the user interface is intuitive, logical and accessible. The instrument uses a tiled graphical display, which can be controlled by the front panel keypad or an external mouse. Tiles can be viewed

in their full-detail maximized state or the minimized state which shows key details and allows active tiles to be viewed at the same time for maximum information display.



3920 Tiled Graphical Users Interface

The color display produces a bright and sharp daylight readable image that can be output to an external monitor. Color coded fields are used to simplify testing and graphical traces utilize color to clearly identify limit line and measurement traces.

Remote Control: The 3920 supports remote control via GPIB for automated test system control. A VXI pnp VISA driver allows easy test system integration of the 3920. In addition to a native 3920 command set, the 3920 Series also supports commands for the HP/Agilent 8920B that allows migration from the 8920B to the 3920 extremely easy.

Remote Operation: Use of the 3920 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 and remotely operate the front panel of the 3920 from virtually anywhere on the planet. All that is needed is the ability to access the unit's IP address.

Cost of Ownership: To manage through life costs, the 3920 comes with a standard 2-year warranty. Users can also purchase a 36 or 60 month warranty period extension with or without scheduled calibration. On request Aeroflex can provide customized premium warranty support designed around your specific needs.

Optional Application Software and Special Features Enhance Test Capabilities

Site Monitoring Application (390XOPT051)

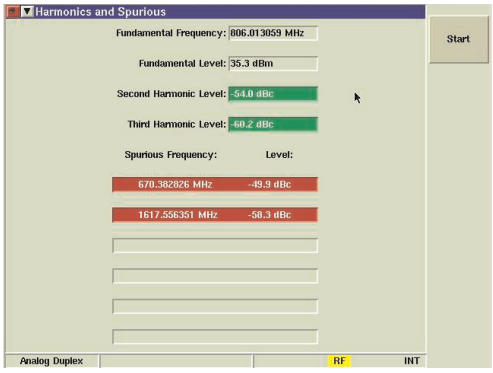
The 3920 brings impressive new capabilities to site monitoring applications. With option 392XOPT051, the user now has the ability to leave the 3920 on-site while the unit provides automated data logging of the site's effective receiver sensitivity. When connected to a good documented receiver (a "golden" radio), the 3920 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 3920'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. The 3920 provides the user with the ability to recall the ERS point at given intervals, as well as spectral data at each of the sample points to view interferes that may be present at one particular time, but not another (for example: 2AM).

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 3920 and used as the modulation source in the Analog Duplex System.

Harmonics and Spurious (390XOPT060)

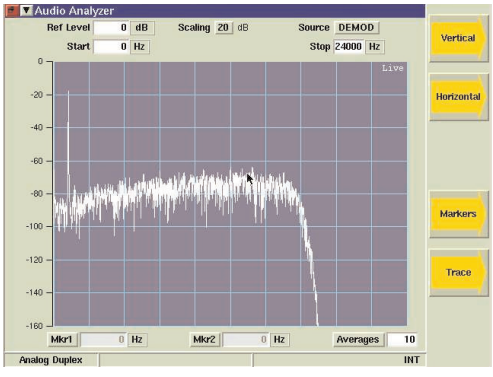
An option for the 3920 is the ability to quickly and accurately measure the harmonics and spurious of the transmitter of a radio. The fundamental frequency is automatically detected and measured and then the second and third harmonics are measured and compared. In addition, the spurious signals that are higher than the configured level are identified and displayed.



Harmonics and Spurious Tile

Audio Analyzer (390XOPT055)

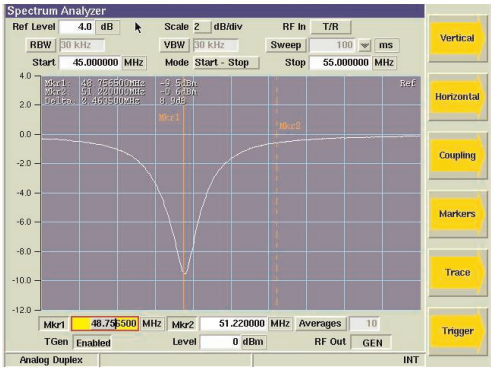
With 3920OPT055, the 3920 Series provides audio spectral analysis of the recovered audio signal, either from the audio inputs or from the demodulated RF signal. This feature allows users to view frequency amplitude in relation to other audio frequencies, and to isolate problems such as noise in audio circuits.



Audio Analyzer Tile Maximized

Tracking Generator (390XOPT061)

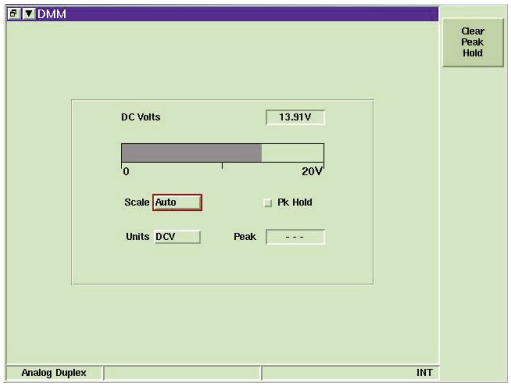
Now available as an option to the spectrum analyzer, the 3920 tracking generator allows the user to look at the response of a duplexer, filter bank or other RF device on the spectrum analyzer. When used with the optional return loss bridge (AC4105), the spectrum analyzer/tracking generator can measure the return loss of an antenna or cable (see screen below).



Spectrum Analyzer with Tracking Generator

Digital Multimeter (392XOPT053)

New for the 3920 is the Digital Multimeter option, number 3920OPT053. With this option come three new ports on the front panel that are used for measuring AC/DC volts, AC/DC amps, and OHMS.

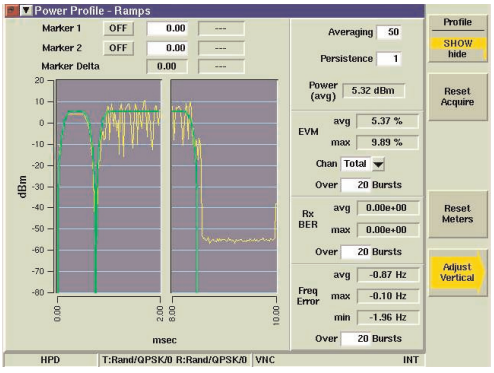


Digital Multimeter Tile Maximized

OPTIONAL SYSTEM PERSONALITIES

With analog duplex featured as standard, the 3920 can support a number of optional test systems installed concurrently. Personalities include:

- TETRA digital trunked radio systems for mobile terminal and base station testing, TETRA direct mode
- HPD® (High Performance Data)
- APCO P25 Conventional and Trunked radios.
- DMR (Digital Mobile Radio) (MOTOTRBO™)
- Smartnet™ / Smartzone™



HPD® Power Profile - Ramps Tile Maximized

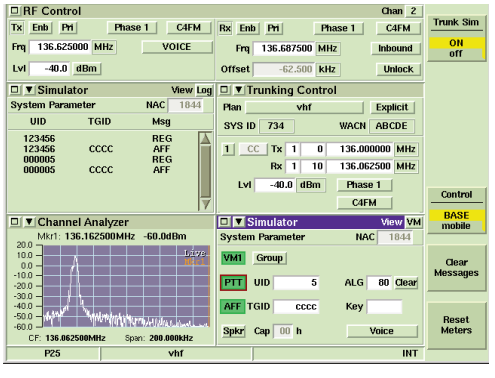
P25 CONVENTIONAL OPERATION (390XOPT200)

- C4FM modulation fidelity and symbol deviation meters
- Power, frequency error and TX BER meters
- Symbol clock error meter
- Eye diagram showing transitional diagram and points to the C4FM frequency states
- Constellation plot
- C4FM symbol deviation distribution plot
- Full TIA/EIA-102 test patterns (STD1011, CAL, SILENCE, etc…) as specified by TIA- EIA-102-CAAA-C
- Decode data
- DES encryption
- IMBE vocoder
- Voice channel digital data display

The 3920 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. An IMBE vocoder enables the user to perform transmit and receive audio testing.

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

To further enhance P25 operation, the addition of the P25 Trunking option allows site 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 log the messages sent by the radio under test and allows the 3920 to simulate a virtual mobile configured to talk to the radio under test.



P25 Trunking Simulation with Virtual Mobile

Explicit Mode Trunking (390XOPT212)

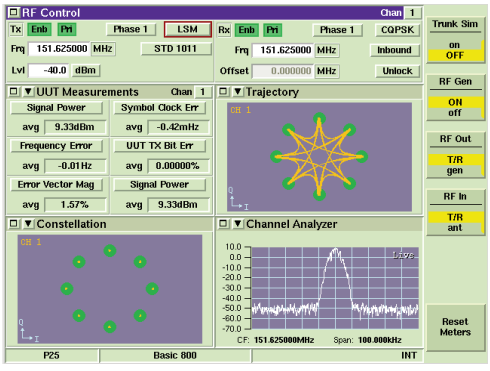
The advanced form of frequency channel assignment known as Explicit Messaging is supported by adding option 390XOPT212 to the P25 Trunking Operation VHF/UHF/700/800MHz option. The explicit mode of operation assigns the actual channel/frequency over the air by providing the exact TX and RX frequency assignments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

P25 AES Encryption (390XOPT240)

With the addition of this option, the 3920 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 key-pad, 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.

LSM Generate and Receive/Analysis (390XOPT204)

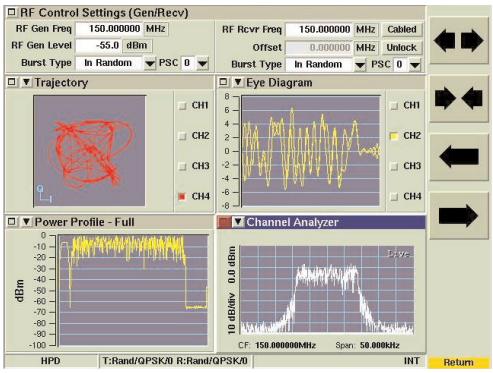
Now available in the 3920 is the capability to generate and receive Linear Simulcast Modulation (LSM). This option, available as an extension of P25 conventional operation, enables measurements that are specific to LSM. It also adds a graphical analysis of the demodulated LSM signal that is normally 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.



LSM Signal Analysis screen

MOTOROLA HPD® TESTING OPERATION (390XOPT300)

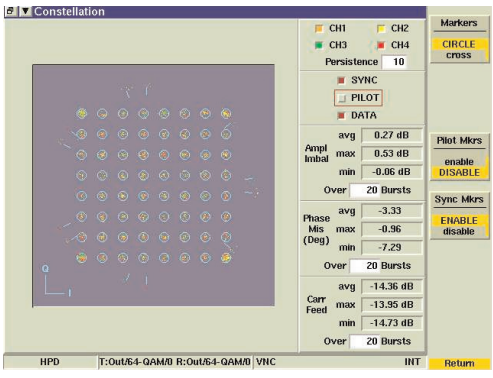
- Generate/receive HPD® signals
- Modulation - 64QAM, 16QAM and QPSK (Inbound and Outbound)
- Transmitter parameters including signal power, frequency error, EVM
- Symbol clock error, RX BER, burst timing error and occupied bandwidth
- I & Q modulation analysis including constellation and trajectory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



Example of HPD® Tiles

Aeroflex 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 3920 HPD® options 390XOPT300 and 390XOPT301 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). More advanced test 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.



HPD® Constellation Tile Maximized

SmartNet™/SmartZone™

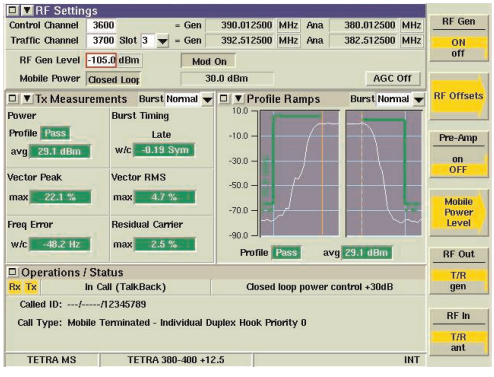
This option (390XOPT207) provides support for Motorola Astro SmartNet™/SmartZone™ systems, including support for rebanded channels in the 800MHz band.

DMR (Digital Mobile Radio)

Add advanced testing capability for DMR (Digital Mobile Radio) with 390XOPT400. Ths option enables the Aeroflex 3920 Series Digital Radio Test Set to test and align a wide range of DMR radios. DMR radio technology is a new digital radio format offering advanced communications features specified by the ETSI technical standard 102-361. DMR technology is currently under development or being released by a number of OEM radio manufacturers, and includes Motorola's new MOTOTRBO® technology.

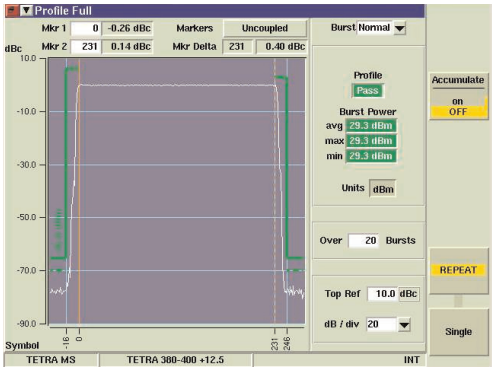
TETRA

- 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)

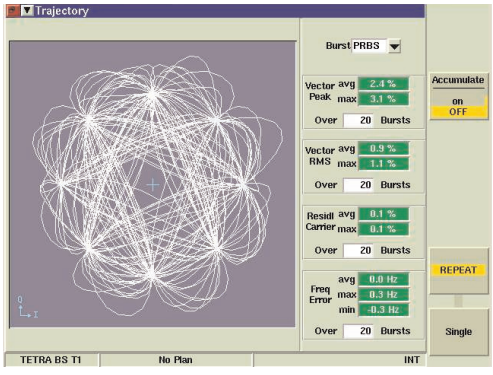


Example of TETRA MS Tiles

For TETRA applications, the 3920 is the successor to the Aeroflex 2968 TETRA Radio Test Set, the 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 3920 with the TETRA options provides the world's best solution for testing TETRA radios. TETRA system options provide signaling 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. Signaling 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 3920 offers high speed measurement capabilities to expedite production testing. As a direct benefit of high power signal processing capacity, TETRA measurements are performed nearly 9 times faster than its predecessor.



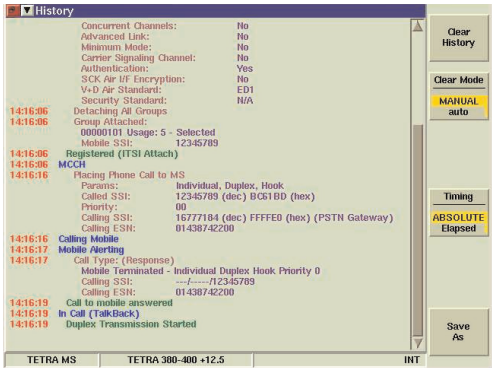
Profile Full Tile Maximized



TETRA Trajectory Tile Maximized

Call Processing Highlights

The 3920 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 3920 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 3920 which can then perform BER/MER/ PUEM measurement. In the BS T1 application, the 3920 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 RBER 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 3920 also supports the testing of Direct Mode Operation. The 3920 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.

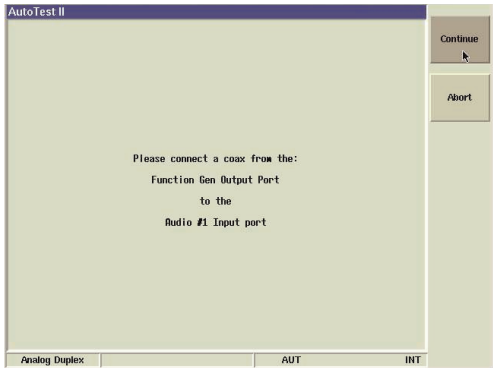
TETRA Energy Economy Mode (390XOPT114)

This optional mode of operation provides protocol signaling 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 signaling 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

- Develop automated tests for AM/FM and P25 systems
- Design your own Graphical User Interface
- Uses TCL scripting language
- Utilizes the full set of 3920 RCI commands

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



Example of Auto-Test II Display

XTS-5000 Auto Alignment (390XOPT600)

Validate radios faster than ever with ease. Connect a single cable, press "Test and Align" and you are free to do more important things. This application is self contained within the 3920 and automatically performs the functions of radio alignment and verification to ensure optimal radio performance. Tests and aligns radios in as little as 6 minutes.

Alignments

- Reference Oscillator
- High Power
- Mid Power
- Low Power
- Deviation Balance
- Deviation Limiting
- Front End Alignment (700/800 MHz band only)

Performance tests

- P25 Modulation Fidelity
- P25 Symbol Deviation
- P25 RX BER

Supports the following radios:

Portables: XTS-5000, XTS-2500, XTS-1500, XTS-4000, SSE-5000, MT-1500

Mobiles: XTL-5000, XTL-2500, XTL-1500

Note: Power alignment is available for Portable radios only.

LMR Auto-Test (390XOPT603)

Validate radios faster than ever with ease. This application is self contained within the 3920 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.

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.

SPECIFICATION

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 -30.0 dBm

Duplex: -130.0 to +10.0 dBm (+10 dBm max for CW or FM; 0 dBm max for complex modulation)

Resolution

0.1 dB

Accuracy (for level > -110 dBm)

T/R port: ±1.0 dB (Typical better than ±0.6 dB)

GEN port: ±1.0 dB (Typical better than ±0.6 dB)

SPECTRAL PURITY

Residual FM

<15 Hz (300 Hz to 3 kHz bandwidth)

Residual AM

<0.1% RMS (300 Hz to 3 kHz bandwidth)

Harmonics

<-34 dBc (Typically -40 dBc, RF level set at +10 dBm)

Non-Harmonics

<-55 dBc (all freq. except crossovers)

<-35 dBc (Crossover freq. = 3411.4 MHz - Gen freq.)

Phase Noise

<-93 dBc/Hz (20 kHz offset, RF <1.05 GHz)

<-90 dBc/Hz (20 kHz offset, RF >1.05 to 2.7 GHz)

MODULATION

INTERNAL FM

RF Range

10 MHz to 1.05 GHz (standard) (Usable from 100 kHz)

10 MHz to 2.7 GHz (390XOPT058) (Usable from 100 kHz)

Deviation

±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 15 kHz

Waveform

Sine, Square, Triangle, Ramp, Digital Coded Squelch, DTMF, Two Tone Sequential, Tone Remote, ZVEI1, ZVEI2, ZVEI3, PZVEI, DZVEI, PDZVEI, CCIR1, CCIR2, PCCIR, EEA, EUROSIG, NATEL, EIA, MODAT

THD

<1% (1 kHz rate, 6 kHz deviation, 300 Hz to 3 kHz BW)

INTERNAL AM

RF Range

10 MHz to 1.05 GHz (standard) (Usable from 100 kHz)

10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)

Modulation Range

0 to 100%

Accuracy

1% (Modulation from 10% to 90%)

Resolution

0.1%

Rate

20 Hz to 15 kHz

Waveform

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

THD

<1% (1 kHz rate, 30 to 70% AM, 300 Hz to 3 kHz BW)

INTERNAL SINGLE-SIDEBAND (SSB)

RF Range

10 MHz to 1.05 GHz (standard) (Usable from 100 kHz)
10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)

Modulation Selection

Upper SideBand (USB) or Lower SideBand (LSB)

Modulation Range

0 to 100%

Resolution

0.1%

Rate

300 Hz to 3 kHz

Waveform

Sine, Square, Triangle, Ramp, Digital Coded Squelch

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 max mod 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 I-Q (OPTIONAL)

RF Range

10 MHz to 1.05 GHz (standard) (usable from 100 kHz)

10 MHz to 2.7 GHz (392XOPT058) (usable from 100 kHz)

Modulation

IQCreator® file downloads for custom I-Q modulation

RF RECEIVE MEASUREMENTS

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)

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)

SELECTIVITY

IF Bandwidth

6.25, 8.33, 10, 12.5, 25, 30, 100, 300 kHz filters

DEMOD OUTPUT LEVEL

FM

2.5 Vrms ±10% (for deviation ±½ of selected BW; 25 kHz BW same output level as 30 kHz BW)

AM

3.0 Vrms ±10% (for 100% AM)

RF COUNTER

FREQUENCY

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)

T/R port: -10 to +50 dBm (Find level is selectable)

ANT port: -60 to +10 dBm (Find level is selectable)

RF POWER METER (BROAD BAND)

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

100 mW to 125 W (Usable from 10 mW)

Resolution

4 digits for W or 0.1 dB

Accuracy

10%, ±1 digit

Power Measurement Range

T/R port: 100 mW to 125 W (25% on/off ratio)

RF POWER METER (IN BAND)

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

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).

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

Resolution

0.1 dB

Accuracy (after user calibration, Preamp OFF)

±1 dB (Input level above minimum for selected BW (display not yellow); typically better than ±0.6 dB)

RF ERROR METER

Counter Range

0 to ±2.5 MHz from receiver frequency (6 MHz IF BW)

Accuracy

Frequency standard ±1 count

Resolution

1 Hz

Level

T/R port: -10 to +50 dBm

ANT port: -60 to +10 dBm

DEMODULATION METERS

DEMOD COUNTER

FREQUENCY

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 ±1 count (±10 ppm typical)

Input Waveform

Sine or Square

RF CHARACTERISTICS

Input RF

10 MHz to 1.05 GHz (standard) (Usable from 100 kHz)

10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)

RF Level

T/R port: -10 to +50 dBm

ANT port: -80 to +10 dBm

FM DEVIATION METER

Range

0 to 150 kHz

Scales

1 to 200 kHz in a 1, 2, 5 sequence, plus auto-scale

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 CHARACTERISTICS

Rate

20 Hz to 20 kHz (IF BW set appropriately for the received modulation BW)

RF Range

10 MHz to 1.05 GHz (standard) (Usable from 100 kHz)

10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)

RF Level

T/R port: - 10 to +50 dBm

ANT port: -80 to +10 dBm

AM METER

Range

0 to 100%

Scales

1 to 100% in a 1, 2, 5 sequence, plus auto-scale

Resolution

0.1%

Accuracy

±3 % + source residual, ±1 count (30 to 90% AM, IF BW set appropriately for the received modulation BW)

AM CHARACTERISTICS

Rate

20 Hz to 15 kHz (IF BW set appropriately for the received modulation BW)

RF Range

10 MHz to 1.05 GHz (standard) (Usable from 100 kHz)

10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)

RF Level

T/R port: -10 to +50 dBm

ANT port: -80 to +10 dBm

AUDIO FUNCTION GENERATOR(S)

Up to 3 function generators can be combined into 1 output signal.

WAVEFORM

Sine, Square, Triangle, Ramp, Digital Coded Squelch, DTMF, Two Tone Sequential, Tone Remote, ZVEI1, ZVEI2, ZVEI3, PZVEI, DZVEI, PDZVEI, CCIR1, CCIR2, PCCIR, EEA, EUROSIG, NATEL, EIA, MODAT

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 15 kHz)

Resolution

0.1 Hz

Accuracy

±50 ppm ±1 count max, ±10 ppm typical

LEVEL (SINE)

Range

1 mV to 5V RMS into a 10 kload

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 40 kHz, 100 mV to 5 Vrms, 80 kHz BW, 10 kΩ load, Sine)

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, ±1 count, ±10 ppm typical

Waveshape

Sine or square

SIGNAL CHARACTERISTICS

Level

10 mV to 30 Vrms (Audio 1 or Audio 2)

AF LEVEL METER

Input

Audio 1 or 2

Range

0 to 30 Vrms

Resolution

Volts: 1 mV (input < 1 V),

10 mV (input = 1 V)

dBr, dBV, dBm: 0.01 dB

Scales

Volts: 20 mV to 50 V in a 1, 2, 5 sequence plus Auto

dBr: 1 dBr to 100 dBr in a 1, 2, 5 sequence plus Auto

dBV: -40, -20, 0, 20, 40 dBV plus Auto

dBm: -30, -20, -10, 0, 10, 20, 30, 40 dBm plus Auto

Frequency

20 Hz to 20 kHz

Accuracy

5% (Unbalanced, Hi-Z, 300 to 3 kHz, 0.1 to 30 Vrms)

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)

SIGNAL CHARACTERISTICS

Signal Frequency

300 Hz to 5 kHz (Entry Range - 0 Hz to 24,000 Hz)

Signal Level

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)

SIGNAL CHARACTERISTICS

Signal Frequency

300 Hz to 5 kHz (Entry Range - 0 Hz to 24,000 Hz)

Signal Level

0.1 to 30 Vrms

Filter	*Type*	*Ripple*	*-1 dB*	*-60 dB*
NONE	No Filter	<±0.2 dB, above 20 Hz	20 kHz	24 kHz
300 Hz	Low-Pass	<0.2 dB, above 20 Hz	400 Hz	800 Hz
5 kHz	Low-Pass	<0.2 dB, above 20 Hz	5 kHz	5.4 kHz
15 kHz	Low-Pass	<±0.2 dB, above 20 Hz	16.5 kHz	18 kHz
20 kHz	Low-Pass	<±0.2 dB, above 20 Hz	20 kHz	21 kHz
0.3 to 3.4 kHz	Band-Pass	<0.2 dB	200 Hz / 3.7 kHz	80 Hz / 4.4 kHz
0.3 to 5 kHz	Band-Pass	<0.2 dB	200 Hz / 5 kHz	80 Hz / 5.4 kHz
0.3 to 15 kHz	Band-Pass	<±0.2 dB	200 Hz / 16.5 kHz	80 Hz / 18 kHz
0.3 to 20 kHz	Band-Pass	<±0.2 dB	200 Hz / 20 kHz	80 Hz / 21 kHz
PSOPH C-MSG Spec	Band-Pass	Per C-MSG Spec	Per C-MSG Spec	Per C-MSG
PSOPH CCITT	Band-Pass	Per CCITT Spec	Per CCITT Spec	Per CCITT Spec
300 Hz	High-Pass	<0.2 dB	200 Hz	80 Hz

HUM AND NOISE

Modes

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

Meter Range

-100 dB to 0 dB

Resolution

0.01 dB

Accuracy

± 1 dB, ± 1 count (> -60 dB, £ -20 dB)

Signal Frequency

300 Hz to 5 kHz (Entry Range - 0 Hz to 24,000 Hz)

Audio Input Signal Level (Mode 1)

0.1 to 30 Vrms

RF Level Input (Mode 2)

T/R Port: - 10 to +50 dBm

ANT Port: -80 to +10 dBm

SIGNAL-TO-NOISE RATIO (SNR)

Modes

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

Meter Range

0 to 60 dB

Resolution

0.01 dB

Accuracy

± 1 dB, ± 1 count (>3 dB, £ 40 dB, 5 kHz LP AF Filter)

Signal Frequency

300 Hz to 5 kHz (Entry Range - 0 Hz to 24,000 Hz)

Audio Input Signal Level (Mode 1)

0.1 to 30 Vrms

RF Level Input (Mode 2)

T/R Port: - 10 to +50 dBm

ANT Port: -80 to +10 dBm

ANT Port: -80 to +10 dBm

AUDIO FILTERS (CHARACTERISTIC RESPONSE)

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

Frequency Accuracy

Same as frequency standard

Span

Span mode: start/stop, center/span and zero span

Span width: 2 kHz to full span

Display Accuracy

Span accuracy + frequency accuracy + 50% of RBW

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)

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, dBµV, dBmV

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

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) -140 dBm with pre-amp enabled

RESOLUTION BANDWIDTH

RBW Selections

300 Hz, 3 kHz, 30 kHz, 60 kHz, 300 kHz, 6 MHz

RBW 60 dB/3 dB 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

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

SWEEP

Frequency Sweep Time

100 mS to 100 S in 1 ms increments

Zero Span Sweep Time

50 mS to 100 S in 1 ms increments

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

2

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

TRACKING GENERATOR OUTPUT

Refer to RF SIGNAL GENERATOR section for:

Frequency range and accuracy

Output level range, resolution and accuracy at center frequency

Spectral purity

CENTER FREQUENCY, SPAN, SWEEP TIME

Same as Spectrum Analyzer

TRACKING GENERATOR CONTROLS

Output port selection

RF level

Reference cal

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

FREQUENCY STANDARD I/O

INTERNAL FREQUENCY STANDARD OUTPUT (OCXO)

Frequency

10 MHz (nominal)

Output Level

1 Vpp (nominal) into 50 Ω

Temperature Stability (0 to 50 degrees 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)

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

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

HARMONICS AND SPURIOUS (OPTIONAL)

HARMONIC LEVEL

Range

0 to -60 dBc

Resolution

0.1

Accuracy

Same as spectrum analyzer

SPURIOUS LEVEL

Range

0 to -60 dBc

Resolution

0.1

Accuracy

Same as spectrum analyzer

P25 (OPTIONAL)

P25 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

LEVEL

Range

T/R Port: -130.0 to -40.0 dBm

Gen Port: -130.0 to +0.0 dBm

Resolution

0.1 dB

Accuracy (for level > -110 dBm & Frequency > 10 MHz)

T/R Port: +/- 1.0 dB (Typical better than +/- 0.6 dB)

GEN Port: +/- 1.0 dB (Typical better than +/- 0.6 dB)

Modulation

C4FM, CQPSK, LSM

Test Patterns

STD 1011, STD CAL, STD SILENCE, STD INTFR, STD BUSY, STD IDLE, STD 511 (O.153), STORED SPCH, VOICE, 1011, SILENCE

P25 RECEIVER

Frequency

10 MHz to 1.05 GHz (standard) (Usable from 100 kHz)

10 MHz to 2.7 GHz (392XOPT058) (Usable from 100 kHz)

RF Level

T/R Port: -10 to +50 dBm

ANT Port: -60.0 to +10 dBm (with preamp -63)

RECEIVER MEASUREMENTS

Modulation Fidelity

Range

0% to 15%

Resolution

0.01%

FREQUENCY ERROR

Range

⑥4000 Hz

Resolution

0.01 Hz

UUT TX Bit Error Rate

Range

0% to 50%.

Resolution

0.00001%

SYMBOL CLOCK ERROR

Range

⑥ 1000 mHz

Resolution

0.01 mHz

BROADBAND POWER

Level

100 mW to 125 W (Usable from 10 mW)

Resolution

4 digits for W or 0.1 dB

Accuracy

10%, ±1 digit

Power Measurement Range

T/R port: 100 mW to 125 W (25% on/off ratio)

SIGNAL POWER

Level

T/R port: -60 to +51 dBm

ANT port: -100 to +10 dBm

Resolution

0.1 dB

Accuracy (after user calibration, Preamp OFF)

±1 dB (typically better than ±0.6 dB)

MOD ACCURACY DISPLAYS

Distribution

Graph of the statistical distribution of the deviation at the symbol point. This graph not only shows the deviation at the symbol point, but shows the relative occurrence of that deviation.

Constellation

Symbol deviation display

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

Voice Frame

Frame #, NAC, DUID, KEY, ALG, MI, RAW, LCO, Protect, SF, EMG, LSD, STS 1, STS 2

CONVENTIONAL MODE SIMULATION

NAC, Call Type, TGID, UID, Alg ID, Key ID

PHASE 1 TRUNKING SIMULATION

System Plan Configuration

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)

DIGITAL MULTIMETER (OPTIONAL)

AC / DC VOLTMETER

Full Scale Ranges

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% FS ± 1 count

AC - ± 5% FS ± 1 count

AC Volts Frequency Range

50 Hz to 20 kHz

AC / DC AMMETER

Full Scale Ranges

20 mA, 200 mA, 2 A, 20 A, Auto

(20 A range uses external shunt connected to Voltmeter)

Maximum Open Circuit Input Voltage

30 V RMS referenced to COMMON or EARTH GROUND, Category I

Resolution

3-½ digits (2000 counts)

Accuracy

DC - ± 5% FS ± 1 count

AC - ± 5% FS ± 1 count

AC Volts Frequency Range

50 Hz to 10 kHz

OHMMETER

Full Scale Ranges

200 ohms, 2 kohms, 20 kohms, 200 kohms,

2 Mohms, 20 Mohms, Auto

Resolution

3-½ digits (2000 counts)

Accuracy

±5% FS ±1 count

INPUT/OUTPUT CONNECTORS

ANT (RF INPUT)

Connector Type

TNC

Function

Receiver input (input port)

Impedance

50 Ω (nominal)

VSWR (with Att ≤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 OUTPUT)

Connector Type

TNC

Function

Generator high-level output (output connector)

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 (input/output connector)

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. Recommend 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, RJ-45 100/10 Mbit/s

Function

10/100 Base-T network connection

VIDEO

Connector Type

15-pin, D-sub, VGA

Function

VGA for external monitor

MIC/ACCESSORY

Connector Type

8 position, female DIN

Function

Microphone connection, modulation input, demod output

PARALLEL PORT

Connector Type

25 position, female D-sub

Function

Printer interface

USB

Connector Type

Twin USB standard connection

Function

USB Version 1.1 interface

TEST PORT

Connector Type

15 position, female 3 tier D-sub

Function

Programmable I/O and voltage output (optional interface)

POWER REQUIREMENTS

AC

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

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)

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 EN61329, Class A

RELIABILITY

> 8,000 hour calculated MTBF

SAFETY STANDARDS

UL 61010B-1

EN 61010-1

CSA C22.2 No. 61010-1

DIMENSIONS AND WEIGHT

Height	Width	Depth
19.7 cm (7.7 in.)	35.6 cm (14.0 in.)	52.0 cm (20.5 in.)

Weight

16.5 kg (36.8 lbs.)

SYSTEM CONFIGURATION

The following information is provided to help the user understand what instruments are available on the 3920 Digital Radio Test Set.

AVAILABLE 3920 SYSTEMS

TETRA SYSTEMS (All TETRA systems are optional)

Available Options

Option 110 - TETRA MS (Mobile Station) and TETRA MS T1 - Compatible with software versions 1.0 and higher

Option 111 - TETRA BS (Base Station) and TETRA BS T1 - Compatible with software versions 1.0 and higher

Option 112 - TETRA DM (Direct Mode) A
Compatible with software versions 1.2 or higher

ANALOG SYSTEMS (Analog functions are provided as standard, but have options available under analog configuration.)

Option 051 - Remote Site Monitoring Application - Compatible with-software versions 1.1 and higher

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

User defined

System Identity

Mobile Country Code, MCC

Mobile Network Code, MNC

Base Color Code, BCC

Location Area Code, LA

Test Modes

Manual test/Auto-Test MS (see Auto-Test)

Manual Test Signaling Functions (TETRA MS mode only)

Protocol functions are compatible with TIP compliant mobiles.

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 4call control (simplex calls)

Power control

Frequency control

Frequency handoff

RF loopback control (TT)

Display of mobile information

Demodulated and channel decoded data

Protocol history display

Subjective mobile audio tests

Talk back, silence and test tone (1 kHz digitally encoded)

TETRA MEASUREMENTS

TETRA RECEIVER MEASUREMENTS

TETRA MS T1 mode, TETRA MS mode, TETRA BS T1 mode (T1 loop-back, TT loopback BER, MER, PUEM, RBER, with pre-set/user defined limit checking, subjective audio testing, (TETRA MS mode), audio talk-back, test tone, silence)

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

SINAD Meter

Same as platform specifications. Not available in direct mode (DM)

TETRA TRANSMITTER MEASUREMENTS

RF power, RF power profile, burst timing, error vector magnitude, frequency error, residual carrier each with pre-set/user defined result limit checking

Input Range

T/R: -40 dBm to + 40 dBm
Ant: -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 RF POWER METER

Average power across the useful part of the burst measured at the symbol points through a TETRA filter. Results available for avg, max and min for a sample of up to 250 bursts

Units

dBm/W

Resolution

0.1 dB / 1 mW

Indication

Numerical value, bar chart and progress indicator

Accuracy

±1.0 dB (±0.6 dB typical)

Level Offset Range

±40.0 dB

TETRA RF POWER PROFILE

(see graphical displays)

BURST TIMING ERROR (MS/MS T1 ONLY)

Timing error relative to downlink results available for avg, max, min and worst case for a sample of up to 250 bursts

Range

±510.00 symbols

Indication

Numerical value, bar chart and progress indicator

Accuracy

±0.05 symbols

Timing offset range

±999.99 symbols

MODULATION ACCURACY

Modulation accuracy measures the displacement of symbol points from their ideal position. Results available for avg. and max for a sample of up to 250 bursts

Modulation Error Range

20.0% RMS vector error

40.0% Peak vector error

20.0% Residual carrier

Indication

Numerical value, bar chart and progress indicator

Accuracy

±0.5% at 10% error

FREQUENCY ERROR

Frequency error is the error relative to the expected frequency.

Results available for avg., max, min and worst case for a sample of up to 250 bursts

Frequency Error Range

±500.0 Hz

Indication

Numerical value, bar chart and progress indicator

Accuracy

±15 Hz + frequency standard accuracy

GRAPHICAL DISPLAYS

BAR CHARTS

Display of average, max, min and worst case values as appropriate with progress bar. Bar chart is color coded to indicate pass, fail low, fail high or accumulating.

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. Displayed profile and pass/fail indication are available as the average for a sample of up to 250 bursts. (N.B. multiple burst averaging is NOT available for the other graphical displays, only for the power profile).

Power Profile Dynamic Range

70 dB

Vertical Scale

20 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 DISPLAYS

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 ±0.1 %/div to ±20 %/div in 1, 2, 5 steps

Display Features

Optimized/maximized

Trace re-fresh or accumulate

Limit lines/checking

Display Mode

Single/repeat

Symbol Markers

Mkr 1 and Mkr 2 plus Mkr Delta, coupled/uncoupled (not available on phase trajectory and constellation displays)

TETRA SIGNAL GENERATOR

Specification as per platform specification unless otherwise stated

TETRA MODULATION

π/4 DQPSK, 18 k symbols/sec, TETRA filter, (RRC with <= 0.35)

Level

T/R Port -130 dBm to -40 dBm

Gen Port -130.0 dBm to 0 dBm

Accuracy

±1.0 dB

Vector Error

<3% RMS

<6% peak

Residual Carrier Power

<-35 dBc

Data TETRA MS mode

Main Control Channel (MCCH) Traffic Channel (TCH/S) containing silence or 1 kHz tone or talk-back, Fast Associated Control Channel (FACCH)

Data TETRA MS T1 mode

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)

Data TETRA BS T1 mode

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

BS T1 Synchronization Mode

Pulse or Auto

GENERAL FEATURES

LCD DISPLAY Screen Size

6.4 in diagonal

162.6 mm diagonal

Active Area

129.6 mm (h) x 97.44 mm (v)

5.1 in. (h) x 3.8 in. (v)

Resolution

640 x 480 pixels

Disk storage

Internal 30 GByte hard disk available for user storage

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Number	Description
3920	Analog and Digital Radio Test Platform

Supplied with

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, 250V

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

390XOPT051	Site Monitoring Application
392XOPT053	Digital Multimeter
390XOPT054	IQ Gen Modulation (for IQ Creator waveforms)
390XOPT055	Audio Analyzer
392XOPT058	2.7GHz Frequency Range Extension
390XOPT059	Auto-Test II Analog
390XOPT060	Harmonics & Spurious Measurements
390XOPT061	Tracking Generator
390XOPT110	TETRA MS (Mobile Station Testing)
390XOPT111	TETRA BS (Base Station Testing)
390XOPT112	TETRA DM (Direct Mode Testing)
390XOPT114	TETRA Energy Economy Mode (Requires 390XOPT110)
390XOPT200	P25 Conventional Operation (with DES OFB Type III)
390XOPT201	P25 Trunking OperationVHF/UHF/700/800MHz (Requires 390XOPT200)
390XOPT204	LSM Generate and Receive/Analysis (Requires 390XOPT200)
390XOPT206	P25 Control Channel Logger Option (Requires 390XOPT200)
390XOPT207	SmartNet™/SmartZone™ Option (Requires 390XOPT200)
390XOPT209	KVL Keyloader Option (Requires 390XOPT200)
390XOPT212	Explicit Mode Trunking (Requires 390XOPT200 and 390XOPT201)
390XOPT218	Auto-Test II for P25 Radio Systems (Requires 390XOPT200)
390XOPT240	P25 AES Encryption (Requires 390XOPT200)
390XOPT250	Occupied Bandwidth for P25 (Requires 390XOPT200)
390XOPT300	Motorola HPD® Testing Option (Available through Motorola Only)
390XOPT301	Motorola HPD® Advanced Analysis Package (Available through Motorola Only)
390XOPT302	Motorola HPD® Testing Suite Combines 390XOPT300 and 390XOPT301
390XOPT303	Auto-Test II HPD
390XOPT400	DMR (MOTOTRBO™) ETSI 102-361
390XOPT401	Auto-Test for DMR Radio Systems (Requires 390XOPT400)
390XOPT600	XTS-5000 Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218)
390XOPT601	XTS-3000 Auto-Test/Alignment Software (Requires 390XOPT200, 390XOPT218)
390XOPT603	TIA/EIA-603 Land Mobile Test Software (Requires 390XOPT059)
81532	TETRALOG Protocol logging and Analysis software

Accessories for 3920

AC24009	DMM Test Leads for use with 392XOPT053. Category 3 rated.
AC24010	20 AMP Current Shunt 0.01 Ohm.
AC25011	Case, Transit W/Wheels
AC25012	Case, Soft Padded Carrying
AC25013	Kit, 10/20 dB Pads, TNC
AC25014	Scope Probe Kit

AC25023	Front/Rear Cover
AC25027	Adapter (BNC-F to TNC-M)
AC25029	Accessory Pouch
AC25036	DC to AC Converter, 12 VDC to 110-120 VAC
AC25042	Antenna (BNC) (50 MHz)
AC25043	Antenna (BNC) (450 MHz)
AC25044	Antenna (BNC) (800 MHz)
AC25045	Antenna (BNC) (150 MHz)
AC25046	4 ft Blue Streak BNC-M to TNC-M cable
AC25047	4 ft Blue Streak N-M to N-M cable
AC25049	4 ft Blue Streak BNC-M to N-M cable
AC25050	QMA "Quick Connect" SMA - QMA Jack Adaptor
AC25053	3 ft Blue Streak N-M to QMA-M quick connect cable
AC25054	Quick Connect Combo Kit AC25053 + AC25050 Cable and Adaptor
AC25055	QMA Adapter Kit (Includes 24 assorted adapters)
AC25056	4 ft Blue Streak QMA to QMA quick connect cable
AC25057	AC25055 + AC25056 Combo
AC25059	6 dB / 150 Watt 1.5 GHz Attenuator
AC25060	10 dB / 150 Watt 1.5 GHz Attenuator
AC25061	50 ohm 250 Watt 5 GHz Termination
AC25081	Site Survey Software
AC4105	Return Loss Bridge (1.3 GHz)
AC8645	Microphone
CALFB390X	Calibration Certificate

Extended Standard Warranties for 3920

W390X/203	Extended Standard Warranty 36 Months
W390X/205	Extended Standard Warranty 60 months

Extended Standard Warranties with Calibration for 3920

W390X/203C	Extended Warranty 36 Months with scheduled calibration
W390X/205C	Extended Warranty 60 Months with scheduled calibration

CHINA Beijing
Tel: [+86] (10) 6539 1166
Fax: [+86] (10) 6539 1778

CHINA Shanghai
Tel: [+86] (21) 5109 5128
Fax: [+86] (21) 5150 6112

FINLAND
Tel: [+358] (9) 2709 5541
Fax: [+358] (9) 804 2441

FRANCE
Tel: [+33] 1 60 79 96 00
Fax: [+33] 1 60 77 69 22

GERMANY
Tel: [+49] 8131 2926-0
Fax: [+49] 8131 2926-130

HONG KONG
Tel: [+852] 2832 7988
Fax: [+852] 2834 5364

INDIA
Tel: [+91] (0) 80 4115 4501
Fax: [+91] (0) 80 4115 4502

JAPAN
Tel: [+81] 3 3500 5591
Fax: [+81] 3 3500 5592

KOREA
Tel: [+82] (2) 3424 2719
Fax: [+82] (2) 3424 8620

SCANDINAVIA
Tel: [+45] 9614 0045
Fax: [+45] 9614 0047

SPAIN
Tel: [+34] (91) 640 11 34
Fax: [+34] (91) 640 06 40

UK Cambridge
Tel: [+44] (0) 1763 262277
Fax: [+44] (0) 1763 285353

UK Stevenage
Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601
Freephone: 0800 282388

USA
Tel: [+1] (316) 522 4981
Fax: [+1] (316) 522 1360
Toll Free: 800 835 2352

AEROFLEX
A passion for performance.

www.aeroflex.com

info-test@aeroflex.com

Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

Part No. 46891/289, Issue 6, 05/09