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Wireless

3900 Series Analog and Digital Radio Test Platform



Featuring ***IQCreator***

New Generation PMR Test Platform

- 1 GHz or 2.7 GHz platform variants
- Standard high performance analog duplex features
- Digital PMR system options for TETRA terminal and base station equipment
- New digital PMR options for P25 physical layer
- New site monitoring application for effective receiver sensitivity testing
- New HPD® (High Performance Data) option
- Auto-Test mode
- Color display with easy to use graphical user interface
- Remote control via GPIB
- Software upgrade via Ethernet and USB
- Full meter range for power, RF error, SINAD, distortion and mod accuracy
- ***IQCreator***
- 8920B emulation

The 3900 Series is the next generation portable test set platform for advanced professional digital radio communications. Building upon a long-standing reputation for excellence in professional radio communication test, the 3900 Series from Aeroflex sets a new benchmark for quality, ease of use, performance and value. The instrument platform provides a comprehensive range of general-purpose analog measurement facilities. Software options expand the measurement and signaling capabilities for communications systems that utilize advanced digital modulation and protocols. Available in two frequency ranges, the 3901 supports RF transmitter and receiver analysis to 1 GHz, while the 3902 supports frequencies to 2.7 GHz.

Designed for flexibility, speed and accuracy

The all-new digital architecture of the 3900 Series not only delivers faster, more accurate measurements than any of its contemporaries and predecessors but also ensures that future market needs can be met in a timely fashion. The future of professional mobile radio is changing rapidly as technology advances and market needs expand, and the 3900 Series is a platform that will stand the test of time.

Applications

Whether the application is radio system development, manufacturing or service support, the 3900 Series is fully equipped for today's needs and ready for the future. The platform is designed specifically for professional mobile communications testing, where radio performance verification is a paramount operational requirement.

Platform Highlights

The 3900 Series offers flexible test capabilities and high performance measurement. It is a robust instrument platform that accommodates a RF receiver, signal generator, powerful digital processing subsystems, and applications software for radio testing.

The platform architecture offers considerable flexibility to meet the growing demands of a range of advanced digital communications systems. Consequently, future technological advances can be incorporated into the 3900 Series with little or no re-design.

More importantly, through the use of software re-configurable digital architecture, future technologies and enhancements can be achieved with simple field programmable software updates. Whatever the system-specific needs of modulation, protocols, applications-specific signal processing, special instrument features, and custom software applications - all can be reconfigured in software. This establishes the platform as a dependable long-term investment.

Combined with the power of an onboard PC with a 30 GB hard-drive and Linux OS, the 3900 Series also supports mouse and keyboard interface as well as almost unlimited save/recall setups, saving time and effort.

Performance Highlights:

Wide Frequency Range: The 3900 Series includes two variants. The 3901 provides continuous frequency coverage from 1 MHz to 1 GHz while the 3902 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 3900 Series 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 per-amp selected.

High Stability Time Base: With a 0.01 ppm OCXO frequency standard, the 3900 series 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 3900 Series provides consistent results in testing receiver parameters.

Full Span Spectrum Analyzer: View signals from 1 MHz to 1 GHz with the 3901 or to a full 2.7 GHz with the 3902. This full band analyzer provides plenty of range to view harmonics and other spurious emmissions in and out of band.

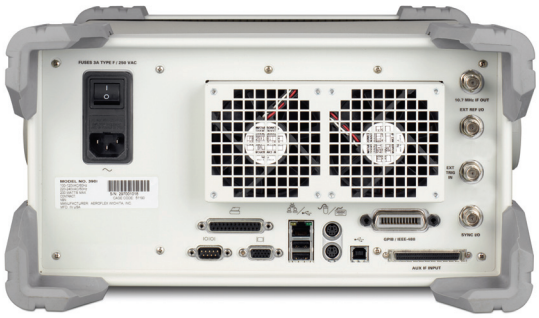
Wide Band Channel Analyzer: The channel analyzer makes it possible to monitor a 5 MHz spectral window around the carrier while simultaneously demodulating the signal. This allows the spectrum around the carrier to be analyzed while the device under test is participating in a call.

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 5 V rms, the 3900 Series 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 .

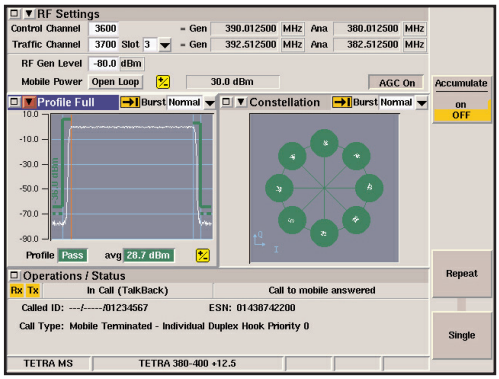
Speed: Measurement speed is directly related to processing power and internal communications. The 3900 Series digital architecture utilizes a mixture of powerful digital signal processors and programmable logic. Coupled to the use of a compact PCI backplane capable of delivering peak rates of >100 Mbytes/s, 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 3900 Series provides a high degree of connectivity as standard, thus ensuring maximum flexibility for test system design. Instrument remote control for automated testing is provided using GPIB but additionally the equipment 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. In anticipation of future requirements, two custom interfaces for device under test connection and digital IF are also provided. Triggering and synchronization interfaces are provided for measurement, along with configurable single-port and dual-port duplex RF input / output configuration and analog audio / modulation I/O.



Rear Panel

Ease of Use: Whether using the 3900 Series manually, remotely or in its Auto-Test mode, the user interface is intuitive, highly flexible yet logical and accessible, without complicated or deeply nested menus. The instrument uses a tiled graphical display, which can be controlled by the front panel keyboard 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 collectively. The minimized state allows different combinations of hardware control, measurement control and results to be displayed simultaneously. Combining softkey control together with tile navigation greatly simplifies operation. 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. Measurement status and result pass/fail conditions each use different colors. Graphical traces utilize color to clearly identify limit line and measurement traces.



3900 tiled graphical user interface

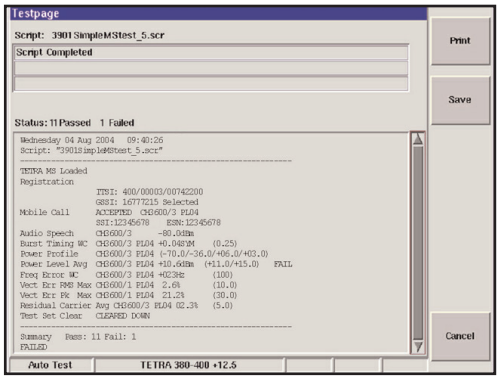
Result Storage and Printing: Auto-Test results, screen dumps and instrument settings can be stored to the instrument hard disk for later retrieval for printing or output to floppy disk. Screen images and Auto-Test results can be printed directly. Measurement results can be stored in a variety of file formats compatible with industry standard software tools. Memory storage to the internal hard disk permits up to a virtually unlimited number of results to be stored. A variety of printer types are supported to enable the printing of formatted Auto-Test results and screen images.

Remote Control: The 3900 Series supports remote control via GPIB for automated test system control. A VXI pnp VISA driver allows easy test system integration of the 3900 Series.

Remote Operation: Use of the 3900 Series ethernet connection permits remote operation from anywhere in the world making it possible to download new software or remotely interrogate instrument status.

Auto-Test: Auto-Test sequences are ideal for service and repair operations. They ensure that testing is performed both efficiently and in a consistent manner for a wide variety of radio types. The user can configure how the instrument behaves in the event of a measurement failure, e.g. repeat test, halt, re-start or skip. This flexibility helps in circumstances where the test item has marginal performance or functions intermittently.

Auto-Test sequences are script based. This provides maximum flexibility in constructing routines against the specific needs of individual radio types or test circumstances. Test limits may be included within the script.



Auto-Test results summary

Cost of Ownership

To manage through life costs, the 3900 Series comes with a standard 2 year warranty. Users can also purchase optional warranty extensions. Enhanced standard warranty provides the benefit of guaranteed product repair time in the event of failure. Standard extended warranty provides either a 36 or 60 month warranty period extension and may be purchased inclusive of scheduled calibration. On request Aeroflex can provide customized premium warranty support designed around your specific needs.

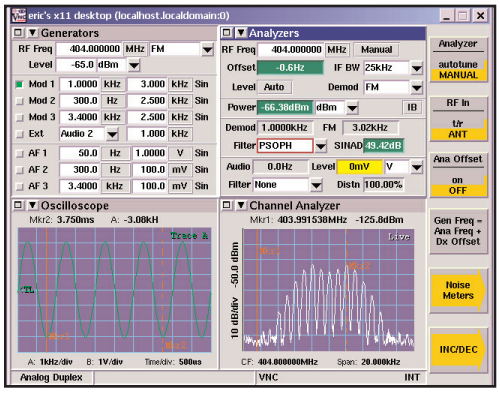
System Personalities

With analog duplex featured as standard, the 3900 Series can support a number of optional systems installed concurrently. Optional personalities support TETRA digital trunked radio systems for mobile terminal and base station testing. New options in the latest release expand available system personalities to include HPD® (High Performance Data), APCO P25 Conventional, and TETRA Direct Mode Operation (DMO).

ANALOG DUPLEX OPERATION

- AM and FM capabilities to either 1 GHz or 2.7 GHz
- Full analog meters include power, RF counter and error, SINAD, distortion, deviation, and AF counter
- Three high accuracy audio modulators
- Three high accuracy audio baseband generators
- FM pre-emphasis and de-emphasis 50 μs, 75 μs and 750 μs for true audio performance analysis
- Analog AutoTest
- IQ GEN modulation
- 8920B emulation

The 3900 Series provides a variety of high performance features that allow the user to quickly test and verify analog performance parameters. 3900 Series analog test features include both AM and FM test capabilities, providing superior accuracy and performance when compared to older analog radio test systems. From the user interface to the superior RF and AF performance, the 3900 Series speeds analog testing with results you can count on.



New analog duplex capabilities

The 3900 Series 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.

The AutoTest Analog option provides the ability for users to create, save and run automated test scripts for conventional FM and AM radio systems. The 3900 Series has the ability, via a USB to RS-232 converter, to issue command strings to a device to automate testing.

IQ Gen Modulation

A new option for the 3900 is the ability to upload waveforms created for the 3900 by ***IQCreator***. ***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. Once the IQ waveform is created it can easily be uploaded to the 3900 and used as the modulation source in the Analog Duplex System.

8920B Emulation

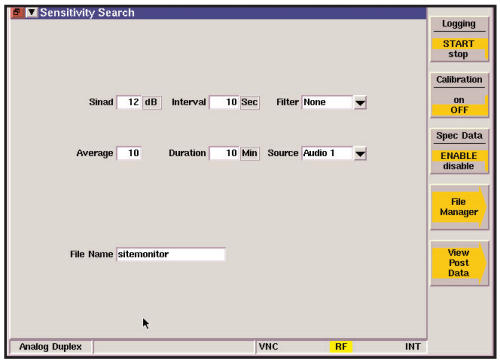
The 3900 now has the ability to replace your worn out 8920B. Enhancements have been implemented that enable the 3900 to emulate most of the 8920B's remote operation via GPIB. These enhancements include the ability to perform measurements and setups in a way that equals or surpasses the capability and speed of the 8920B. In addition, most of the 8920B functionality is available from the front panel of the 3900, with an easy to use, mouse driven, user interface.

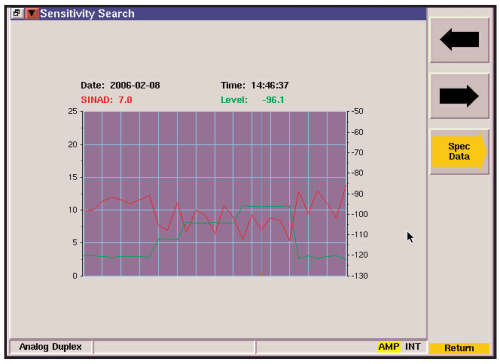
Audio Testing

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. It is also possible to monitor the terminal audio output during silence or tone stimulation. This allows investigation of audio pickup or noise type problems.

Site Monitoring

With a new level of automation that was previously unattainable with past radio test systems, the 3900 Series brings impressive new capabilities to site monitoring applications. With the ability to leave the 3900 on site, the 3900 Series provides automated data logging of the site's effective receiver sensitivity. When connected to a good documented receiver (a "golden" radio), the 3900 Series 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 3900'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 3900 Series 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 interferers that may be present at one particular time, but not another (for example - 2AM).





HPD® OPERATION

- Generate/Receive HPD Signals
- Modulation - 64QAM, 16QAM and QPSK
- 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.

This test mode has been developed by Aeroflex 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 3900 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® MSU's. When configured to operate in MSU Mode the Test Set simulates Mobile Subscriber Unit operation and is used to test the functionality of Motorola BR's.

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.

P25 Conventional Operation

- P25 C4FM Error Meter.
- Eye Diagram showing transitional diagram and points to the C4FM frequency states.
- Constellation Plot.
- Power, Frequency Error and TX BER Meters
- Full TIA/EIA-102 Test Patterns (STD1011, CAL, SILENCE, LDU1 Trigger, etc..) as specified by TIA-EIA-102-CAAA-A

The 3900 Series P25 Conventional Option provides test features for testing P25 radios and systems. Included is the ability to transmit P25 C4FM standard waveforms and analyze P25 received waveforms. The analysis of the received waveforms includes the ability to perform RF and modulation parametric tests. This option, 390XOPT200, provides the first implementation of P25 on the 3900 Series and provides the basic parametric analysis of the P25 signal. Features include:

TETRA

- TETRA RF signal generator
- TETRA RF signal analyzer
- TETRA protocol analyzer / generator
- TETRA RF power meter and burst power analysis up to 125 W
- Expandable for next generation TETRA tests

For TETRA applications, the 3900 Series 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 3900 Series with the TETRA options provides the world's best solution for testing TETRA radios. Maximizing customer value, product performance and ease of use have been achieved through careful design with attention given to every detail.

TETRA system options provide signaling and physical layer measurement requirements for testing TETRA radio equipment. The 3900 includes options for testing both mobiles and base stations. A new option enables testing of the mobile's direct mode call setup and parameters. Measurements are made in accordance with ETSI EN 300 394-1 for on channel transmitter and receiver parameters, including transmitted RF power, link power control, power profile, frequency error, modulation quality (error vector magnitude), frame alignment, and receiver sensitivity (BER/RBER/MER). 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 TETRA system options are designed for R&D, manufacturing application development and maintenance requirements. The 3900 Series 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. Measurements may be made individually or grouped together into test sequences. By grouping measurements together, the software is able to collect measurement samples and process all parameters in parallel. Transmitter and receiver measurements can also be made concurrently, providing for more efficient measurements.

Call Processing Highlights

The 3900 Series provides comprehensive signaling to functionally test TETRA equipment. The 3900 Series can be freely configured to emulate a TETRA network by selection of the appropriate channel plan, country code, network code, color code, etc. Network configuration can be stored as part of the instrument setup. 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. Mobile and network terminated call setup and clear down are both supported. SDS messages (types 1 to 4 and SDS-TL) can be sent or received. SDS-TL support can be used for end-to-end application testing in development and final acceptance. In this mode the 3900 Series functions as an RF modem between an external PC and the device under test. Where appropriate, calls can be configured as simplex or duplex, hook signaling or direct setup and message or transmission trunking.

The 3900 Series 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.

TETRA Test Modes T1 and TT Loopback

The 3900 Series implement MS, MS T1, BS and BS T1 as separate systems with their own parameters making the 3900 Series easier to use than its predecessor.

The TETRA application provides various T1 test signals as defined in ETSI EN 300 394-1, for performing manual testing of TETRA receivers. TETRA T1 and TT loopback modes include the following T1 test signals for mobile and base station equipment:

Type 1 TCH/7.2, Type 2 SCH/F, Type 3 BSCH, Type 4 TCH/2.4 and for base stations:

Type 7 TCH/7.2, Type 8 SCH/F, Type 9 STCH+STCH UL, Type 10 TCH/2.4, 18 frame PRBS, framed PRBS, and unframed PRBS.

T1 test signals provide 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, where supported by the mobile, the mobile can be commanded to loop back the received data to the 3900 Series which can then perform BER measurement auto-

matically where the application software will recover the modulated data and perform automated BER measurement. In this "T1 loopback mode", the BER is reported for a user specified number of bit samples. When supported by the terminal type, the application also supports TT loopback mode whereby the receiver's BER, MER and RBER performance can all be reported. The 3900 Series TETRA option 111 also supports T1 loopback BER / MER / PUEM measurements for base stations.

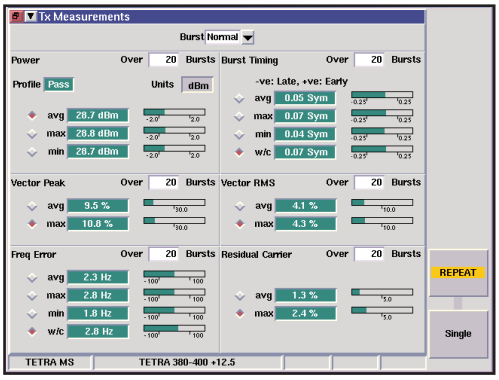
Results

Result information can be displayed numerically or graphically and where appropriate with a choice of dimensions, e.g. power in W or dBm. The transmitted power envelope is displayed in the time domain against the TETRA mask. Close inspection of ramp up/down periods is supported. Modulation quality can be displayed using a variety of formats including vector diagram, constellation diagram and rotated constellation. Modulation quality can also be displayed as a function of time either directly, as EVM (error vector magnitude) or as a phase or as amplitude versus time. Test limits can be selected from either ETSI specified normal or extreme settings or user defined limits.

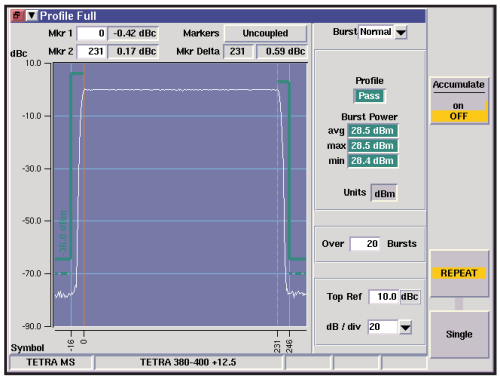
Demodulated and channel-decoded symbol data can be displayed, stored to memory and if desired output over a selected interface. It is possible to save the MAC layer hex messages of up to 1000 transmitted bursts (approx 13 seconds).

Where measurements are made for a number of burst averages, the software maintains a record of the minimum, maximum and running average for each parameter measured. This can be invaluable to aid identification of patterns of behavior when investigating problems.

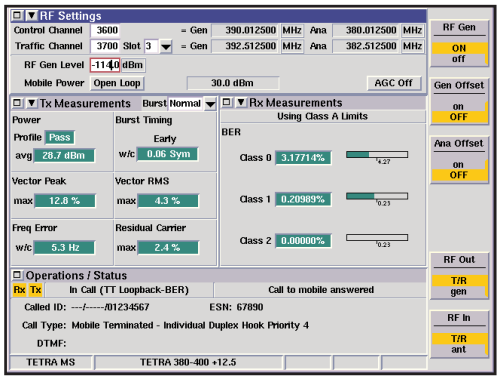
A scrollable log of time stamped protocol history is available. This can be very useful in fault tracing and software development applications.



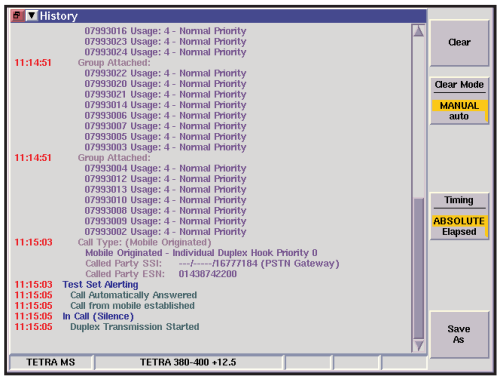
TX measurements maximized tile



Profile full maximized tile



Tx and Rx minimized tile



Protocol history maximized tile

SPECIFICATION

RF SIGNAL GENERATOR

FREQUENCY

Range

10 MHz to 1.05 GHz (3901) (Usable from 100 kHz)
10 MHz to 2.7 GHz (3902) (Usable from 100 kHz)

Resolution

1 Hz

Accuracy

Frequency standard ±1 count

INTERNAL SINGLE-SIDEBAND (SBB)

RF Range

10 MHz to 1.05 GHz (3901) (Usable from 100 kHz)
10 MHz to 2.7 GHz (3902) (Usable from 100 kHz)

Modulation Selection

Upper SideBand (USB) or Lower SideBand (LSB)

Modulation Range

0 to 100%

Resolution

0.1%

Rate

300 kHz to 3 kHz

Waveform

Sine

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 (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

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

THD

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

INTERNAL AM

RF Range

10 MHz to 1.05 GHz (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

Modulation Range

0 to 100%

Accuracy

1% (Modulation from 10 to 90%)

Resolution

0.1%

Rate

20 Hz to 15 kHz

Waveform

Sine

THD

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

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).

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)).

RF RECEIVE MEASUREMENTS

RF RECEIVER

FREQUENCY

Range

10 MHz to 1.05 GHz (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

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 (3901) (Usable from 500 kHz, auto-tune)
10 MHz to 2.7 GHz (3902) (Usable from 500 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 (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

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 (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

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

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 (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

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

Rate

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

RF Range

10 MHz to 1.05 GHz (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

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

Rate

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

RF Range

10 MHz to 1.05 GHz (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

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.

WAVESHAPE

Sine or square

FREQUENCY

Range

Sine: 20 Hz to 40 kHz (usable 1 Hz to 40 kHz)
Square: 20 Hz to 4 kHz (usable 1 Hz to 4 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 kΩ load

Resolution

0.1 mV

Accuracy

±1% of setting (10 kΩ load)

Impedance

600 Ω (nominal)

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 k load, Sine)

AUDIO & MODULATION MEASUREMENTS

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 5 Vrms (Audio 1 or Audio 2)

Impedance

600 Ω or Hi-Z (Hi-Z is ~10 kW)
600 Ω balanced (Audio 1 and 2)

AF LEVEL METER

Input

Audio 1 or 2

Range

0 to 5 Vrms

Resolution

1 mV (Unbalanced)
0.1 dB (600 Ω Balanced)

Scales

20 mV to 5 V in a 1, 2, 5 sequence, plus auto-scale

Frequency

20 Hz to 20 kHz

Accuracy

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

SINAD METER

Range

0 to 60 dB

Resolution

0.1 dB

Accuracy

±1 dB, ±1 count (SINAD >3 dB, ≤40 dB, 5 kHz LP AF filter)

SIGNAL CHARACTERISTICS

Signal Frequency

1 kHz

Signal Level

0.1 to 5 Vrms
Audio 1 or 2 (600 Ω or Hi-Z)
Audio 1 and 2 (600 Ω balanced)

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

1 kHz

Signal Level

0.1 to 5 Vrms
Audio 1 or 2 (600 Ω or Hi-Z)
Audio 1 and 2 (600 Ω balanced)

AUDIO FILTERS

None
Low Pass: 300 Hz, 5 kHz, 20 kHz
Band Pass: 300 Hz to 3.4 kHz, 300 Hz to 5 kHz,
300 Hz to 20 kHz, psophometric (CMESS or CCITT weighted)

RF SPECTRUM ANALYZER

FREQUENCY

Range

10 MHz to 1.05 GHz (3901) (Usable from 1 MHz)
10 MHz to 2.7 GHz (3902) (Usable from 1 MHz)

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)

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, and 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 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

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)

OSCILLOSCOPE

DISPLAY

Traces

2

Trace Types

Live, captured, accumulated

Markers

2

Marker Functions

Time with amplitude, deviation or %depth
Delta marker (including 1/Δt, 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

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)

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

RS-232 (FUTURE)

Connector Type

9-Pin, D-sub Male

Baud Rates

300, 600, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, 115,200

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

PARALLEL PORT

Connector Type

25 position, female D-sub

Function

Printer Interface

USB

Connector Type

Twin USB standard connection

Function

USB Version 1.1 & 2.0 interface (733 MHz CPU)
USB Version 1.1 interface (266 MHz)

PS/2 INTERFACES

Connector Type

Dual-PS/2 connectors

Function

PS/2 mouse and keyboard interfaces

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)

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

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 (7.75")	*35.6 cm (14")*	*52.0 cm (20.5")*

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 3900 Digital Radio Test Set.

AVAILABLE 3900 SYSTEMS

TETRA SYSTEMS (All TETRA systems are optional)

Available Options

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

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

Option 112 - TETRA DM (Direct Mode) Available December 2005 - Compatible with software versions 1.2 or higher

ANALOG SYSTEMS (Analog functions are provided as standard, but have options available under the 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 loopback, 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 and MER

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

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: Synchronization Burst (SB), Normal Downlink Burst (NDB)

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 α = 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

DIRECT MODE (OPTION 112) FUNCTIONALITY

Direct Mode Parametric Test & Measurement functionality

Burst type selection MASTER (NORMAL / SYNC), NORMAL, SYNC, INITIAL, SLAVE.
Measurement of discontinuous and initial continuous Direct Mode bursts
Measurement of Power and Power Profile taking account of continuous / discontinuous bursts
Measure Frequency Error
Measure Vector Error (RMS, Peak, Residual Carrier)
Measure Timing Error (where applicable i.e. slave transmission)
Measurement averaging, limits, re-start as appropriate similar to other TETRA systems
Graphical displays similar to those available under the other 3900 TETRA systems

Direct Mode Protocol / Functionality

Mobile Originated group / Open Group (broadcast) / private call / Emergency
Testset Originated group / Open Group (broadcast) / private call / Emergency
Mobile Originated private call with presence check, testset always accepts call.
Testset Originated private call with presence check, mobile acceptance or rejection.
Call pre-emption and change over
Inter-MNI supported for all call types
Talk-back, silence, test tone for receiver and audio evaluation
Mobile transmit request, Mobile end of transmission
Testset transmit request, Testset end of transmission
Mobile transmit request whilst testset transmitting (transmit always granted by testset)
Testset timers for testset transmit time, quiet time before testset transmission, quiet time before implicit cleardown (reservation time)
Explicit call clear down from mobile or implicit clear down on mobile quiet time expiry
Explicit call clear down from testset or implicit clear down on testset quiet time expiry
Testset/Mobile originated status messages and SDS type 1, 2 and 3
Testset/Mobile originated SDS type 4 simple and TL.
Extensive call status/protocol history and information displays

AUTO-TEST (MOBILE STATION ONLY)

Example scripts available from www.aeroflex.com (Under the 3900 Application note area)

Auto-Test Commands

Call processing

Registration, test mode registration, de-registration
Mobile originated and mobile terminated call (all call types)
Hand off
Cleardown to / from mobile
Speech quality, talk-back, test tone, silence

Measurements

TX: *Burst timing, power profile, power level, frequency error, vector Error (RMS/Peak), residual carrier*
RX: *BER / RBER / MER (Using TT TETRA test-mode)*
Audio: *Talk-back, 1 kHz tone, silence*

Controls

On error - ignore, pause, abort
Results - Print / Save / Recall

GENERAL FEATURES

LCD DISPLAY

Screen Size

6.4 inch diagonal
162.6 mm diagonal

Active Area

129.6 mm (h) x 97.44 mm (v)
5.1 inch (h) x 3.8 in (v)

Resolution

640 x 480 pixels

Disk storage

3.5 inch floppy disk

Internal hard disk or 30 Gbytes available for user storage

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers	Versions
IFR3901	Advanced Radio Test System – 1 GHz
IFR3902	Advanced Radio Test System – 2.7 GHz
390XOPT200	P25 Conventional Operation Mode
	Supplied with
	Operating and programming manual (CD ROM)
	AC Supply lead

	Options
Option 051	Remote Site Monitoring application
Option 110	TETRA MS (Mobile Station)
Option 111	TETRA BS (Base Station)
Option 112	TETRA DM (Direct Mode)
	Accessories for 390X
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	TNC To BNC Adapter
AC25029	Accessory Pouch
AC25036	DC to AC Converter, 12 VDC to 110-120 VAC
AC25042	HF Antenna
AC25043	UHF Antenna
AC25044	800 MHz Antenna
AC25045	VHF Antenna
AC4105	Return Loss Bridge (1.3 GHz)
CALFB390X	Calibration Certificate
AC8645	Microphone
Enhanced Standard Warranty for 390X	
W390X/201	Enhanced Standard Warranty
Extended Standard Warranties for 390X	
W390X/203	Extended Standard Warranty 36 Months
W390X/205	Extended Standard Warranty 60 months
Extended Standard Warranties with Calibration for 390X	
W390X/203C	Extended Warranty 36 Months w/scheduled cal
W390X/205C	Extended Warranty 60 Months w/scheduled cal

Notes

Maximum span width limited to 5 MHz when in channel analyzer mode

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] 80 5115 4501
Fax: [+91] 80 5115 4502

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 Burnham
Tel: [+44] (0) 1628 604455
Fax: [+44] (0) 1628 662017

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

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www.aeroflex.com
info-test@aeroflex.com

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