

# Wireless

## 3500A Portable Radio Communications Test Set



### Digital Radio Test Options for P25, DMR and NXDN™!

#### Featuring

- 2 MHz - 1 GHz operation
- Transmitter and Receiver testing
- AM/FM Transceiver testing
- P25/DMR/NXDN™ digital radio test options
- Spectrum analyzer with <-136 dBm noise floor
- Tracking generator for duplex tuning
- Oscilloscope
- Save/Recall user setups
- Antenna and cable tests

#### The Aeroflex 3500A, the First Truly Rugged, Portable Radio Test Set

With the latest in portability, battery life and performance, the Aeroflex 3500A builds upon Aeroflex's expertise in developing portable radio communications test sets with exclusive features and affordability that are destined to set a new standard in portable radio test sets. Designed to meet the needs of a multitude of radio tests, the 3500A provides fast, reliable measurements of the radio's transmitter and receiver parameters. With the additional capability to perform quick testing of antennas and cables, the 3500A provides the most complete portable test solution available to quickly isolate problems and assess performance of the radio, cable and antenna systems. In addition, the tracking generator gives you the ability to re-tune your antenna duplexer located at your remote repeater sites.

#### Digital Radio Options

Now with support for DMR and NXDN™ along with P25, the 3500A has the capability of supporting the latest digital radio systems. Key RF modulation fidelity parameters along with several modulation patterns give the 3500A the power to quickly check the operation of a digital mobile or base station.

#### Portable and Rugged

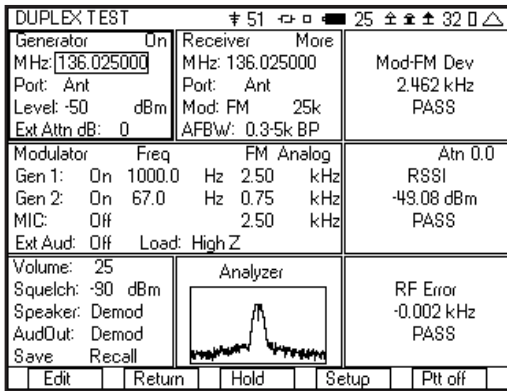
- Easy portability - weighs less than 8 lbs. (3.6 kg)
- Rugged construction - solid magnesium alloy weatherproof case
- -20° to +55° C operating temperature range<sup>(1)</sup>
- 5 hour battery life

Aeroflex engineers designed the 3500A from the ground up to be portable and rugged, weighing in at less than 8 lbs. (3.6 kg) including the battery. It has a solid magnesium alloy weatherproof case, an operating temperature range of -20° to +55°C, and rugged construction specifications (Mil-PRF-28800A) for humidity, altitude, shock, and vibration. The battery gives the user 5 hours of operation and can be fully re-charged and ready to operate in only 4 hours.

#### Radio Installation Failures

- Handset and antenna allow over the air "Talk Test"
- RSSI meter
- RF Error meter
- Modulation measurements
- Audio frequency counter
- Spectrum analyzer
- Audio frequency oscilloscope

We designed the 3500A so that you could use it for quick installed radio testing and efficiently find radio failures. The 3500A is lightweight and perfect for hand-held testing. There is no need to connect to the radio under test, simply connect the supplied antenna, key up the radio and then measure the radio parameters over-the-air. A push-to-talk button on the handset controls whether your 3500A is transmitting or receiving. The Duplex test screen is ideal for making quick transmitter and receiver measurements on an installed radio system.



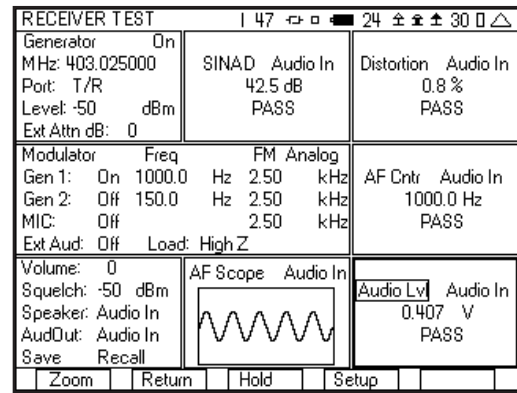
Duplex Test Screen

### Direct Connect Testing

- RF power and frequency error
- AM modulation/FM deviation
- Audio frequency counter
- Receive Signal Strength Indicator (RSSI)
- DCS encode/decode
- DTMF encode/decode
- Distortion meter
- SINAD/sensitivity
- Spectrum analyzer
- Audio frequency oscilloscope
- Frequency find
- Audio level meter
- Pass/Fail limits

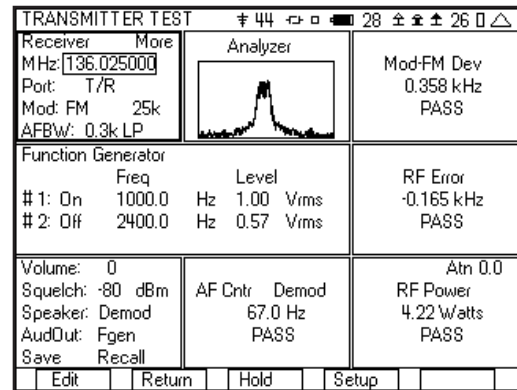
In addition to performing over the air measurements, the 3500A includes the capability to perform direct connect type testing on a radio. All radio parameters including power, frequency error, modulation accuracy, receiver sensitivity and audio performance are easily accessed and tested with the 3500A.

With the Receiver Test screen selected, the 3500A operates as a signal generator, enabling the testing of the receiver portion of the radio. Audio SINAD, distortion and frequency are among the tests that the 3500A can perform on the radio's receiver. With two internal generators that can be used as modulation sources, the 3500A can modulate the carrier with both a test tone and a squelch tone. Alternatively, the internal generators can generate both a test tone and DCS, enabling the testing of mobiles requiring a digitally coded squelch.



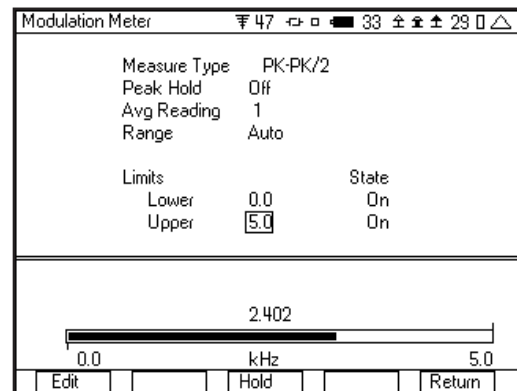
Receiver Test Screen

The Transmitter Test screen operates as a signal analyzer, measuring the parameters associated with the transmit portion of the radio being tested. Included in this screen are measurements of the modulation, the RF power, and RF frequency error. The frequency of sub-audible tones can also be measured by using the 0.3k LP filter and audio frequency counter.



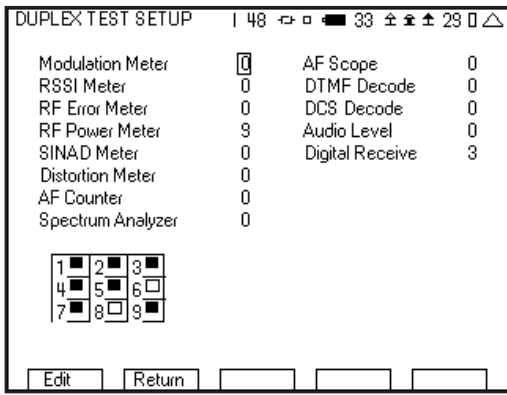
Transmitter Test Screen

Many of the meters can be "zoomed" into for additional setup, including programming the number of values to average and the pass/fail limits. The zoomed in meters also include bar graphs for a visual indication of the measurement.

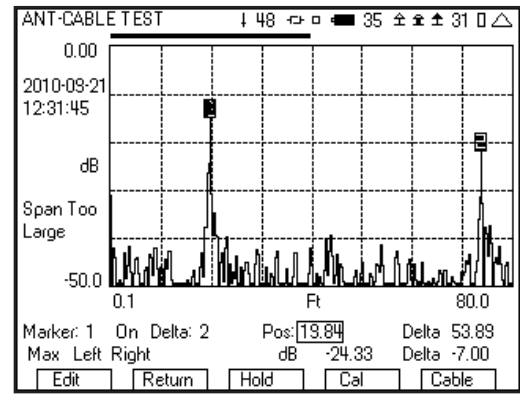


Modulation Meter

Any of the test screens can be easily configured with the meters that are needed according to the type of tests that the user wants to perform by selecting the meters from the setup screen. Users can quickly define the "look" of the instrument by configuring the way the meters are displayed on the screen.



Duplex Test Setup Screen



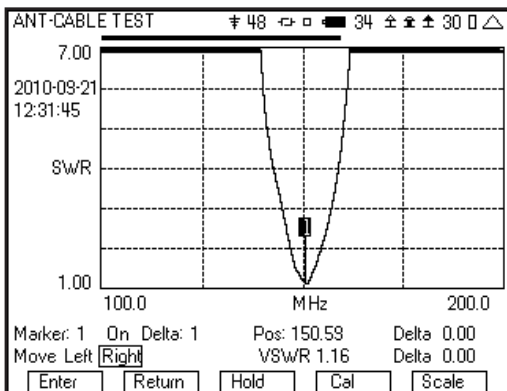
Distance to Fault screen

### Isolate Cable and Antenna Problems

Since many radio faults in an installed radio system lie in the cabling and/or antenna and not with the radio, the 3500A includes the capability to measure the VSWR or return loss of an antenna and the loss or distance to fault of a cable. By isolating the problem to the cable, connector or antenna you can avoid returning good radios to the depot or manufacturer for repair, thus, avoiding radio system downtime. The ANT-CABLE Test screen provides the user with the option to display:

- VSWR versus frequency
- Return loss versus frequency
- Cable loss versus frequency
- Return loss versus feet

The display of VSWR or Return Loss (RL) versus frequency is valuable for observing the performance of an antenna.

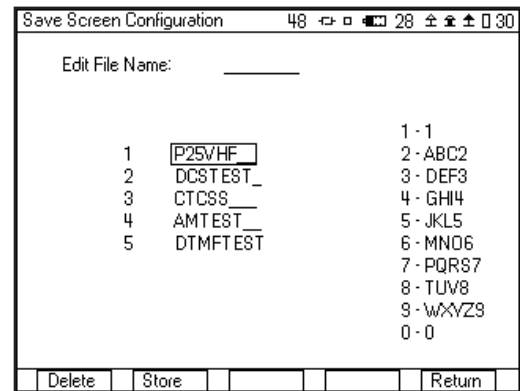


VSWR of a VHF Antenna

The display of return loss versus feet is descriptive of the characteristics of a cable, illustrating to the user the precise location of faults (DTF). For example, the following illustrates a cable that has a minor fault with the location of marker 1 at the fault and marker 2 at the end of the cable.

### Save/Recall Features

The 3500A allows users to configure the test setup and then save these setups internally for future use. This feature allows fast testing on radios that require constant testing, base station verification and for testing a large number of the same radio.

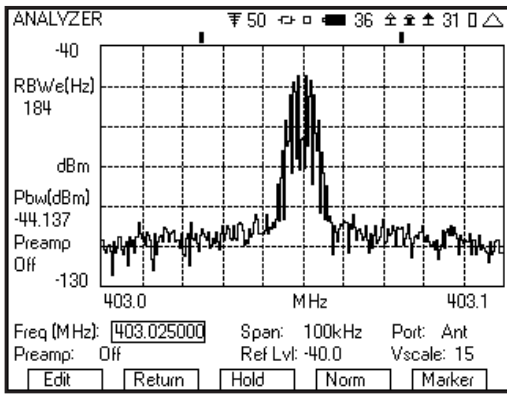


Save Screen

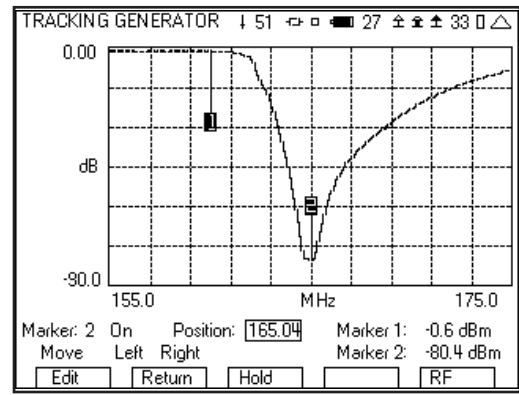
### Spectrum Analyzer (35XXOPT01)

- Noise floor <-136 dBm
- Spans from 10 kHz to 5 MHz
- Effective resolution bandwidths down to 19 Hz
- Peak hold
- Average function

Option 35XXOPT01 is an FFT based spectrum analyzer. An FFT analyzer uses a snapshot of the incoming RF signal that is within the selected span and converts it to a frequency spectrum. The advantage of using this method is that the spectrum is converted from one set of data and not from a sweep where the RF signal may have changed from the start of the frequency sweep to the finish. The noise floor of the spectrum analyzer is <-136 dBm in the 10 kHz span. The 3500A analyzer has a span width that ranges from 10 kHz to 5 MHz with an effective resolution bandwidth as narrow as 19 Hz. A marker function includes the capability of measuring the power within a particular bandwidth and at a specified offset from the center frequency. The 3500A Spectrum Analyzer can be accessed from the Transmitter Test screen, the Duplex Test screen, and as a stand-alone spectrum analyzer.



Spectrum Analyzer Screen

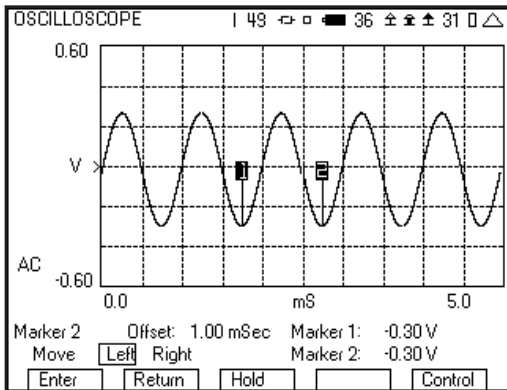


Tracking Generator

### Oscilloscope (35XXOPT02)

- Horizontal range of 50 ms/Div to 0.1 Sec/Div
- Two markers
- Audio bandwidth

With the oscilloscope option, we can display external audio or the demodulated audio of a received signal. The oscilloscope features 2 markers and a horizontal range of 50 mS/Div to 0.1 Sec/Div, sufficient for observing and analyzing audio signals. The oscilloscope is available from the Duplex, Transmitter, or Receiver Test screens for use during any type of testing.



Oscilloscope Screen

### Tracking Generator (35XXOPT08)

- Spans from 10 kHz to full span
- 2 markers for pinpointing level of signal
- Output level adjustable from 0 to -60 dB (relative to maximum output of 3500A)

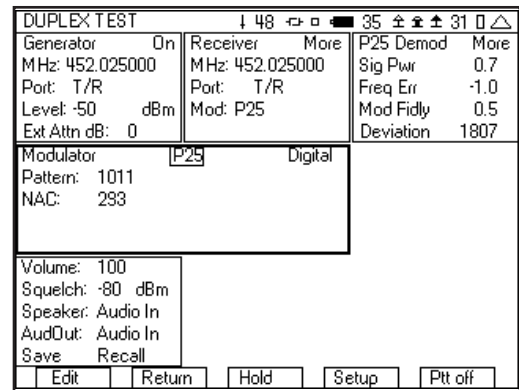
This option is totally software based and is upgradable to units that are already in the field. This option was designed specifically for aligning duplexers and filters.

### DIGITAL RADIO OPTIONS

#### P25 Test (35XXOPT07)

- Modulation Fidelity, Deviation, and Frequency error meters
- Transmit BER meter
- Signal power meter
- Transmit standard 1011 Hz, O.153, and calibration patterns

The 3500A P25 option gives you the capability to test P25 mobiles, hand-helds, repeaters and base stations. With this option, you can measure Modulation fidelity, deviation and frequency error and transmit standard patterns as specified by TIA-102.CAAA-C. This function becomes part of the Duplex, Transmitter or Receiver testing screens when this option is installed.



Duplex Test Screen with P25

#### NXDN™ Test (35XXOPT33)

- Signal power meter
- Frequency Error meter
- FSK Error meter
- Symbol Deviation meter
- Transmit BER meter
- RAN Decode
- Transmit 1031 Hz, O.153, and calibration patterns
- User programmable RAN for transmit

With the NXDN™ test option you will be able to measure the key NXDN™ RF parameters with the 3500A. These measurements verify

the correct operation of both the transmitter and receiver of an NXDN™ radio. The 1031 Hz pattern along with the selectable RAN enables a test of the audio of a NXDN™ radio without requiring it to be in test mode. With the O.153 random data pattern, you can perform BER testing of the receiver, to verify that it meets its sensitivity requirements.

DUPLX TEST		
Generator On	Receiver More	NXDN Demod More
MHz: 136.025000	MHz: 136.025000	Sig Pwr 36.3 P
Port: T/R	Port: T/R	Freq Err -142.8 P
Level: -50 dBm	Mod: NXDN	FSK Err 1.2 P
Ext Attn dB: 0		Sym Dev 1053 P
Modulator NXDN Digital		
Pattern: 1031		
RAN: 1		
Rate: 4800		
Volume: 100		
Squelch: -80 dBm		
Speaker: Audio In		
AudOut: Audio In		
Save Recall		
Edit	Return	Hold Setup Ptt off

Duplex Screen with NXDN™

### DMR Test (35XXOPT34)

- Burst Power meter
- Frequency Error meter
- FSK Error meter
- Symbol Deviation meter
- Magnitude Error meter
- Transmit BER meter
- Color Code, Call ID, and Radio ID decode
- Transmit 1031 Hz, O.153, and calibration patterns
- Base Repeater pattern for duplex radio testing
- User programmable Color Code and Call ID

With the DMR option, the 3500A can now perform a complete test on the transmitter and receiver of a DMR radio. This testing includes the measurement of the key modulation fidelity parameters, FSK error, magnitude error, symbol deviation and frequency error. The 3500A can also measure the power during the burst and the power level between the bursts. In order to enable the testing of radios, without requiring them to be put into a special test mode, the 3500A also has a programmable color code and call ID. A key feature of the 3500A is the base repeater (BR) pattern. A radio in duplex mode must synchronize with this BR pattern before it can transmit. It would not be possible to test a duplex radio without this selection.

DUPLX TEST		
Generator On	Receiver More	DMR Demod More
MHz: 403.025000	MHz: 408.025000	Freq Err -92.1
Port: T/R	Port: T/R	FSK Err 1.5
Level: -50 dBm	Mod: DMR	Sym Dev 1930
Ext Attn dB: 0		Mag Err 0.44
Modulator DMR Digital		
Pattern: BR		
Color: 1		
Volume: 100		
Squelch: -80 dBm		
Speaker: Audio In		
AudOut: Audio In		
Save Recall		
Edit	Return	Hold Setup Ptt off

Duplex Test Screen with DMR

## SPECIFICATION

### RF SIGNAL GENERATOR

#### FREQUENCY

##### Range

2 MHz to 1 GHz (Useable from 500 kHz)

##### Resolution

1 Hz

#### OUTPUT LEVEL

##### Range

T/R port: -50 to -120 dBm/707.11  $\mu$ V to 0.22  $\mu$ V

ANT port: -30 to -90 dBm/7071.07  $\mu$ V to 7.07  $\mu$ V

SWR port: -5 to -65 dBm/125743.3  $\mu$ V to 125.7  $\mu$ V

##### Resolution

Display 1 dB/0.01  $\mu$ V

Step size 1 dB

##### Accuracy

$\pm$ 2 dB

$\pm$ 3 dB (<-100 dBm)

#### SSB PHASE NOISE

-80 dBc/Hz at 20 kHz offset,

#### SPURIOUS

##### Harmonics

-30 dBc

##### Non-Harmonics

-40 dBc (> $\pm$ 20 kHz offset from carrier) in Band

#### RESIDUAL FM

<60 Hz in 300 Hz to 3 kHz BW

Typically <20 Hz

#### RESIDUAL AM

<5% in 300 Hz to 3 kHz BW

Typically <1%

#### PORT INPUT PROTECTION

ANT port: +20 dBm

SWR port: +20 dBm

T/R port: +44 dBm

#### PORT VSWR

ANT port: <1.5 : 1

SWR port: <1.5 : 1

T/R port: <1.25 : 1

## **FM DEVIATION (GEN 1 AND GEN 2)**

### **Modulation Frequency Rate**

#### **Range**

0.0 Hz to 20.0 kHz

#### **Resolution**

0.1 Hz

#### **Accuracy**

Timebase  $\pm 2$  Hz

### **FM Modulation**

#### **Range**

Off, 0 Hz to 100 kHz

#### **Resolution**

10 Hz

#### **Accuracy**

$\pm 10\%$  (2 kHz to 50 kHz deviation, 150 Hz to 5 kHz rate)

Typically <2% (5.6 kHz deviation, 1 kHz rate)

#### **Total Harmonic Distortion**

3% (1 kHz rate, >2 kHz deviation, 300 Hz - 3 kHz BP filter)

## **EXTERNAL FM**

### **MIC IN**

#### **Input Range**

Range 1: 2–15 mVrms (8 mVrms nominal) MIC E-OPEN, F-GND

Range 2: 35-350 mVrms (100 mVrms nominal) MIC E-GND, F-OPEN

Range 3: 2-32 mVrms (20 mVrms nominal) MIC E-OPEN, F-OPEN

Range 2 turns on a nominal 3 Vdc bias voltage

### **Frequency Range**

300 Hz to 3 KHz

### **Deviation Range**

Off, 0 Hz to 80 kHz

### **Modulation Accuracy**

$\pm 20\%$  (300 Hz to 1.2 kHz)

$\pm 30\%$  (>1.2 kHz)

### **Slope**

Positive voltage yields positive deviation

## **AUDIO IN**

### **Switchable Loads**

150 ohms, 600 ohms, 1 K ohms, DIV 10, High Z

### **Input Levels**

0.05 to 3 Vrms

### **Frequency Range**

300 Hz to 5 kHz

### **Level Sensitivity**

1 kHz/35 mVrms

### **Slope**

Positive voltage yields positive deviation

## **AM MODULATION (GEN 1 AND GEN 2)**

### **Modulation Frequency Rate**

#### **Range**

10.0 Hz to 20.0 KHz

#### **Resolution**

0.1 Hz

#### **Accuracy**

Timebase  $\pm 2$  Hz

### **AM Modulation**

#### **Range**

OFF, 0 to 100%

#### **Resolution**

0.1%

#### **Modulation Accuracy**

10% off setting, 150 Hz to 5 kHz rate, 10% to 90% modulation

#### **Total Harmonic Distortion**

3% (20% to 90% mod, 1 kHz rate, 300 Hz to 3 kHz BP filter)

## **EXTERNAL AM**

### **MIC IN**

#### **Input Range**

Range 1: 2–15 mVrms (8 mVrms nominal) MIC E-OPEN, F-GND

Range 2: 35-350 mVrms (100 mVrms nominal) MIC E-GND, F-OPEN

Range 3: 2-32 mVrms (20 mVrms nominal) MIC E-OPEN, F-OPEN

Range 2 turns on a nominal 3 Vdc bias voltage

### **Frequency Range**

300 Hz to 3 KHz

### **Modulation Range**

Off, 0 Hz to 80 KHz

## **AUDIO IN**

### **Switchable Loads**

150 ohm, 600 ohms, 1 K ohms, DIV 10, High Z



### Input Levels

0.05 to 3 Vrms

### Frequency Range

300 Hz to 5 kHz

### Level Sensitivity

1% / 35 mVrms nominal

## AFGEN 1 AND AFGEN 2

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### FREQUENCY

#### Range

30 Hz to 5 kHz (spec)

0.0 Hz to 20.0 kHz (usable)

#### Resolution

0.1 Hz

#### Accuracy

Timebase  $\pm 2$  Hz

### OUTPUT LEVEL

#### Range

0 to 1.57 Vrms (into 600  $\Omega$ )

#### Resolution

0.01 Vrms

#### Accuracy

$\pm 10\%$

#### Distortion

<3% (1 kHz rate, sine, 300 Hz to 3 kHz)

## RF RECEIVER

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### FREQUENCY

#### Range

2 MHz to 1 GHz (useable from 750 kHz)

#### Resolution

1 Hz

#### Accuracy

Same as timebase

### INPUT AMPLITUDE

#### Minimum Input Level, Audio Sensitivity

ANT: -80 dBm (22.4  $\mu$ V), typical 10 dB SINAD (-110 dBm with preamp)

T/R: -40 dBm (2236  $\mu$ V), typical, 10 dB SINAD

#### Usable Input Level Range

ANT: -60 dBm (-80 dBm with RF Amp On) to -10 dBm (RF Error, Distortion, Modulation, AF Counter and AF Level)

ANT: -90 dBm (-110 dBm with RF Amp On) to -10 dBm (RSSI)

T/R: -20 dBm to maximum input level (RF error, Distortion, Modulation, AF Counter and AF Level)

T/R: -50 dBm to maximum input level (RSSI)

#### Maximum Input Level

ANT: +20 dBm/0.1 W for 10 seconds

T/R: +43 dBm/20 W (FM) and +37 dBm (AM)

+47 dBm/50 W (FM) and +41 dBm (AM) with 50 W attenuator

+51.76 dBm/150 W (FM) and 45.76 dBm (AM) with 150 W attenuator

## AM/FM DEMODULATION

### IF Bandwidth

FM: 5 kHz, 6.25 kHz, 8.33 kHz, 10 kHz, 12.5 kHz, 25 kHz, 30 kHz, 100 kHz, 300 kHz

AM: 5 kHz, 6.25 kHz, 8.33 kHz, 10 kHz, 12.5 kHz, 25 kHz, 30 kHz

### Audio Filters Bandwidth

0.3-20 k BP, 0.3-5 k BP, 0.3-3 k BP, 0.3HP, CCITT BP, C-Wt BP, 15 K LP, 5 K LP, 3 K LP, 0.3 K LP

### Audio Output Level Sensitivity

FM: (3 Vrms/kHz Dev)/IF BW (kHz)  $\pm 15\%$

AM: 7 mVrms/% AM  $\pm 15\%$

### SPEAKER OUTPUT

75 dBa min. at 0.5 m, 600 - 1800 Hz, max volume

### VOLUME CONTROL

#### Range

0 to 100

### LO EMISSIONS

> -50 dBc

### QUIETED CHANNELS

10 frequencies allowed between 2 MHz and 999.999 MHz quieted by no more than 30 dBRF TRANSMITTER TEST METERS

### RF FREQUENCY ERROR METER

#### Range

$\pm 200$  kHz

#### Resolution

1 Hz

#### Accuracy

Same as timebase  $\pm 2$  Hz

### RSSI INDICATOR (RF POWER WITHIN RECEIVER IF BANDWIDTH)

#### Display Range

dBm: -120 dBm to +43 dBm (+53 dBm with Ext Attn dB set to 20 dB)

Watts: 10 pW to 20 W (200 W with Ext Attn dB set to 20 dB)

#### Usable Meter Reading RF Level Range

T/R port: -50 dBm to +43 dBm

ANT port (without RF amp on): -90 dBm to -10 dBm

ANT port (with RF amp on): -110 dBm to -10 dBm

#### Resolution

0.01 dBm

#### Accuracy

$\pm 3$  dB (> -50 dBm into T/R, > -90 dBm into ANT or > -120 dBm into ANT with RF Amp On)

### RF POWER METER (BROADBAND RF POWER INTO T/R PORT)

#### Display Range

0 to 43 dBm (0 to 20 W)

#### Minimum Input Level

0.10 W/+20 dBm

#### Maximum Input Level

20 W/43 dBm for 10 minutes at +25° C or until thermal alarm sounds

**Resolution**

0.01 W/0.1 dBm

**Accuracy**

±1 dB

**FM DEVIATION METER****Range**

500 Hz to ±100 kHz

**Modes**

Peak+, Peak-, (Peak+ - Peak-)/2

**Resolution**

1 Hz

**Accuracy**

±10% of reading 500 Hz to 100 kHz Deviation

±5% 1 kHz to 10 kHz Deviation, 150 Hz and 1 kHz rate

**AM PERCENT METER****Range**

5% to 100%

**Modes**

Peak+, Peak-, (Peak+ - Peak-)/2

**Resolution**

1%

**Accuracy**

±5% of reading, 1 kHz rate, 30% to 90% modulation, 3 kHz LPF

**ANT-CABLE TEST****Frequency Range**

2.0 MHz to 1000.0 MHz

**Span Range**

10.0 MHz to 998 MHz

**Start Range**

2.0 MHz to 990.0 MHz

**Stop Range**

12.0 MHz to 1000.0 MHz

**Frequency Resolution**

0.1 MHz

**Markers**

3

**Immunity to Interfering Signal**

Typically -30 dBm

**SWR MEASUREMENT****VSWR Range**

1.00 to 20.00

**Resolution**

0.02

**VSWR Accuracy**

±10% of SWR readings (calibrated) <300 MHz

±20% of SWR readings (calibrated) =300 MHz

**RETURN LOSS (RL) MEASUREMENT****Range**

0.0 to -50.0 dB

**Resolution**

0.01 dB

**CABLE LOSS MEASUREMENT****Range**

0.0 to -50.0 dB

**Resolution**

0.01 dB

**DTF MEASUREMENT****Measurement Range**

3 ft to 328 ft

1 m to 100 m

**Return Loss Range**

0.0 to -50.0 dB

**Cable Types**

USER, RG-8x, RG-8, RG-8foam, RG-8A, RG-55, RG-55A, RG-55B, RG-58, RG-58foam, RG-58A, RG-58B, RG-58C, RG-174, RG-213, RG-214, RG-223, RG-400

**Velocity**

0.00 to 1.00, automatically selected by cable type

**Loss**

0.00 to 100.00 dB per 100 ft, automatically selected by cable type

**Est Length**

40, 80, 200 or 400 ft

12.2, 24.4, 61 or 121.9 m

**AUDIO METERS****AUDIO INPUT (AUDIO IN)****Source**

BNC Input on front panel

**Frequency Range**

300 Hz to 10 kHz

**Level Range**

0.2 Vp-p to 5 Vp-p

**SINAD METER (WITH 1 KHZ AUDIO)****Measurement Sources**

Audio in, demod

**Audio Frequency**

1 kHz

**Display Range**

0 to 40 dB

**Resolution**

0.1 dB

**Accuracy**

±1.5 dB from 8 to 40 dB

**DISTORTION METER****Measurement Sources**

Audio in, demod

**Audio Frequency**

1 kHz



**Reading Range**

0% to 100%

**Resolution**

0.1%

**Accuracy**

±10% from 1% to 20%

**AUDIO FREQUENCY COUNTER**

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**Range Demod****FM**

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

**AM**

100 Hz to 10 kHz (IF BW set appropriately for received modulation BW)

**Range Audio Input**

15 Hz to 20 kHz

**Audio Input Level**

10 mV p-p to 5 V p-p

**Resolution**

0.1 Hz

**Accuracy**

±1 Hz

**AUDIO FREQUENCY LEVEL METER**

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**Measurement Sources**

AUDIO IN, DVM

**Frequency Range**

200 Hz to &lt;5 kHz

**Input Level**

AUDIO IN	10 mV rms to 3 V rms (x1)
	1 V rms to 30 V rms (÷10)
DVM	10 mV rms to 3 V rms (x1)
	1 V rms to 30 V rms (÷20)

**Display Unit Resolution**

Volts	0.001 V
mV	0.001 mV
dBuV	0.001 dBuV
dBm	0.001 dBm
Watts	0.001W

**Accuracy**

±5% Audio In

**ANALYZER (OPTIONAL)**

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**FREQUENCY****Range**

2 MHz to 1 GHz

**Resolution**

1 Hz

**Accuracy**

Same as timebase

**Span**

10 kHz to 5 MHz in 1,2,5 sequence

**EFFECTIVE RBW****Range**

19 Hz to 25 kHz (Effective RBW calculated based on FFT window type and Span)

**POWER BANDWIDTH****Offset Range**

0 to ±2.495 MHz

**Bandwidth Range**

1 kHz to 5 MHz in a 1,2,5 sequence (maximum bandwidth is the selected span)

**Power Bandwidth Display Range**

-137 dBm to +43 dBm

**Power Bandwidth Display Resolution**

0.001 dBm

**Power Bandwidth Accuracy**

±3 dB (&gt;-50 dBm into T/R, &gt;-90 dBm into ANT or &gt;-110 dBm into ANT with RF Amp On)

**Displayed Average Noise Level (DANL)**

-120 dBm (Typical, 10 kHz span) -136 dBm with pre-amp enabled

**Sweep time**

700 ms (Typical)

**OSCILLOSCOPE (OPTIONAL)**

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**Source**

DVM, Audio In, Demod

**Traces**

One

**Markers**

Two

**Trigger****Type**

Auto, Norm

**Edge**

Rising, Falling

**Level**

-100 to +100 V

**Horizontal****Range**

0.5 ms/div to 0.1 sec/div

**Accuracy**

3% of full scale

## Vertical

### Range

#### FM demod

0.1 kHz to 50 kHz/div in a 1, 2, 5 sequence

#### AM demod

5, 10, 20, 50%/div

#### DVM and Audio in

10 mV to 10 V/div in a 1, 2, 5 sequence

### Accuracy

10% of full scale

### Coupling:

DVM Input: AC, DC and GND

AUDIO IN: AC

### Input Impedance

DVM Input: 1 M  $\Omega$

AUDIO IN: 150  $\Omega$ , 600  $\Omega$ , 1 K $\Omega$ , High Z, Div by 10

### Bandwidth

5 kHz

## TIMEBASE

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### Temperature Stability

$\pm 0.25$  ppm at 25°C

$\pm 0.5$  ppm over temp range

### Aging

1 ppm/year standard

### Warm-up time

3 min.

## ENVIRONMENTAL/PHYSICAL

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### Overall Dimensions

231 mm x 285 mm x 70 mm (W x L x D)

9.1 in. x 11.2 in. x 2.8 in.

### Weight

8 lbs. (3.6 kg); 12 lbs. (5.4 kg) with accessories and softbag

### Temperature

Storage: -51°C to +71°C storage

Note: Battery must not be subjected to temperatures below -20°C, nor above +60°C

Operation:

DC only Operation: -20°C to +55°C (battery removed, contingent upon applied RF power over time<sup>(1)</sup>).

Battery Operation: -20°C to +40°C (typical based on internal temperature rise and usage of the instrument<sup>(1)</sup>)

Note: Battery to be charged at temperatures between 0°C and +45°C

### Humidity

95% max. (non-condensing) (MIL-PRF-28800F Class 2)

### Altitude

4,600 m max. (15,092 ft.) (MIL-PRF-28800F Class 2)

### Shock, Functional

30G (MIL-PRF-28800F Class 2)

## Vibration

Random 10 - 500 Hz (MIL-PRF-28800F Class 2)

## Bench Handling

MIL-PRF-288000F, Class 2

## COMPLIANCE

## ENVIRONMENTAL

### Use

Pollution degree 2

Mil-PRF-28800F class 2

Salt fog

Splash proof

Acoustic noise

Explosive atmosphere

Fungus resistance

Dust resistance

Drip proof

Solar radiation

## EMC

### Emissions

Mil-PRF-28800F

EN61326: 1998 class A

EN61000-3-2

EN61000-3-3

### Immunity

Mil-PRF-28800F

EN61326: 1998

EN61000-6-1

## SAFETY

### Standard

UL 61010-1

## Usage Environment

Indoor use, maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% RH at +40°C, Installation Category II, Pollution degree 2

## AC INPUT POWER (AC TO DC CONVERTER / CHARGER UNIT)

### AC Input Voltage Range

100 to 240 VAC, 1.5 A max., 47 Hz - 63 Hz

### AC Input Voltage Fluctuation

Less than 10% of the nominal input voltage

### Transient Overvoltage

According to Installation Category II

## Usage Environment

Indoor use, maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% RH at +40°C, Installation Category II, Pollution degree 2

### Operating Temperature

0°C to +40°C

### Storage Temperature

-20°C to + 85°C

(1) Consider the use of the instrument for thermal operating temperature. All thermal ratings are dependent upon applied RF power. The 3500A will alarm once the internal temperature exceeds safety limits. Applying power continuously in high ambient temperature environment will result in a heat build-up within the instrument. The 3500A is rated for 20 W (43 dBm) for 10 minutes at +25°C or until thermal alarm sounds. Exceeding these conditions will result in thermal shutdown.

## EMI

EN55022 class B, EN61000-3-2 class D

## Safety

UL 1950, CSA 22.2 No. 234 and No.950, IEC 950/EN 60950

## DC INPUT POWER

### DC Input Voltage Range (DC INPUT CONNECTOR)

11 VDC to 32 VDC

### DC Power Input, Max. (DC INPUT CONNECTOR)

55 W

### DC Power Input, Nominal (DC INPUT CONNECTOR)

25 W

### DC Fuse Requirement (DC INPUT CONNECTOR)

5A, 32 VDC, Type F

## BATTERY

### Battery Type

Lithium Ion (Li Ion) battery pack

Note: Battery must not be subjected to temperatures below -20°C, nor above +60°C

### Battery Operation Time

5 hours continuous use

No backlight, duty cycle 80% transmitter and 20% Receiver tests, Auto shutoff if key is not pressed for 10 minutes

7 hours typical use

### Battery Charge Time

4 hours

Note: Battery to be charged at temperatures between +0°C and +45°C only

## DIRECTIONAL COUPLER

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### Coupling

30 dB

### Frequency Range

20 MHz to 200 MHz

### Power Rating

250 W CW

### Insertion Loss

0.25 dB Max.

### VSWR

1.10:1 Max.

### Flatness

± 0.5 dB Max.

### Directivity

20 dB Min

### Connectors

RF In: Type N

RF Out: Type N

FWD: BNC

REV: BNC

## Kit Includes

Coupler (Werlatone Model: C1569-13)

2 BNC cables (12 in)

2 Adapters (N-F to BNC-F)

1 10 dB attenuator

## 20 db/50 W ATTENUATOR

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Attenuator Type

Bi-Directional

DC - 18 GHz

Power Rating

(mounted horizontally): 50 watts average (bi-directional) to 25°C ambient temperature, derated linearly to 10 Watts @ 125°C. 1 kW peak (5 µsec pulse width; 2.5% duty cycle).

### Maximum deviation over frequency

± 0.75 dB

### Maximum SWR

1.15

## Kit Includes

20 dB/50 W attenuator

N-F, BNC-F adapter

TNC-M, N-M adapter

## 20 db/150 W ATTENUATOR

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Attenuator Type

Uni-Directional

DC - 1.5 GHz

### Power Rating

(mounted horizontally with fins vertical): 150 watts average (unidirectional) to 55°C ambient temperature, derated linearly to 10% @ 125°C.

### Maximum deviation over frequency

± 0.50 dB

### Maximum SWR

1.10

## Kit Includes

20 dB/150 W attenuator

N-F, BNC-F adapter

N-M, BNC-F adapter

## P25 FUNCTIONS

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- C4FM modulation fidelity
- C4FM frequency error
- Power
- Tx BER
- STD 1011, 0.153 CAL generator for BER

## VERSIONS, OPTIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

Ordering Numbers	Description
3500A	Portable Radio Test Set
3500AUK	Portable Radio Test Set plus upgrade kit

### 3500A SUPPLIED ACCESSORIES

Case, Soft -Sided Carrying  
External DC Power Supply  
Power Cable (AC)  
Handset  
Short-Open-Load VSWR Calibrator  
Comm Breakout Box  
Cable (TNC) (M-M) (48 in)  
2 X Cable (BNC) (M-M) (48 in)  
5 X Adapter (BNC-F to TNC-M)  
2 X Fuse, Spare (5 A, 32 Vdc, Type F)  
Case, Accessory  
Power Cable (DC cigarette lighter)  
Getting Started Manual (Paper)  
Operation/ICW Manual (CD)  
Antenna (BNC) (50 MHz)  
Antenna (BNC) (150 MHz)  
Antenna (BNC) (450 MHz)  
Antenna (BNC) (800 MHz)  
Flash Drive, 1 GB USB

### 3500AUK ADDITIONAL SUPPLIED ACCESSORIES

Flip Cover  
Attenuator (20 dB / 50 W)  
Adapter (N-M to TNC-M)  
2 X Adapter (N-F to BNC-F)  
Attenuator (20 dB / 150 W)

Adapter (N-M to BNC-F)

### Options

35XX0PT01	Spectrum Analyzer
35XX0PT02	Oscilloscope
35XXOPT07	P25 Test
35XXOPT08	Tracking Generator
35XXOPT09	dPMR Test
35XXOPT33	NXDN™ Test
35XXOPT34	DMR Test

### Optional Accessories

AC number	Description
AC27002	Attenuator (20 dB / 50 W), Adapter (N-F to BNC-F), Adapter (N-M to TNC-M)
AC27003	Attenuator (20 dB / 150 W), Adapter (N-F to BNC-F), Adapter (N-M to BNC-F)
AC27013	Directional Coupler (20 to 200 MHz), 2 X Adapter (N-M to BNC-F), Attenuator (10 dB), 2 X Cable (BNC) (M-M) (16 in)
AC27005	Battery, Spare
AC27001	Case, Transit
AC27006	Flip Cover
AC27009	Maintenance Manual (CD)
AC0820	Desk Top Stand
AC0826	Tripod
AC24006	Tripod, Dolly, Stand

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