# Wireless

## 3500 Portable Radio Communications Test Set

**Designed to dramatically improve radio operational time in vehicle installations and reduce the number of incorrectly diagnosed radios that result in NTF (No Trouble Found).**

- Easy portability - weighs only 8.5 lbs. (3.9 kg)
- 5 hour battery life
- 2 MHz - 1 GHz operation
- Rugged construction
- -20° to +55° C operating temperature range
- Built-in generator and receiver to 1 GHz
- AM/FM transmitter tests
  - RF power
  - RF frequency error
  - AM modulation / FM deviation
  - Receive Signal Strength Indicator (RSSI)
- AM/FM receiver tests
  - Distortion
  - SINAD / Sensitivity
- VSWR and Distance to Fault tests for cable and antenna testing
- Software defined features allow field upgrades
- Handset and antenna allow over the air "Talk Test"

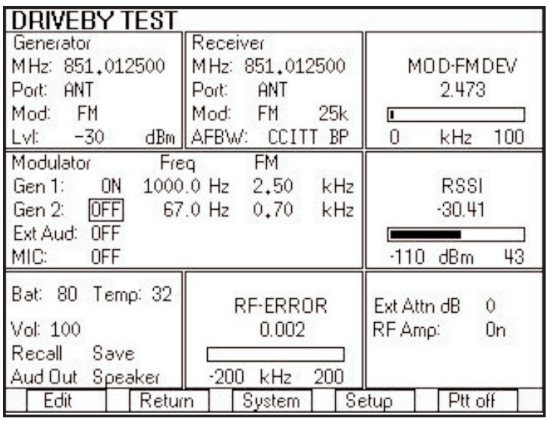
The Aeroflex 3500 is a new Aeroflex Radio Test Set with the latest in portability, battery life and performance. The Aeroflex 3500 Radio Test Set builds upon Aeroflex's expertise in developing portable radio test sets with exclusive features and affordability that are destined to set a new standard in portable radio test sets. The 3500 is capable of measuring high power (20 watts without an external attenuator, up to 200 watts with an external attenuator option), as well as finding faults in antennas, power amplifiers and interconnects. Designed to meet the needs of a variety of vehicle radio tests, the 3500 provides fast, reliable measurements of the radio's transmitter parameters and receiver sensitivity. With the additional capability to perform quick testing of antennas and cables, the 3500 provides the most complete in-vehicle test solution available to quickly isolate problems and assess performance of the radio, cable and antenna systems. The 3500 was designed to significantly reduce the number of radios incorrectly removed from vehicles where it was later determined to have no trouble found. With extensive operational capability, the 3500 provides portable test features that are typically found in bench top radio test equipment.

### Portable and Rugged

The 3500 Radio Test Set was designed from the ground up to be portable and rugged, weighing in at only 8.5 lbs (3.9 kg). including the battery. It has a solid aluminum weatherproof case, an operating temperature range of -20° to +55° C, and rugged construction specifications for humidity, altitude, shock, and vibration. The battery gives the user 5 hours of operation and can be fully recharged and ready to operate in only 4 hours. In addition, the 3500 and the optional accessories can be stored in a ruggedized transport case.

### Quick Drive By Testing To Isolate Radio Installation Failures

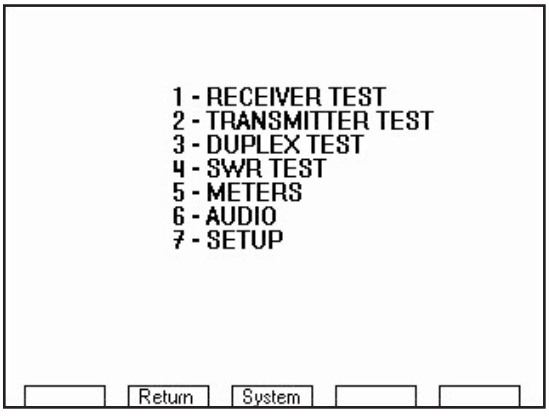
Designed to be used for quick Drive By Testing, the 3500 can efficiently and easily find radio failures. There is no need to connect to the radio under test, simply connect the supplied antenna, key up the radio and then measure the radio parameters over-the-air. A handset is provided to check voice quality of the transmitter and receiver. A push-to-talk button on the handset controls whether the 3500 is transmitting or receiving.




*Drive By Test Screen*

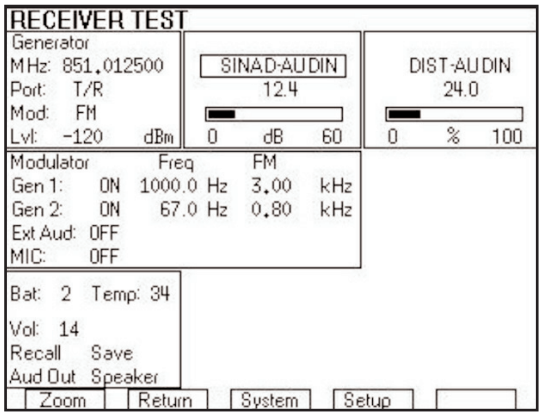
### Bench Top Testing

Also included in the operation of the 3500 is the capability to perform bench top type testing on a radio. All radio parameters including power, frequency error, modulation accuracy, receiver sensitivity and audio performance can be easily accessed and tested with the 3500. In the Bench Top Mode, the user has the ability to tailor the operation of the 3500 to the type of testing to be performed. The user can select a Receiver Test, Transmitter Test, or Duplex Test screen from the Bench Top Menu screen.



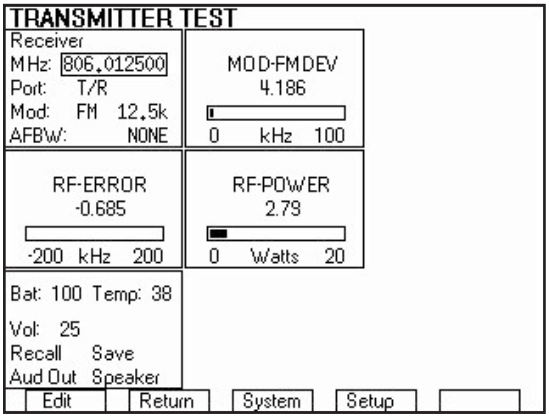

*Bench Top Menu Screen*

If the Receiver Test is selected, the 3500 operates as a signal generator, enabling the testing of the receiver portion of the radio. Audio SINAD and distortion are among the tests that can be performed on the radio's receiver. With two internal generators that can be used as modulation sources, the 3500 can modulate the carrier with both a test tone and a squelch tone.



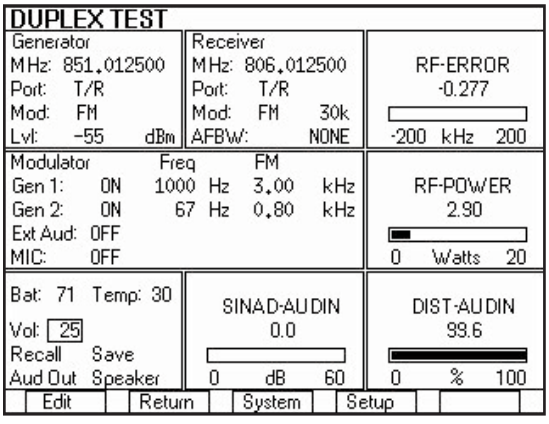

*Receiver Test Screen*

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.



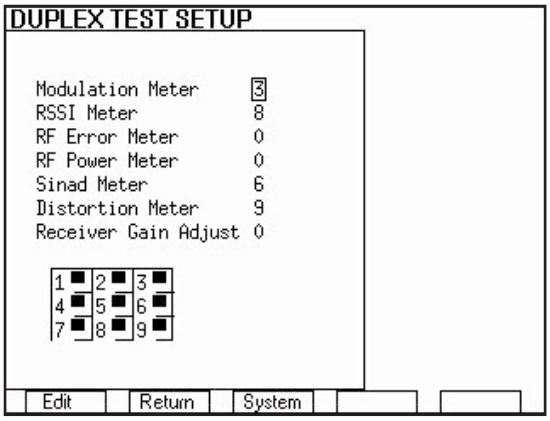

*Transmitter Test Screen*

The Duplex Test Screen operates as both a signal generator and analyzer, allowing simultaneous testing of the transmitter and receiver of the radio being tested.




*Duplex Test Screen*

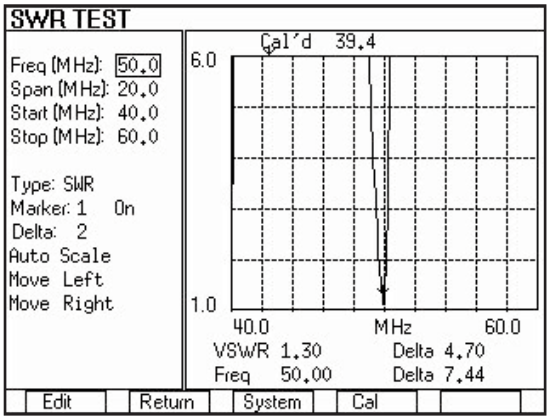
Any of the test screens can be easily configured with the meters that are needed according to the type of tests that the user wants to perform by selecting the meters from the setup screen. Users can quickly define the "look" of the instrument by configuring the way the meters are displayed on the screen.



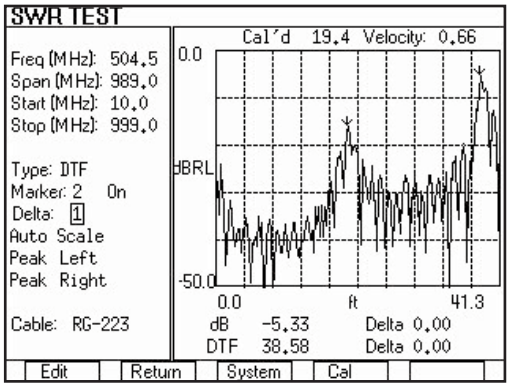

*Setup Screen*

### Isolate Cable and Antenna Problems

Since many radio faults lie in the cabling and/or antenna and not with the radio, the 3500 includes the capability to measure the VSWR of an antenna or the return loss of a cable. A large VSWR can be an indication of a high return loss caused by a bad cable, connector or antenna. 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 down time. The SWR Test screen displays either VSWR versus frequency or return loss versus feet. VSWR versus frequency is useful for displaying the VSWR characteristics of an 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).




*SWR Test Screen Showing VSWR Versus Frequency*




*SWR Test Screen Showing Return Loss Versus Feet*

Up to six markers can be enabled for use in analyzing the graphical data that is acquired for SWR or DTF. The markers provide the user with information on the precise return loss at a given distance for DTF mode or the exact VSWR at a given frequency for SWR mode. A delta function, associated with the markers, is also available in order to show the difference in VSWR and frequency, or return loss and feet, between two of the markers.

### Save/Recall Features

The 3500 allows users to define pass/fail parameters and configure the test parameters and then save these files 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.

### Future Updates

The 3500 utilizes a software-defined radio architecture. The software defines almost all of the functionality of the test set from the RF physical layer and up. This software-defined feature allows for future updates and improvements to the capability of the instrument and allows the user to easily add options or update functional improvements in the field, without the need to return the instrument to the factory. Future enhancements will include a spectrum analyzer and oscilloscope.

## *SPECIFICATION*

### *RF SIGNAL GENERATOR*

#### *FREQUENCY*

***Range***

*2 MHz to 1 GHz*

***Resolution***

*1 Hz*

***Accuracy***

*Same as Timebase*

#### *OUTPUT LEVEL*

***Range***

*T/R Port: -50 to -120 dBm / 707 µV to .224 µV*

*ANT Port: -30 to -90 dBm / 7071 µV to 7.07 µV*

*SWR Port: -5 to -65 dBm / 125743 µV to 126 µV*

***Resolution***

*1 dB*

***Accuracy***

*±3 dB*

#### *SSB PHASE NOISE*

*-80 dBc/Hz at 20 kHz offset*

#### *SPURIOUS*

***Harmonics***

*-30 dBc*

***Non-Harmonics***

*-40 dBc (>±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*

***MODULATION FREQUENCY (RATE) - AM AND FM***

***Range***

*150 Hz to 5 kHz*

***Resolution***

*0.1 Hz*

***Accuracy***

*Timebase ± Hz*

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

***Range***

*Off, 500 Hz to 50 kHz*

***Total Harmonic Distortion***

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

***Resolution***

*10 Hz*

***Accuracy***

*±10% (2 kHz to 50 kHz deviation, 150 Hz to 5 kHz rate)*

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

***EXTERNAL FM***

***MIC IN***

*Level: 1 to 30 mVrms, voiced tone (whistle)*

*Frequency Range: 400 Hz to 1.2 kHz*

*Level Sensitivity: 1 mVrms = 7 kHz deviation nominal*

***AUDIO IN***

*Switchable Loads: 150 ohms, 600 ohms, High Z*

*Input Levels: 0.05 to 3 Vrms*

*Frequency Range: 300 Hz to 5 kHz*

*Level Sensitivity: 10 Hz / mVp-p nominal*

*Slope: Positive voltage yields positive deviation*

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

***Range***

*0 to 95%*

***Resolution***

*1%*

***Total Harmonic Distortion***

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

***Accuracy***

*10% of setting (150 Hz to 5 kHz rate, 10% to 90% Modulation)*

***EXTERNAL AM***

***MIC IN***

*Frequency Range: 400 Hz to 1.2 kHz*

*Level Sensitivity: 1 mVrms = 7% Modulation, nominal*

***AUDIO IN***

*Switchable Loads: 150 ohm, 600 ohms, High Z*

*Input Levels: 0.05 to 3 Vrms*

*Frequency Range: 300 Hz to 5 kHz*

*Level Sensitivity: 1% / 20 mVp-p nominal*

## *AFGEN 1 AND AFGEN 2*

***FREQUENCY***

***Range***

*30 Hz to 5 kHz*

***Resolution***

*0.1 Hz*

***Accuracy***

*Timebase ±2 Hz*

***OUTPUT LEVEL***

***Load Impedance***

*600 ohms*

***Range***

*0 to 1.5 Vrms*

***Resolution***

*0.01 Vrms*

***Accuracy***

*±10%*

***Distortion***

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

## *RF RECEIVER*

***FREQUENCY***

***Range***

*2 MHz to 1 GHz*

***Resolution***

*1 Hz*

***Accuracy***

*Same as Timebase*

***INPUT AMPLITUDE***

***Minimum Input Level, Audio Sensitivity***

*ANT: -80 dBm (22.4 µV), typical 10 dB SINAD*

*T/R: -40 dBm (2236 µV), typical, 10 dB SINAD*

***Useable Input Level Range***

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

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

*T/R: -20 dBm to Maximum Input Level (RF Error, Distortion, and Modulation)*

*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)*

***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***

*NONE, 15 k LP, 5 k LP, 0.3 k LP, 0.3-5 k BP, 0.3 k HP, C-Wt BP, CCITT BP*

***Audio Output Level Sensitivity***

*FM: (3 Vrms/kHz Dev)/IF BW (kHz) ± 15%*

*AM: 7 mVrms / % AM ±15%*

## *RF TRANSMITTER TEST METERS*

***RF FREQUENCY ERROR METER***

***Range***

*±200 kHz*

***Resolution***

*1 Hz*

***Accuracy***

*Same as Timebase*

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

***Display Range***

*dBm: -110 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)*

***Useable 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***

*0.1 dBm*

***Accuracy***

*±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***

*Ext Attn set to 0 dBm: 0 to 43 dBm (0 to 20 W)*

*Ext Attn set to 20 dBm: 0 to 53 dBm (0 to 200 W)*

***Minimum Input Level***

*0.10 W/+20 dBm*

***Maximum Input Level***

*No external attenuator:*

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

*With external 50 Watt attenuator:*

*50 W/47 dBm average at +25° C*

*With external 150 Watt attenuator:*

*150 W/51.8 dBm average for temperatures up to +25° C, linearly derated to 125 W at 55° C*

*200 W/53 dBm peak for 30 seconds on / 5 minutes off at +25° C.*

***Resolution***

*0.01 W/0.1 dBm*

***Accuracy***

*±1 dB for internal attenuator*

*±1.5 dB using external attenuator*

***FM DEVIATION METER***

***Range***

*500 Hz to ± 100 kHz*

***Modes***

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

***Resolution***

*1 Hz*

***Accuracy***

*±10% of reading*

*Typically <3% ( 1 kHz rate, 5 kHz deviation)*

***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*

## *SWR MEASUREMENT*

***Frequency Range***

*2.0 MHz to 1000.0 MHz*

***Span Range***

*0.2 MHz to 998 MHz*

***Start Range***

*2.0 MHz to 999.8 MHz*

***Stop Range***

*2.2 MHz to 1000.0 MHz*

***Frequency Accuracy***

*Same as timebase*

***Frequency Resolution***

*0.1 MHz*

***VSWR Range***

*1.00 to 6.00*

***VSWR Resolution***

*0.01*

***VSWR Accuracy***

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

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

***Return Loss Range***

*0.0 to -50.0 dB*

***DTF range***

*Base on Frequency Span*

*Min: 0 to 41 ft.*

*Max: limited by cable loss*

## AUDIO METERS

***AUDIO INPUT (EXT AUDIN)***

***Source***

*BNC Input on Handset*

***Frequency Range***

*300 Hz to 10 kHz*

***Level Range***

*0 V 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%*

## TIMEBASE

***Temperature Stability***

*1 ppm standard*

***Aging***

*1 ppm / year standard*

***Warm-up time***

*3 minutes*

## ENVIROMENTAL / PHYSICAL

***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***

*8.5 lbs. (3.9 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: -20°C to +55°C*

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

***Humidity***

*95% maximum (non-condensing) (MIL-PRF-28800F Class 2)*

***Altitude***

*4,600 meters 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)*

***Compliance***

*Safety Standard: UL 61010-1*

*EMC: Mil-PRF-28800F Class 2*
*CE*
*EN 61000*
*EN 61326;1998*

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

***AC Input Voltage Range***

*100 to 240 VAC, 1.5 A maximum, 47 Hz - 63 Hz*

***AC Input Voltage Fluctuation***

*Less than 10% of the nominal input voltage*

***DC INPUT POWER***

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

*11 VDC to 32 VDC*

***DC Power Input, Maximum (DC INPUT CONNECTOR)***

*55 W*

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

*25 W*

***DC Fuse Requirement (DC INPUT CONNECTOR)***

*5A, 32VDC, 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.*

## *VERSIONS, OPTIONS AND ACCESSORIES*

*When ordering please quote the full ordering number information.*

### SUPPLIED ACCESSORIES

Soft-side carrying case
AC to DC charger with AC power cord
Audio/Microphone handset
Audio/Microphone handset cable
Short/1 GHz VSWR load TNC female
Breakout box
TNC-M to TNC-M cable
BNC-M to BNC-M cable (2)
TNC-M to BNC-F adapter (5)
Fuses 5A 32V (2)
Accessory case
Internal battery
DC cigarette lighter adapter
Getting Started manual
CD-ROM manual

### OPTIONAL ACCESSORIES

AC27001 - Hard-side carrying case
AC27002 - 20 dB, 50 W attenuator kit

**Kit Includes**

20 dB/50 W attenuator
N-F, BNC-F adapter
TNC-M, N-M adapter
**Attenuator Type**
Bi-Directional
DC - 18 GHz
**Maximum Input Level**
50 W/47 dBm average at +25° C

AC27003 - 20 dB/150 W attenuator kit includes

**Kit Includes**

20 dB/150 W attenuator
N-F, BNC-F adapter
N-M, BNC-F adapter
**Attenuator Type**
Uni-Directional
**Maximum Input Level**
150 W average for temperatures up to 25 °C, linearly derated to 125 W at 55 C, horizontal 200 watts peak for 30 seconds ON/ 5 minutes OFF at 25 °C

AC27004 - Extra soft-side carrying case
AC27005 - Extra battery
AC27006 - Flip cover
AC25042 - Antenna, BNC, 50 MHz
AC25045 - Antenna, BNC, 150 MHz
AC25043 - Antenna, BNC, 450 MHz
AC25044 - Antenna, BNC, 800 MHz
AC27013 - Dual Directional Coupler kit

**Includes**

Dual Directional Coupler
10 dB attenuator
BNC 12 inch cables (2)

Dual directional coupler type

**Frequency**

20 to 200 MHz

**Power**

250 W

**Coupler**

30 dB

**I/O**

Type N input - radio under test transmitter

Type N output - cable/antenna under test

BNC output - measuring forward power

BNC output - measuring reverse power

## EXTENDED STANDARD WARRANTIES FOR 3500

| | |
|---|---|
| W3500/203 | Extended Standard Warranty 36 Months |
| W3500/205 | Extended Standard Warranty 60 Months |

## EXTENDED STANDARD WARRANTIES WITH CALIBRATION FOR 3500

| | |
|---|---|
| W3500/203C | Extended Standard Warranty 36 Months with scheduled calibration |
| W3500/205C | Extended Standard Warranty 60 Months with scheduled calibration |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AEROFLEX
A passion for performance.



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


*Part No. 46891/266, Issue 4, 03/07*