AUTOMOTIVE • AVIATION • TELECOM

AUDIO BANDWIDTH TEST SYSTEMS

Designed to meet the rigorous requirements of EMC testing.
The 3110A is a simple-to-use yet powerful standards waveform generator. It has been designed to be used quickly and easily with other AE Techron products to create a wide range of powerful and intelligent EMC test solutions. The 3110A outputs a standard analog signal that can work with any AE Techron amplifier or other LF amplifiers that you already have. It has a scalable output, so the values entered in the 3110A interface will result in your desired system output. When coupled with the AE Techron model 7228 amplifier, the 3110A can create virtually all waveforms, DC offsets, drop outs and surges needed for EMC tests with rise/fall times of 1 µs or greater and frequencies from DC to 1 MHz.

The 3110A software is built around the simple concept of a waveform segment. Each waveform segment can have a unique waveform, (sine, square, triangle, and/or DC offset). Frequency, amplitude and DC offset can be clipped, fixed, variable or swept. Segments can be calibrated (as required in CS101) and set to continue on to the next segment or to hold for an external trigger. Individual segments can be as short as 50 µs or as long as 144 hours. The power of the system occurs when waveform segments are linked to create test sequences. These test sequences can be of any length and can be run as a single sequence, looped, or looped with multiple variables changing within the test sequence (as required in multiple Toyota and GM standards). Finally, multiple sequences can be combined to create a single customized extended test.

An extensive library of 1500+ tests for many automotive, aviation and industry Standards makes it possible for the 3110A to save time from day one. And, for customers that require over-testing or testing for products that have no predefined standard, tests from the Standards Library can be easily modified and saved for later use.

The 3110A delivers extensive capabilities for LF EMC testing with very short training-time requirements. Plus, it makes it easy to automate repetitive and labor-intensive tasks, making the 3110A a very efficient and cost-effective solution for LF EMC testing.

**3110A Standards Waveform Generator**

**Up to 1 MHz EMC Testing**

- Easiest-to-use LF wave sequence generator
- 1500+ automotive and aviation standard’s tests included
- Dramatically reduces test time for repetitive test sequences
- Semi-automatic calibration routine significantly reduces labor-intensive tasks (like CS101)
- Very easy to modify included waveform sequences or create new ones

**Bandwidth** – DC to 1 MHz  
**Rise Time** – Under 1 µs  
**Minimum Pulse Duration** – Under 50 µs  
**Maximum Waveform Duration** – 144 hours

**LF Tests from the following Standards are included in the 3110A Standards Library**

- Airbus ABDO100.1.8 Issue C (2008-07)
- Airbus ABDO100.1.8 Issue E (2005-04)
- Airbus AM2-4 Issue C (2005-03)
- ANSI ASAE EP435
- Audi I EE-32 (2006-06)
- BMW GS 95003-2 (2010-01)
- BMW GS 95003-3 (2010-01)
- BMW GS 95024-2-1 (2010-01)
- BMW GS 95024-2-2 (2011-01)
- Boeing D6-16050-5 Issue C (2006-09)
- Case New Holland ENS0310 (12-2-2010)
- Chrysler CS-11809 (2009-05-29)
- Chrysler CS-11979 (2010-04-13)
- Claas CN 05 0215 (2004-12)
- Cummins 14269 (06201-028)
- Cummins 14387 (102020-119)
- DAF BSL003 (1998-12)
- DAF BSL006 (2009-04)
- Daimler Chrysler PF-9326 Change D
- DAIMLER CHRYSLER DC-10842 (2003-12)
- DAIMLER CHRYSLER PF-9326 Change D
- DO160G (2012-12)
- Fiat 9.90110 Issue 13 (2007-03)
- Ford CS-209.1 (2-11-2010)
- GMW 3172 H (July 2010)
- Hyundai ES 39110-00-00 (5-8-2012)
- Hyundai ES 95400-10 (2007-11-14)
- Hyundai ES 96100-02 (2006-11-16)
- Hyundai ES 96200-00 (2008-07-03)
- ISO 7637-2:2011 (E)
- ISO 16750-2:2012 (E)
- JASO D001-94 (1994)
- Mazda MES PW 67600 (1995-17)
- MIL-STD-461F (2007-12)
- MILHDBK-704F (2007-12)
- Mitsubishi ES X82115 Rev C (2009-03)
- Mitsubishi ES X82115 Rev C (2009-03)
- Nissan 28400 NDS 02, 03
- Nissan 28401 NDS 02 Rev.4 (2008-08)
- SAE J1113-2, -11
- SAE J2139 SEP2005
- SAE J2628 JUL2007
- Toyota TSC3590G Rev 7 (June 2001)
- Toyota TSC3590G Rev 8 (May 2005)
- VW 80000 (2009-10)
- VW 80101 (2009-03)
- VW 80101 (2009-03)
- VW 80101 (2009-03)
- VW 80101 (2009-03)
- VW 80101 (2009-03)
- VW 80101 (2009-03)
- VW 80101 (2009-03)
**DC + AC Amplifiers / Battery Simulators**

7114 and 7136 power amplifiers

### 7114 / 7118 / 7136

**Exceptional Versatility & Value**

AE Techron’s **7100-series** amplifiers are 4-quadrant, AC and DC amplifiers that provide exceptional versatility and value. Compact size, user configurability, DC-Max™ topology, and AE Techron toughness make the 7100-series amplifiers the ideal lab partners for automotive conducted immunity testing, PSRR testing, or any application where more voltage or current is needed than is available from the signal source.

### 7114 Features
- 15A DC and capable of reproducing 250 kHz ripple or <4 μs dropout/pulses
- User-variable DC offset: ±20V or ±45V
- User-adjustable current limit: 1A to 25A
- Variable gain: 0 to 10
- Compact 9.5-inch width, 2U height; weighs only 20 lbs.

### 7118 Features
- Up to 425 watts RMS power output
- Capable of reproducing 150 kHz ripple or <4 μs dropout/pulses
- User-variable DC offset: ±20V or ±45V
- User-adjustable current limit: 1A to 25A
- Variable gain: 0 to 20
- Compact 9.5-inch width, 2U height; weighs only 20 lbs.

### 7136 Features
- 180VRMS at 5 amps; 200Vrms capable
- Precision, user-variable DC offset: ±2V or ±20V
- User-adjustable current limit: 1A to 25A
- Variable gain: 0 to 40
- Compact 2U height; weighs only 40 lbs.

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**AE Techron Tough:** Protection from over-temperature, over-current, over/under supply voltages; will drive capacitive and inductive loads.

<table>
<thead>
<tr>
<th>Maximum Output:</th>
<th>7114*</th>
<th>7118*</th>
<th>7136*</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 VA</td>
<td>425VA</td>
<td>900 VA</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Small Signal (8V p-p)</th>
<th>400 kHz</th>
<th>400 kHz</th>
<th>400 kHz</th>
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<table>
<thead>
<tr>
<th>For High-Power Applications to</th>
<th>50 kHz</th>
<th>50 kHz</th>
<th>50 kHz</th>
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<table>
<thead>
<tr>
<th>Output Voltage</th>
<th>±92 Vp or ±42 Vp</th>
<th>±148 Vp or ±92 Vp</th>
<th>±300 Vp or ±150 Vp</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DC Power</th>
<th>15A at 13.5 VDC</th>
<th>9A at 48 VDC</th>
<th>5A from 13.5-48 VDC</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>40 ms Pulse</th>
<th>25 Ap (0.5Ω)</th>
<th>24 Ap (2Ω)</th>
<th>25 Ap (4Ω)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Slew Rate</th>
<th>50 V/μs</th>
<th>75 V/μs</th>
<th>165 V/μs</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Output Impedance</th>
<th>10 mΩ in series with 0.95 μH</th>
<th>10 mΩ in series with 0.95 μH</th>
<th>10 mΩ in series with 0.95 μH</th>
</tr>
</thead>
</table>

*NOTE: These models do not carry the CE mark.*
Amplifiers for Conducted & Radiated Immunity Testing

7220-series amplifiers, when used with a signal generator such as the AE Techron 3110A, can simultaneously produce both the DC voltage needed to drive the DUT and the high-frequency (AC ripple) conducted interference waveform required in cranking tests found in Standards like FMC1278. They can also be used to perform surge and dropout.

DC Amplifiers / Battery Simulators

7796HC / 7794 / 7796 Modular Power

- Up to 5000 watts RMS power output
- Small signal response up to 250 kHz
- Controlled-voltage and controlled-current modes
- Output protected from open circuit, shorting, back EMF; amplifier protected from over temperature, under/over voltage and over current
- Can be used alone or combined with like models in Series or Parallel systems for up to 400 ARMS or 300 VRMS continuous output
Radiated Immunity Testing

7796HC /7794/7796 power amplifiers offer great power and flexibility. The series consists of three models. Each model can be used as a free-standing gain block or combined in multiples to achieve high voltage (300 VRMS at 50 ARMS) or high current (up to 300A at 13.5V DC continuously).

A single 7796HC makes a very good choice for 13.5V DC-based power susceptibility test standards for high current draw (up to 85A) EUTs.*

The 7794 was designed with a very low output impedance; a single 7794 is able to produce up to 106A continuous at 28V DC, making it an excellent battery substitute for transient immunity testing. It is also capable of producing the 80V surges required for DO-160G section 16.6.2.4 abnormal surge testing and is well suited for ISO 7637 pulse 2b and 4 testing.

The 7796, when run in controlled-current mode, is a perfect choice to drive medium to large diameter Helmholtz coils and radiators like those specified in Ford FMC1278 (RI140, RI150).

The 7796HC is only available in 208V AC source; 400V version not available.

AE Techron precision amplifiers are used in difficult, high-reliability applications around the world – everything from controlling plasma in a reactor to driving the motors that aim telescopes on mountain tops.

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7226 amplifier

7228 amplifier

• DC (0 Hz) to 1 MHz
• 100 V/µs rise time
• 0 to 30V DC, 0 up to 60 Ap, or 0 to 110 VRMS modes
• Signal Integrity: <1 mV noise floor; <0.1% THD
• Maximum Power Output: 1000 watts

The 7228 offers up to 4X the long-term power of the 7224 above 100 kHz, and a small-signal response to 1 MHz. It also features ultra-low DC drift and offset, adjustable current limits, and convenient configuration control (including controlled-voltage or controlled-current operation) via external switches.

• Can be combined in series or parallel systems for increased voltage or current
• Rugged Design – Output protected from open circuit, shorting, back EMF; amplifier protected from over temperature, under/over voltage and over current

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AE Techron precision amplifiers are used in difficult, high-reliability applications around the world – everything from controlling plasma in a reactor to driving the motors that aim telescopes on mountain tops.
Low-Frequency Test Systems

AE Techron’s DSR Series systems provide complete, single-box solutions for immunity testing. They include a simple-to-use yet powerful standards waveform generator matched with an industry leading power supply technology and come with an extensive library of tests for many automotive, aviation and industry standards.

All models of the DSR Series are 4-quadrant, allowing them to source and sink current. The DSR Series has power in reserve; each model provides continuous DC power as rated, and is able to provide 4X rated power for in-rush testing up to 200 ms, as is required in DO 160 Section 16.

DSR systems are faster than the 10 μs transition time specified in Ford FMC1278: CI260 (Immunity to Voltage Dropout).

DSR Voltage Transition Time

<table>
<thead>
<tr>
<th>Output Current (continuous)</th>
<th>DSR 75-75</th>
<th>DSR 75-150</th>
</tr>
</thead>
<tbody>
<tr>
<td>85A at 13.5VDC</td>
<td>170A at 13.5VDC</td>
<td></td>
</tr>
<tr>
<td>70A at 28VDC</td>
<td>140A at 28VDC</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Peak Current (200 ms)</th>
<th>110A</th>
<th>220A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Signal Bandwidth (-3 dB)</td>
<td>DC - 150 kHz</td>
<td>DC - 150 kHz</td>
</tr>
<tr>
<td>Small Signal Bandwidth (20 Vp-p)</td>
<td>DC - 250 kHz</td>
<td>DC - 250 kHz</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>Three-phase, 208V</td>
<td>Three-phase, 208V</td>
</tr>
</tbody>
</table>

All DSR test systems include LF tests from a wide variety of Standards, including:
- Airbus ABD0100.1.8.1 Issue C (2008-07)
- Boeing D6-16050-5 Issue C (2006-09)
- DO160G (2012-12)
- ISO 16750-2:2012 (E)
- Ford FMC1278
- MIL-461F (2007-12)
- GMW 3172 H (July 2010)
- SAE J1113-2, -11
- ISO 7637-2:2011 (E)
- and many more.

See the complete test list at aetechron.com.
DSR 100 Series
Dropout, Surge, Ripple Simulator & AC/DC Voltage Source

- ±80V DC supply for 12V to 48V systems; meets 80V surge requirements
- Sine up to 300 kHz allows reproduction of DC ripple tests for all major standards
- 3 µs rise time exceeds surge and dropout slew rate requirements
- 3 mΩ DC source impedance; outperforms ISO 7637-2 requirements
- Includes 1500+ routines for testing to EMC Standards
- Models from 15A to 200A continuous output current available

DSR 75 test systems are your “automobile specialists.” They are capable of the 10 µs pulse required by Ford standards and provide maximum current for 13.5V DC automotive EMC testing.

DSR 100 test systems are your “switch hitters.” They can produce the 10 µs pulse required in automotive EMC testing and meet the 80V surge requirements for aviation EMC testing.

CHOOSE YOUR SYSTEM

DSR 75-225  DSR 75-300  DSR 100-15  DSR 100-50  DSR 100-100  DSR 100-150  DSR 100-200
255A at 13.5VDC 340A at 13.5VDC 60A at 13.5VDC 120A at 13.5VDC 180A at 13.5VDC 240A at 13.5VDC
210A at 28VDC 280A at 28VDC 106A at 28VDC 212A at 28VDC 318A at 28VDC 424A at 28VDC
330A 440A 50A 200A 400A 600A 800A
DC - 150 kHz DC - 150 kHz DC - 150 kHz DC - 150 kHz DC - 150 kHz DC - 150 kHz
DC - 250 kHz DC - 250 kHz DC - 250 kHz DC - 250 kHz DC - 250 kHz DC - 250 kHz
Three-phase, Three-phase, Three-phase, Three-phase, Three-phase, Three-phase,
208V 208V or 400V 208V or 400V 208V or 400V 208V or 400V 208V or 400V

DSR “R” Series
“Ready” for increased power

- Anticipate and budget for future increased power requirements
- Add up to three additional amplifier modules into the original cabinet
- Just a small, nominal surcharge for Ready models
AE Techron’s **4301 Series** have been specially designed for EMC testing of network telecommunications equipment and are the best systems available for producing the waveforms required for transient voltage measurements as described in GR-1089 Section 10 and ATIS-0600315.2007. They are designed to work with a standard arbitrary waveform generator or signal source that can be triggered.

Available in 208V or 400V AC supply.

### Transformers

**T1000**
**AF Magnetic Field Susceptibility Transformer**
- Up to 100 AMPS
- 350 Hz to 25 kHz
- Turns ratio 10:1 step-down
- Exceeds DO 160 Section 19 and Boeing D6-16050-5 Section 7.2 requirements

**T2000**
**LF Conducted Susceptibility Transformer**
- Audio power up to 200 watts
- Secondary saturation: 40A
- Turns ratio: 2:1 step down
- 10 Hz to 250 kHz bandwidth
- Exceeds DO 160 Section 18 requirements

**T3700**
**AF Electric Field Susceptibility Transformer**
- Up to 3,700 VRMS output potential
- Turns ratio of 1:37 step up
- 250 Hz to 35 kHz bandwidth
- Withstand tested to 5,000 VDC
- Exceeds DO 160 Section 19 and Boeing D6-16050-5 requirements

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**Protection** – Circuit Breaker/Fuse to protect from damage

**Design** – Modern toroidal design gives wider bandwidth, lower weight and a contemporary look

**Integration** – Specifically designed to work in conjunction with AE Techron 7220 Series amplifiers

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The 4301 can output transient voltages of 50-100V in less than 2μS, or 5-100V in less than 5μS (shown). It can reproduce either the combined waveform/single measurement or the multiple waveform/multiple measurement methods described in the ATIS standard.