



## 3110A Automotive & Aviation Standards Waveform Generator

### Features

- 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

**AE Techron's 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, dropouts and surges needed for EMC tests with rise/ fall times of 1  $\mu$ s or greater and frequencies from DC to 1 MHz.

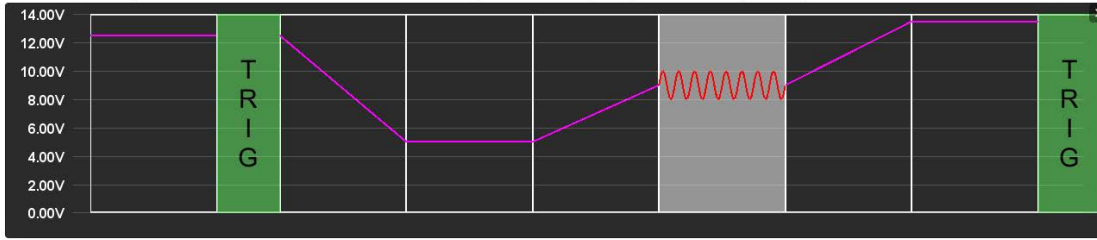
The 3110A software is built around the simple concept of a waveform segment. Each waveform segment can have a unique waveform, (sine, square, triangle, and/or DC offset). Frequency, amplitude and DC offset can be clipped, fixed, variable or swept. Segments



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Standards Library\AUTOMOTIVE\Ford\FMC1278\CI 230Immunity from Power Cycling, Waveform B (7-1-2015)



Disable Output

Add Wave Add Control System Status: IDLE

|       |   |            |   |       |   |       |   |       |   |         |   |       |   |
|-------|---|------------|---|-------|---|-------|---|-------|---|---------|---|-------|---|
| 1. DC | x | 2. Trigger | x | 3. DC | x | 4. DC | x | 5. DC | x | 6. Sine | x | 7. DC | x |
| 8. DC | x | 9. Trigger | x |       |   |       |   |       |   |         |   |       |   |

Wave Properties Segment Enabled Calibration

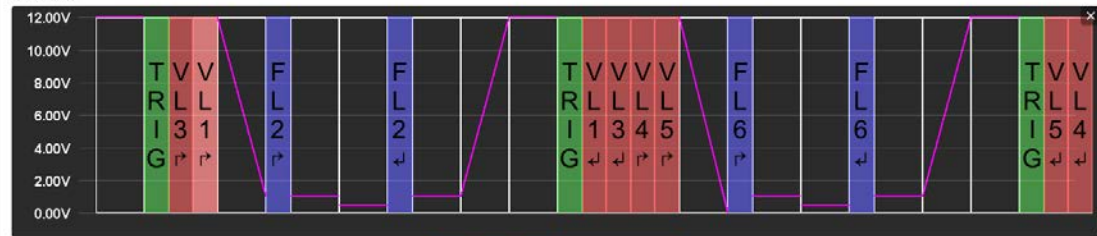
Start Amplitude: 1 Vp End Amplitude: 1 Vp Start Frequency: 4 Hz End Frequency: 4 Hz Start Offset: 9 End Offset: 9

Amplitude Sweep: LIN Ripple: Clip Amplitude: Frequency Sweep: LIN Phase Angle: 0 deg Offset Sweep: LIN Duration: 10 Sec

### BUILD A TEST

Tests are created by combining Wave segments and/or Control segments together. An individual segment within a test, can be as short as 50  $\mu$ S or as long as 144 hours.

Standards Library\AUTOMOTIVE\Toyota\TSC7021G (2007-06)\TSC7021G 5.2 Waveform 14 (+B) IG Operation When Battery Voltage Dropped, 12VDC, (2007-06)



Disable Output

Add Wave Add Control System Status: IDLE

|         |   |            |   |         |   |        |   |             |   |             |   |         |   |
|---------|---|------------|---|---------|---|--------|---|-------------|---|-------------|---|---------|---|
| 1. DC   | x | 2. Trigger | x | 3. VL3  | x | 4. VL1 | x | 5. DC       | x | 6. FL2      | x | 7. DC   | x |
| 8. DC   | x | 9. FL2     | x | 10. DC  | x | 11. DC | x | 12. DC      | x | 13. Trigger | x | 14. VL1 | x |
| 15. VL3 | x | 16. VL4    | x | 17. VL5 | x | 18. DC | x | 19. FL6     | x | 20. DC      | x | 21. DC  | x |
| 22. FL6 | x | 23. DC     | x | 24. DC  | x | 25. DC | x | 26. Trigger | x | 27. VL5     | x | 28. VL4 | x |

Control Properties

Type: Linear

Variable A: Start: 1 End: -1.001 -By: 0.1 21 Loops

Variable B: Start: 0.5 End: -1.501 -By: 0.1 21 Loops

Variable C: Start: Starting End: Ending By: In/Decr 0 Loops

Variable D: Start: Starting End: Ending By: In/Decr 0 Loops

All values entered in this Variable Loop must be in the following units:  
 • Amplitude: Vp (Volts Peak)  
 • Frequency: Hz (Hertz)  
 • Offset: VDC (Volts DC)  
 • Duration: ms (Milliseconds)

**WAVE CONTROLS** like Fixed Loop, Variable Loop, and Trigger make the 3110A able to reproduce very complex standards.

The test shown above highlights several key abilities made possible by these wave controls.

A multi-step waveform can start at one level/condition, then be repeated, with up to four variables changing. Single or multi-step

waveforms can be made to repeat (or loop) and these repeating waveforms can be nested within a larger simple or repeating waveform.

At any point during a waveform sequence, the program can be automatically paused (either holding the previous condition or muting) and wait for an external trigger before resuming.

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  $\mu$ s or as long as 144 hours.

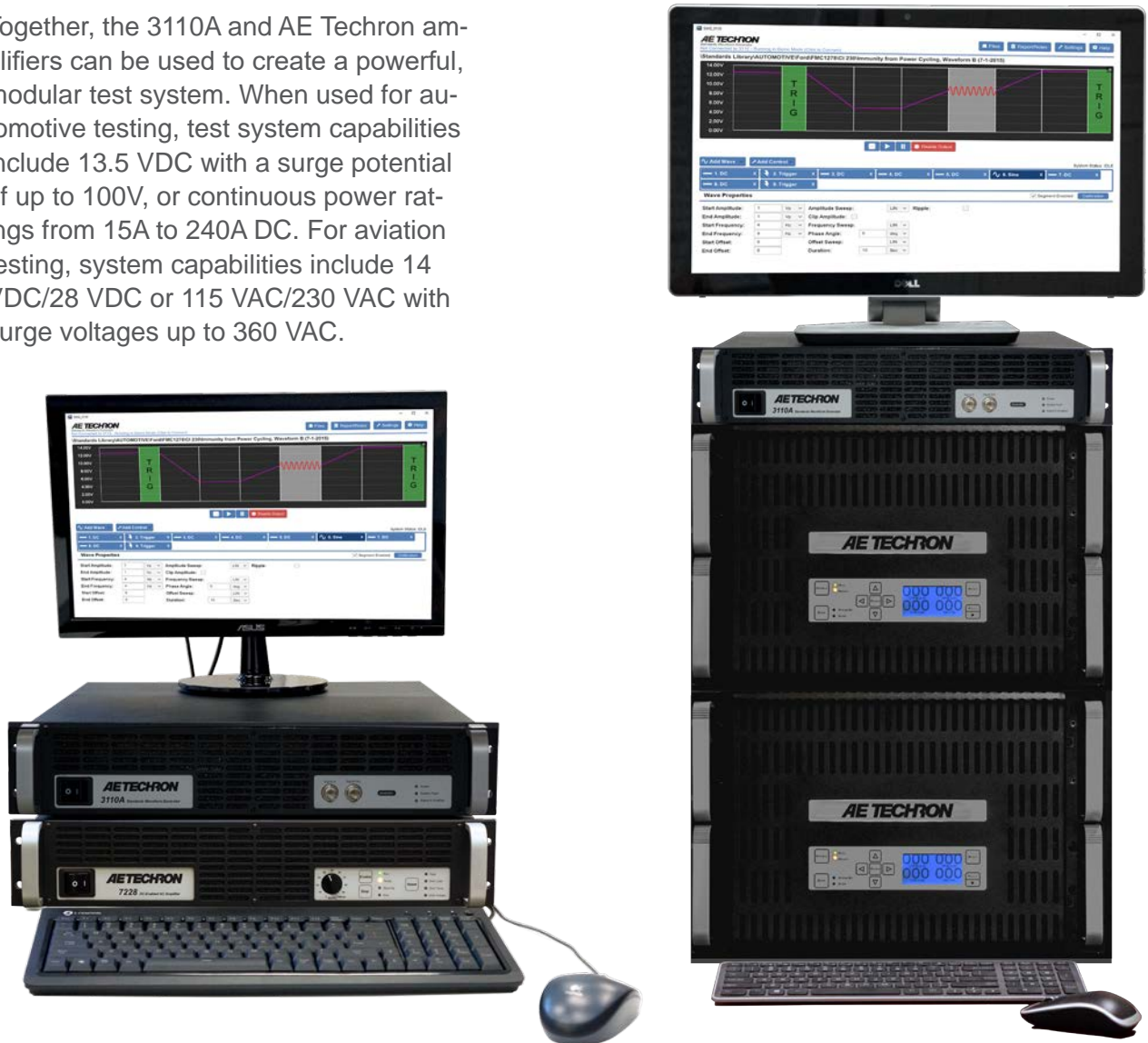
The power of the system occurs when waveform segments are linked to create test sequences. These test sequences can be of any length and can be run as a single sequence, looped, or looped with multiple

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.

### BUILD A SYSTEM

Together, the 3110A and AE Techron amplifiers can be used to create a powerful, modular test system. When used for automotive testing, test system capabilities include 13.5 VDC with a surge potential of up to 100V, or continuous power ratings from 15A to 240A DC. For aviation testing, system capabilities include 14 VDC/28 VDC or 115 VAC/230 VAC with surge voltages up to 360 VAC.



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.

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## Technical Details - Hardware

**Output channels:** 1

**Output Voltage:** 10 V<sub>pk</sub>

**Signal Generation:**

**DAC:**

18 bit

DC – 20 kHz (any wave form)

1 μs rise time

**Sine:**

14 bit

DC – 300 kHz

400 Msps

0.01 Hz frequency resolution or better

0.002° phase granularity

**Amplitude:**

76 μV resolution

**Frequency:**

Stability: ±50 ppm

Accuracy: ±0.1%

## Control, Status, I/O

**Front Panel:**

**On/Off/Breaker**

**Signal Output:** BNC (analog - 10V<sub>p</sub>)

**LED Displays:** Power, System Fault, Signal-In Enabled

**Back Panel:**

**Power Connection:**

120VAC: IEC cable with NEMA 5-15

230VAC: IEC cable with CEE 7/7

**Fuse:** 2A, 250V slow blow (5 mm)

## Physical Characteristics

**Chassis:**

The 3110A is designed for table-top or rack-mounted operation. The chassis is aluminum with a black powder-coat finish. The unit occupies two EIA 19-inch-wide units.

**Weight:** 9.5 lbs (4.31 kg)

**Shipping Weight:** 19.5 lbs (8.85 kg)

**AC Power:**

Single-phase, 120 VAC, 50/60 Hz, 2A service;  
230 VAC, 50/60 Hz, 2A model available

**Dimensions:**

19 in. x 11.75 in. x 3.5 in.

(48.3 cm x 29.8 cm x 8.9 cm)

## Technical Highlights – Software

**Waveforms Supported:**

Sine, Ripple, DC, Triangle, Square, Sawtooth

**Waveform Modifiers:**

Amplitude, frequency and DC offset (fixed or linear, logarithmic\* or exponential sweep); phase angle; duration; clipped amplitude; and ripple on AC

**Waveform Controls:**

Trigger (user, GPIO, LAN), Fixed Loop, Variable Loop, Scripted Variable Loop, Template Playback, GPIO Output, LAN Output

**Test Capabilities,**

**Maximum Waveform Duration:** 1193 hours

**Minimum Waveform Duration:** 50 μs

**Maximum Number of Loop Repeats:** >1 million

**Storage Capabilities, Number of Tests:**

300,000 (expandable to 1 million)

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\*Logarithmic sweep available for sine, ripple and DC offset waveforms only.