Calibration Guide

for the 3110 Standards Waveform Generator

Introduction

Thank you for the purchase of the AE Techron 3110 Standards Waveform Generator. The 3110 produces standard signals and waveforms with or without a DC offset. Frequency, amplitude and DC offset can be fixed or swept, and sweeps can be linear, logarithmic or exponential. It can create dropouts and surges with rise and fall times as fast as 3µs. Individual signal duration can be as short as 100µs or as long as 49 days. It can also produce ripple waveforms of up to 300 kHz. This document will provide guidelines for establishing the performance of key parameters for the 3110 output.

Scope

This document will provide instructions for the measurement of the various output signals the 3110 can provide. Although the output of the 3110 can be adjusted via the gain settings, this feature is intended for use in calibrating the system (both the 3110 and the associated amplifier) and not for calibrating the output of the isolated 3110. For instructions on the calibration of a 3110/amplifier system, please review the Help Files under the topic “System Calibration.”

For the calibration of an isolated 3110, tolerances and ranges will be provided for a variety of measurements. The results of the measurements will be essentially a “Pass’ or “Fail.” Tests conducted according to these instructions should be considered “functional tests” that are intended to confirm the function of the settings of the 3110. Since fine adjustment of the test system can be accomplished via the 3110/amplifier System Calibration, the calibration of the isolated 3110 will require only general instrumentation. The procedure should be carried out with the gain set at the anticipated gain to be used in testing. The default gain used in the assessment tables is 20.

Documentation

Standard SI units commonly found in electrical standard are used for checking the calibration of the 3110. The minimum requirements for calibration documentation are that the instruments used should be able to accurately measure the quantities in Table 1 within the tolerances provided. Instruments should bear evidence (via a label on the instrument or similar documentation) that the measuring instrument is calibrated. The enclosed table is provided to record the performance of the 3110 in key areas, and to facilitate interaction with the AE Techron when needed.

ANSI Z540 or ISO 17205 calibration with documentation is available as an option.

Required Instruments

Instruments required are an oscilloscope and a digital multimeter. All measurements should be made into high impedance instruments. The measurements outlined herein do not require a probe. Using BNC connectors to both instruments is advised. It is assumed that the oscilloscope probe attenuation is set at 1X.

Best performance will be attained if the measuring instruments are either isolated (battery powered) or grounded at the same point with the 3110.

Instruments requirements are suggested requirements. Virtually any calibrated high impedance DMM and oscilloscope will serve. Observe any temperature corrections or other temperature based requirements for the measuring instruments.

Oscilloscope:

Bandwidth:	50 MHz, minimum
Sample Rate:	1 GS/sec minimum
Automatic Measurements:	Frequency, RMS, Peak-to-Peak
Input Impedance (DC):	10 MΩ

DMM:

Frequency Range:	± (% of reading + # of counts)
50 Hz to 10 kHz:	0.3 + 20
10 to 20 kHz:	1 + 40
20 to 100 kHz:	2 + 150
Impedance:	Up to 20 MΩ over available ranges

Connections

- Test connections are made from the front panel Signal Out BNC connector to the test instrument.
- Cables and connectors having minimal insertion loss over the bandwidth (DC to 300 kHz) are required.
- An amplifier may be connected to the 3110, but must be turned off during this series of tests.
- No other peripheral connections will affect these tests.
- Use common ground or isolated instruments, if possible. Select an environment with minimal radiated noise.

Temperature and run time

Allow the 3110 to run for 20 minutes in a quiescent state.

Settings and features not tested

Sweep functions, Control functions, Duration setting

Output Assessment

The assessment of a waveform consists of setting up the 3110 SWG user interface with the values as indicated for each waveform type listed on the far left of Table 1. The duration may be set for several seconds, or more depending on the triggering selected. The test varies voltage and, for alternating waveforms, a range of frequencies is given for each voltage level.

Set up the test waveforms in the “User Defined Standards” Directory

Procedure for Phase Testing

1. Create a 0 VDC segment of short duration (no more than a few seconds)
2. Insert a trigger (True) after the 0 VDC segment
3. Insert a ripple waveform with the following settings:
4. Recommended Vp = 20 Vp (Start and End)

5. f = 1 kHz
6. Offset = 0 V
7. Sweep = LIN (ALL settings)
8. For testing each phase shift, enter the value of the phase for each test and start the waveform running. With the oscilloscope trigger function set to capture the initiation of the ripple function, touch the space bar and measure the time from the start of the (truncated ripple to the end of the first cycle. Repeat for each of the phase values shown in Table 1.

Assessment Table

Notes: G = 20.0 for all waveforms
Use 0 VDC for offset setting for varying waveforms
Sweep Type = LIN for all tests
Where applicable, frequency values should be within 2% of values selected
For the Square waveform, slew rate should be within 3 V/ms for each test

Waveform	Start/End Offset (V)	Frequency (kHz)	Measured Frequency (kHz)	Low Limit (V)	Measured (V)	High Limit (V)
DC	0	NA	NA	0.0		0.0
	100	NA	NA	4.9		5.1
	200	NA	NA	9.9		10.1
Ripple	Start/End Amplitude, V_p	Frequency (kHz)	Measured Frequency (kHz)	Low Limit (V_p)	Measured (V)	High Limit (V_p)
	100	1		4.8		5.3
		10		4.8		5.3
		100		4.8		5.3
		300		3.5		3.6
	200	1		9.5		10.5
		10		9.3		9.5
		100		9.3		9.5
		300		6.8		7.1
Square	Start/End Amplitude, V_p	Frequency (kHz)	Measured Frequency (kHz)	Low Limit (V)	Measured (V)	High Limit (V)
	100	1		4.8		5.3
		10		4.8		5.3
		20		4.8		5.3
	200	1		9.5		10.5
		10		9.5		10.5
		20		9.5		10.5

Triangle	Start/End Amplitude, V_p	Frequency (kHz)	Measured Frequency (kHz)	Low Limit (V)	Measured (V)	High Limit (V)
	100	1		4.8		5.3
		10		4.8		5.3
		20		4.8		5.3
	200	1		9.5		10.5
		10		9.5		10.5
		20		9.5		10.5
Sawtooth	Start/End Amplitude, V_p	Frequency (kHz)	Measured Frequency (kHz)	Low Limit (V)	Measured (V)	High Limit (V)
	100	1		4.8		5.3
		10		4.8		5.3
		20		4.8		5.3
	200	1		9.5		10.5
		10		9.5		10.5
		20		9.5		10.5
Phase*	Start/End V_p = 20 V, f = 1 kHz	Phase Offset (°)	Measured Frequency (kHz)	Low Time (µsec)	Measured Time (µsec)	High Time (µsec)
		90	NA	735		765
		180	NA	490		510
		270	NA	245		255

Table 1

*See procedure above.

If you have any questions, please contact AE Techron Technical Support at 574-295-9495.