

# MODEL 9354-1 UNIVERSAL TRANSIENT GENERATOR

for susceptibility tests MIL-STD461C/D/E, DO-160C/D and other specifications



## APPLICATION

The **Model 9354-1 Universal Transient Generator** was especially designed for the performance of a variety of pulse susceptibility tests on subsystems and/or equipment, in accordance with MIL-STD-461D and E, method CS116; RTCA DO160D, section 22; MIL-STD-461C, methods CS10 and CS11.

Through the use of many Solar accessories, including various reactive networks and coupling devices, as well as other commercially available items such as loop antennas, parallel plates, and TEM cells, the generated output may be modified and applied to other specifications. (Contact Solar customer service for details.)

## DESCRIPTION

**Model 9354-1 Universal Transient Generator** provides nine selectable waveforms, including six damped sinusoidal pulses (10 KHz, 100 KHz, 1 MHz, 10 MHz, 30 MHz, and 100 MHz) and three double exponential pulses (6.4  $\mu$ S, 70  $\mu$ S and 500  $\mu$ S).

Auto pulsing of the sinusoidal repetition rate is internally adjusted from 0.5 to 1.0 pulse per second. A front panel-mounted push button can be used to manually trigger single pulses. The peak amplitude of the selected output pulse is adjustable as a percentage of the charge voltage.

The six damped sinusoidal waveforms were designed to meet the requirements of MIL-STD-461D and E, method CS116, when applied in accordance with the test method of MIL-STD-462D. Continuous tunable frequencies can be obtained by the use of the optional variable frequency modules.

These same waveforms are applicable to the requirements of MIL-STD-461C, methods CS10 and CS11, when applied in accordance with the test method of MIL-STD-462, Notice 5.

The 1MHz and 10 MHz damped sinusoidal waveforms have been extended to a peak open circuit voltage of 3200 volts and a calculated short circuit current of 128 amperes to meet the requirements of RTCA DO-160D, Section 22, Table 22-2, waveform 3.

The three double exponential pulses were designed to meet the requirements of RTCA DO-160D, Section 22, Tables 22-2 and 22-3. Table 1 lists the test level that can be achieved from the **Model 9354-1**.

## FEATURES

- Panel-mounted digital voltmeter. Monitors the adjusted open circuit discharge voltage.
- Pulse rates up to two pulses per second maximum (factory adjusted).
- Single pulse feature enables controlled isolation of transient effects.
- Output voltage adjustable from 0.1% to 100% of selected discharge voltage.

**Table 1: DO-160D Test Levels possible from Model 9354-1**

Waveform	Pin Injection	Cable Bundle Injection
1 (70 $\mu$ S)	no requirement	level 1 - 4
2 (6.4 $\mu$ S)	no requirement	level 1 - 4
3 (1MHz & 10 MHz)	level 1 - 5	level 1 - 4
4 (70 $\mu$ S)	level 1 - 5	level 1 - 4
5B (500 $\mu$ S)	level 1 - 4	level 1 - 3



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## AVAILABLE ACCESSORIES

**Variable and Step Frequency Modules.** Provides tunable frequencies for injection of damped sinusoidal wave forms from 10 KHz to 100 MHz when used with **Model 9354-1**. Five individual modules waveforms cover the entire frequency range required by MIL-STD-461D. Detailed information provided on separate data sheet.

**Type 9335-2 Universal Coupling Device.** An inductive injection device that provides voltage and current transfer of 1:1, 1:1.5 and 3:1 voltage step-up (current step-down) as well as 2:1 voltage step-down (current step-up). For maximum power transfer, these ratios are selected by connecting to one of the four BNC connectors. This device, through its various connector ports, provides a better impedance match or power transfer, higher open circuit voltages, or higher short circuit currents. Useable for cable current injection from 10KHz to 10 MHz. Detailed information provided on separate data sheet.

**Type 9719-1N Injection Probe.** Provides the required current levels of MIL-STD-461D and E, method CS116 throughout the entire frequency range of 10 KHz to 100 MHz.

**Type 9357-1 Calibration Fixture.** Calibration fixture provides a 50 ohm characteristic impedance based on the dimensions of the **Type 9335-2 Universal Coupling Device** and **Type 9719-1N Injection Probe**. The fixture maintains a low standing wave ratio from 10 KHz to 100 MHz in a 50 ohm circuit.

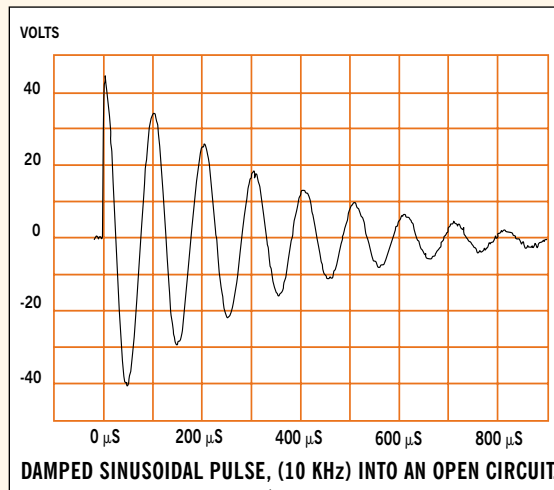
**Type 9142-1N Injection Probe.** Used to inject current on cables from 1 MHz to 100 MHz.

**Type 9125-1 Calibration Fixture.** Calibration fixture for use with **Type 9142-1N Injection Probe**.

**Type 9123-1N Current Probe.** Used to monitor injected pulses. Frequency range from 10 KHz to 500 MHz.

**Type 9410-1 50Ω/50Ω and Type 9454-1 600Ω/50Ω High Voltage Attenuators.** Provides 40 dB attenuation from 10 KHz to 100 MHz. Protects oscilloscope from high voltage damage when verifying the output pulses of the **Model 9354-1**. The **Type 9454-1** provides a high impedance to the oscilloscope for making measurements of open circuit output pulses.

**Type 6220-4 High Voltage Audio Isolation Transformer.** When connected in series with the power lead under test, provides twice the open circuit voltage or twice the short circuit current for the 10 KHz and 100 MHz damped sinusoid waves and the 6.4 μS and 70 μS double exponential pulses. Capable of handling up to 4000 volts.



**Type 9616-1 Injection Clamp.** Provides coupling for high voltage pulses produced by the **Model 9354-1**. Meets the inductive indirect injection device requirement of MIL-STD-462, notice 5, method CS10 and CS11. Enables injection of 70 μS double exponential pulses without need for direct connection.

## SPECIFICATIONS

### DAMPED SINUSOID PULSES

(NOTE: MEASUREMENT OF SHORT CIRCUIT CURRENTS ARE LIMITED BY THE  $X_L$  OF THE CIRCUIT. ALL VALUES ARE CALCULATED.)

#### 10 KHz

Open Circuit Voltage ..... 30 V.  
Calculated Short Circuit Current ..... 120 A.  
Source Impedance ..... <0.25 Ω

#### 100 KHz

Open Circuit Voltage ..... 300 V.  
Calculated Short Circuit Current ..... 120 A.  
Source Impedance ..... <2.5 Ω

#### 1 MHz

Open Circuit Voltage ..... 3200 V.  
Calculated Short Circuit Current ..... 128 A.  
Source Impedance ..... <25 Ω

#### 10 MHz

Open Circuit Voltage ..... 3200 V.  
Calculated Short Circuit Current ..... 128 A.  
Source Impedance ..... <25 Ω

#### 30 MHz

Open Circuit Voltage ..... 1000 V.  
Calculated Short Circuit Current ..... 20 A.  
Source Impedance ..... <50 Ω

#### 100 MHz

Open Circuit Voltage ..... 300 V.  
Calculated Short Circuit Current ..... 6 A.  
Source Impedance ..... <50 Ω



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## DOUBLE EXPONENTIAL PULSES

(NOTE: MEASUREMENT OF SHORT CIRCUIT CURRENTS ARE LIMITED BY THE  $X_L$  OF THE CIRCUIT. ALL VALUES ARE CALCULATED.)

### 6.4 $\mu$ S

Rise Time .....100 nS.  
 Open Circuit Voltage .....1600 V.  
 Calculated Short Circuit Current ..... .800 A.  
 Source Impedance .....<2.0  $\Omega$

### 70.0 $\mu$ S

Rise Time .....6.4  $\mu$ S.  
 Open Circuit Voltage .....1600 V.  
 Calculated Short Circuit Current ..... .800 A.  
 Source Impedance .....<2.0  $\Omega$

### 500 $\mu$ S

Rise Time .....50  $\mu$ S.  
 Open Circuit Voltage .....1600 V.  
 Calculated Short Circuit Current ..... .400 A.  
 Source Impedance .....<4.0  $\Omega$

## DIMENSIONS

Weight: 55.0 lbs. (25 Kg)  
 Size: 17.25" (43.5 cm) wide x 8.75" (22.2 cm) high x 13" (33.0 cm) deep.

