

FireSet Test System

Description

The **FireSet Manual Test System** is used for capacitive discharge testing of automotive and aerospace initiators. Standardized testing methods, such as Bruceton, may be used to determine all-fire and no-fire conditions. This instrument will provide a stable source of DC voltage, an externally accessible charge capacitor and an externally accessible series resistance. The user may control the following test parameters:

1. Firing voltage (2.0 to 25 volts DC)
2. Firing capacitance value (provided by user, connects to test set rear panel)
3. Series resistance value (provided by user, connects to test set rear panel)
4. Firing pulse duration (1 to 1000 milliseconds, internal adjustment)

In addition to these user-defined parameters, the instrument has an input for an external safety interlock circuit and a trigger output to drive an oscilloscope or other recording device. A 3 ½ digit backlit panel meter (digital voltmeter) accurately indicates the firing voltage, and a STANDBY/TEST switch enables or disables the charging circuits.

Preparation for use

Before testing initiators with the FireSet equipment you must supply power and connect the interlock safety circuits to the rear panel inputs. Please complete the following:

- Connect a switch that is actuated by test chamber door to the rear panel inputs marked Interlock input. The switch must be closed when the door is closed to enable the internal charging circuits. The total wiring and switch resistance must be less than 10 ohms.
- Verify that the switch within the AC input module on the rear panel is set to "O". Connect a modular AC cord to a source of 115VAC/2A/60Hz.
- Connect a BNC cable to the rear panel output marked Trigger if you wish to use an oscilloscope or other recording device.

Startup

To use the instrument please follow the following sequence:

- Open the test chamber door and examine the test fixture. *Be certain that all parts have been removed before proceeding or applying power.*
- Verify that the Standby/Test switch on the front panel is in the Standby position.
- Connect a capacitor across the banana jacks marked "capacitor" on the rear panel. If a polarized capacitor is used place the positive end to the yellow banana jack marked "+".
- If you wish to place a resistance in series with the part under test connect the resistor across the banana jacks marked "Resistor" on the rear panel. For best performance use a non-inductive resistor rated for the load current. If a resistor is not used place a short piece of wire across the terminals. The instrument will not function properly without a connection across these terminals.
- Connect the rear panel terminals marked "Firing Output" to the test chamber fixture that parts to be tested will be placed into.
- Press the switch position marked "1" on the AC input module on the rear panel. The LCD voltmeter on the front panel should illuminate.

Using the FireSet; Controls and Indicators



Figure 1: FireSet Front Panel

The controls of the FireSet are designed for ease of use and simplicity.

The rear panel Interlock inputs must be shorted to each other before the test system may be used. These banana jacks are typically connected to the test chamber door safety switches to ensure safe conditions for operation of the test set and for the operator.

When the Interlock switch is closed the front panel Firing Voltage may be adjusted. Place the Standby/Test switch into the Test position. The Firing Voltage control may now be used to adjust the voltage used for charging the firing capacitor.

The digital voltmeter indicates the DC voltage present at the output of the charging circuit. When the unit is in SAFE mode the firing capacitor is disconnected from the charging circuits and the voltage may be adjusted using the voltage set control while observing the voltmeter display.

When the ARM button is pressed, the firing capacitor is connected to the charging circuits and the progress of capacitor charging can be observed on the voltmeter display. The ARMED LED on the front panel is illuminated when in the ARM mode.

Pressing the SAFE button when the test system is ARMED will disconnect the firing capacitor from the charging circuits and will also discharge the firing capacitor through a 100-ohm resistor.

Pressing the FIRE button when the test system is in the ARM mode enables the firing circuits and will discharge the firing capacitor into a load placed across the Firing Output terminals. The ARM button must be pressed within 60 seconds after the test system is ARMED.

Rear panel connections

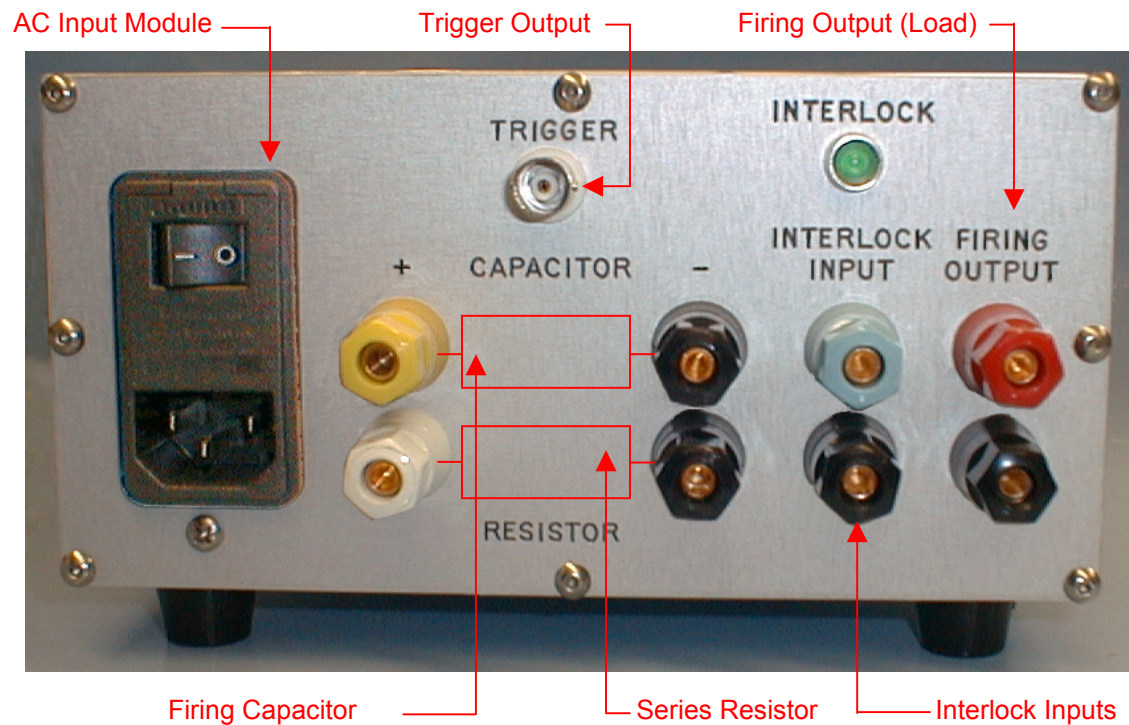


Figure 2: FireSet Rear Panel

Testing parts with the FireSet Instrument

1. *DO NOT turn power to the FireSet test system on or off with a part loaded in the test chamber. Inspect the test chamber before turning on power to the FireSet test system.*
2. Place the test system into the Standby Mode and load a part to be tested into the test chamber. Close the test chamber door. The rear panel Interlock LED should illuminate when the test chamber door is closed.
3. With a part to be tested loaded in the test chamber and the test chamber door closed you may now test the part.
4. Place the Standby/Test switch into the Test position.
5. Adjust the voltmeter display to the desired level.
6. Inspect the test chamber area for safe firing conditions.
7. Press the ARM pushbutton. The ARM LED should illuminate and the voltmeter will display the voltage across the firing capacitor. Wait until the voltage stabilizes at the preset level before pressing the Fire button. Note that the Fire button must be pressed within 60 seconds of ARming the test system or it will revert to the Safe Mode.
8. Press the FIRE pushbutton. The firing capacitor is discharged into the part to be tested. The firing circuitry is automatically disconnected after a few milliseconds and the equipment is placed into the Safe Mode.
9. Remove the tested part from the chamber.

Pulse Duration Adjustments

These adjustments should only be made by qualified service personnel.

A 20-turn trimpot inside the test set may be adjusted for the desired duration of the firing pulse. The range of this adjustment is from less than 1 millisecond to over 1000 milliseconds. When the Standby/Test toggle switch is in Standby Mode, firing pulses are available on the trigger BNC output. They may be used to test external trigger circuits or (with an oscilloscope) for adjustment of the firing pulse duration. When the Standby/Test switch is in Test Mode the trigger BNC output will generate only a single pulse when the FIRE button is actuated.

The factory setting for the Firing pulse width is 20mS. To change this setting the enclosure must be opened. Remove the screws holding the front and rear panels to the case and slide the top plate to the rear. Locate VR1, the trimpot near the microcontroller. Place the instrument into the Standby Mode and monitor the trigger output while adjusting this trimpot for the desired pulse width. When all adjustments are complete carefully replace the top, front and rear panels.

Sample Waveforms

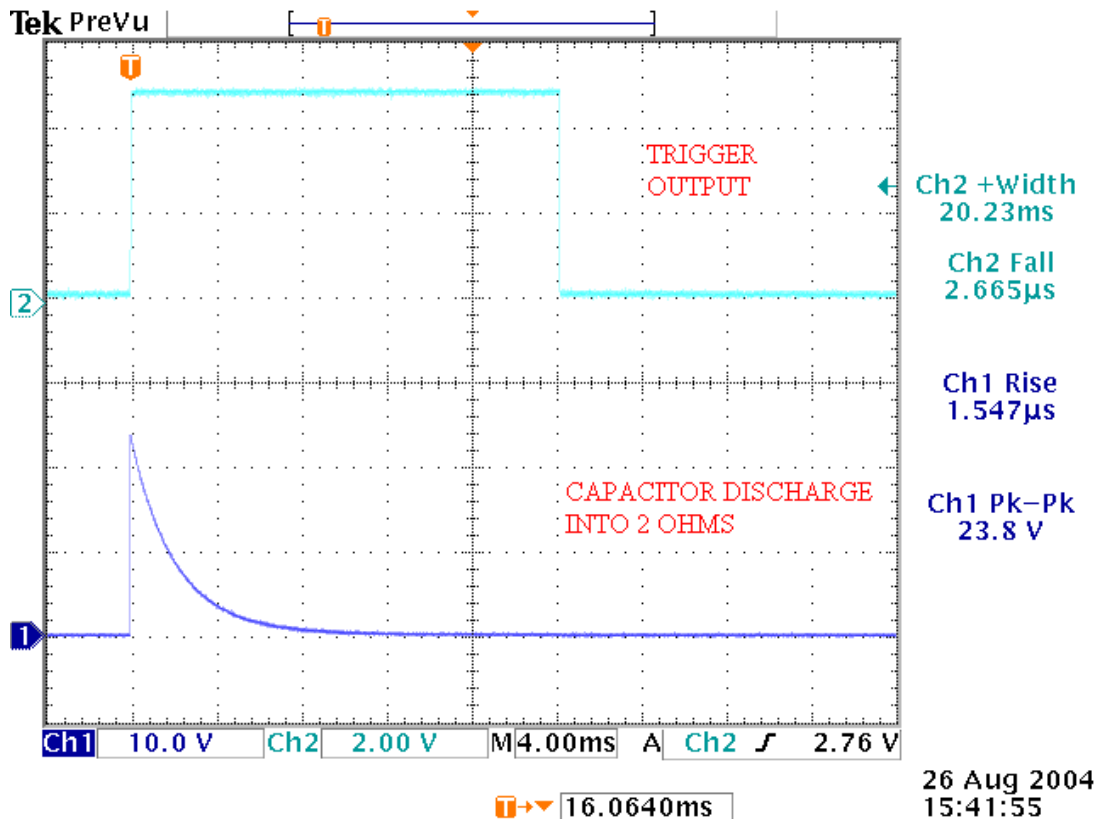


Figure 3: 1000µF discharge into a 2-ohm load

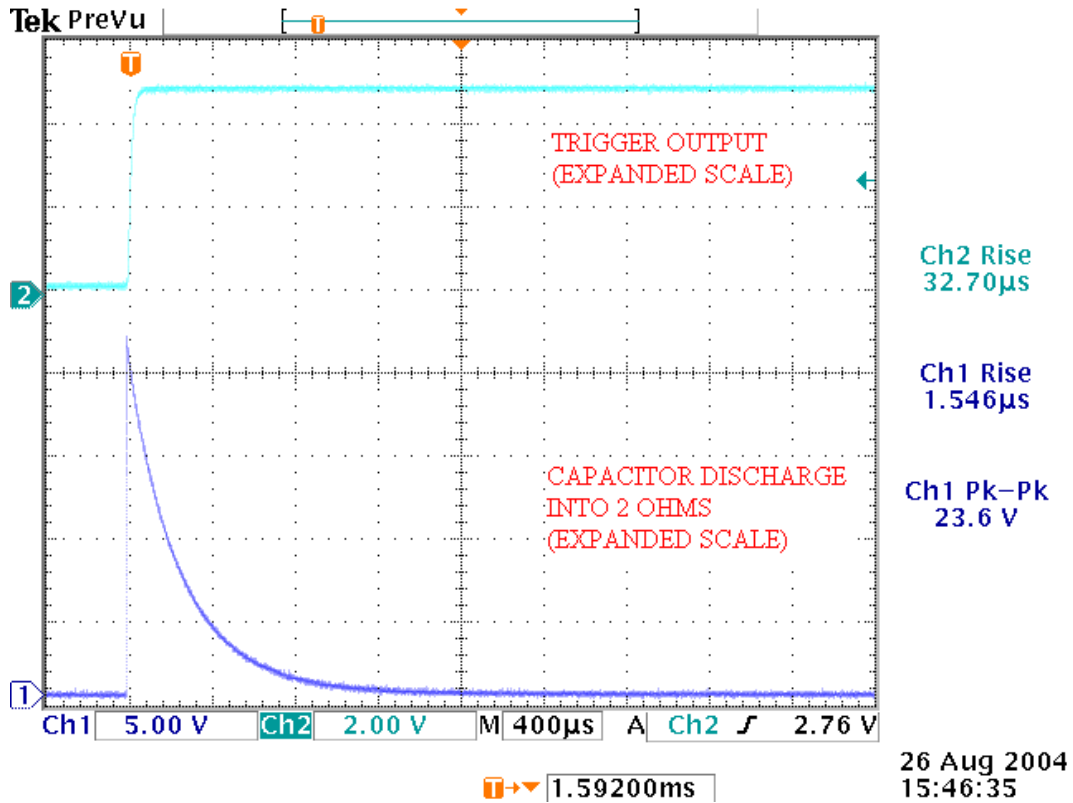


Figure 4: 100uF discharge into a 2-ohm load; expanded scale