Title	*Fast Shutter Driver Installation Procedure*
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Applicable Hardware	*D1400078*

1 Overview

The Fast Shutter Driver Chassis, D1400078 is designed to supply a drive signal to the in-vacuum fast shutter, D1003318. The drive signal can be broken into two categories: Fast Drive, and Slow Drive. The fast drive signal can have voltages of 500V peak and peak currents of up to 30A. The slow drive signal supplies only about 100mA to the in-vacuum fast shutter.

This installation procedure verifies the installed shutter is functioning correctly for the most up-to-date operating parameters. The procedure measures the applied coil current as a function of time. An optically derived signal from the AS WFS-A DC Quadrant-1 is used as the optical gated measure of timing. The Fast Shutter Driver chassis contains hazardous voltages. All applicable site procedures for working on energized gear must be utilized by personnel involved in this procedure.

2 Procedure

2.1 Equipment State

Install the Fast Shutter Driver chassis in the bottom of the rack, but not screwed into the rack rails to permit access. Attach all the cables (minus the fast trigger input) to the front and back of the chassis. The supplied test board, D1400208 and associated cable will be used to take local manual control of the chassis during testing. Verify the system parameters agree with Table 1for the operating configuration described therein. The lid should be removed from the chassis to permit a clamp-on current probe to be used to measure the current pulse delivered to the in-vacuum shutter. There must be some light on the AS-A WFS while this test is performed so that optical timing information can be obtained.

Table 1, STATE

Parameter	State
+/-18VDC Power Switch	OFF
HV Enable Switch	DISABLED
Current Probe	On plus output to coil (orange wire) to channel 1 of scope
Normal Chassis Cables	All Connected **Except Trigger Input BNC** including cable to in-vacuum shutter in HAM6
Test Board and Cables	Connected
+/- 18VDC supplies	18VDC +/- 1VDC
Applied High Voltage	250VDC +/- 2VDC
Beckhoff Bits	None Asserted
9 pin Breakout Board	On WFS AS-A DC Out, Quadrant 1 to channel 2 of scope

After establishing the above state, turn on the low voltage +/-18VDC rocker switch on the rear panel. Paying attention to the LCD after boot is complete and the front panel LEDs, verify that all conditions are as shown in Table 2.

Table 2, VERIFY

Item	Condition	Check
LCD Charge Voltage	0VDC	☐
Front Panel Power LEDs	LIT	☐
HV Enabled LED	NOT LIT	☐
Fault LED	NOT LIT	☐
Slow Up LED	NOT LIT	☐
Slow Low LED	NOT LIT	☐
HV Ready LED	NOT LIT	☐

Push the Slow Up button on the test board and while it is pushed, verify the following then release the button:

Item	Condition	Check
Slow Up LED	LIT	☐
Light on AS WFS	Gone on scope	☐

Push the Slow Low button on the test board and while it is pushed, verify the following then release the button:

Item	Condition	Check
Slow Low LED	Pulsed On Once	☐

Put the HV Enable switch into the Enable position. Verify the following:

Item	Condition	Check
LCD Charge Voltage	245VDC +/-4VDC	☐
HV Ready LED	LIT When charge voltage is greater than 235VDC	☐

Put the HV Enable switch into the Disable position. Verify the following:

Item	Condition	Check
LCD Charge Voltage	Discharges to 0VDC in under 1 minute	☐
HV Ready LED	NOT LIT	☐

Put the HV Enable switch back into the Enable position and wait until the HV Ready LED is once again lit. The next step will deliver a pulse to the in-vacuum shutter. The pulse is initiated whenever the Fast Up button is depressed on the test board. Now is a good time to set up the scope for single trigger operation. A screenshot is shown in Figure 1 to see what to expect. After each fast pulse is applied, a downward pulse must be initiated by pushing the Slow Low button on the test board. This is to be sure that the shutter bobbin starts from a fully seated position. It takes about 10 seconds for the capacitor bank to charge again after firing a pulse. This is normal.

2.2 Timing Measurement

After capturing a current pulse, verify that everything looks like it does in Figure 1 and that the time from the leading edge of the current pulse to the leading edge of the WFS DC trace (going from a negative voltage to zero volts as the light is blocked) is around 1.95 milliseconds +/- 0.05 milliseconds. After the test is complete, disable the HV, unplug the test board and test leads, and put the lid back on the chassis. The chassis can now be re-mounted into the rack at the appropriate position. Reattach the trigger input BNC to the shutter controller such that normal triggering can resume. Enable the HV when it is desired to resume operation of the Fast Shutter System.

Figure 1, yellow is current delivered through the series 20ohm resistor to the fast shutter motor, blue is the DC light level of the AS DC WFS A used to measure timing (breakout board was used locally).