Test Procedure for Shutter Controller

Paul Schwinberg and Daniel Sigg

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The following test procedure describes the test of proper operation of the shutter controller.

2	Test	Equi	pment

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

# 3 Tests 51203606

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK Not OK	close OK	Not OK
Channel 2 open OKNot OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

 Channel 1 open HI
 5
 V
 LO
 .1
 V
 close HI
 5
 V
 LO
 .1
 V

 Channel 2 open HI
 5
 V
 LO
 .1
 V
 close HI
 5
 V
 LO
 .1
 V

2)	Verify that with no threshold voltage applied the shutter does not close. Set the
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Not OK \_\_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 2 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2\_3\( \) V

Channel 2 Highest set point \_\_\_\_\_ V Readback \_\_\_\_\_ V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_\_ Trigger 1 \_\_\_\_\_ V Channel 2 OK \_\_\_\_ Trigger 2 \_\_\_\_\_ V

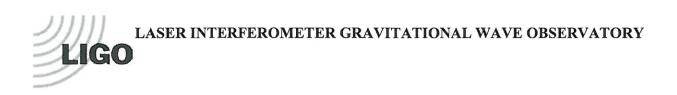
Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO 218 V

Channel 2 out HI 5 V LO -219 V

Channel 1 Lowest set point	. 003 V Readback 003	V
Channel 1 Mid set point	1-3 2.5 V Readback 1.29	V
Channel 1 Highest set point	2.6 V Readback 2.58	V
Channel 2 Lowest set point	V Readback OS	V
Channel 2 Mid set point	2.5_ V Readback 1.29	V
Channel 2 Highest set point	2.6 V Readback 2.5%	V

Channel 1 OK		Not OK	Channel 2 OK	1	Not OK	



# 51203607

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Channel 2 open OK	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI	5	<b>1</b> 7	10	1044	17	5		V 10		<b>T</b>
Chamier i open mi		_ ^	LU -		_ v	close HI_		_ v _ LO _	-	_ V
	5			.1			5		.)	
Channel 2 open HI		_ V	LO		_ V	close HI_		_V LO_		V

2)	Verify that with no threshold voltage applied the shutter does not close. Set the
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Not OK \_\_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point \_\_\_\_ V Readback \_ 60 V

Channel 1 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2.345V

Channel 1 Highest set point 4,645v Readback 4,402v

Channel 2 Lowest set point . . . . V Readback . . . V

Channel 2 Mid set point 2.5 V Readback 2.345 V

Channel 2 Highest set point 4,645 V Readback 4.402 V
3.0-0 Pen Both 6 hu HeRS: Sets both Pots to Min

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_ Z . 506V Channel 2 OK \_\_\_ Trigger 2 \_ Z . 506V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO .22 V

Channel 2 out HI 5, V LO . 22 V

Channel 1 Lowest set point V Readback V	
Channel 1 Mid set point V Readback V	
Channel 1 Highest set point V Readback V	
Channel 2 Lowest set point V Readback V	
Channel 2 Mid set point V Readback V	
Channel 2 Highest set point V Readback V	
4) Verify that when close is applied the shutter stays closed. Mount a 50 terminator to the front panel close BNC. Set the threshold pot at 2.5 volts and verify with meter connected J1. Now ramp the PD pot from minimum to maximum, the shutter should stay close for a voltages.	to
Channel 1 OK Not OK Channel 2 OK Not OK	

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Channel 2 open OK Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI 5	V LO_	.	V close HI	5	_V LO	- 1	V
Channel 2 open HI5	V LO_	- (	V close HI	5	_V LO	. (	V

Verify that with no threshold voltage applied the shutter does not close. Set the	
threshold pot at minimum and verify the voltage is zero with a meter connected to J1. No	)W
ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.	

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 2 Highest set point 4.46 V Readback 4.40 V

Channel 2 Mid set point 2.5 V Readback 2 3 V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_\_\_ V Channel 2 OK \_\_\_\_ Trigger 2 \_\_\_ V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI \_\_\_\_ V LO \_\_.22 \_\_ V

Channel 2 out HI 5 V LO 22 V

Channel 1 Lowest set point	V Readback CO3 V
Channel 1 Mid set point	V Readback 1. 3
Channel 1 Highest set point	2.6 V Readback 258 V
Channel 2 Lowest set point	V Readback CO3 V
Channel 2 Mid set point	1. 3 2.5 V Readback 1.3 V
Channel 2 Highest set point	2-6 V Readback 2.58 V

Channel 1 OK	Not OK _	Not OK	

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A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers.

The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OKNot OK	close OK Not OK
Channel 2 open OKNot OK	close OK Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

2)	Verify th	at with	no	threshold	voltage	applied	the	shutter	does	not	close.	Set	the
				um and ver									
	ramp the l	PD pot fr	om 1	minimum to	maximu	ım, the m	onito	or LEDs s	hould	not o	change	state	<b>;</b> .

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point \_\_\_\_\_ V Readback \_\_\_\_ V

Channel 1 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2.37v

Channel 1 Highest set point 4.69 V Readback 4.7 V

Channel 2 Lowest set point \_-OO3 V Readback \_-OO3 V

Channel 2 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2.5\_\_ V

Channel 2 Highest set point 4.67 V Readback V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_\_\_\_ V Channel 2 OK \_\_\_ Trigger 2 . 5 5 V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO 22 V

Channel 2 out HI 5 V LO - 2 V

Channel 1 Lowest set point	V ReadbackCOS V
Channel 1 Mid set point	1.3 
Channel 1 Highest set point	2.6 V Readback 2.58 V
Channel 2 Lowest set point	V Readback V
Channel 2 Mid set point	1.3 2.5 V Readback V
Channel 2 Highest set point	2.6 V Readback 2.58 V

Channel 1 OK Not OK	Channel 2 OK	Not OK	

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- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
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The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	i/	Not OK	close OK _	·/	Not OK
Channel 2 open OK	/	Not OK	close OK _		Not OK
1000 EVIL 1000	10	85 0-52 2780			

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

2)	Verify	that	with	no	threshold	voltage	applied	the	shutter	does	not	close.	Set	the
		-			um and ver	•	_							
	ramp the	e PD	pot fro	om 1	ninimum to	maximu	ım, the m	onito	or LEDs s	hould	not o	change	state	<b>:</b> .

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 2 Highest set point V Readback V.48 V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI \_\_\_\_\_ V LO \_\_\_\_ 22\_\_ V

Channel 2 out HI 5 V LO .22 V

Channel 1 Lowest set point	V Readback COT	V
Channel 1 Mid set point	1.3 2.5 V Readback 1.3	V
Channel 1 Highest set point	2.6 V Readback 2.58	V
Channel 2 Lowest set point	V Readback OUT	V
Channel 2 Mid set point	V Readback 1.3	V
Channel 2 Highest set point	2.6 V Readback 2.58	V

Channel 1 OK Not OK	Channel 2 OK	Not OK	

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A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	Not OK	close OK	Not OK
Channel 2 open OK	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI \_\_\_\_\_\_ V \_ LO \_\_\_\_ V \_ close HI \_\_\_\_\_ V \_ LO \_\_\_\_ V \_ Channel 2 open HI \_\_\_\_\_ V \_ LO \_\_\_\_ V \_ Close HI \_\_\_\_\_ V \_ LO \_\_\_\_ V

2)	Verify that with no threshold voltage applied the shutter does not close. Set the
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point V Readback V

Channel 1 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2.5\_\_ V

Channel 1 Highest set point \_\_\_\_\_ V Readback \_\_\_\_\_ V

Channel 2 Lowest set point \_\_\_\_ V Readback \_\_\_ V

Channel 2 Mid set point \_\_\_\_\_2.5\_\_ V Readback \_\_\_2-7\_\_\_ V

Channel 2 Highest set point 4.64 V Readback 4.4 V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_\_\_ V Channel 2 OK \_\_\_ Trigger 2 \_\_\_ 5 \_\_ V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO . 22 V

Channel 2 out HI 5 V LO 22 V

Channel 1 Lowest set point	V Readback 003	V
Channel 1 Mid set point	1.3 2.5 V Readback 1-3	V
Channel 1 Highest set point	2.5 V Readback 2.5	V
Channel 2 Lowest set point	V Readback 607	V
Channel 2 Mid set point	1.3 2.5 V Readback	V
Channel 2 Highest set point	2.5 V Readback 2.5	V

Channel 1 OK	Not OK	Channel 2 OK	Not OK

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Channel 1 open OK		Not OK _		,	close OK _		Not O	к	
Channel 2 open OK		Not OK _		(	close OK _	_	Not O	K	
Verify with a toggling open									
Channel 1 open HI _	5	V LO_	. 1	V	close HI	5	V LO	. (	_ v
Channel 2 open HI	5	V LO_	- (	V	close HI	5	V LO	. 1	V

2) Verify that with no threshold voltage applied the shutter does not close. Set the threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

Channel 1 OK Not OK	Channel 2 OK Not OK			

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	V Readback COS
Channel 1 Mid set point	1:3 V Readback 1.3 V
Channel 1 Highest set point	2.6 476 V Readback 2.58 V
Channel 2 Lowest set point	V Readback CO3 V
Channel 2 Mid set point	V Readback 1.3 V
Channel 2 Highest set point	

Channel 1 OK	Not OK	Channel 2 OK	Not OK	
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- Shutter Controller Tester <u>D1200449-v1</u>.
- 2 Uniblitz shutters
- Board Schematics D1102312-v1.

# 3 Tests 51203613

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	Not OK	close OK	Not OK	
Channel 2 open OK	Not OK	close OK	Not OK	

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI \_\_\_\_\_\_ V \_ LO \_\_\_ I \_\_\_ V \_ close HI \_\_\_\_ V \_ LO \_\_\_ I \_\_\_ V Channel 2 open HI \_\_\_\_\_ S \_\_\_ V \_ LO \_\_\_ I \_\_\_ V \_ close HI \_\_\_ S \_\_\_ V \_ LO \_\_\_ I \_\_\_ V

2)	Verify	that	with	no	threshold	voltage	applied	the	shutter	does	not	close.	Set	the
	threshole	d pot	at mi	nim	um and ver	ify the vo	oltage is a	zero	with a m	eter co	onnec	eted to	J1. N	low
	ramp the	e PD	pot fro	om 1	ninimum to	maximu	ım, the m	onito	or LEDs s	hould	not o	change	state	<b>).</b>

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point \_\_\_\_\_ V Readback \_\_\_\_ V

Channel 1 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_2-3\frac{3\frac{9}{2}}{2} V

Channel 1 Highest set point \_\_\_\_\_\_\_ V Readback \_\_\_\_\_\_\_ V

Channel 2 Lowest set point \_\_\_\_\_ V Readback \_\_\_\_\_ V

Channel 2 Mid set point 2.5 V Readback 2.38 V

Channel 2 Highest set point 4.6 V Readback 4.4 V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI \_\_\_\_\_ V LO \_\_\_\_ 22\_\_ V

Channel 2 out HI \_\_\_\_\_ V LO \_\_\_\_ V

Channel 1 Lowest set point	V Readback
Channel 1 Mid set point	V Readback V
Channel 1 Highest set point	2-6 V Readback 2.5 V
Channel 2 Lowest set point	VO3_V ReadbackVO3_V
Channel 2 Mid set point	V Readback 1.3 V
Channel 2 Highest set point	

Channel 1 OK	Not OK	Channel 2 OK _	Not OK	<u>.</u>

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### Test Procedure for Shutter Controller

Paul Schwinberg and Daniel Sigg

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The following test procedure describes the test of proper operation of the shutter controller.

2	Tool		:		-4
2	Test	. Eq	ulp	mei	π

- Voltmeter
- Oscilloscope
- Shutter Controller Tester <u>D1200449-v1</u>.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

# 3 Tests 512 03614

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers.

The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK \_\_\_\_\_ Not OK \_\_\_\_\_ Not OK \_\_\_\_\_

Channel 2 open OK \_\_\_\_\_ Not OK \_\_\_\_ close OK \_\_\_\_ Not OK \_\_\_\_

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI \_\_\_\_\_\_ V \_ LO \_\_\_\_ V \_ close HI \_\_\_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Channel 2 open HI \_\_\_\_\_ V \_ LO \_\_\_ \ V \_ LO \_\_\_ \ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ LO \_\_\_ \ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ Close HI \_\_\_\_ S \_\_\_ V \_ Close HI \_\_\_\_ Y \_ Y \_ Close HI \_\_\_\_ Y

2)	Verify that with no threshold voltage applied the shutter does not close. Set the
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point \_\_\_\_\_ V Readback \_\_\_\_ V

Channel 1 Mid set point \_\_\_\_2.5\_\_ V Readback \_ 2 · Y ( V

Channel 1 Highest set point 4.6 V Readback 4.48 V

Channel 2 Lowest set point \_\_\_\_\_ V Readback \_\_\_\_ V

Channel 2 Mid set point 2.5 V Readback 2.4 V

Channel 2 Highest set point Y. U Readback V. 4V V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK V Trigger 1 5 V Channel 2 OK V Trigger 2 5 V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI S V LO . . 22 V

Channel 2 out HI \_\_\_\_\_ V LO \_\_\_\_ 2 \_\_\_ v

Channel 1 Lowest set point	V Readback CO3	<sub>-</sub> V
Channel 1 Mid set point	1.3 2.5 V Readback 1.29	V
Channel 1 Highest set point	2.6 V Readback 2.58	V
Channel 2 Lowest set point	V Readback - 003	V
Channel 2 Mid set point	1.3 V Readback (.29	V
Channel 2 Highest set point	2.6 V Readback 2.58	v

Channel 1 OK _	Not OK	Channel 2 OK Not OK

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Test Procedure for Shutter Controller

Paul Schwinberg and Daniel Sigg

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The following test procedure describes the test of proper operation of the shutter controller.

•	-	Change in	
2	LACT	-AIII	INMANT
	ICOL	Lyu	pment

- Voltmeter
- Oscilloscope
- Shutter Controller Tester <u>D1200449-v1</u>.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

#### 3 Tests 51203615

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK Not OK	close OK	Not OK
Channel 2 open OK Not OK	close OK	Not OK
Verify with a voltmeter that the front pa toggling open and close. Write down the vo		
Channel 1 open HI V V	close HI 5	V LO V
Channel 2 open HI V LO V	close HI 5	/ LOV

2)	Verify	that	with	no	threshold	voltage	applied	the	shutter	does	not	close.	Set	the
					um and ver	-	_							
	ramp th	e PD	pot fr	om 1	ninimum to	maximu	ım, the m	onito	or LEDs s	hould	not	change	state	<b>;</b> .

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point \_\_\_\_\_ V Readback \_\_\_\_ V

Channel 1 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2.3\% V

Channel 1 Highest set point 4.6 V Readback 7.49 V

Channel 2 Lowest set point V Readback V

Channel 2 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_2.39 V

Channel 2 Highest set point \_\_\_\_\_ V Readback \_\_\_\_\_ V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_\_\_ 5 \_\_ V Channel 2 OK \_\_\_\_ Trigger 2 \_\_ 5 \_\_ V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO .22 V

Channel 2 out HI 5 V LO -22 V

Channel 1 Lowest set point	V Readback OC3 V
Channel 1 Mid set point	<del>2.3</del> V Readback 1 - 29 V
Channel 1 Highest set point	2.6 V Readback 2.58 V
Channel 2 Lowest set point	_、こころ V Readback、公ろ V
Channel 2 Mid set point	1.3 V Readback 1.29 V
Channel 2 Highest set point	2.6 V Readback 2.59 V

Channel 1 OK	Not OK	Channel 2 OK Not OK		

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Test Procedure for Shutter Controller

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The following test procedure describes the test of proper operation of the shutter controller.

2	Toof	Earli	mmand
2	iest	Equi	pment

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

## 3 Tests S 1203616

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers.

The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK \_\_\_\_\_ Not OK \_\_\_\_\_ close OK \_\_\_\_ Not OK \_\_\_\_\_

Channel 2 open OK \_\_\_\_ Not OK \_\_\_\_ close OK \_\_\_\_ Not OK \_\_\_\_\_

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI \_\_\_\_ 5 \_\_\_ V \_\_LO \_\_\_ \_\_ V \_\_ close HI \_\_\_ 5 \_\_\_ V \_\_LO \_\_\_ \_\_ V

Channel 2 open HI \_ 5 \_ V LO \_ · | \_ V close HI \_ 5 \_ V LO \_ · | \_ V

2)	Verify that with no threshold voltage applied the shutter does not close. Set th	1e
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Nov	W
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.	

Channel 1 OK Not OK	Channel 2 OKNot OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	V Readback - CC3	_ v
Channel 1 Mid set point	1.3 V Readback 1.29	_ V
Channel 1 Highest set point	2.6 V Readback 2.5	V
Channel 2 Lowest set point	、このう V Readback _。603	V
Channel 2 Mid set point	V Readback	_ v
Channel 2 Highest set point	2.6 V Readback 2.5	_ v

Channel 1 OK _	V	Not OK	F	Channel 2 OK _	V	_ Not OK	

Test Procedure for Shutter Controller

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The following test procedure describes the test of proper operation of the shutter controller.

0	T4	Per		4
2	Iest	Equi	nme	nt
	1006		PILLO	

- Voltmeter
- Oscilloscope
- Shutter Controller Tester <u>D1200449-v1</u>.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

## 3 Tests 51203617

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK Not OK	close OK	Not OK
Channel 2 open OK Not OK	close OK	Not OK
Verify with a voltmeter that the front period toggling open and close. Write down the vo		· ·
Channel 1 open HI _ 5 _ V LO l	V close HI5	v LO V

Channel 2 open HI 5 V LO V close HI 5 V LO V

2)	Verify that with no threshold voltage applied the shutter does not close. Set the	he
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. No	W
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.	

Channel 1 OK	Not OK	Channel 2 OK _	Not OK	

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 v LO . 22 v

Channel 2 out HI 5 v LO . 22 v

Channel 1 Lowest set point	-003	V	Readback	:003	V
Channel 1 Mid set point	2.5	V	Readback	1.29	V
Channel 1 Highest set point	2.6	V	Readback	2.5	V
Channel 2 Lowest set point	.003	V	Readback	.003	V
Channel 2 Mid set point	1.3 2.5	V	Readback	1.3	V
Channel 2 Highest set point	2.6	v	Readback	2.5	V

			. /	
Channel 1 OK	Not OK	Channel 2 OK _	Not OK	

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Test Procedure for Shutter Controller

Paul Schwinberg and Daniel Sigg

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The following test procedure describes the test of proper operation of the shutter controller.

2	Test	Equi	pment
	1001	-941	PILICIAL

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

## 3 Tests 51203618

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers.

The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK	Not OK	close OK	Not OK
Channel 2 open OK	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI _	5	_ V	LO		1	_ V	close HI_	5	_ V	LO	. (	v
Channel 2 open HI	5	V	LO	<u>-</u>	(	V	close HI	5	V	LO	_ )	V

2) Verify that with no threshold voltage applied the shutter does not close. Set the threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

	. /	
Channel 1 OK	Not OK	Channel 2 OK Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point	-063	_ V	Readback	_603	V
Channel 1 Mid set point	2.5	V	Readback	2.34	_ V
Channel 1 Highest set point	4.6	_ V	Readback_	4,4	V
Channel 2 Lowest set point	-05)	_V	Readback _	-003	V
Channel 2 Mid set point	2.5	V	Readback _	2.38	V
Channel 2 Highest set point	4.6	V	Readback_	4.4	V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	V Readback V
Channel 1 Mid set point	V ReadbackV
Channel 1 Highest set point	2.6 V Readback 2.5 V
Channel 2 Lowest set point	V Readback V
Channel 2 Mid set point	1.3 2.5 V Readback 1.3 V
Channel 2 Highest set point	2.6 V Readback 2.5 V

	. /				
Channel 1 OK _	V	Not OK	 Channel 2 OK	Not OK _	

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Test Procedure for Shutter Controller

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The following test procedure describes the test of proper operation of the shutter controller.

2 Test Equipment	2	Test	Eq	ui	pm	ent	t
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- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

3	Tests <sub>S</sub>	12036	19
	$\mathcal{L}$	12() 36	1/

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	Not OK	close OK	Not OK
CI 10 OV	N. OY		
Channel 2 open OK _	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI \_ 5 \_ V \_ LO \_ . | \_ V \_ close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Channel 2 open HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ LO \_ . | \_ V \_ Close HI \_ 5 \_ V \_ Close HI \_

2)	Verify that with no threshold voltage applied the shutter does not close. Set the	ne
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. No	w
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.	

Channel 1 OK Not OK	Channel 2 OK Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point	1603 V	Readback	·053	V
Channel 1 Mid set point	2.5V	Readback	294	V
Channel 1 Highest set point	_4.6_v	Readback	1.4	V
Channel 2 Lowest set point	·003_v	Readback	-603	V
Channel 2 Mid set point	2.5V	Readback	244	V
Channel 2 Highest set point	4.6 v	Readback	4.4	v

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	V Readback V
Channel 1 Mid set point	1.3 V Readback V
Channel 1 Highest set point	2.5 V Readback 2.5 V
Channel 2 Lowest set point	V Readback V
Channel 2 Mid set point	1.3 2.5 V Readback 1.3 V
Channel 2 Highest set point	2.5 v Readback 2.5 v

Channel 1 OK Not OK	Channel 2 OK Not OK

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Test Procedure for Shutter Controller

Paul Schwinberg and Daniel Sigg

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The following test procedure describes the test of proper operation of the shutter controller.



- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

3	Tests	5	120	3(0	20
			10-0	3 6 5	1

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	Not OK	close OK _	Not OK
Channel 2 open OK	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

 2) Verify that with no threshold voltage applied the shutter does not close. Set the threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

Channel 1 OK Not OK	Channel 2 OK Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	V Readback w 7 V
Channel 1 Mid set point	1.3 V Readback 1.29 V
Channel 1 Highest set point	2.6 V Readback 2.5 V
Channel 2 Lowest set point	<u>·O€3</u> V Readback <u></u> co 7 V
Channel 2 Mid set point	1.3 2.5 V Readback 1.29 V
Channel 2 Highest set point	

Channel 1 OK Not OK	Channel 2 OK Not OK

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The following test procedure describes the test of proper operation of the shutter controller.

2	Test	Ea	aiu	me	nt
200000			ou 1 la		

- Voltmeter
- Oscilloscope
- Shutter Controller Tester <u>D1200449-v1</u>.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

## 3 Tests 5/203621

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK Not OK	close OK	Not OK
Channel 2 open OK Not OK	close OK	Not OK
Verify with a voltmeter that the front patoggling open and close. Write down the vo		
Channel 1 open HI5 V LO \	V close HI _5	V LOV
Channel 2 open HI V LO V	V close HI	v LO . / v

2) Verify that with no threshold voltage applied the shutter does not close. Set the threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

			_	
Channel 1 OK _	Not OK	Channel 2 OK _		_ Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point

Channel 1 Mid set point

2.5 V Readback

Channel 1 Highest set point

Channel 2 Lowest set point

Channel 2 Mid set point

2.5 V Readback

V V Readback

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO 122 V

Channel 2 out HI 5 V LO 22 V

Channel 1 Lowest set point	V Readback VOS V
Channel 1 Mid set point	1.3 V Readback _ 1.3 _ V
Channel 1 Highest set point	2.6 V Readback 2.58 V
Channel 2 Lowest set point	V Readback 1603 V
Channel 2 Mid set point	1-3 2.5_ V Readback 1.3 V
Channel 2 Highest set point	2.6 V Readback 2.58 V

Channel 1 OK	Not OK	Channel 2 OK	Not OK	

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### Test Procedure for Shutter Controller

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The following test procedure describes the test of proper operation of the shutter controller.

2	<b>Test</b>	Equi	pment

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

# 3 Tests 512 03622

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK	Not OK	close OK	Not OK
Channel 2 open OK	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI _		V LO	. (	_ V	close HI	5	_V LO_	- )	\
Channel 2 open HI	5	V LO_	. 1	_ V	close HI	3	_V LO_	. 1	V

2)	Verify that with no threshold voltage applied the shutter does not close. Set the	he
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. No	W
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.	

					_	
Channel 1 OK	i Not	OK	Channel 2 OK	-	Not OK	

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI \_\_5 \_\_ v \_ LO \_ · 22 \_\_ v

Channel 2 out HI \_\_5 \_\_ v \_ LO \_ · 22 \_\_ v

Channel 1 Lowest set point	V Readback OO >	V
Channel 1 Mid set point	1.3 2.5 V Readback 1.3	V
Channel 1 Highest set point	26 V Readback 2.5	V
Channel 2 Lowest set point	V Readback Cold	V
Channel 2 Mid set point	1.3 2.5 V Readback 1.3	V
Channel 2 Highest set point	2.6 V Readback 2.5 V	V

Channel 1 OK	Not OK	Channel 2 OKNot OK

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The following test procedure describes the test of proper operation of the shutter controller.

2	Test	Equi	pme	nt
-			P. III	

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

### 3 Tests 51203623

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers.

The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK Not OK	close OK Not OK
Channel 2 open OKNot OK	close OKNot OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

2)	Verify that with no threshold voltage applied the shutter does not close. Set th
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Nov
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

Channel 1 OK Not OK	Channel 2 OK Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point	.003	V Readback	.003	V
Channel 1 Mid set point	2.5 V	Readback _	2.4	V
Channel 1 Highest set point	4.6	Readback _	4.4	V
Channel 2 Lowest set point	1 [00]	Readback _	·00 7	V
Channel 2 Mid set point	2.5 V	Readback_	2.4	V
Channel 2 Highest set point	4.6 V	Readback	4.4	v

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	(063 V R	teadback _ co3	_ V
Channel 1 Mid set point	<del>2.5</del> _V R	eadback 1.3	V
Channel 1 Highest set point	<u>2.6</u> v r	eadback 2.5	V
Channel 2 Lowest set point	-003 V R	eadback CO 3	V
Channel 2 Mid set point	1.3 2.5_ V R	eadback (.3	V
Channel 2 Highest set point	2.6 V R	eadback 2.5	v

Channel 1 OK	Not OK	Channel 2 OK Not OK		

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The following test procedure describes the test of proper operation of the shutter controller.

-	magnet of	Breeze 20	4
2	IDCT	-AIII	nmont
_	1631	Luui	pment

- Voltmeter
- Oscilloscope
- Shutter Controller Tester <u>D1200449-v1</u>.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

3	Tests	S1203624
· · ·		31203624
The	Shutter	Control has two D880C Shutter Drivers mounted on the main PCB.
The	Shutter	Controller Tester should be powered up and plugged into the powered Shutter Control.
$A \ \mathcal{L}$	Iniblitz si	hutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	Not OK	close OK	Not OK
Channel 2 open OK	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI _	5	V	LO_	. 1	V	close HI	5	_V	LO.	. ί	_ v
Channel 2 open HI _	5	V	LO_	- 1	V	close HI	5	_ V	LO.	. [	_ V

2)	Verify that with no threshold voltage applied the shutter does not close. Set th
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Nov
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_\_ Trigger 1 \_\_\_\_\_ V Channel 2 OK \_\_\_\_ Trigger 2 \_\_\_\_\_ V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	(603	V	Readback	.003	V
Channel 1 Mid set point	1.3	V	Readback	1.3	V
Channel 1 Highest set point	2.6	V	Readback _	2.5	V
Channel 2 Lowest set point	1003	V	Readback _	,003	V
Channel 2 Mid set point	(.3 2.5	V	Readback _	1.3	V
Channel 2 Highest set point	2.6	V	Readback _	2.5	v

Channel 1 OK	Not OK	Channel 2 OK	2	Not OK	

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The following test procedure describes the test of proper operation of the shutter controller.

2	Test	Equi	pment

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

### 3 Tests 51203625

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers.

The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OKNot OK	close OK Not OK	
Channel 2 open OK Not OK	close OK Not OK	

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

2)	Verify that with no threshold voltage applied the shutter does not close. Set	the
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. N	low
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.	

Channel 1 OK \_ Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point \_\_\_\_\_\_ V Readback \_\_\_\_\_ V Channel 1 Mid set point \_\_\_\_\_\_ 2.5\_\_ V Readback \_\_\_\_\_ V

Channel 1 Highest set point \_\_\_\_\_\_ V Readback \_\_\_\_\_ V

Channel 2 Lowest set point \_\_\_\_\_ V Readback \_\_\_\_ V

Channel 2 Mid set point 2.5 V Readback V

Channel 2 Highest set point \_\_\_\_\_\_\_\_ V Readback \_\_\_\_\_\_\_ V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_\_\_\_ 5 V Channel 2 OK \_\_\_\_ Trigger 2 \_\_\_ 5 V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI \_\_\_5\_\_ v Lo \_\_\_22\_\_ v

Channel 2 out HI 5 V LO · 22 V

4) Verify that when close is applied the shutter stays closed. Mount a 50 terminator to the front panel close BNC. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should stay close for all voltages.

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_

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Test Procedure for Shutter Controller

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Phone 225-686-7189

The following test procedure describes the test of proper operation of the shutter controller.

2	Test	Equi	pment
			P

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics D1102312-v1.

# 3 Tests 5/2 03626

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK Not OK	close OK Not OK	_
Channel 2 open OK Not OK	close OK Not OK	

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

2)	Verify that with no threshold voltage applied the shutter does not close. Set	the
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. I	Now
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state	Э.

Channel 1 OK \_\_\_\_\_ Not OK \_\_\_\_\_ Channel 2 OK \_\_\_\_ Not OK \_\_\_\_\_

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point \_\_\_\_\_ V Readback \_\_\_\_ V

Channel 1 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_2. \( \frac{2}{2} \) V

Channel 1 Highest set point \_\_\_\_\_ V Readback \_\_\_\_\_ V

Channel 2 Lowest set point \_\_\_\_ V Readback \_\_\_\_ V

Channel 2 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2.4\_\_\_ V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_ . 5 \_ V Channel 2 OK \_\_\_ Trigger 2 \_ . 5 \_ V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO 122 V

Channel 2 out HI 5 V LO 22 V

Channel 1 Lowest set point	V Readback OOS
Channel 1 Mid set point	1.3 2.5 V Readback 1.3 V
Channel 1 Highest set point	2.6 V Readback 2.5 V
Channel 2 Lowest set point	V Readback 003 V
Channel 2 Mid set point	V Readback 1.3 V
Channel 2 Highest set point	26 V Readback 1-3 V

Channel 1 OK Not OK	Channel 2 OKNot OK

LIGO-E1200340-v1 advanced LIGO

Test Procedure for Shutter Controller

Paul Schwinberg and Daniel Sigg

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The following test procedure describes the test of proper operation of the shutter controller.



- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

### 3 Tests 51203627

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	/	Not OK	 close OK _		Not OK
				/	
Channel 2 open OK _	V	Not OK	 close OK _		Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI \_\_\_\_\_\_ V \_ LO \_\_\_\_\_ V \_ close HI \_\_\_\_\_ V \_ LO \_\_\_\_ V \_ Channel 2 open HI \_\_\_\_\_ 5 \_\_\_ V \_ LO \_\_\_\_ V \_ LO \_\_\_\_ V \_ Channel 2 open HI \_\_\_\_\_ 5 \_\_\_ V \_ LO \_\_\_ / \_\_\_ V

2)	Verify that with no threshold voltage applied the shutter does not close. Set the	ne
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. No	W
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.	

Channel 1 OK Not OK Channel 2 OK Not OK Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 2 Highest set point \_\_\_\_\_\_ V Readback \_\_\_\_\_ V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_\_\_ 5 \_\_ V Channel 2 OK \_\_\_ Trigger 2 \_\_ 5 \_\_ V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO · 22 V

Channel 2 out HI \_\_\_5 \_\_\_ v \_ LO \_\_-22 \_\_\_ v

Channel 1 Lowest set point	<u>、003</u> V Readback <u>・003</u> V
Channel 1 Mid set point	1.3 V Readback
Channel 1 Highest set point	2.6 V Readback 2.5 V
Channel 2 Lowest set point	V Readback OOS V
Channel 2 Mid set point	1.3 2.5 V Readback 3 V
Channel 2 Highest set point	2.6 V Readback 2.5 V

. /		
Channel 1 OK Not OK	Channel 2 OK Not OK	

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Test Procedure for Shutter Controller

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The following test procedure describes the test of proper operation of the shutter controller.

### 2 Test Equipment

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

## 3 Tests 5/203628

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK	Not OK	close OK	Not OK
Channel 2 open OK	Not OK	close OK _	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI \_\_\_\_\_\_ V \_ LO \_\_\_\_ V \_ close HI \_\_\_\_\_ V \_ LO \_\_\_\_ V \_ Channel 2 open HI \_\_\_\_\_ V \_ LO \_\_\_\_ V \_ Close HI \_\_\_\_\_ V \_ LO \_\_\_\_ V

2)	Verify that with no threshold voltage applied the shutter does not close. Set	the
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. N	Vow
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state	<b>)</b> .

Channel 1 OK _	Not OK	Channel 2 OK	Not OK	

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point	- 003 v	Readback	. 603	V
Channel 1 Mid set point	2.5 V	Readback	2.4	V
Channel 1 Highest set point	4.6 -003 V	Readback	4.4	V
Channel 2 Lowest set point	.003 V	Readback	.003	V
Channel 2 Mid set point	2.5V	Readback	2.4	V
Channel 2 Highest set point	4.6 v	Readback	4.4	v

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	V Readback 003	.V
Channel 1 Mid set point	1.3 2.5 V Readback (.3	V
Channel 1 Highest set point	V Readback	V
Channel 2 Lowest set point	V Readback 903	V
Channel 2 Mid set point	V Readback	V
Channel 2 Highest set point	26 V Readback 2.5	V

Channel 1 OK Not OK	Channel 2 OK Not OK

Test Procedure for Shutter Controller

Paul Schwinberg and Daniel Sigg

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The following test procedure describes the test of proper operation of the shutter controller.



- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

### 3 Tests \$1203629

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers.

The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	Not OK	close OK	Not OK
Channel 2 open OK _	Not OK	close OK	Not OK_

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI _	5	_ V	LO_	. 1	V	close HI_	5	V	LO	. (	_ V
Channel 2 open HI _	5	_ V :	LO_	.	V	close HI _	5	V	LO	.	_ V

Verify that with no threshold voltage applied the shutter does not close. Set the
threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now
ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

. /			
Channel 1 OK Not OK	Channel 2 OK	Not OK	-

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 V LO - 22 V

Channel 2 out  $HI _{5} V LO _{2} V$ 

Channel 1 Lowest set point	V Readback	_ V
Channel 1 Mid set point	1.3 2.5 V Readback 1-3	_ v
Channel 1 Highest set point	2.6 V Readback 2.5	_v
Channel 2 Lowest set point	V Readback (65)	_ v
Channel 2 Mid set point	1.3 V Readback 1.3	_ V
Channel 2 Highest set point	Readback 2.5	_ v

				/		
Channel 1 OK	V	Not OK	Channel 2 OK		Not OK	

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advanced LIGO

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### Test Procedure for Shutter Controller

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The following test procedure describes the test of proper operation of the shutter controller.

2	Test	Eaui	pment
			10

- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

## 3 Tests 51203630

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK	Not OK	close OK	Not OK
Channel 2 open OK	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI \_\_\_\_\_\_\_ V \_ LO \_\_\_\_ V \_ close HI \_\_\_\_\_\_ V \_ LO \_\_\_\_ V \_ Channel 2 open HI \_\_\_\_\_\_ V \_ LO \_\_\_\_ V \_ Close HI \_\_\_\_\_\_ V \_ LO \_\_\_\_ V

2)	Verify that with no threshold voltage applied the shutter does not close. Set the	ne
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. No	w
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.	

Channel 1 OK Not OK Channel 2 OK Not OK Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point \_\_\_\_ V Readback \_\_\_ V

Channel 1 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2.4\_\_ V

Channel 2 Lowest set point \_\_\_\_ V Readback \_\_\_ V

Channel 2 Mid set point \_\_\_\_2.5\_\_ V Readback \_\_\_2. \( \frac{1}{2} \) V

Channel 2 Highest set point 4.6 V Readback 1.7 V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Channel 1 OK \_\_\_\_ Trigger 1 \_\_\_ 5 V Channel 2 OK \_\_\_ Trigger 2 \_\_ 5 V

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 out HI 5 v LO · 22 v

Channel 2 out HI 5 v LO 22 v

Channel 1 Lowest set point	V Readback VO3	V
Channel 1 Mid set point	1.3 2.5 V Readback 1.3	V
Channel 1 Highest set point	2.6 V Readback 2.5	V
Channel 2 Lowest set point	OC3V ReadbackOC3	V
Channel 2 Mid set point	1.3 V Readback _ 1.3	V
Channel 2 Highest set point	2.6 V Readback 2.5	V

Channel 1 OK	Not OK	Channel 2 OK Not OK

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Test Procedure for Shutter Controller

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The following test procedure describes the test of proper operation of the shutter controller.



- Voltmeter
- Oscilloscope
- Shutter Controller Tester D1200449-v1.
- 2 Uniblitz shutters
- Board Schematics <u>D1102312-v1</u>.

# 3 Tests 51203631

The Shutter Control has two D880C Shutter Drivers mounted on the main PCB.

The Shutter Controller Tester should be powered up and plugged into the powered Shutter Control.

A Uniblitz shutter should be connected to each output.

1) Verify that the basic logic works. Toggle the open and close switches for both drivers. The monitor LEDs on both the Controller and Tester should change states.

Channel 1 open OK _	Not OK	close OK	Not OK
Channel 2 open OK	Not OK	close OK	Not OK

Verify with a voltmeter that the front panel BNCs read the correct TTL levels, when toggling open and close. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 open HI	5	V	LO	. (	V	close HI	5	_ V	LO_	- (	V
Channel 2 open HI	5	V	LO	1	V	close HI	5	V	LO	. 1	V

2)	Verify that with no threshold voltage applied the shutter does not close. Set the
	threshold pot at minimum and verify the voltage is zero with a meter connected to J1. Now
	ramp the PD pot from minimum to maximum, the monitor LEDs should not change state.

	/				
Channel 1 OK _		Not OK	 Channel 2 OK	~	Not OK

Verify with a voltmeter that the front panel BNC readback shows the correct photodetector voltage levels, when ramping. The photodiode voltages at the BNC should be 5% below the set point. Write down the voltages for

Channel 1 Lowest set point	V Readbackのう	V
Channel 1 Mid set point	2.5 V Readback _ 2.4	V
Channel 1 Highest set point	Y.6 V Readback Y.4	V
Channel 2 Lowest set point	V Readback OCT	V
Channel 2 Mid set point	2.5 V Readback2.4	V
Channel 2 Highest set point	U_U_V ReadbackU_U	V

3) Verify that when a threshold voltage is applied the shutter closes. Set the threshold pot at 2.5 volts and verify with meter connected to J1. Now ramp the PD pot from minimum to maximum, the shutter should close and the monitor LEDs should change state, read the trigger voltage with a meter connected to J1.

Verify with a voltmeter that the front panel OUT BNCs read the correct TTL levels, when toggling the shutter. Write down the voltages (TTL HI > 2.0V and TTL LO < 0.8V).

Channel 1 Lowest set point	V Readback OGS	V
Channel 1 Mid set point	1.3 2.5 V Readback 1.3	V
Channel 1 Highest set point	2.6 V Readback 2.5	V
Channel 2 Lowest set point	V Readback 003	V
Channel 2 Mid set point	V Readback 1.3	V
Channel 2 Highest set point	2.6 V Readback 2.5	V

Channel 1 OK	V	Not OK	Channel 2 OK	Not OK	