

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests

S1200537

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with  $50\Omega$  terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low ( $<0.8V$ ).

TP6 (+5V) +5V

TP8 (+15V) +15V

TP3 (-15V) -15V

TP9 (OK) +3V

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests S1200538

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5V

TP8 (+15V) +15V

TP3 (-15V) -15V

TP9 (OK) +3V

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read  $50\Omega$ .

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests S1200539

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50 $\Omega$  terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED Yes

Rear panel LEDs Yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests S1200540

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50 $\Omega$  terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read  $50\Omega$ .

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass



## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests S1200541

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with  $50\Omega$  terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low ( $<0.8V$ ).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read  $50\Omega$ .

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

### 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

### 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

### 3 Documentation

- Schematics—D1102045-v1

### 4 Tests

S1200542

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

#### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5V

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

#### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

### 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

### 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

### 3 Documentation

- Schematics—D1102045-v1

### 4 Tests

~~S1200543~~ S1200543

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between “PD DC 1-4 Out” and “PD DC 5-8 IN”. Connect the test cables to “PD DC 1-4 IN” and “PD DC 5-8 OUT”.

#### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

#### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests *S1200544*

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50 $\Omega$  terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power *SA*

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass



## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests *S1200545*

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between “PD DC 1-4 Out” and “PD DC 5-8 IN”. Connect the test cables to “PD DC 1-4 IN” and “PD DC 5-8 OUT”.

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests *S1200546*

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED Yes

Rear panel LEDs Yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read  $50\Omega$ .

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	PASS
PZT 1X Sensor	PZT readback	PASS
PZT 1Y HV	PZT readback	PASS
PZT 1Y Sensor	PZT readback	PASS
PZT 2X HV	PZT readback	PASS
PZT 2X Sensor	PZT readback	PASS
PZT 2Y HV	PZT readback	PASS
PZT 2Y Sensor	PZT readback	PASS
Temp Laser	Temperature control	PASS
Temp Doubler	Temperature control	PASS

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	PASS	PASS	PASS	PASS	PASS
BNC 2	PASS	PASS	PASS	PASS	PASS
BNC 3	PASS	PASS	PASS	PASS	PASS
BNC 4	PASS	PASS	PASS	PASS	PASS

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests S1200547

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests

512 00548

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with  $50\Omega$  terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low ( $<0.8V$ ).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read  $50\Omega$ .

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass



## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests

S1200549

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50 $\Omega$  terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read  $50\Omega$ .

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

### 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

### 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

### 3 Documentation

- Schematics—D1102045-v1

### 4 Tests *31200550*

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

#### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

#### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED Yes

Rear panel LEDs Yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read  $50\Omega$ .

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests

S1200551

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read  $50\Omega$ .

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests *3/200552*

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED Yes

Rear panel LEDs Yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass



## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests *S1200553*

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED Yes

Rear panel LEDs Yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass

## 1 Overview

The slow controls concentrator auxiliary 2 supports 8 photodiodes, 2 temperature control outputs and 4 axes of PZT readbacks.

## 2 Test Equipment

- Multimeter, scope and signal generator.
- Second slow controls concentrator auxiliary 2 (D1102045-v1).  
Replace the 2 quad photodiode breakout boards with 2 quad TNC/GND breakouts.
- 2 test cables DB9 to 4xBNC (D1102414-v1).
- DC power supplies.

## 3 Documentation

- Schematics—D1102045-v1

## 4 Tests *SIRCOSSY*

Power up the measurement equipment and connect open the lid of the DUT. Connect a DB37 cable (male-male) between the DUT and the second slow controls concentrator. Equip the TNC inputs (but not the BNC inputs) of the DUT with 50Ω terminators. Connect a DB15 (male-female) between "PD DC 1-4 Out" and "PD DC 5-8 IN". Connect the test cables to "PD DC 1-4 IN" and "PD DC 5-8 OUT".

### 4.1 Power

Check the voltages on the concentrator power board. The voltage should be within 5% of nominal. Test that the OK signal is a TTL low (<0.8V).

TP6 (+5V) +5

TP8 (+15V) +15

TP3 (-15V) -15

TP9 (OK) +3

### 4.2 LED

Check that the LED on the front panel and the 3 LEDs on the rear panel are lit.

Front panel LED yes

Rear panel LEDs yes

### 4.3 Testing

Use an Ohmmeter and check the continuity of the signal lines between the two slow controls concentrators. Each tested signal should read 50Ω.

Concentrator	Signal	Pass/Fail
PZT 1X HV	PZT readback	Pass
PZT 1X Sensor	PZT readback	Pass
PZT 1Y HV	PZT readback	Pass
PZT 1Y Sensor	PZT readback	Pass
PZT 2X HV	PZT readback	Pass
PZT 2X Sensor	PZT readback	Pass
PZT 2Y HV	PZT readback	Pass
PZT 2Y Sensor	PZT readback	Pass
Temp Laser	Temperature control	Pass
Temp Doubler	Temperature control	Pass

Apply a 1kHz sine wave to each the BNCs of the first test cable while measuring the response with a scope on the second test cable, at the front panel BNCs of the DUT and at the front panel BNCs of the second concentrator. Since the 2 photodiode inputs are connected together, the response of the first 4 front panel BNCs is seen on the next 4 as well.

Cable 1	Pass/Fail				
	Cable 2	DUT		2 <sup>nd</sup> concentrator	
		PDMon	PDMon+4	PDMon	PDMon+4
BNC 1	Pass	Pass	Pass	Pass	Pass
BNC 2	Pass	Pass	Pass	Pass	Pass
BNC 3	Pass	Pass	Pass	Pass	Pass
BNC 4	Pass	Pass	Pass	Pass	Pass