VIBRATION ANALYSIS HARDWARE


# SCD111 Series Monitoring System
# 4 Sensor Inputs
# Product Manual

# Table of Contents

# Introduction

CTC offers Relay and Display solutions that provide a visual display of the machinery vibration values, while also allowing a customer-defined input level to trigger a relay and shut down equipment that is operating outside of tolerance.

**SCD111**

The SCD111 Series system monitors a machine's condition based on its level of vibration. The system can be integrated into a circuit to shut down a machine when preset vibration levels are reached. The system detects high vibration energy sensed via the input accelerometers and actuates relays based on alert and alarm set points. The system will indicate the instantaneous vibration levels and relay status at each channel through the display meters. The system also supplies outputs for Dynamic Vibration data (Waveforms) transmitted by the accelerometers via the BNCs on the front of the enclosure. The waveforms are obtained from the BNC jacks located on the front of the enclosure or wired from screw terminals identified by "Sensor Output."

The SCD111 Series system is contained within a standard fiberglass enclosure. Mounting brackets are provided for wall-mounting the enclosure (wall anchoring screws are not included).

Rated for NEMA 4X (IP66), the SCD111 Series can withstand harsh environments including temperatures ranging from -58°F to 180°F (-50°C to 82°C). The box is also resistant to hose-directed fluid and corrosion. A snap latch is installed on the door allowing the box to be sealed from the elements when not in use.

# Product Dimensions

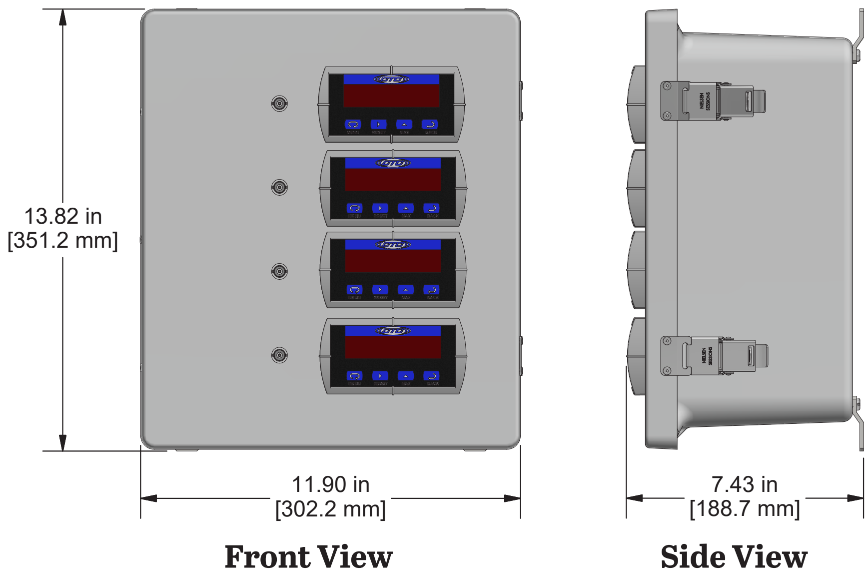



*Figure 1. Dimensions*

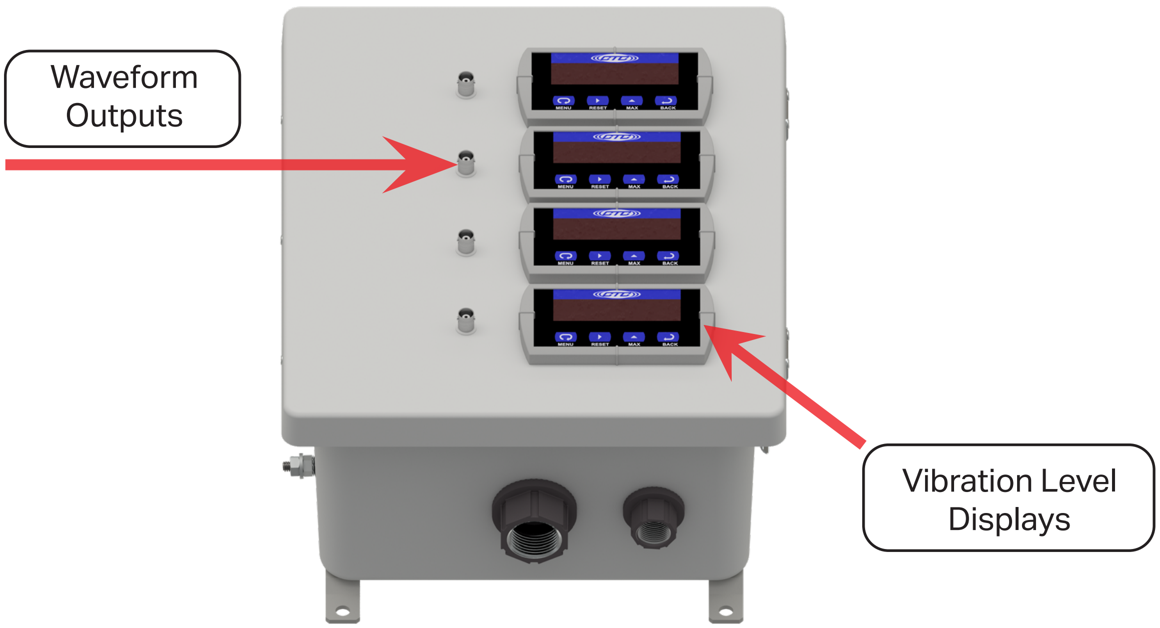



*Figure 2. Diagram*

# Mounting Instructions

Independent stainless steel mounting feet are included on the enclosure. Wall anchoring screws are not included. **Note:** If you have purchased a SCD111 series enclosure without cable entries provided, you should add your own entry prior to mounting the enclosure. CTC does not recommend putting holes in the top of the enclosure due to access and moisture concerns.

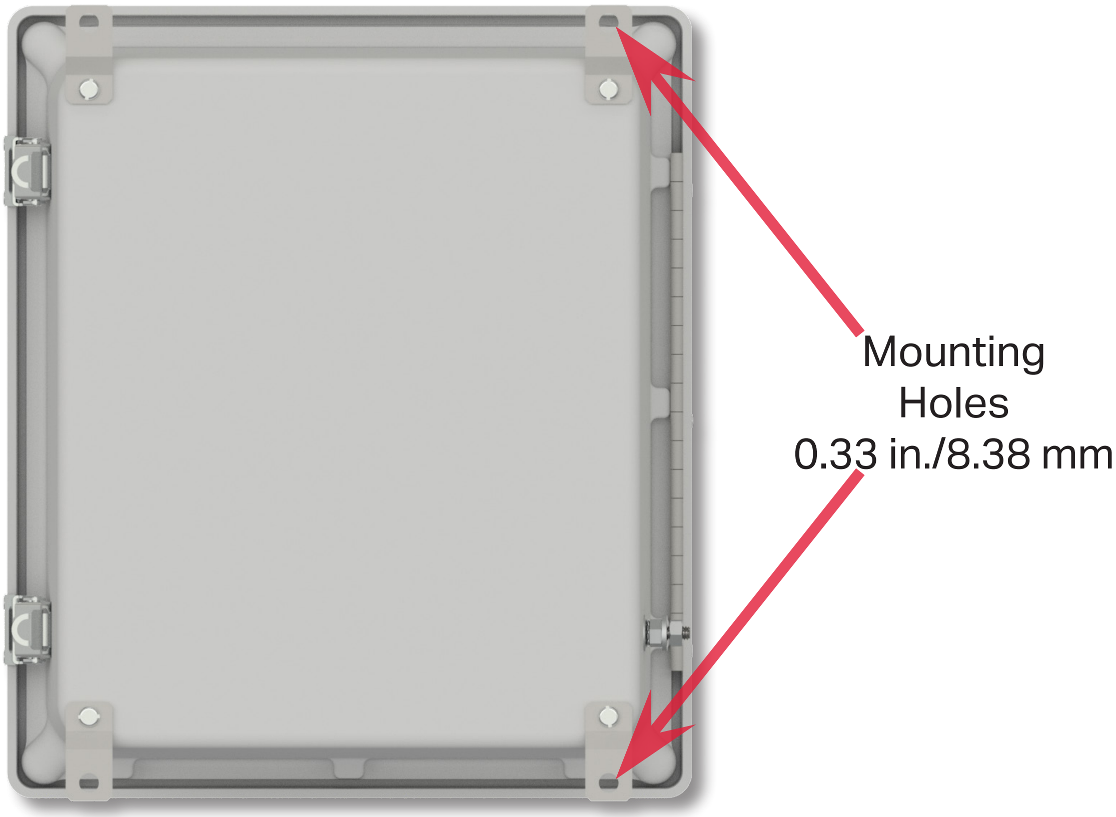



*Figure 3. SCD111 Series Rear View*

## Conduit Entry

If you are running conduit to your enclosure, ensure the conduit cable entry enters from the bottom of the enclosure when mounted.

**Note:** To ensure moisture will not flow into the enclosure, a hole should be drilled at the lowest point in the conduit to provide drainage for any moisture.

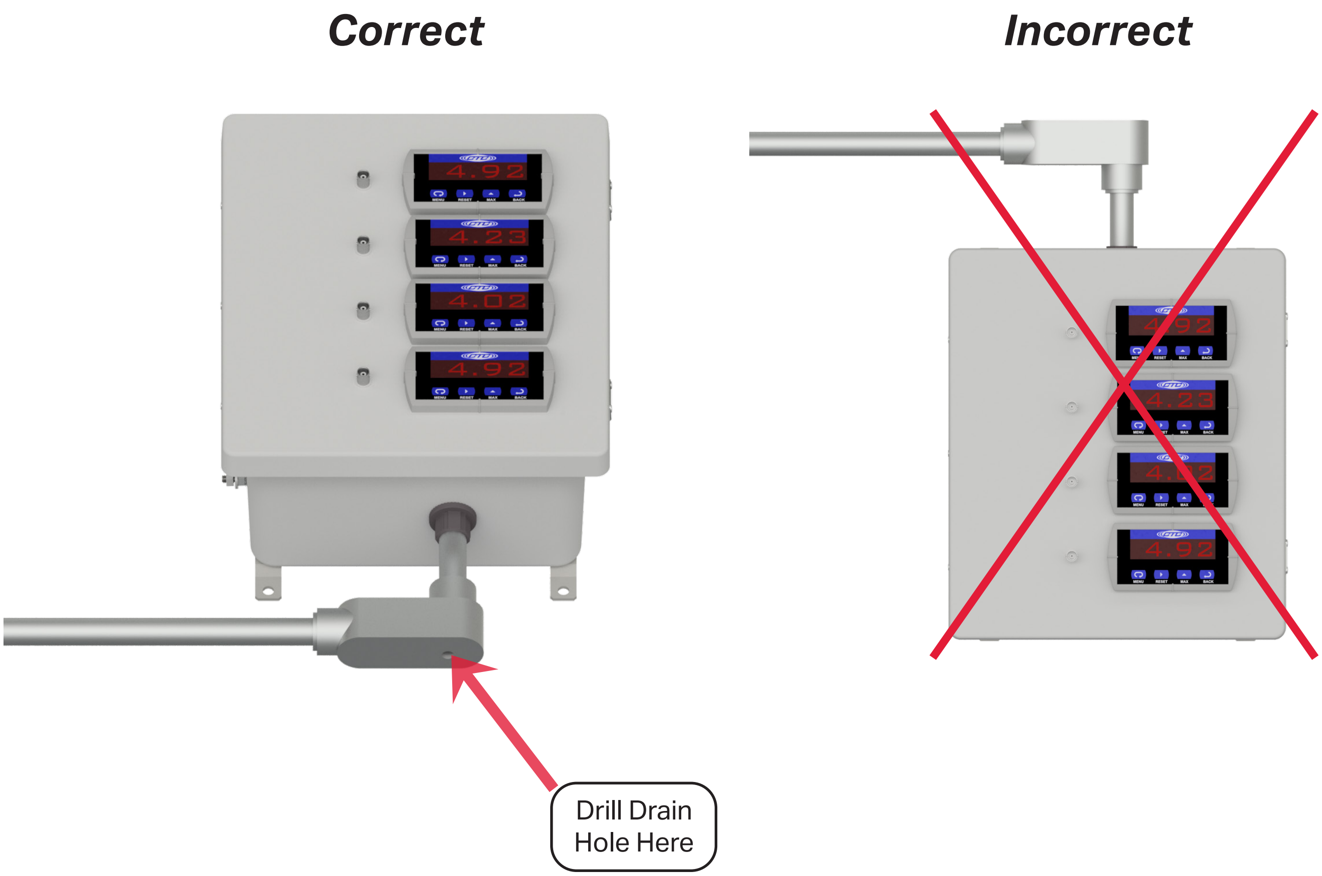



***Figure 4. Conduit Entry for SCD111***

## Grounding

Ensure the shield ground wire on the SCD111 Series enclosure is grounded to earth ground.

*A. Mounting to Earth Ground*

When mounting SCD111 Series enclosures to earth ground (such as an I-Beam), mount the shield ground wire using a mounting bolt through one of the mounting brackets on the enclosure.


***Figure 5. Proper Shield Grounding Technique***

*B. Mounting to Non-Grounded Structure*

When mounting the SCD111 enclosure to a non-grounded structure, ensure the shield ground wire or customer-supplied ground wire is tied to a source of earth ground.

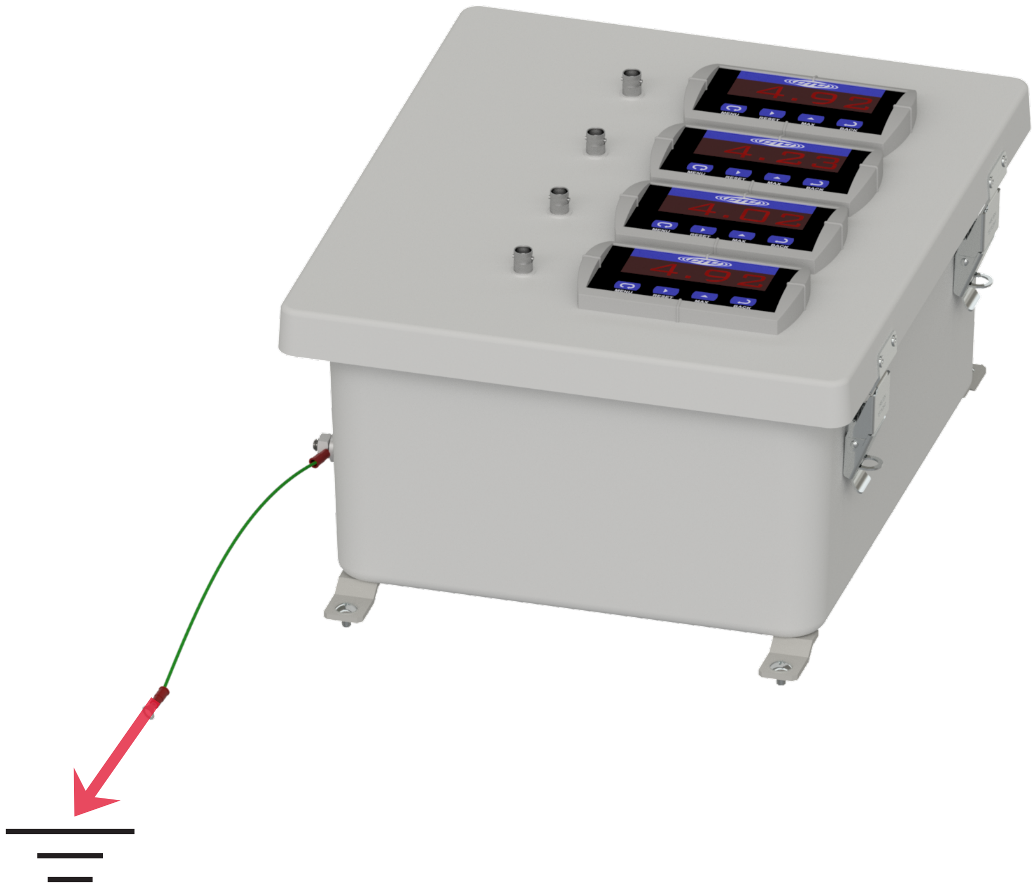


***Figure 6. Ground Wire Placement***

# Electrical Connectons

Cables enter and exit the enclosure through conduit fittings or cord grips on the bottom of the unit. All input and output wiring is connected to the terminal blocks and signal conditioners inside the unit. Inputs are routed through a 1½ in. conduit fitting or cord grips (1 per channel), output wiring is routed through a 1½ in. conduit fitting. 110 VAC is needed to power the unit through the terminal on the right side of the enclosure. If input options are selected when ordering, a ½ in. conduit fitting is provided for AC power entry.

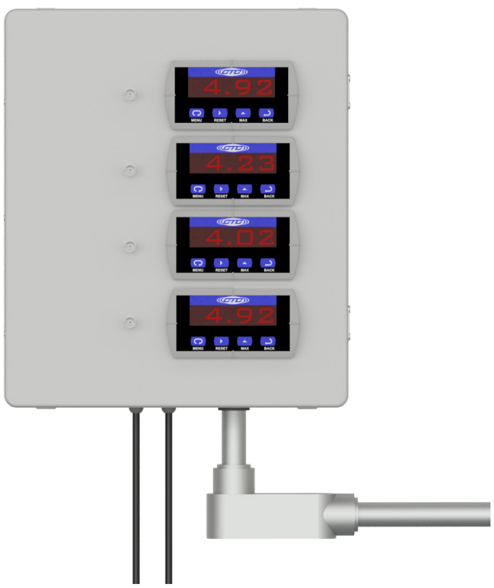


*Figure 7. Front View*

*Figure 8. Bottom View*

**Wiring Inputs and Outputs**

When purchasing signal conditioners with an SCD111 Series enclosure, CTC will install and wire the signal conditioners inside the enclosure prior to shipment. If a signal conditioner requires a replacement post installation, use the following pages to determine the correct wiring application.

## Wiring Single Channel Vibration (Voltage)

### Wiring Inputs

| Signal Conditioner Terminal Block Position | Display Terminal Block Position | Cable Color | Destination |
|---|---|---|---|
| 5 | P+ | Black | Power In (+) |
| 6 | P- | White | Power In (-) |
| 13 | - | Red | Signal (+) |
| 14 | - | Black | Common |

### Wiring Outputs

| Signal Conditioner Terminal Block Position | Display Terminal Block Position | Cable Color | Destination |
|---|---|---|---|
| 3 | BNC (+) | Red | Dynamic Output (+) |
| 4 | BNC (-) | Black | Dynamic Output (-) |
| 11 | V+ | Red | Ch 1 Signal |
| 12 | COM | Black | Ch 1 Common |

## Wiring Single Channel Vibration (4-20 mA)

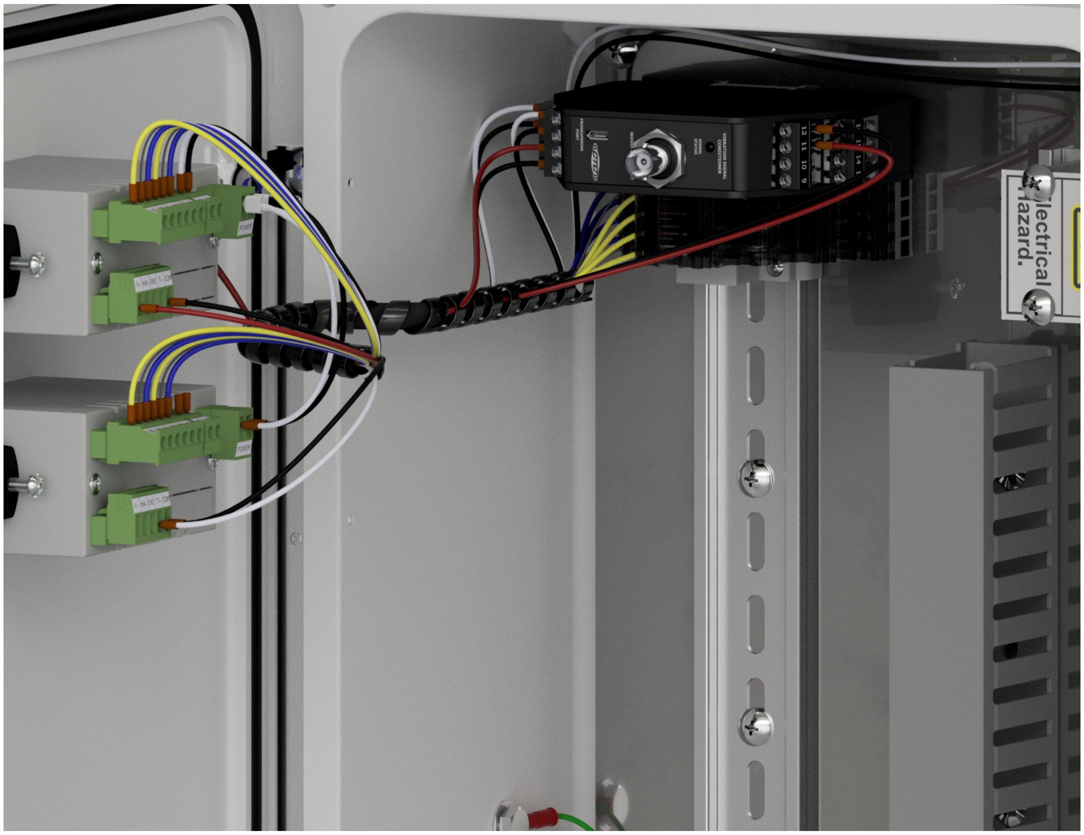

### Wiring Inputs

| Signal Conditioner Terminal Block Position | Display Terminal Block Position | Cable Color | Destination |
|---|---|---|---|
| 5 | P+ | Black | Power In (+) |
| 6 | P- | White | Power In (-) |
| 13 | - | Red | Signal (+) |
| 14 | - | Black | Common |

### Wiring Outputs

| Signal Conditioner Terminal Block Position | Display Terminal Block Position | Cable Color | Destination |
|---|---|---|---|
| 3 | BNC (+) | Red | Dynamic Output (+) |
| 4 | BNC (-) | Black | Dynamic Output (-) |
| 11 | mA+ | Red | Ch 1 Signal |
| 12 | COM | Black | Ch 1 Common |

## Wiring Single Channel Vibration (Voltage) with Temperature



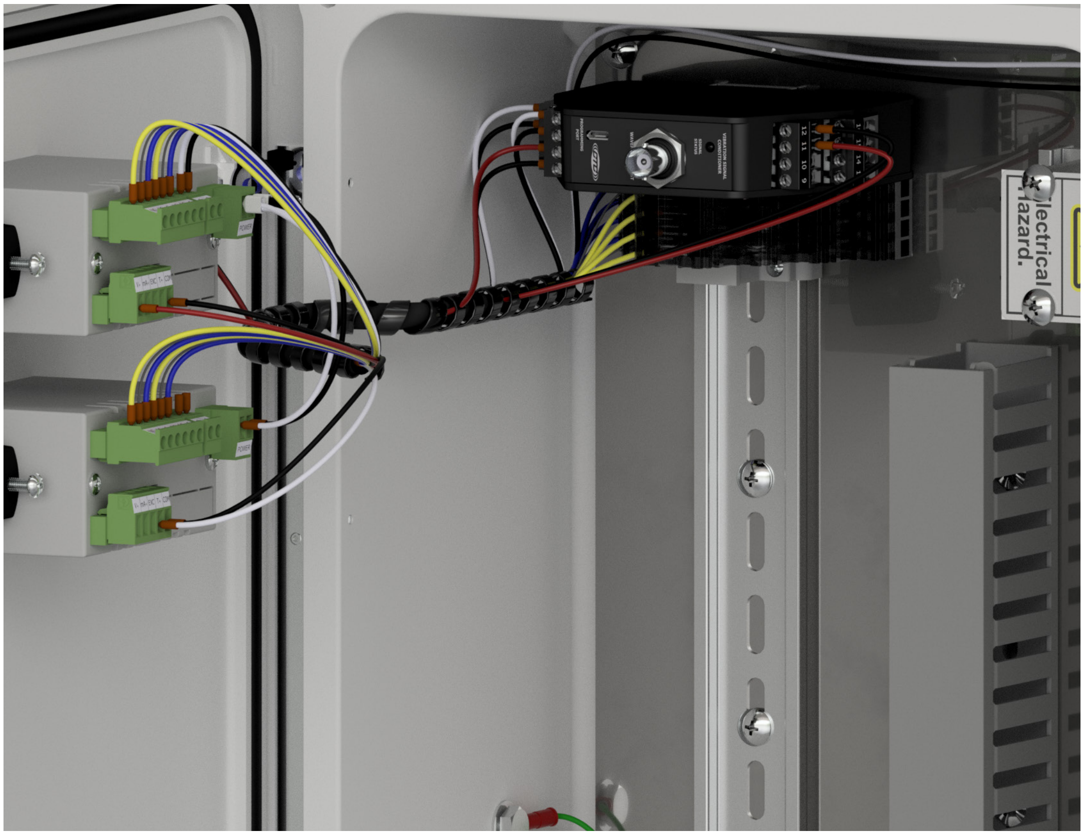
### Wiring Inputs

| Signal Conditioner Terminal Block Position | Display Terminal Block Position | Cable Color | Destination |
|---|---|---|---|
| 5 | P+ | Black | Power In (+) |
| 6 | P- | White | Power In (-) |
| 13 | - | Red | Signal (+) |
| 14 | - | Black | Common |
| 16 | - | White | Temp (+) |

### Wiring Outputs

| Signal Conditioner Terminal Block Position | Display Terminal Block Position | Cable Color | Destination |
|---|---|---|---|
| 3 | BNC (+) | Red | Dynamic Output (+) |
| 4 | BNC(-) | Black | Dynamic Output (-) |
| 11 | V+ | Red | Ch 1 Signal |
| 12 | COM | Black | Ch 1 Common |
| 1 | Display 2 mA+ | White | Temp Signal |
| 2 | Display 2 COM | Black | Temp Common |

## Wiring Single Channel Vibration (4-20 mA) with Temperature



### Wiring Inputs

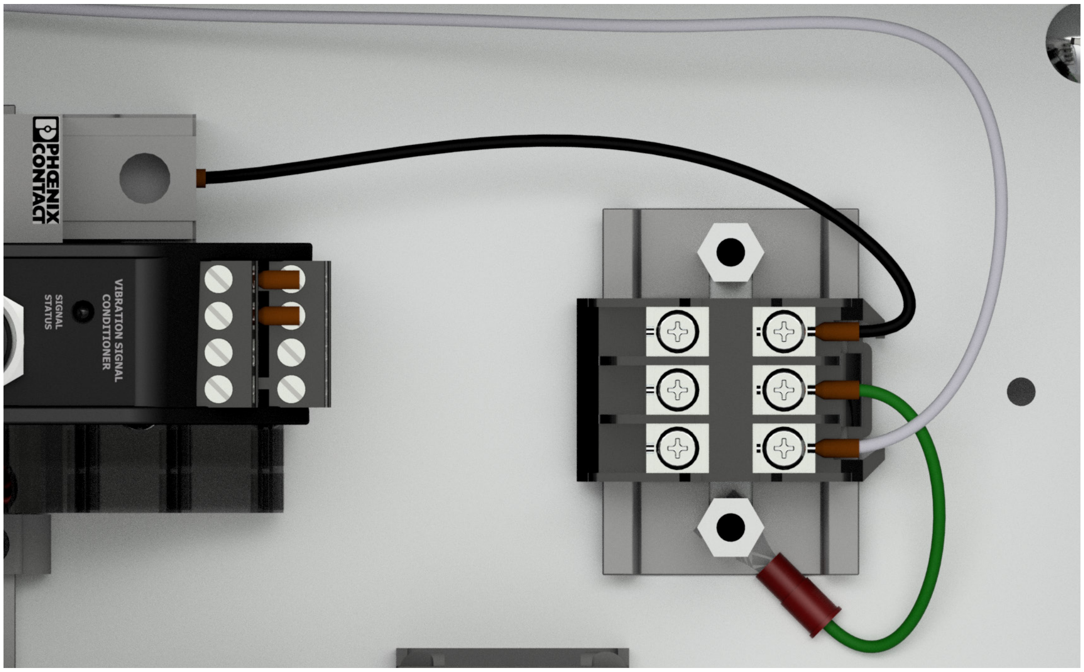
| Signal Conditioner Terminal Block Position | Display Terminal Block Position | Cable Color | Destination |
|---|---|---|---|
| 5 | P+ | Black | Power In (+) |
| 6 | P- | White | Power In (-) |
| 13 | - | Red | Signal (+) |
| 14 | - | Black | Common |
| 16 | - | White | Temp (+) |

### Wiring Outputs

| Signal Conditioner Terminal Block Position | Display Terminal Block Position | Cable Color | Destination |
|---|---|---|---|
| 3 | BNC (+) | Red | Dynamic Output (+) |
| 4 | BNC(-) | Black | Dynamic Output (-) |
| 11 | mA+ | Red | Ch 1 Signal |
| 12 | COM | Black | Ch 1 Common |
| 1 | Display 2 mA+ | White | Temp Signal |
| 2 | Display 2 COM | Black | Temp Common |

## Wiring Power

In order to supply power to the signal conditioners, the SCD111 features a power supply and circuit breaker. Below is the wiring configuration to bring live power into the enclosure. ***Note: Do not connect signal conditioners to live AC power.***




| Cable | Cable Color |
|---|---|
| Ground | Green |
| Neutral Power | White |
| Live Power | Black |

# Configuring Relays

The input to the internal controller comes from the vibration transmitter. They are built with a specific full-scale range and frequency band. The full-scale range of the transmitters must be known for the controllers to display the correct vibration value. The transmitter will not display any vibration energy present at frequencies outside the filtering range. Refer to the user manual for your specific CTC signal conditioner for instructions on calibration and operation.

**Example: Full Scale 0 – 1.0 IPS, Frequency Band 10 – 1000 Hz**
At 0 IPS, 0.00 V flows from the transmitter to the controller. At 0.50 IPS, 2.5 V flows from the transmitter to the controller. At 1.0 IPS, 5.0 V flows from the transmitter to the controller.

The monitoring channel provides two relay outputs. The system comes from the factory with a specific vibration range in IPS or mm/s. This range must be known to configure the relay set points. It is recommended that baseline and typical alarm values of vibration are also known before setup is attempted. The relays provided by the internal controller are highly configurable. Refer to the PD765 user manual for detailed programming instructions.

All of the following parameters can be adjusted:

- Relay Action – Automatic, Latching, Auto + Manual Reset, Latch with Clear
- Relay Operation – Set and Reset points (Hysteresis), On and Off time Delays

**Example Setup 1:**
A full-scale range of 0 – 1 IPS has been specified. The baseline vibration on the machine to be monitored is 0.18 IPS-pk. Alarm and shutdown levels of vibration are defined as 0.35 IPS-pk and 0.65 IPS-pk, respectively. Reset points are specified as 0.30 IPS-pk and 0.60 IPS-pk. Using the provided PD765 Process Controller manual, select the relay operation and action desired. For this example, we will have LOC, Latching Operation with Clear relays. Then program “Set 1” as 0.35 and “Set 2” as 0.65, then program reset points, “rST 1” as 0.30 and “rST 2” as 0.60. After relays have been programmed, scaling must be set. For this example, we will use a 0-5 V input with a 0-1 IPS display. Program “inP1” as 0.00, then “diS1” as 0.00, then “inP2” as 5.00, then “diS2” as 1.00. This will create an input of 0.00 V, display of 0.00 IPS, and at an input of 5 V, 1.00 IPS will be displayed by the meter. The system will now actuate the LOC Relay (Relay 1) when the vibration level reaches 0.35 IPS-pk and another LOC Relay (Relay 2) when the vibration

level reaches 0.65 IPS-pk. To reset the LOC relays, the vibration level must fall below the reset point of 0.60, then press the ACK for relay two. Once the vibration level falls below 0.30, press the ACK to reset relay 1.

**Analog Output**
The analog 4-20mA signal represents the amount of vibration energy present at each channel based on the internal transmitter's full scale, i.e., a 12mA signal from a 0 - 2.0 IPS transmitter represents a vibration level of 1.0 IPS.

Manual adjustment of the internal transmitters may be needed to obtain the analog 4-20mA output upon installation. Refer to the CTC Signal Conditioner user manual for specific instructions.

**Note:** CTC does not provide the wiring to obtain the 4-20mA signal.

# Troubleshooting

If there is no sensor wired to the sensor input terminal, the corresponding transmitter for that channel will not power on. This will cause the Output Display to read low or negative values. Be sure to power the system on AFTER the sensor has been connected.

If the display fails to output a value after power has been turned on and the sensor has been wired, turn off the unit, wait several seconds, and reapply power. The internal electronics require some time to ramp up and settle before they are fully operational.

Intermittent Power Failure:

- Ensure that there is no other power source connected to the dynamic pins.
- Depending on where the dynamic pins being wired to/measured from, try measuring the dynamic outputs with a standard multimeter to rule out other equipment interference/failure.
- Is the problem present on both dynamic outputs (the BNC and the pins)? Test them each individually with the other disconnected and ensure proper wiring. If it is only occurring on one of them, it can be faulty wiring or something coming unsoldered from the board due to stress. Also, make sure the ± of the dynamic outputs are not shorted together during measurement.
- Is the signal conditioner configured to have IEPE power turned on? If the voltage does not work when the dynamic output is zero, and everything else above is fine, we could be looking at a faulty part. There may be a bad transistor or op-amp, or some other part damage.

# Warranty & Refund

**Warranty**
All CTC products are backed by our unconditional lifetime warranty. If any CTC product should ever fail, we will repair or replace it at no charge.

**Refund**
All stock products can be returned for a 25% restocking fee if returned in new condition within 90 days of shipment. Stock products qualify for free cancellation if your order is cancelled within 24 hours of purchase. Built-to-order products qualify for a 50% refund if returned in new condition within 90 days of shipment. Custom products are quoted and built specifically to the requirements of the customer, which may include completely custom product designs or private labeled versions of standard products for OEM customers. Custom products ordered are non-cancellable, non-returnable and non-refundable.