

VibraLINK[®] switchable junction boxes

Installation and operating guide VLS and VLD series



Caution: This guide should be read carefully before installation



Safety section

VibraLINK® switchboxes can be safely installed when the instructions in this manual are carefully followed. This section summarizes the safety considerations. Reminders in the form described below, will appear in the detailed instructions to assure operator awareness of these safety considerations. Qualified personnel should install the VibraLINK® enclosure only after becoming thoroughly familiar with this manual.



CAUTION: This symbol is used when caution is needed to prevent damage to equipment. It is used where careful attention to certain procedures described in the instruction manual is needed. This symbol is also used to emphasize procedures other than normal operating procedures.

Safety summary

1. The VibraLINK® switchboxes covered by this installation guide do not require any special precautions, protective devices or equipment.
2. Because the junction boxes are designed to be installed in an industrial environment, personnel involved with the installation should be familiar with all plant safety requirements before beginning installation.
3. There are no user serviceable parts.
4. Use common sense and avoid haste during installation and operation.



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1.0 Introduction

This guide is designed to assist the user in the physical installation and wiring of VibraLINK® switchable junction boxes. A section is included explaining proper operation of this series of enclosures.

2.0 Description

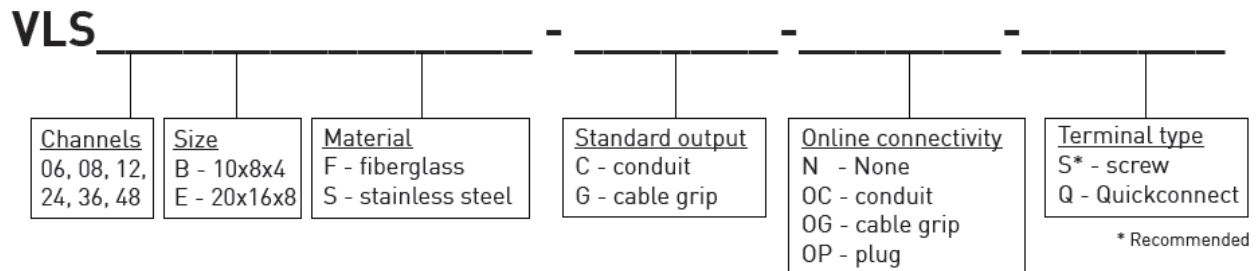
The VibraLINK® series of switchboxes handle from 1 to 48 channels and are offered in two sizes (depending on the number of channels ordered) that are NEMA 4X/IP66 rated for harsh environments. They provide a central collection point for safe and convenient sensor inputs to portable data collection and analysis equipment.

The VLS series support vibration input sensors (acceleration or velocity) only. The VLD series support multi-function, or dual-output, sensors that provide both vibration and temperature data.

The dynamic signal from the accelerometer (and temperature in the case of the VLD version) is available for connectivity to remote monitoring equipment where continuous monitoring is required. This feature requires the online connectivity option specified by the model number suffix “OC” or “OG”.

3.0 Applicable models

All versions of the dual-input (VLD) and the single input (VLS) are covered by this manual. Below is a guide to determine the model number of the applicable VibraLINK® junction box. The prefix “VLS” refers to a single output unit. Substitute “VLD” in the prefix for a dual-output unit.



4.0 Mounting

Securely mount the enclosure using the holes provided in the box flanges. Do not drill holes in the enclosure since this may cause moisture entry. Always mount the enclosure with the cable entry ports on the bottom to prevent moisture ingress. Pole mounts are available, contact Wilcoxon Sensing Technologies for more information.



5.0 Electrical installation

5.1 Installation of sensor cables

When opening the enclosure, the circuit board will be visible as shown in figure 2.

Note that the sensor input connectors are arranged in the same order as the switch position channels and are also placed at an angle (see figure 2). This layout helps prevent wiring errors during the installation process while the terminal strip angle reduces strain on the wire connections.

While the sensor cable can be run directly to the VibraLINK[®] transducer input connectors, it is recommended that the sensor's cables terminate at an intermediate terminal block located near the machine being monitored. It is further recommended that the cable going between the VibraLINK[®] and the terminal block be identified with cable identification markers at both ends of the cable (see figure 3).

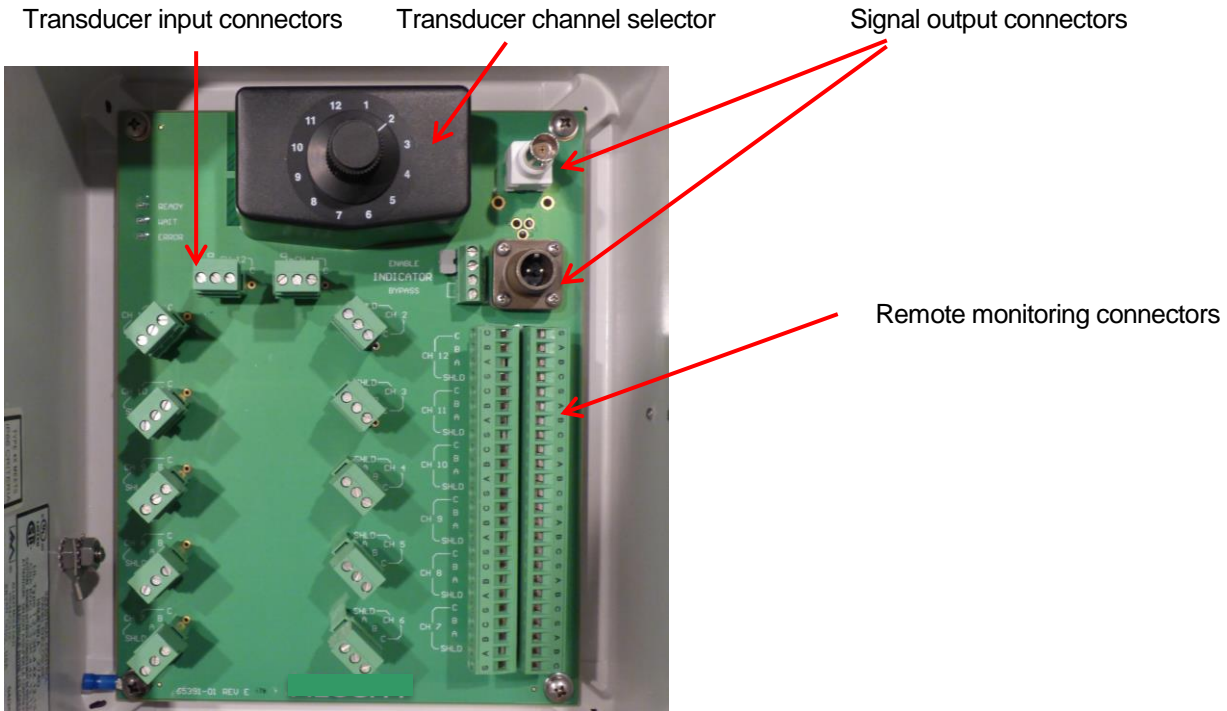


Figure 2: Interior view showing the circuit board

1. Feed blunt cut cables through the cable entry.
2. Strip 1 ¼" of insulation off of the outer cable jacket.
3. Separate the internal wires from the shield and twist the shield.
4. Strip ½" of insulation off of each of the wires.
5. Locate the appropriate plug, identified by channel number, remove the plug and install the wires using a small screwdriver.
6. Insert plug into the appropriate PC board connector and double check to ensure that the cable is going to the correct channel.



In the case of a single output VibraLINK® (VLS prefix), three connections per sensor plug are provided. Install wires as indicated (colors for Wilcoxon J9T2A cable):

Figure 3a:

| | |
|--------|--------------|
| Signal | Pin A, white |
| Common | Pin B, black |
| SHLD | shield |

For multi-function, or dual-output transducers (VLD prefix) four connections per sensor plug are provided. Below is the wiring configuration (colors for Wilcoxon J9T3A cable):

Figure 3b:

| | |
|--------------------|---------------|
| Vibration signal | Pin A, red |
| Common | Pin B, black |
| Temperature signal | Pin C, white |
| SHLD | Pin D, shield |

5.2 Cable entry

VibraLINK® switchboxes are provided with pre-drilled ports to accommodate either conduit or exposed cables.

- Units supplied with the “C” and/or “OC” option are equipped with conduit (C option) outputs. The hole and clamp will accommodate conduit up to 1.5” diameter.
- The cable grip option (“G” and/or OG) will accommodate up to 12 cables per cable, entry where the cable diameter is 0.190” diameter.
- The OP option will not accommodate cable entry, it comes with a plugged hole.

Holes are provided for each individual cable where the number of holes will equal the number of input channels ordered. Multiple cable entry holes will be provided for units with more than 12 channels. Once cables are installed use the compression bridge to hold the cables in place.

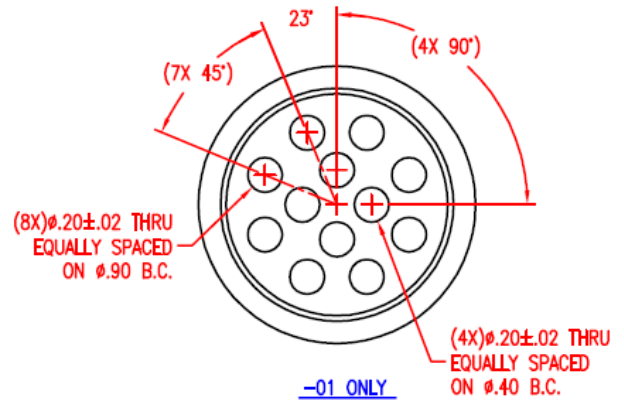


Figure 4: Cable feed through holes provided with cable grip option (12 hole)

For single output accelerometers, J9T2A two conductor shielded cable is recommended. For multi-function (dual-output) transducers, J9T3A three conductor shielded cable is recommended. Both cable types feature Teflon® insulation with a temperature range of -112 to +392° F (-80 to +200° C).

5.3 Online connectivity (optional)

Units with the part number suffix of “OC”, “OG” or “OP” are equipped with plugs to connect to an external device such as an online monitoring system, analyzer, etc. See figure 5 and note the connectors on the right side of the enclosure. There will also be provisions for a cable or conduit entry on the enclosure.

1. Feed blunt cut cables through the cable entr



2. Strip 1 ¼" of insulation off of the outer cable jacket
3. Separate the internal wires from the shield and twist the shield
4. Strip ½" of insulation off of each of the wires
5. Locate the appropriate connection point, identified by channel number, remove the plug and install the wires using a small screwdriver.
6. Remove the plug on the "INDICATOR" terminal strip and using a small screwdriver, move the jumper to the bypass position, and then reinsert the plug and secure the jumper using a small screwdriver. See Figure 5. Moving the jumper to the bypass position will allow the junction box and accelerometer to receive power from the remote monitor rather than the data collector.

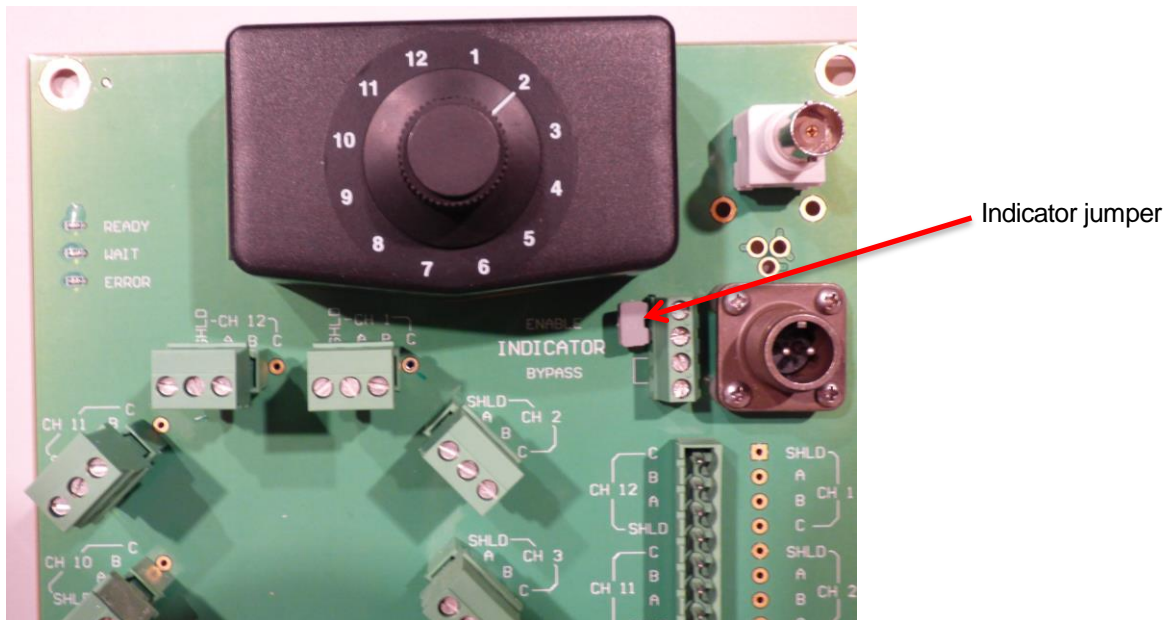


Figure 5: The "INDICATOR" jumper is to be moved to bypass position when using the online connectivity option.

The same cables described in section 5.2 (above) are also recommended for the output connectivity lines.

6.0 Post-installation testing

It is recommended that post installation testing be performed with the same type of instrument that will be used when taking routine measurements.

One method to determine proper operation and the correct measurement location is to connect a data collector to the VibraLINK® and have a second person at the measurement location.

1. With the data collector activated, select the desired channel and confirm that the "READY" LED is illuminated on the VibraLINK®. The LED should illuminate within 7 seconds.
2. Have the person at the measurement location disconnect the accelerometer.
3. When the accelerometer is disconnected, the "ERROR" LED should illuminate thus confirming that the transducer location is connected to the correct channel switch position.
4. Reconnect the accelerometer and confirm that the LED's illuminate to signal that the user must first "WAIT," and then when "READY" to take data.



5. Repeat the above steps for each measurement location to verify that the accelerometer locations are properly identified in the enclosure.

6.1 Common installation errors

If the “ERROR” LED remains illuminated on a verified channel, here are some possible causes:

- Cable not connected, or short circuited at the accelerometer or VibraLINK® end
- Broken cable
- Water or other contamination in the connector
- Reversed wiring (+ and – leads reversed)
- BOV not reaching steady state

6.2 Operational verification

This is an optional test that can provide further confidence that the channel is operational and is properly calibrated. This is a two-person operation and the procedure would be the same as in Section 6.0. It will be necessary to remove the transducer, or make this test prior to installing the transducer. In this instance an actual signal will be produced to check the system.

Wilcoxon’s REF2500 is ideal for performing the above test. The shaker generates a 1 g signal at a frequency selected by the user. For accelerometers a frequency of 100 Hz is recommended. For velocity, use 61.4 Hz to produce 1 IPS velocity. The sensor to be tested is mounted on the top where the shaker operates at 1 g.



Figure 6:
ReferenceMate
portable shaker

7.0 Operating guide

The primary purpose of the VibraLINK® enclosure is to provide a central collection point for multiple sensors. It may also be interfaced with remote monitoring or analysis equipment if equipped with the appropriate option. This section will provide operating instructions and also cover some pitfalls that the operator may encounter.

The VibraLINK® enclosure is equipped with electronic circuits to inform the operator that the vibration transducer is ready to take data and provide an error indication if there is a circuit or transducer malfunction. The VibraLINK® enclosure **does not** contain a power supply thus all power is obtained from the data collector (If a remote monitor is connected to the junction box, the power will be supplied by the monitor).

7.1 Steps for data collection

1. Plug the data collector into either the MIL- 5015 or BNC connector located on the upper right-hand side of the board.
2. Select the desired sensor using the rotary switch at the top of the board.
3. Three LEDs provided on the upper left side indicate the transducer status.
4. Once power is applied, the LED next to “WAIT” will illuminate indicating that the sensor’s bias voltage has not yet stabilized.
5. Once the bias voltage has stabilized, the LED indicating “READY” will illuminate. The stabilization time can vary and is determined by the transducer design.



6. Collect data and then switch to the next channel and repeat the above procedure.

7.2 Data ready light offset information

The data ready light will introduce an increase of approximately 2.2 V to the BOV of each sensor data is being collected from. This offset will not affect the performance of the sensor, the data collected from the sensor, or the overall electrical circuit. Users should be aware of the possible variance in BOV, especially when employing portable data collectors that display sensor voltages, but keep in mind the lack of any data collection influence.

If the user wishes to bypass the DC offset, the jumper shown in Figure 5 provides a simple solution. All that is needed is a small screwdriver. The user will loosen the screw terminals holding the jumper in the “ENABLE” position, remove the jumper, install the jumper in the two screw terminals indicating the “BYPASS” position, and tighten said screws to secure the jumper. The data ready light is now removed from the circuit and BOV levels will return to normal. If the data ready light is bypassed, the LEDs will not illuminate. This leaves data collection timing up to the user and opens the possibility for premature data collection and subsequently incorrect data. If at any time the user wishes to enable the data ready light again, he/she must simply reverse the steps previously listed.

7.3 Error indicator

In the event the “ERROR” LED illuminates, the bias voltage is out of range or unstable. Below are some possible causes:

- Open or shorted measurement cable
- Transducer failure
- Insufficient bias current. Most transducers require at least 2 mA. Make sure the data collector current is properly set.
- Safety barrier encountered. See section 7.3



Figure 7: Upper left side of the VibraLINK® board showing the location of the status LEDs



7.4 Use with zener safety barriers

Safety barriers are used to connect intrinsically safe circuits with non-intrinsically safe circuits. Their purpose is to protect circuits installed in explosive risk areas. In some instances, the safety barrier may cause an error indication on the VibraLINK® enclosure front.

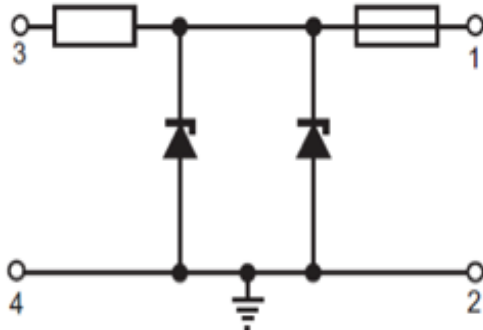


Figure 8: Typical zener safety barrier. The maximum end to end resistance (between 3 and 1) is 330 Ω

IEPE sensors have an output that is a combination of the DC bias output voltage (BOV) and the superimposed vibration signal. The BOV is controlled by the sensor design and exists as long as the current source provides adequate current. The sensor generally needs at least 2 mA of current. It is common to use current values of 2 to 4 mA for the constant-current source. When IEPE sensors are used in intrinsically safe circuits, the effects of the zener safety barrier must be considered in the sensor operating circuit. It is possible to use a barrier that provides a safe circuit, but precludes the proper operation of the sensor.

Referring to figure 7, the zener barrier has four wiring connections. Terminals 1 and 2 are the connection points and are outside of the hazardous area. Terminals 3 and 4 are located within the hazardous area. An intrinsically safe rated accelerometer is connected to terminals 3 and 4.

The series resistance of 330 Ω causes a voltage drop proportional to the current applied. If the excitation voltage is 18 volts, 2 mA may cause the accelerometer to turn off. With a 4 mA current, the accelerometer will probably turn off. Using a higher excitation voltage would correct this problem. Most Wilcoxon accelerometers will operate up to 30 VDC.

The safety barrier will also cause a change in the bias voltage, which can limit the dynamic range of the accelerometer.

As illustrated in figure 7, the accelerometer will be connected across terminals 3 and 4 in the circuit. Assume the manufacturing specification of the accelerometer calls for its BOV not to exceed 13.5 volts. If a Wilcoxon 793E accelerometer is powered using a constant-current diode value of 4 mA, then the resistance of the barrier will cause a voltage drop of 1.332 volts (333×0.004). The total voltage drop across the barrier and the accelerometer could then be as high as 14.83 volts ($13.5 + 1.33$) and will appear to be the BOV of the accelerometer as viewed across terminals 1 and 2 of the barrier. This is the effective maximum BOV that would be seen by an analyzer connected to this circuit and using a powering current of 4 mA.

Since the accelerometer should allow for a maximum voltage to be 2 volts less than the open-circuit supply voltage, a BOV of 14.83 volts means that the dynamic range of the sensor will be



limited. Assuming a typical supply voltage of 24 volts, the signal can only go 7.17 volts from the zero reference before entering this "forbidden" 2 volt zone of operation. That means the effective dynamic signal is limited to 71.7 g's (7.17 volts at 100 mV/g). If the accelerometer had its nominal BOV of 12 volts across its terminals, then the BOV seen at the output of the zener safety barrier would be about 13.33 volts and the entire dynamic range would be available.

If problems are encountered, it is suggested that an increase in the excitation current and excitation voltage be implemented, one at a time. Never exceed the maximum specified current and voltage ratings of the sensor in use. Try to keep the current as low as possible.

8.0 Technical assistance

For technical assistance, please contact our Applications Engineer at 301-330-8811 or email info@wilcoxon.com.

Visit www.wilcoxon.com for technical papers that provide details on many applicable subjects.

9.0 Customer service

For all customer service inquiries, please call 301-330-8811 or email info@wilcoxon.com.