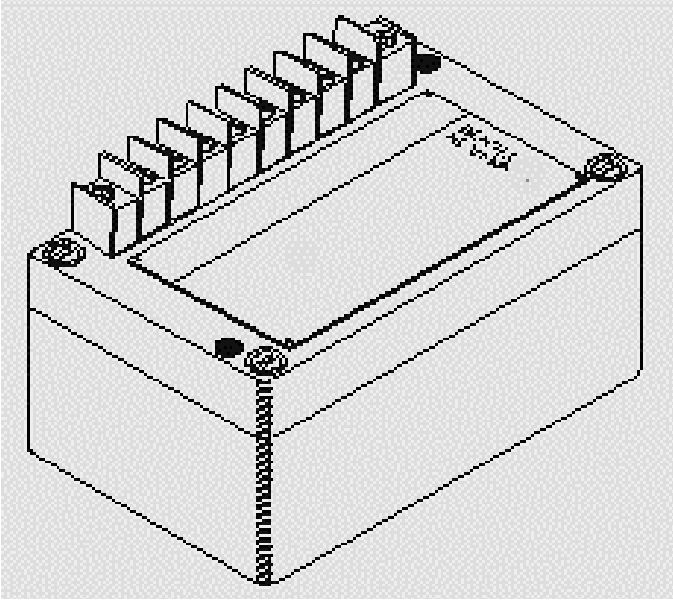
Operation Manual

Bently Nevada™ Asset Condition Monitoring



Accelerometer Interface Module

imagination at work

Part Number 88301-01
Rev. H (08/07)

Contact Information

The following ways of contacting Bently Nevada are provided for those times when you cannot contact your local representative:

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Additional Information

Notice:

This manual does not contain all the information required to operate and maintain the product. Refer to the following manuals for other required information.

3300 System Overview (Part Number 80171-01)

3300 System Installation Instructions (Part Number 80172-01)

3300 System Troubleshooting (Part Number 80173-01)

3300/95 Filter Module/Vibration Monitor Operation Manual (Part Number 88060-01)

3300/17 Aeroderivative Gas Turbine Vibration Monitor Operation (Part Number 88061-01)

3300/17 Aeroderivative Gas Turbine Vibration Monitor Maintenance (Part Number 88062-01)

3300/15 Dual Vibration Monitor Maintenance (Part Number 80177-01)

3300/25 Dual Acceleration Monitor Maintenance (Part Number 80181-01)

Rolls Royce RB211 and Avon Vibration Monitoring (Part Number AN051)

General Electric LM 1600 Gas Generator and Gas Turbine Vibration Monitoring (Part Number AN052)

General Electric LM 2500 Gas Generator and Gas Turbine Vibration Monitoring (Part Number AN053)

General Electric LM 5000 Gas Generator and Gas Turbine Vibration Monitoring (Part Number AN054)

General Electric LM 6000 Gas Turbine Vibration Monitoring (Part Number AN055)

Product Disposal Statement

Customers and third parties, who are not member states of the European Union, who are in control of the product at the end of its life or at the end of its use, are solely responsible for the proper disposal of the product. No person, firm, corporation, association or agency that is in control of product shall dispose of it in a manner that is in violation of any applicable federal, state, local or international law. Bently Nevada LLC is not responsible for the disposal of the product at the end of its life or at the end of its use.

Contents

1. INTRODUCTION 1

2. SYSTEM OVERVIEW 2

2.1 Accelerometer Interface Module 3

2.2 Extension Cable 4

2.3 Accelerometer 5

3. INSTALLATION 6

3.1 Receiving, Inspecting, and Handling 6

3.2 Installation 6

3.3 Field Wiring 8

4. MAINTENANCE 18

4.1 Calibration and Velocity Signal Path Verification 18

4.2 Common Mode Rejection Measurement 23

4.3 Troubleshooting 23

4.3.1 Fault Indication #1: 23

4.3.2 Fault Indication #2: 24

4.3.3 Fault Indication #3: 24

5. ORDERING INFORMATION 26

6. INTERFACE MODULE OPTIONS 28

7. SPECIFICATIONS 29

7.1 Accelerometer Interface Module 29

7.2 Accelerometer Interface Module 30

7.3 Extension Cable 31

7.4 Accelerometer, P/N 45357-01 32

8. APPENDIX 33

1. INTRODUCTION

The 86517 Accelerometer Interface Module is a component in accelerometer- based transducer systems commonly used for vibration monitoring of aeroderivative gas generators and gas turbines. The interface module is designed for use with the Bently Nevada 3300 series 3300/95 Filter Module/Vibration Monitor and can also be used with specially modified 3300 monitors such as the 3300/15 and 3300/25.

Section 1 describes the transducer system and its individual components and explains some of the features of the system.

Section 2 gives typical receiving, inspecting, and installation instructions and field wiring and hazardous area installation instructions.

Section 3 shows how to recalibrate the charge amplifier and verify the velocity signal output. This section also contains troubleshooting information.

Section 4 provides ordering information and Section 5 describes the ordering options for the accelerometer interface module.

Specifications are provided in Section 6.

The appendix contains drawings of the interface module, extension cables, and a weatherproof housing. Also included are installation drawings for Canadian Standards Association Class 1, Division 1, and CENELEC (SIRA) Zone 1, Group IIB hazardous environments.

2. SYSTEM OVERVIEW

The accelerometer-based transducer system consists of a high temperature charge-coupled accelerometer; rugged, low-noise, high temperature extension cable(s); and the accelerometer interface module as shown below.

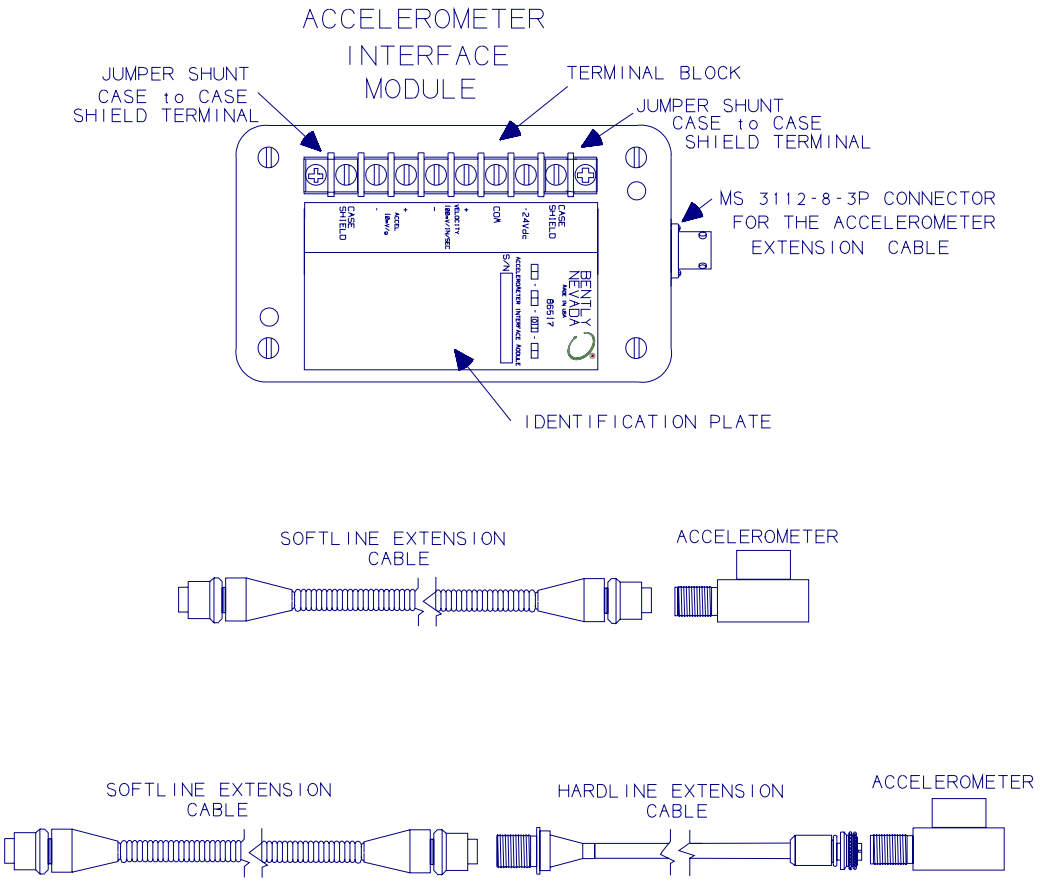


Figure 1.1 Transducer System

2.1 Accelerometer Interface Module

A functional block diagram of the interface module is shown below:

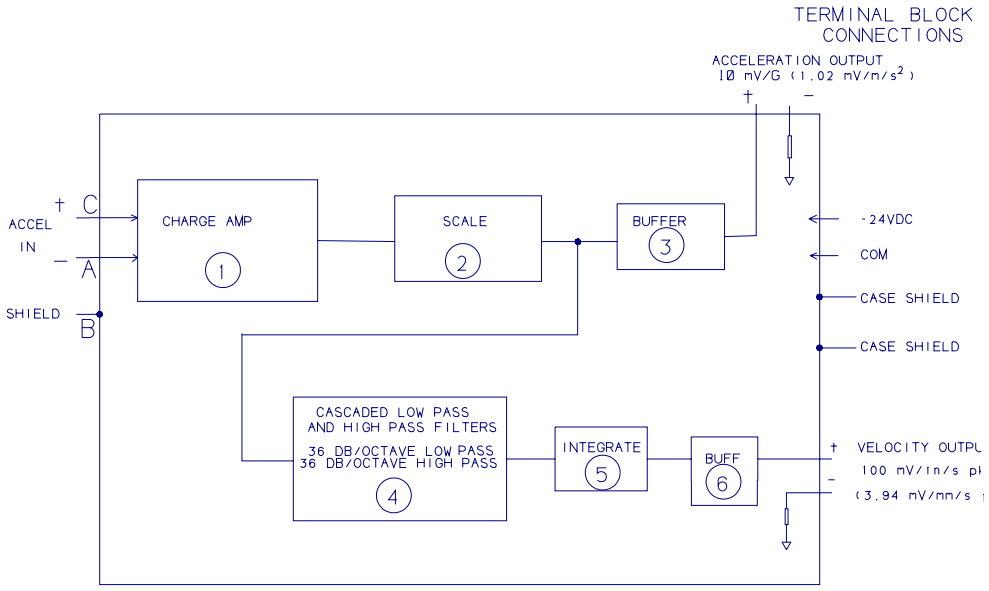


Figure 1.2 Interface Module Block Diagram

The accelerometer interface module performs the following functions:

1. Converts a charge input from the accelerometer to a voltage acceleration signal.

2. Scales the voltage signal to 10 mV/g peak (1.02 mV/m/s^2 pk).

3. Buffers the acceleration signal so that it can be connected to instrumentation over long cable lengths.

4. Bandpass filters the acceleration signal using a 12th order filter with corner frequencies determined by option BB.

5. Integrates the filtered acceleration signal to a velocity signal with a sensitivity of 100 mV/in/s pk (3.94 mV/mm/s pk).

6. Buffers the velocity signal so that it can be connected to monitoring instruments over long cable lengths. The velocity signal is typically used to monitor machines.

The differential charge output of the accelerometer enters the interface module through pins C and A of the three-pin locking connector while pin B connects to the extension cable inner shield and to the interface module case. The charge amplifier converts the differential charge input to a low impedance voltage signal and the subsequent scaling stage adjusts the sensitivity to 10 mV/g pk (1.02 mV/m/s^2 pk). The frequency response of the charge amplifier/scaling stage combination has an overall bandpass transfer characteristic. See Section 6 for specifications. The interface module can be ordered to operate with accelerometers having charge sensitivities of 50 pC/g or 100 pC/g. This option is not field programmable.

The interface module filters are cascaded 6th order low pass and 6th order high pass filters with a Butterworth response. Filter corner frequencies are determined at ordering and are not field programmable. The corner frequencies are normally chosen to pass the vibration component at the rotative speed of each rotor while excluding higher and lower frequency signals which may be due to blade passings or structural resonances. The standard corner frequency options conform to requirements for General Electric LM 2500, LM 5000, LM 1600, and LM 6000 series aeroderivative gas turbines. Contact your Bently Nevada representative for nonstandard corner frequencies. If you elect to use corner frequencies not recommended by the engine manufacturer consideration should be given to the fact that the acceleration signal will contain structural and/or structural-borne noise that is not related to rotor vibration. Most common machine malfunctions originate on the rotor and can be detected as a change in rotor vibration. Choose corner frequencies carefully.

Both the acceleration and velocity signal outputs can be wired as either single-ended outputs or as balanced two-wire outputs. In the single-ended configuration, only the **+ ACCEL** or **+ VELOCITY** terminal is wired to the monitoring or measuring instrumentation. In the balanced two-wire mode the **+ VELOCITY** and **- VELOCITY** outputs create a differential output and the **+ ACCEL** and **- ACCEL** outputs create a differential output. Inside the interface module the (**-**) terminals are connected to signal common through an impedance which matches the output impedance of its mate. The **+VELOCITY** and **+ACCEL** outputs are biased at -10 Vdc nominal.

2.2 Extension Cable

The extension cable connects the accelerometer and the interface module and may consist of a single softline cable or two cables where the cable on the accelerometer side is a hardline, mineral-insulated cable rated for higher temperatures. The extension cables must be constructed with special low noise characteristics and resist high temperatures and corrosive environments. The low noise construction is a conductive treatment on the surface between the center conductors and the dielectric and between the dielectric and the inner shield. This treatment minimizes the charge induced between the surfaces by motion or vibration of the cable. This phenomenon is called triboelectric noise and can be particularly troublesome in charge amplifier systems. The total pole-to-pole

capacitance of the accelerometer plus the distributed cable capacitance should not exceed 8300 picofarads. Cable drawings and schematics are in the appendix.

2.3 Accelerometer

For aeroderivative gas turbines, the accelerometers are typically provided with the engine either by the manufacturer or the packager and must be qualified by the engine manufacturer. Accelerometers of this type are typically constructed with a piezoelectric crystal isolated from the accelerometer case so that the accelerometer output is differential. Accelerometers used with the 86517 interface module must have a sensitivity of 50 picocoulombes per g or 100 picocoulombes per g, and the necessary connector.

Bently Nevada offers a 50 pC/g charge coupled accelerometer (part number 45357-01) that can be used with this system. This accelerometer has a typical pole-to-pole capacitance of 1000 picofarads.

3. INSTALLATION

3.1 Receiving, Inspecting, and Handling

Carefully remove the interface module, extension cable and accelerometer (if applicable) from their shipping containers and inspect them for shipping damage. If you remove the lid, be careful not to lose the two mounting screws located in the base of the interface module enclosure. If shipping damage is apparent, file a claim with the carrier, and submit a copy to Bently Nevada Corporation. Include part numbers and serial numbers on all correspondence. If no damage is apparent and the equipment is not going to be used immediately, return the equipment to the shipping containers, and reseal until ready for use. Store the equipment in an environment free from potentially damaging conditions such as high temperature, excessive humidity, or a corrosive atmosphere. See Section 6 for environmental specifications.

3.2 Installation

Installation consists of mounting the interface module in a housing and connecting the field wiring and the extension cable to the accelerometer. In most cases the accelerometer will already be mounted on the engine.

Interface Module

Mount the interface module in an enclosure that protects it from mechanical damage, contamination, the weather, and which isolates the interface module. Bently Nevada part number 80808-01 and -02 are stainless steel weatherproof housings with a built-in insulated mounting plate. Housing drawings are in the appendix. For installations in hazardous areas requiring agency approvals, the housing must be approved by the local inspection authority. For notes on installation in hazardous environments rated Class 1, Division 1 by CSA, or Zone 1, IIB by CENELEC (European standards) see drawings 141243 or 141110 in the appendix.

Figure 2.1 illustrates the basic mounting configuration; it is imperative that the enclosure and interface module be installed in a HORIZONTAL postion, as shown. Mount the interface module by using the two mounting bolts located at diagonal corners of the interface module. The bolts can be accessed with the lid in place by removing the two plastic caps on the lid as shown in Figure 2.1. Make sure the lid is tightly closed. Locate the interface module outside the turbine enclosure or at the coolest location in the turbine enclosure. The recommended mounting location for the interface module is on a structure where vibration components between 20 Hz and 400 Hz do not exceed 0.1 g-pk in any of three orthogonal directions.

Connect the extension cable tightly to the accelerometer and safety wire the connector. A major cause of nuisance alarms is a loose connection to the accelerometer. Route the extension cable away from the turbine, and in the case of steam injection turbines, away from any steam manifolds. Secure the extension cable at frequent intervals to prevent excessive vibration. Cable vibration can induce charge on the conductors which appear as noise to the input of the charge amplifier.

CAUTION

To prevent interference of machinery monitoring, radio transmitters should not be operated/used within 6 feet (2 metres) of the accelerometer interface module.

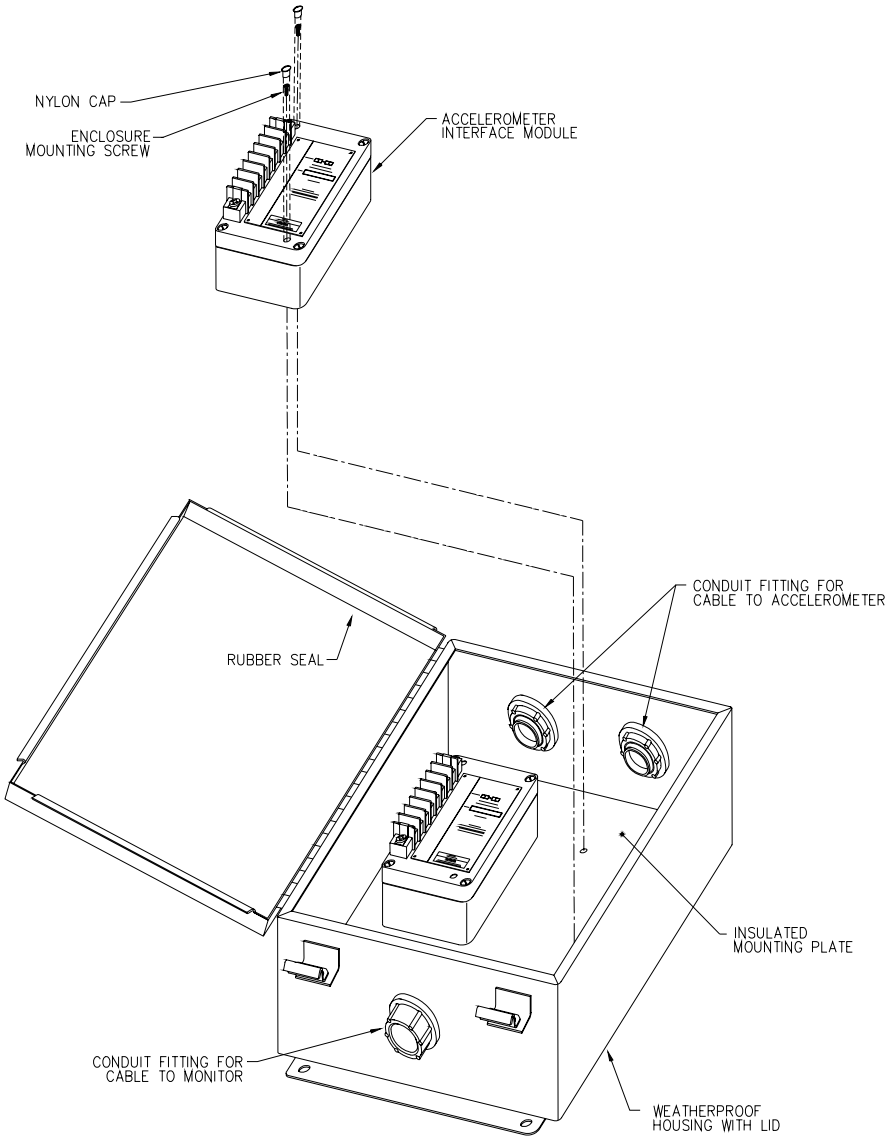


Figure 2.1 Typical Installation

Accelerometer

If you are installing the Bently Nevada accelerometer (P/N 45357-01) then follow these directions:

Contact the turbine manufacturer or your original equipment manufacturer (OEM) for instructions on mounting the accelerometer. The correct mounting location and mounting structures, such as brackets and fasteners, are critical to the performance of the transducer system.

The accelerometer can be mounted in any orientation as long as its sensitive axis (indicated by arrow on side of accelerometer) is 90 degrees to the axis of the rotor. Four mounting holes should be drilled for 1/4 inch (6 mm) bolts at the corners of a 1.188 inch (30.18 mm) square. The mounting holes should be perpendicular to the mounting surface and the mounting surface must be flat and smooth. The mounting structure must also be rigid and have no mechanical resonances within the frequency range of interest.

Connect and safety wire the extension cable to the accelerometer.

Hazardous Area Considerations

The accelerometer interface module agency approvals are "entity" approvals. This means that each component, or entity, of the transducer system must be certified for the overall system to meet certification requirements. When specifying an agency certified system you should verify that both the interface module and accelerometer have the appropriate hazardous area certification. The Bently Nevada accelerometer, part number 45357-01, is certified for use in Class I, Divisions 1 and 2 by the Canadian Standards Association.

When installing a CENELEC approved system you must attach a system cable tag to the interface module field wire, refer to Drawing 141110 in the appendix. The tag is shipped in a plastic bag attached to the interface module. Attach the tag to the power field wire near the safety barrier using the adhesive backing. Protect the label using the piece of transparent heat shrink tubing supplied with the tag.

3.3 Field Wiring

You must supply the field wiring from the interface module to the monitor unless you specifically request that Bently Nevada Corporation provide it. The 86517 interface module is intended to be used with the 3300/95 Filter Module/Vibration Monitor but may also be connected to certain specially modified 3300 series monitors such as the 3300/15 and 3300/25. Figure 2.2 shows the wiring connections to a 3300/95 monitor without barriers and Figure 2.3 shows the wiring connections to a 3300/15 (or equivalent) without barriers. Figures 2.4 and 2.5 show connections for Division 1/Zone 1 installations when external safety barriers are used.

Refer to drawing 141243 (see appendix) for field wiring connections to 3300 series monitors with internal safety barriers. Notes are referenced in each of the wiring diagrams which address grounding and shielding and making recommendations.

Drawings 141243 and 141110 in the appendix are agency approval drawings showing installation and wiring for Division 1 and Zone 1 hazardous areas. Note that to meet the requirements of the Zone 1, IIB approval from SIRA certification services a tag should be attached to the power/common/signal cable at the safety barrier. When the interface module is ordered with the CENELEC Zone 1 approval the unit is shipped with the tag attached to the ground strap on the terminal block. The tag is mylar with an adhesive back and can be attached directly to the cable. Protect the tag with the piece of clear heat shrink tubing provided with the tag.

In all installations isolate the interface module case.

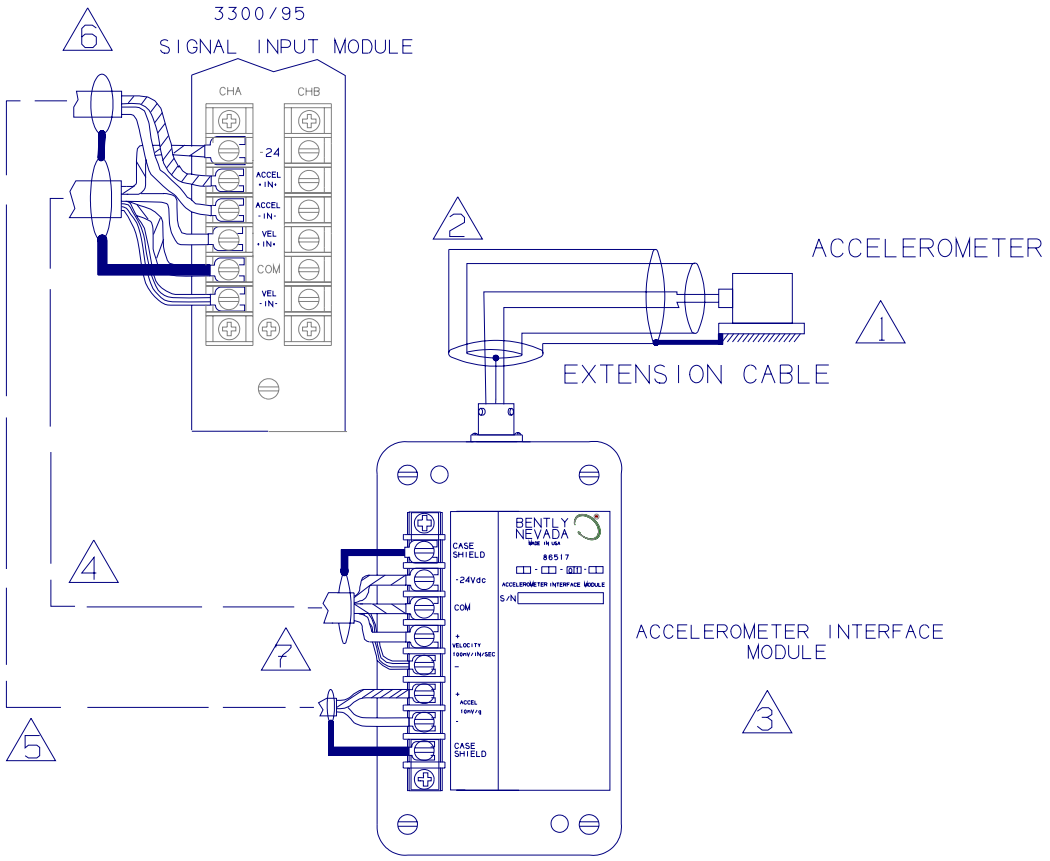


Figure 2.2 Field Wiring to 3300/95 Monitor without Barriers
(Notes on following page)

Notes for Figure 2.2

1 The accelerometer case is connected to the machine earth and the differential signal output is isolated. The accelerometer case connects to the extension cable shield through the cable connector for the hardline cable and connects to the outer shield for the softline cable.

3 The interface module case must be isolated. Bently Nevada housing, part number 80808-01 or -02, contains a mounting plate which provides isolation.

Wiring Recommendations:

2 Accelerometer to interface: Use extension cable, Bently Nevada part numbers 45358-07 and -09, or 83387-xxx, or equivalent.

4 Interface module to monitor; Power, Common, +Velocity, and -Velocity wiring recommendation: two twisted pairs of stranded 18 to 22 AWG wire with insulating sheath and 100% shield coverage. 1000 feet (305 metres) maximum. Use Bently Nevada part number 02101200 or equivalent.

5 Interface module to monitor +/- Accel wiring recommendation: stranded twisted pair, 18 to 22 AWG, insulating sheath and 100% shield coverage. 1000 feet (305 metres) maximum.

Shielding:

6 Shields terminate at signal common at the monitor. The jumper between signal common and 3300 rack chassis should be installed on the Power Input Module at the rear of the 3300 rack. See the 3300 System Installation Instructions, (document part number 80172-01).

7 At the interface module the shields connect to the terminals marked CASE SHIELD. Note that a jumper shunt is installed between the terminal block mounting screw and the CASE SHIELD terminal.

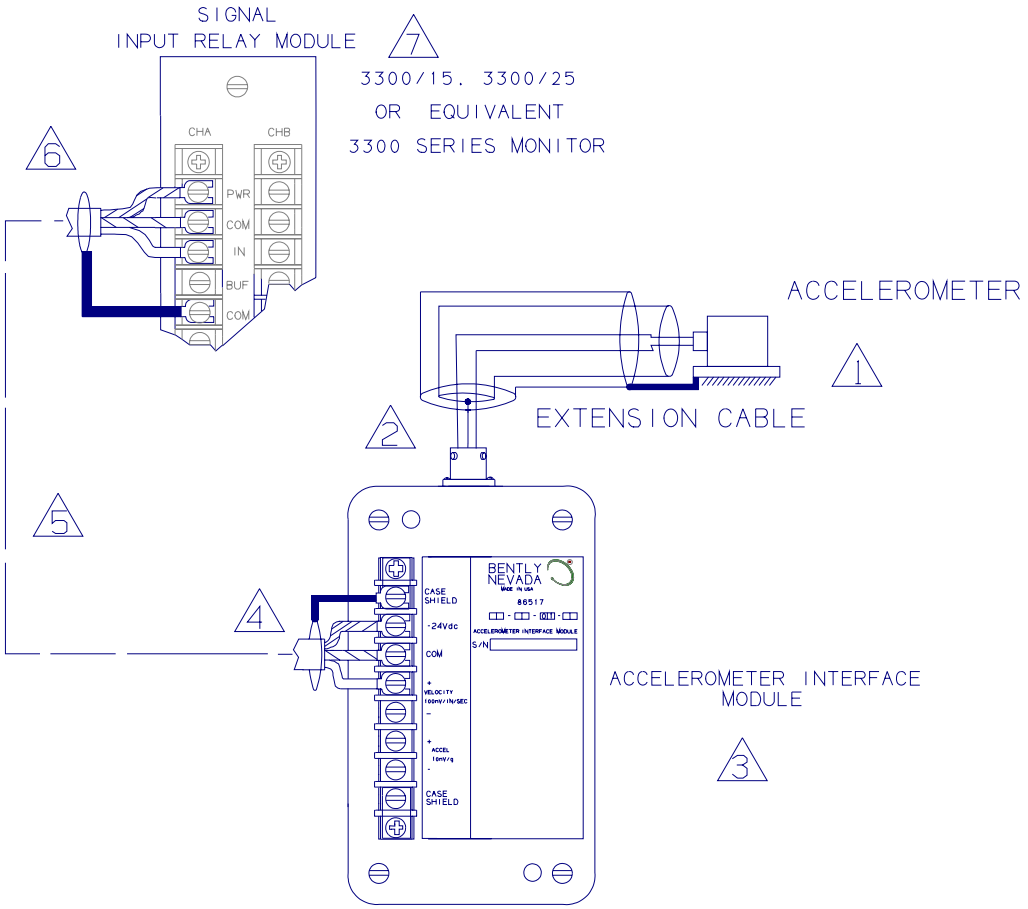


Figure 2.3 Field Wiring to 3300 Monitor without Barriers
(Notes on following page)

Notes for Figure 2.3

1 The accelerometer case is connected to the machine earth and the differential signal output is isolated. The accelerometer case connects to the extension cable shield through the cable connector for the hardline cable and connects to the outer shield for the softline cable.

3 The interface module case must be isolated. Bently Nevada housing, part number 80808-01, or -02, contains a mounting plate which provides isolation.

Wiring Recommendations:

2 Accelerometer to interface: Use extension cable, Bently Nevada part numbers 45358-07 and -09, or 83387-xxx, or equivalent.

5 Interface module to monitor Power, Common, and +Velocity wiring recommendation: 18 to 22 AWG stranded, three conductor wire with insulating sheath and 100% shield coverage. 1000 feet (305 metres) maximum. 18 AWG Belden 83336 or 22 AWG Belden 83334 can be used.

Shielding:

4 At the interface module the shield connects to the terminal marked CASE SHIELD. Note that a jumper shunt is installed between the terminal block mounting screw and the CASE SHIELD terminal.

6 The shield terminates at signal common at the monitor. The jumper between signal common and 3300 rack chassis should be installed on the Power Input Module at the rear of the 3300 rack. See the 3300 System Installation Instructions, (document part number 80172-01).

7 3300 series monitors other than the 3300/95 must be modified before connection to the interface module. Contact your Bently Nevada representative. Other connections are possible. For example the acceleration signal could be connected to a monitor for some special applications.

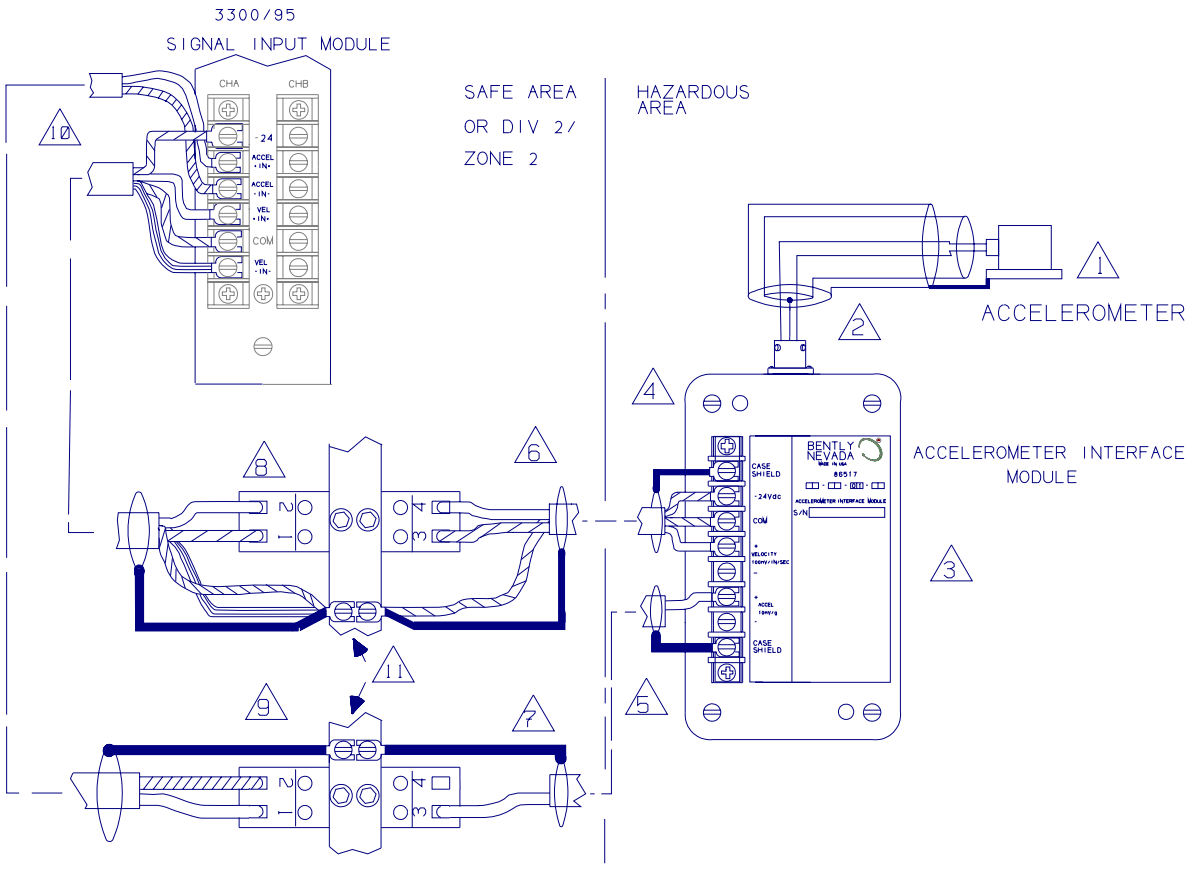


Figure 2.4 Field Wiring Interface Module to 3300/95 Monitor with Barriers
(Notes on following page)

Notes for Figure 2.4

1 The accelerometer case is connected to the machine earth and the differential signal output is isolated. The installer must ensure that the accelerometer mounting structure has the same ground potential as barrier ground. Total earth loop impedance should be less than 1 ohm. The accelerometer case connects to the extension cable shield through the cable connector for the hardline cable and to the inner shield for the softline connector.

3 The interface module case must be isolated. The interface module must be installed in a housing which meets approval agency requirements for the installation site.

Wiring Recommendations:

2 Accelerometer to interface: Use extension cable, Bently Nevada part numbers 45358-07 and -09, or 83387-xxx, or equivalent.

4 Interface module to monitor, Power, Common, and Velocity signal wiring recommendation: two twisted pairs of stranded 18 to 22 AWG wire with insulating sheath and 100% shield coverage. Connect the -Velocity wire from the monitor to barrier ground but not to the interface module. The shield connects to the CASE SHIELD terminal at the interface module. The maximum length is 800 feet (244 metres) between the interface module and the barrier and 1000 feet (305 metres) between the interface module and the monitor. Use Bently Nevada part number 02101200 or equivalent.

5 Interface module to monitor, acceleration signal wiring recommendation: Single twisted pair, stranded 18 to 22 AWG with insulating sheath and 100% shield coverage. Connect the -Accel wire from the monitor to barrier ground, (connection is made inside the barrier), but not to the interface module. The shield connects to the CASE SHIELD terminal at the interface module. The maximum length is 800 feet (244 metres) between the interface module and the barrier and 1000 feet (305 metres) between the interface module and the monitor.

Shielding:

6 Shield connects to barrier ground.

7 Shield connects to barrier ground.

10 Shields float at monitor. -Velocity and -Accel must connect from monitor to barrier ground.

Safety Barriers:

8 MTL 796(**-**) barrier is recommended for power and velocity signal. Power: V_{max} =

-26 V, R_{min} = 300 ohms. Velocity: V_{max} = **-**20 V, R_{min} = 390 ohms.

9 MTL 728(-) barrier is recommended for acceleration signal. Power: V_{max} = -28 V, R_{min} = 300 ohms.

11 Barrier ground is the single point earth ground.

NOTE: When external barriers are used the jumper between signal common and rack chassis on the 3300 Power Input Module at the rear of the 3300 rack must be removed. See the 3300 System Installation Instructions, (document part number 80172-01

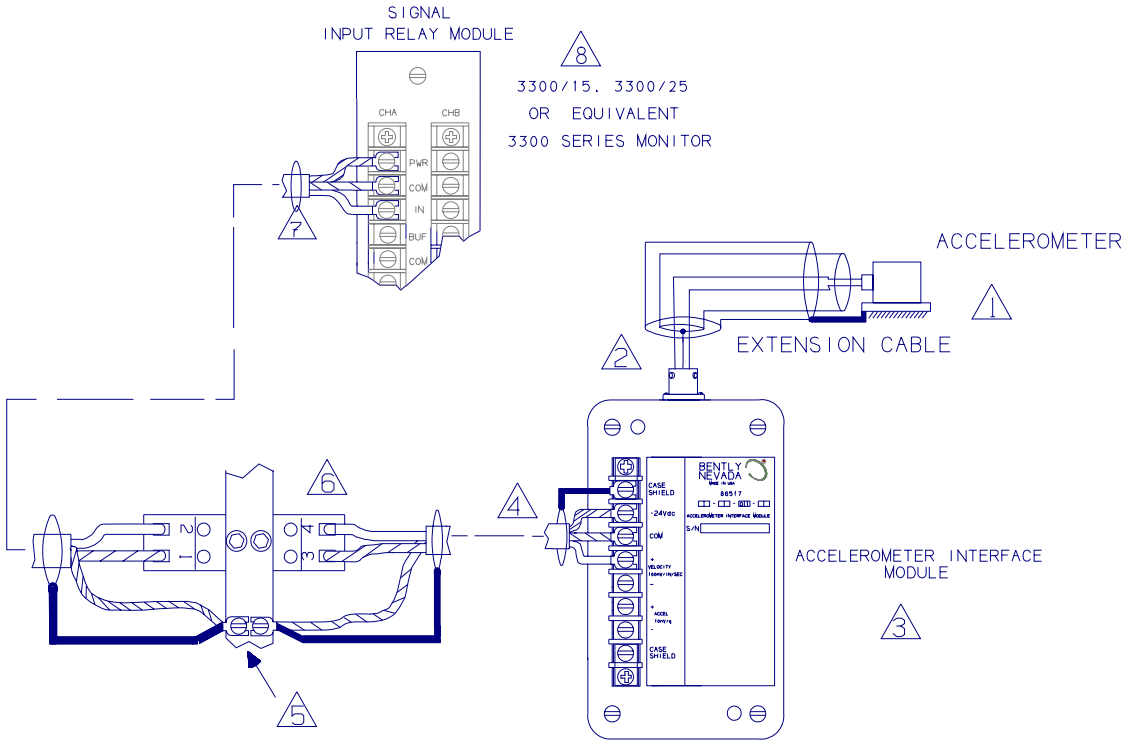


Figure 2.5 Field Wiring Interface Module to 3300 Monitor with External Barriers

(Notes on the following page)

Notes for Figure 2.5

1 The accelerometer case is connected to the machine earth and the differential signal output is isolated. The installer must ensure that the accelerometer mounting structure has the same ground potential as barrier ground. Total earth loop impedance should be less than 1 ohm. The accelerometer case connects to the extension cable shield through the cable connector for the hardline cable and to the inner shield for the softline connector.

3 The interface module case must be isolated. The interface module must be installed in a housing which meets approval agency requirements for the installation site.

Wiring Recommendations:

2 Accelerometer to interface: Use extension cable, Bently Nevada part numbers 45358-07 and -09, or 83387-xxx, or equivalent.

4 Interface module to monitor Power, Common, and Velocity signal wiring recommendation: 18 to 22 AWG stranded, three conductor wire with insulating sheath and 100% shield coverage. The **-**Velocity output at the interface module is not connected. The maximum cable length between the monitor and the interface module is 1000 feet (305 metres) and the maximum length between the interface module and the barrier is 800 feet (244 metres). 18 AWG Belden 83336 or 22 AWG Belden 83334 can be used.

Shielding:

5 Barrier ground is the single point earth ground. The shields should be earthed only at this point.

7 Shield floats at the monitor and is earthed at barrier ground.

Safety Barriers:

6 MTL 796(**-**) barrier recommended for power and velocity signal. Power: V_{max} = **-**26 V, R_{min} = 300 ohms. Velocity: V_{max} = **-**20 V, R_{min} = 390 ohms.

8 3300 series monitors other than the 3300/95 must be modified before connection to the interface module. Contact your Bently Nevada representative. Other connections are possible. For example the acceleration signal could be connected to a monitor for some special applications.

NOTE: When you use external barriers, remove the jumper between signal common and rack chassis on the 3300 Power Input Module at the rear of the 3300 rack. See the 3300 System Installation Instructions, (document number 80172-01).

4. MAINTENANCE

This section describes a calibration procedure for the acceleration signal and provides some troubleshooting procedures for the transducer system. To perform these procedures you will need the following tools and instruments:

function generator, (50 ohm output)

DC power supply

multimeter

screwdriver

small screw driver

(2) 0.01 microfarad 1% capacitors, (BNC P/N 00448308)

(2) MS 3116 connectors (mates to interface module to extension cable connector, BNC P/N 00591075)

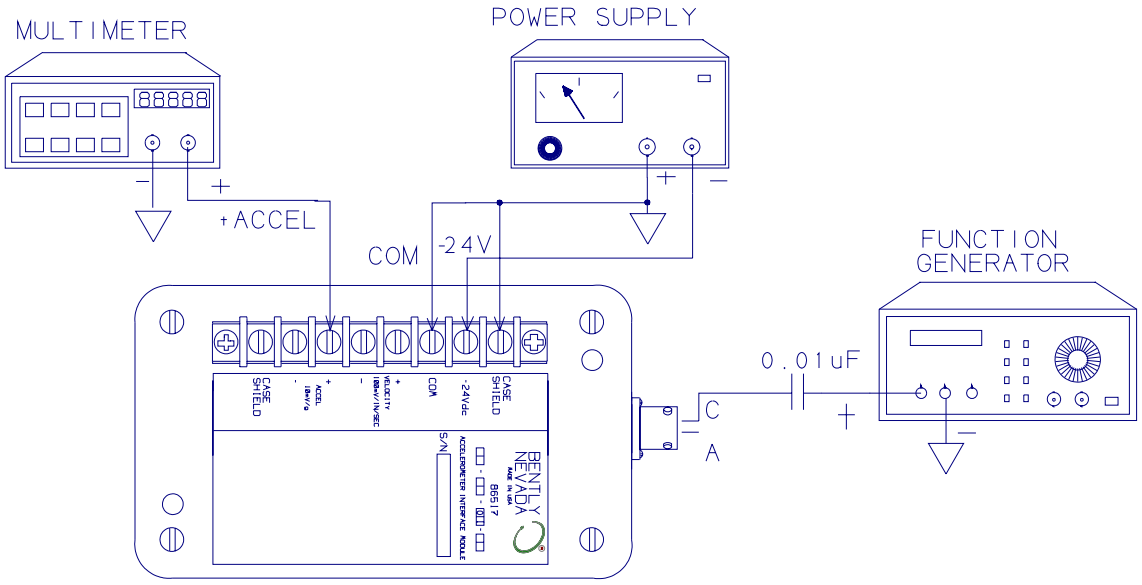
4.1 Calibration and Velocity Signal Path Verification

Although the interface module acceleration output is calibrated at the factory, the acceleration output can be recalibrated. Ideally the interface module should be calibrated with an accelerometer, a shake table, and a high quality reference accelerometer. Unfortunately this is not usually practical. This procedure uses a voltage signal from a function generator and a capacitor to produce a charge input to the interface module. The technique works well provided that you are in a low EMI environment, make good connections, have a clean ground, and use a function generator with a 50 ohm output. This is a bench procedure and it is assumed at the start that the interface module is not connected.

Use the two connectors and the two capacitors to make a calibration assembly as described:

1) Solder one of the capacitors to the pin C solder tail on one connector and solder the other capacitor to the pin A solder tail on the second connector. Label the two connectors

Use the connector/capacitor assembly in the following procedure.



1. Connect the Power Supply to the **-24Vdc** and **COM** terminals on the interface module as shown and adjust the voltage to -24 Vdc. Connect the multimeter to the **+ACCEL** terminal. Connect the 0.01 uF capacitor and function generator as shown. The input should connect to pin C and leave pins A and B unconnected. Connect the interface module case to common through the **CASE SHIELD** terminal. Make sure the interface module case is isolated.

2. Adjust the function generator to a null output level and measure the acceleration signal with the multimeter. If the reading is more than a few millivolts rms then the test setup is probably injecting power line noise into the charge amplifier. You need to lower the noise level before continuing. Try reducing lead lengths and changing lead routing.

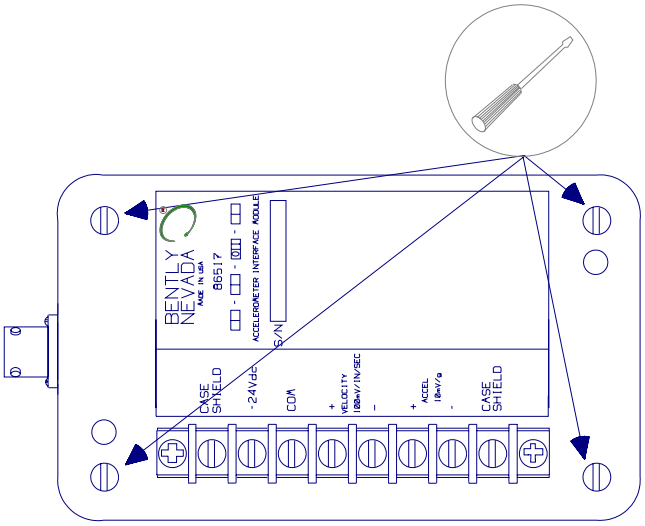
3. Adjust the function generator to output a 0.3535 Vrms sine wave at 100 Hz for a transducer sensitivity of 50 pC/g, or 0.707 Vrms for a transducer sensitivity of 100 pC/g.

4. Measure the acceleration output with the multimeter. If the output reads 0.3535 ±7.0 mVrms go to step 8.

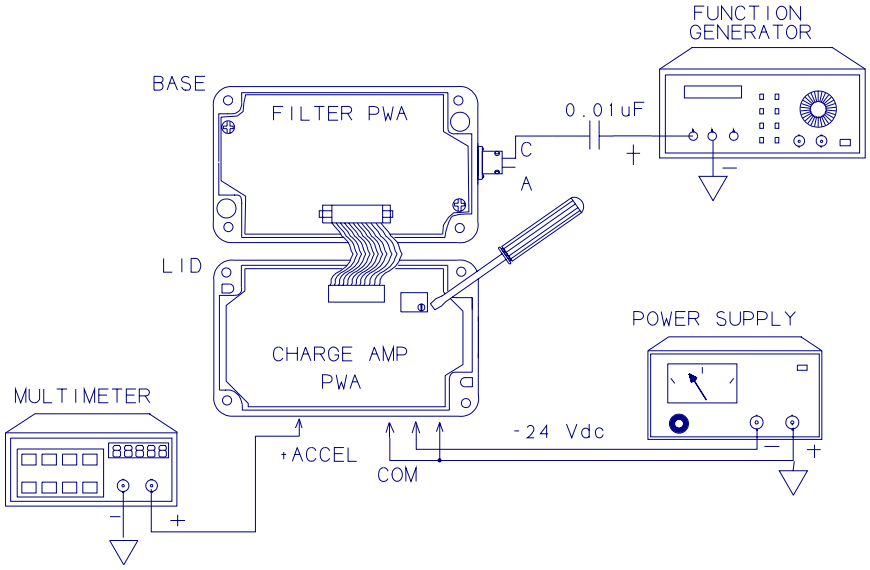
If the output does not read 0.3535 Vrms ±7.0 mVrms continue with step 5

5. Unscrew the four screws at each

corner of the lid.

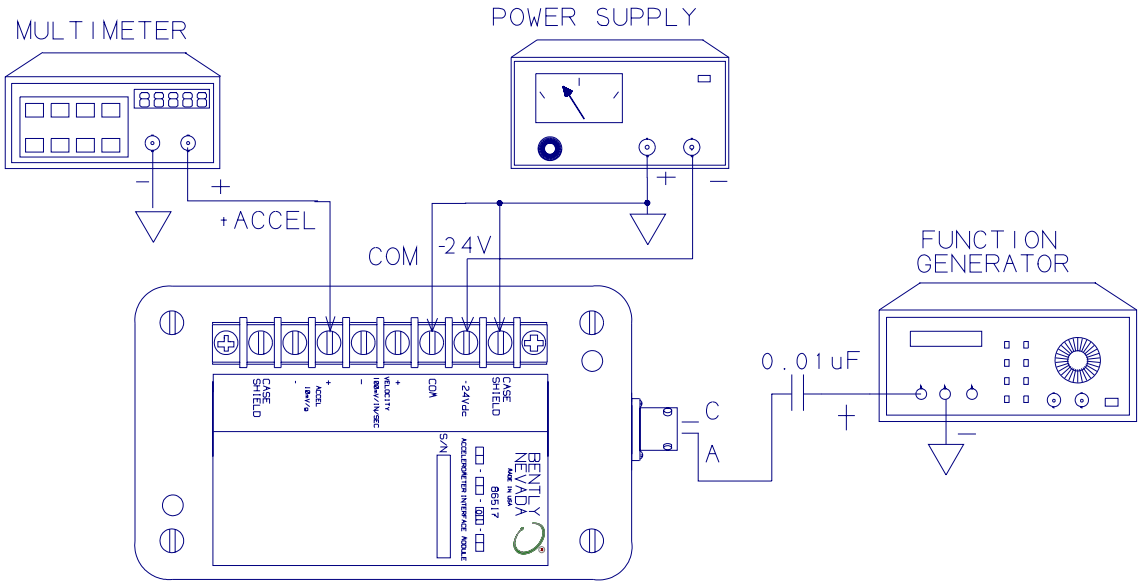


6. Open the lid and fold it back.



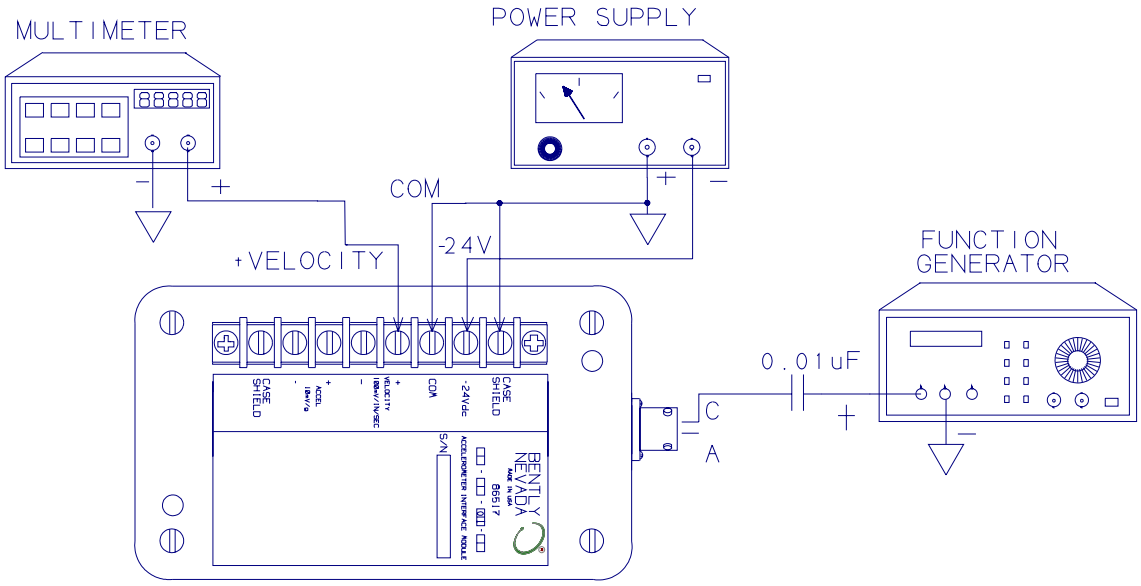
7. Adjust the potentiometer until the multimeter reads 0.3535 ±7.0 Vrms.

Close and tighten the lid and verify that the multimeter still reads 0.3535 Vrms. If it does not then repeat steps 6 and 7. Note that when the lid is open the circuitry is unshielded and the charge amp can pick up noise.



8. Disconnect the input from pin C and connect it to pin A and leave pins C and B not connected. Verify that the multimeter still reads 0.3535 Vrms ±7.0 mVrms. If it does not then check your test setup as in step 2 and then repeat this step. If the test is not passed then replace the interface module.

To verify the velocity signal path, continue with step 9 on the following page.



9. Connect the input to pin C and connect the multimeter to the **+VELOCITY** terminal as shown above.

10. Adjust the function generator to output a sine wave with the frequency and amplitude based on the filter corner frequencies and accelerometer charge sensitivity as shown in the table below:

Corner frequency		Function Generator Setting	
High Pass Corner	Low Pass Corner	Frequency	Amplitude
(Hz)	(Hz)	(Hz)	(mVrms)
25	350	93.5	53.8 (50 pC transducer)
100	560	236.6	136.2 (50 pC transducer)
40	300	109.5	126.0 (100 pC transducer)

11. Measure the **+VELOCITY** output with the multimeter. It should read 0.3535 Vrms ± 18.0 mVrms. If it does not then the interface module should be replaced.

4.2 Common Mode Rejection Measurement

The amount of noise that will appear at the output of the module is directly related to the interface module's ability to reject common mode voltage at its input. To assure that the module's noise floor remains in accordance with the specification by which it was designed, the following common mode rejection measurement is recommended every two years. If the interface module does not perform within the limits outlined below, return the module to Bently Nevada in Minden, Nevada for repair.

1. Connect terminals A and C together. Input 5 Vp-p (1.767 Vrms) @ 600 Hz to terminal C. Verify output at "+ ACCEL" (TB1-6) is less than 60 mVrms.

2. Change frequency to 1000 Hz. Verify output at TB1-6 is less than 56 mVrms.

4.3 Troubleshooting

The following troubleshooting procedure will help you interpret a fault indication and isolate faults in an installed transducer system. Before beginning make sure the system has been correctly.

CAUTION

Machine protection will be lost during these procedures.

installed

When a malfunction occurs, locate the fault indication, check the probable causes for the fault indication, and follow the procedure to isolate and correct the problem.

4.3.1 Fault Indication #1:

The voltage between the **-24Vdc** and **COM** terminals is not within the range of -22 Vdc to -25 Vdc

(-16.0 Vdc to -25 Vdc with safety barriers).

Probable Cause:

Faulty wiring between the monitor and the interface module.

Faulty power supply.

Faulty interface module.

Isolation and Correction:

Disconnect the power and signal wiring from the interface module and measure the voltage between the common wire and the supply voltage wire. If the voltage remains outside the limits then there is a problem with either the power supply or the power and common field wiring. If the

voltage is between approximately -22 Vdc and -25 Vdc then either the acceleration or velocity field wiring or the interface module is defective. Reconnect the power and common wiring to the interface module but do not connect the signal wiring. If the voltage between the **-24Vdc** and **COM** terminals remains outside the range of -22 to -25 Vdc (-18 Vdc to -25 Vdc for barriers), then the interface module is defective and should be replaced with a spare. If the voltage is within the limits then the velocity or acceleration field wiring is defective.

4.3.2 Fault Indication #2:

The voltage between the **+VELOCITY** and **COM** terminals is not within the range of -9 to -11 Vdc (-11 to -13 Vdc for interface modules which used the CC = 00 option. These interface modules are identified by a 00 in the third option configurator of the part number which is shown on the interface module identification plate.)

Probable Cause:

Fault in the Velocity signal field wiring.

Faulty power supply.

Faulty interface module.

Isolation and Correction:

Verify that fault condition #1 does not exist. Disconnect the **+VELOCITY** and **-VELOCITY** wires from the interface module and measure the voltage between **+VELOCITY** and **COM**. If the voltage is within the limits then the **+VELOCITY** and/or **-VELOCITY** field wires are faulty. If the voltage is not within the limits then the interface module is defective and should be replaced.

4.3.3 Fault Indication #3:

Signal "spiking", (transient high-amplitude signals that can cause false alarms or transient not OK indications on the monitor).

Probable Cause:

Faulty or loose extension cable to accelerometer connector.

Faulty or loose extension cable to interface module connector.

Faulty accelerometer mounting.

Faulty extension cable.

Intermittent fault in the interface module to monitor signal wiring.

Faulty interface module.

Isolation and Correction:

Because this type of problem is usually observed at the monitor, you need to determine if the fault lies with the transducer system, the monitor, or, in the case of 1X filtered monitor channels, with the rotor speed signal. Check the components of the transducer system in the following order:

Check all connectors and connections in the signal path. Check the accelerometer mounting. Check the extension cable for damage and make sure it is well secured at regular intervals to prevent cable vibration. Verify that the interface module is isolated from earth and that the shields are wired correctly.

If the problem still exists after completing the troubleshooting procedure and you are sure the spiking is not a real vibration signal then replace the transducer system components one at a time until the problem is resolved. Replace the extension cable first, then the interface module, and replace the accelerometer last.

5. ORDERING INFORMATION

Accelerometer Interface Module

86517 – AXX – BXX – CXX - DXX

A Transducer Charge Input Sensitivity Option

- 01 50 pC/g
- 02 100 pC/g

B Filter Corner Frequency Option

- 01 25 Hz high pass corner, 350 Hz low pass corner
- 02 100 Hz high pass corner, 560 Hz low pass corner
- 03 40 Hz high pass corner, 300 Hz low pass corner

C DC Signal Bias Voltage

- 01 -10 Vdc, No other option available

D Agency Approval

- 00 Not Required
- 01 Canadian Standards Association
- 02 CENELEC (SIRA)

Extension Cable

Softline Cable

- 45358 - 07 7 Metre
- 45358 - 09 9 Metre

Hardline Cable

- 83387 - 054 54 inch
- 065 65 inch
- 096 96 inch
- 100 100 inch
- 132 132 inch

Accelerometer

45357 - 01 50 pC/g Accelerometer.

Weatherproof Housing*

80808 - 01 Housing for two interface modules.

80808 - 02 Housing for four interface modules.

* Housings come with 3/4 inch conduit hubs. Conduit and fittings as necessary will need to be procured separately.

Accessories

0.01 microfarad capacitor: BNC P/N 00448308

Connector for connection of unterminated extension cables to interface module. (Requires potting). BNC P/N 00591075.

Recommended Spare Parts

One spare interface module, extension cable, and accelerometer should be kept on hand. If five or more transducer systems are installed then one spare of each part is suggested in a ratio of one spare to five installed units.

6. INTERFACE MODULE OPTIONS

Option AA, Transducer Charge Input Sensitivity

This option sets the charge sensitivity of the charge amplifier at 50 pC/g or 100 pC/g. If soldered link W1 on the charge amplifier PWA (printed wiring assembly) is not installed then the 50 pC/g option is selected, when W1 is installed then the 100 pC/g option is selected. Calibration and velocity path verification is required if the option is changed.

Option BB, Filter Corner Frequency

This option determines the filter corner frequencies and cannot be changed without changing components on the Filter PWA.

Option CC, DC Signal Bias Voltage

Only Option CC = 01 is available. This sets the dc bias voltage at -10 Vdc. Soldered link W2 on the Filter PWA is not installed.

Option DD, Agency Approval

The 86517 interface module is certified for use in certain hazardous areas. Safety barriers are required for installations in Class I, Division 1 or Zone 1 environments. Contact Bently Nevada Corporation for more information on using the interface module in hazardous areas.

7. SPECIFICATIONS

The following specifications apply with a -24 Vdc supply voltage, 100 KΩ load, at 77° F (25° C) unless otherwise specified.

7.1 Accelerometer Interface Module

POWER

Supply Voltage:	-23 Vdc to -26 Vdc
Current Draw:	22 mA maximum

INPUT

Acceleration:	Differential input from a piezoelectric accelerometer with a sensitivity of 50 pC/g pk or 100 pC/g pk. Accelerometer pole to pole capacitance plus extension cable capacitance should not exceed 8300 picofarads.
Overload:	50,000 pC peak for accelerometers with 50 pC/g pk sensitivity, and 100,000 pC peak for accelerometers with 100 pC/g pk sensitivity.

ACCELERATION OUTPUT

Sensitivity:	10 mV/g pk (1.02 mV/m/s^2 pk) balanced output, 50 ohm nominal output impedance.
Dynamic Range:	750 gs (7350 m/s^2) without barriers typical. 500 gs (4902 m/s^2) with barriers typical.
Frequency Response:	The low frequency response is controlled by the charge amplifier. The -3 dB corner is at 4.7 Hz. The high frequency response is controlled by the combination of the accelerometer and extension cable capacitance, the charge amplifier/scaling stage, and the load capacitance on the acceleration output buffer. For an accelerometer capacitance of 1000 pF and a cable capacitance of 1000 pF the upper -3 dB frequency is approximately 5000 Hz.

VELOCITY OUTPUT

Sensitivity:	100 mV/in/s pk (3.93 mV/mm/s pk), balanced output. Output impedance 100 ohms nominal.
Dynamic Range:	20 in/s pk (508 mm/s pk) 25 Hz to 1000 Hz.
Frequency Response:	Dependent on filters. See filter specifications.

7.2 Accelerometer Interface Module

VELOCITY OUTPUT

Accuracy:	±5.0% of calculated velocity from an ideal input in the passband of the bandpass filter at 77□ F (25□ C)

FILTERS

High and low pass corner frequencies are ordered as pairs, the following pairs can be ordered:

High Pass Corner	Low Pass Corner
25 Hz	350 Hz
40 Hz	300 Hz
100 Hz	560 Hz

The high and low pass filters are 6th order with -36 dB/octave rolloff and have a butterworth response. Attenuation at the corner frequency is -3 dB ±0.5 dB.

ENVIRONMENTAL

Operating Temperature:	+32° F to +158° F (0° C to 70° C)
Storage Temperature:	-40° F to +185° F (-40° C to +85° C)
Humidity:	0 to 95%, noncondensing

MECHANICAL

Accelerometer Input Connector:	MS-3112-8-3P
Power/Output Connector:	8 lug terminal block
Dimensions:	
Height:	3.00 inches, (76.2 mm)
Width:	3.25 inches, (82.6 mm)
Length:	5.50 inches, (139.7 mm)

Mounting:	Two 0.16 inch diameter 8 - 32 allen head bolts located at opposite diagonal corners of a 4.45 inch by 2.05 inch (113 mm by 52 mm) rectangle . The interface module must be isolated from ground.

7.3 Extension Cable

SOFTLINE CABLE

Accelerometer Mating Connector:

Mates to MS 3100R-10SL-4P receptacle and has a Viton insert.

Interface Module Mating Connector:

Mates to MS 3112-8-3P

Cable:	Twisted shielded pair with low noise construction. Protected by convoluted teflon tubing overall and the rear of the connectors are potted.

Operating Temperatures:

Cable -65° F to +400° F (-54° C to +204° C)

Accelerometer mating connector -65° F to +392° F (-54° C to +200° C)

Interface module mating connector -50° F to +200° F (-45° C to +93° C)

HARDLINE CABLE

Accelerometer Mating Connector:

Mates to MS 3100R-10SL-4P receptacle and has a Viton insert.

Disconnect Interface Mating Connector:

Mates to MS 3106-10SL-4S

Cable:	Twisted shielded pair with mineral insulation and protected by a stainless steel overbraid.

Operating Temperatures:	
	Cable -65° F to +1200° F (-54° C to +649° C)
	Accelerometer mating connector -65° F to +800° F (-54° C to +427° C)
	Disconnect interface mating connector -65° F to +800° F (-54° C to +427°C)

7.4 Accelerometer, P/N 45357-01

Sensitivity:	50 pC/g ±5%
Mounting:	4 holes at the corners of a square with 1.188 inch (30.17 mm) sides. Suitable for mounting with 0.25 inch or 6 mm bolts.
Connector:	MS3100R-10SL-4P
Weight:	15 Ounces (425 grams) nominal

8. APPENDIX

Drawings

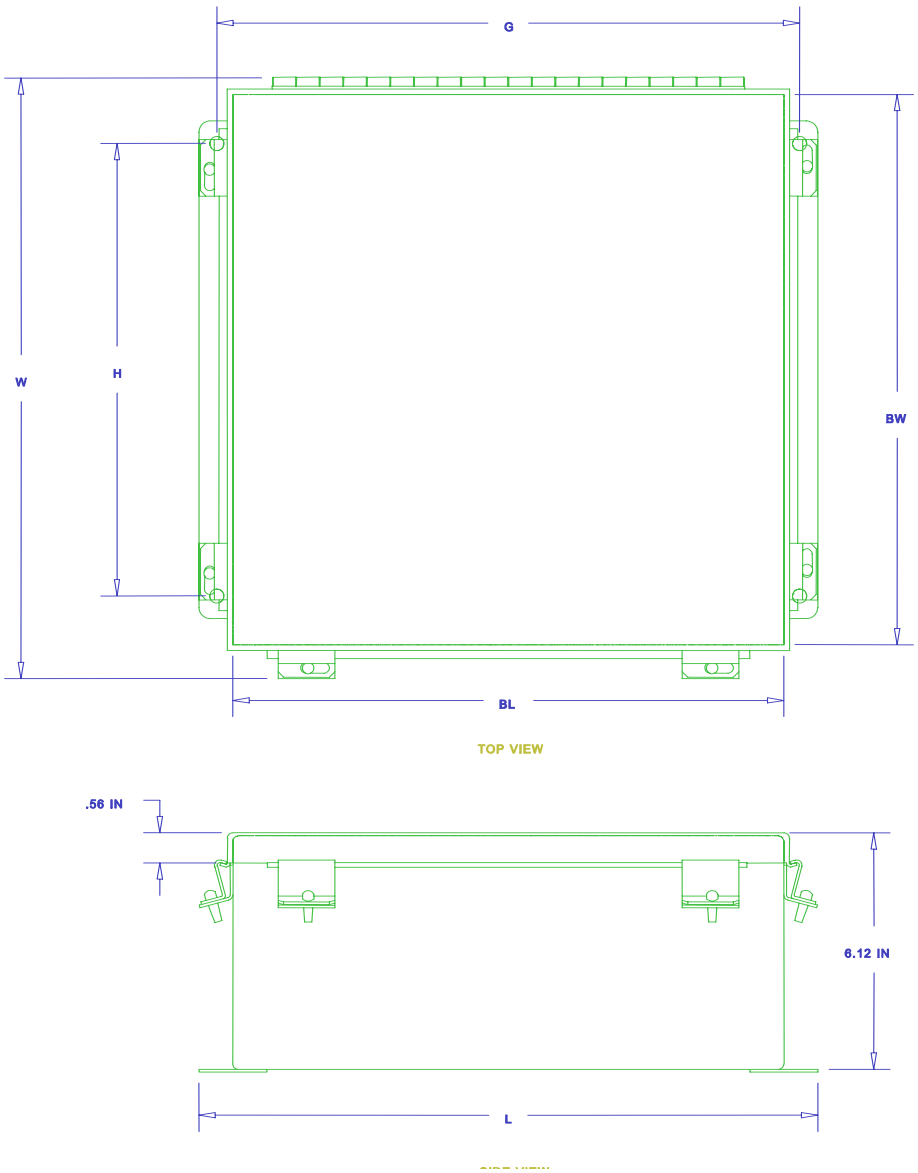


Figure A-1 80808 Weatherproof Housing

Description	Overall Base BL x BW	Overall L x W	Mounting G x H
Small SST Enclosure	12.00 in x 12.00 in (304.8mm x 304.8mm)	13.50 in x 12.94 in (342.9mm x 328.7mm)	12.75 in x 10.00 in (323.8mm x 254mm)
Large SST Enclosure	18.00 in x 18.00 in (457.2mm x 457.2mm)	19.50 in x 18.94 in (495.3mm x 481.1mm)	18.75 in x 16.00 in (476.2mm x 406.4mm)

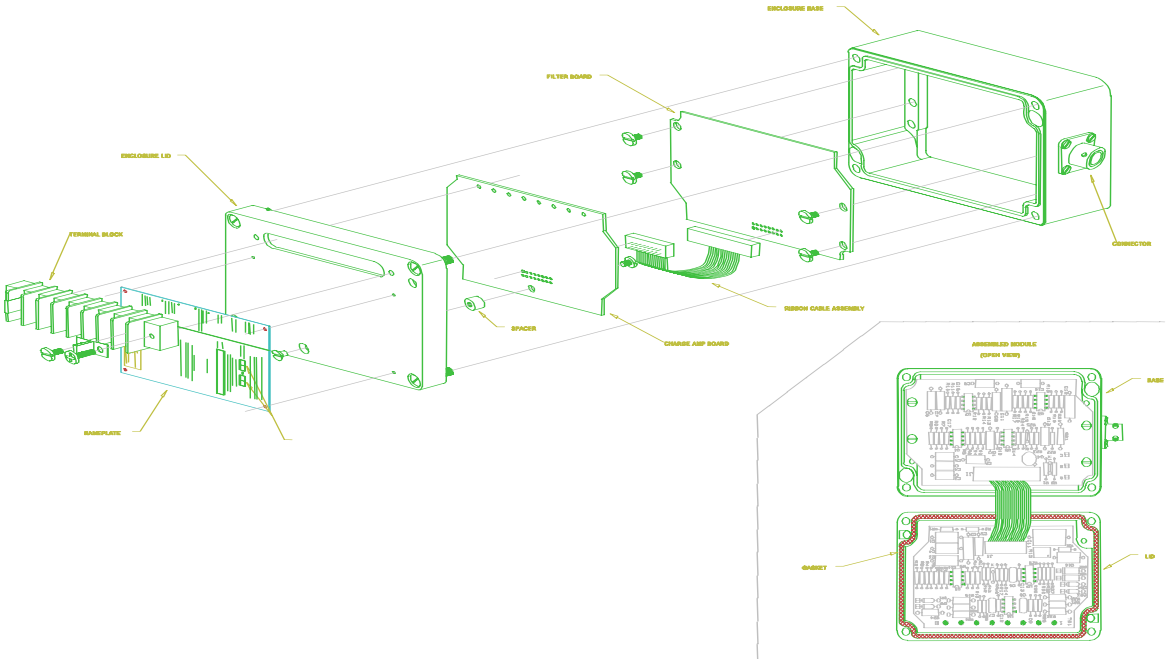


Figure A-2 Interfaule Assembly