STI Vibration Monitoring Inc.

Field Application Note

Accelerometer Installation Guide AIG

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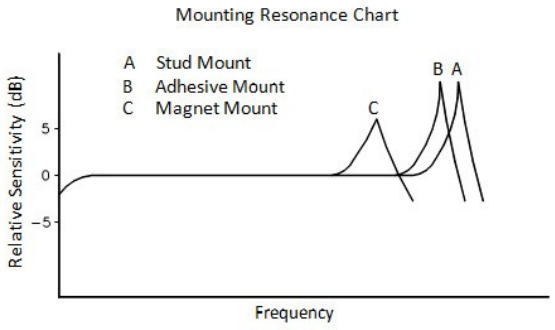
Section I: Introduction:

There are three mounting methods typically used for vibration monitoring applications; stud mounting, adhesive bonding and magnetic mounting. Stud mounting is the preferred method for permanent mounting applications. This method is accomplished by securing the sensor directly to the bearing housing using a mounting stud. This method allows the sensor to measure vibration according to the manufacturer's specifications. The mounting location for the accelerometer should be clean and paint free, also the mounting surface should be spot-faced to a surface smoothness of 32 micro-inches. The diameter of the spot-face should be about 10% larger than the sensor diameter. Any irregularities in the mounting surface preparation will translate into improper measurements or damage to the sensor may occur. STI prefers that a mounting pad be placed between the machine and the sensor to provide a smooth surface for the accelerometer to attach to.

Adhesive or glue mounting provides a secure attachment without extensive machining; however this method will reduce the operational frequency range since the adhesive will act like a shock absorber, this is also known as damping. The replacement or removal of the sensor is also more difficult than any other mounting method. The most important issue for using adhesives is surface cleanliness, without a clean surface the adhesive will not fully bond to the machine.

The magnetic mounting method is typically used for temporary measurements with a portable data collector or analyzer. This method is not recommended for permanent monitoring. The sensor may be inadvertently moved and the multiple surfaces and materials of the magnet may interfere with or increase high frequency signals.

As can be seen in the figure below, the mounting method has an effect on the operating frequency range of an accelerometer. By design, accelerometers have a natural resonance which is 3 to 5 times higher than the advertised high end frequency response. The frequency response range is limited so that a flat response is provided over the operating range. The advertised range is achievable only by stud mounting. Any other mounting method will adversely affect the natural resonance, and in turn the usable frequency response range.



STI's preferred mounting method is the stud mount with mounting pad and epoxy.

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Section II:
Mounting Accessories:

Part Number	Description	Use	
CMCP-200 Series	**Accelerometer Mounting Pads**	Provides Ideal Mounting Surface. Use 1/4” pad for stud/adhesive mounting and 3/8” pad for adhesive mounting.	
CMCP200-01	1/4” x 1” Dia.		
CMCP200-02	3/8” x 1” Dia.		
CMCP203 Series	**Pipe Thread Mounting Adapter**	Makes use of existing NPT threaded holes to mount sensors. Adapters are finished with a lapped surface and a 1/4”-28 threaded hole.	
CMCP203-01	1/2” NPT		
CMCP203-02	3/4” NPT		
CMCP203-03	3/8” NPT		
CMCP203-04	1/4” NPT		
CMCP205 Series	**Motor Fin Mounts**	Allows for mounting sensors in between motor fins when a flat surface is not available. Tips are angled to ensure contact with machine casing.	
CMCP205-01	1.25” L x 0.50” W		
CMCP205-02	2.00” L x 0.50” W		
CMCP205-03	1.75” L x 0.25” W		
CMCP205-04	1.00” L x 025” W		
CMCP230 Series	**1/4”-28 UNF Mounting Studs**	Sold in packs of 10.	
CMCP230-01	1/2” in Length		
CMCP230-02	3/4” in Length		
CMCP230-03	3/8” in Length		

Installation Tools:

Part Number	Description	Use	
CMCP270	Piloted End Mill	Used to mill a 1” flat surface and also provides a guide hole for tapping ¼”- 28 threads. Includes end mill, pilot, drill bit and Allen wrench	
CMCP271	Piloted End Mill with Replaceable Cutting Tips	Same as CMCP270 but provides replaceable cutting tips. Cost effective when mounting a large quantity of sensors.	

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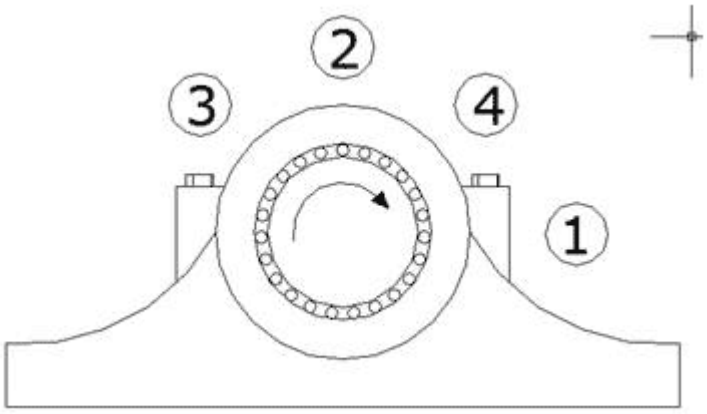
Adhesives and Sealants:

Part Number	Description	Use	
CMCP206	Adhesive Filler	Used to fill voids when installing CMCP205 motor fin mounts. 2 Part Epoxy	
CMCP207	Adhesive Dispenser	Used to dispense CMCP206 Adhesive Filler	
CMCP208	Mixing Nozzle	Used to mix CMCP206 two part epoxy	
CMCP210	Acrylic Adhesive Bypacs	2 Part Epoxy for easier mounting of 1 or 2 sensors	
CMCP211	Depend 330 and Activator	2 Part Adhesive with spray activator. Good for over 10 installations	
CMCP212	Silicone Dielectric	Helps ensure transmittal of higher frequencies	
CMCP213	Silicone Sealant	Used to “flood” connectors to eliminate moisture build up inside of sensor connector	

Section III:
Preferred Mounting Locations:



Preferred Mounting Locations

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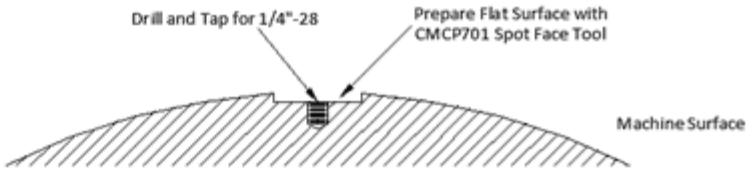
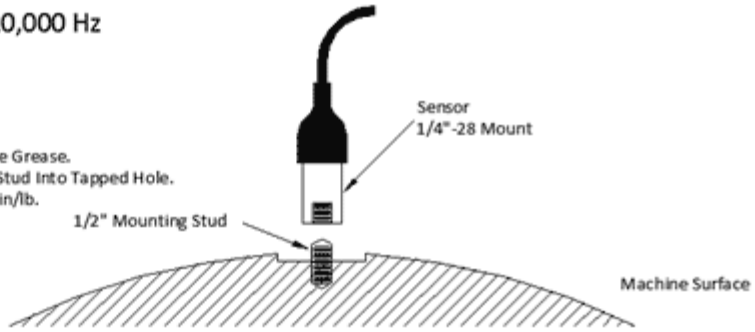
Direct Stud Mount:



Sensor Installation - Stud Mount
Applicable Frequency Range: 0.32 - 10,000 Hz

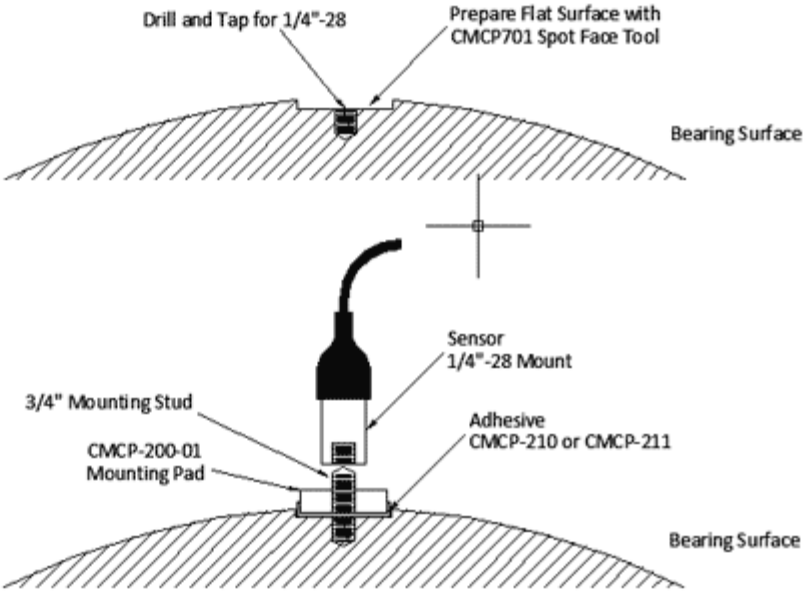
1. Locate Sensor Location.
2. Machine Flat Area Using CMCP701 Kit.
3. Drill and Tap Location for 1/4"-28 UNF.
4. Remove All Debris and Clean.
5. Lightly Grease Contact Surface w/CMCP212 Silicone Grease.
6. Install CMCP230-01 1/4"-28 UNF x 1/2" Mounting Stud Into Tapped Hole.
7. Attach Sensor to Extruding Stud and Tighten to 30 in/lb.



Mounting Pad Mount w/Adhesive: (Preferred)

CMCP200-0X Mounting Pad Installation - Stud/Adhesive Mount
Applicable Frequency Range: 6,000 - 10,000 Hz

1. Locate Sensor Location
2. Machine Flat Area
3. Using CMCP-701 Kit, Drill and Tap Location for 1/4"-28
4. Remove All Debris and Clean with ODC Free Cleaner
5. Install 1/4"-28 x 3/4" Mounting Stud Into Tapped Hole
6. Apply Adhesive to Mounting Pad
7. Screw Mounting Pad onto Mounting Stud
8. Attach Sensor to Extruding Stud On Top of Mounting Pad



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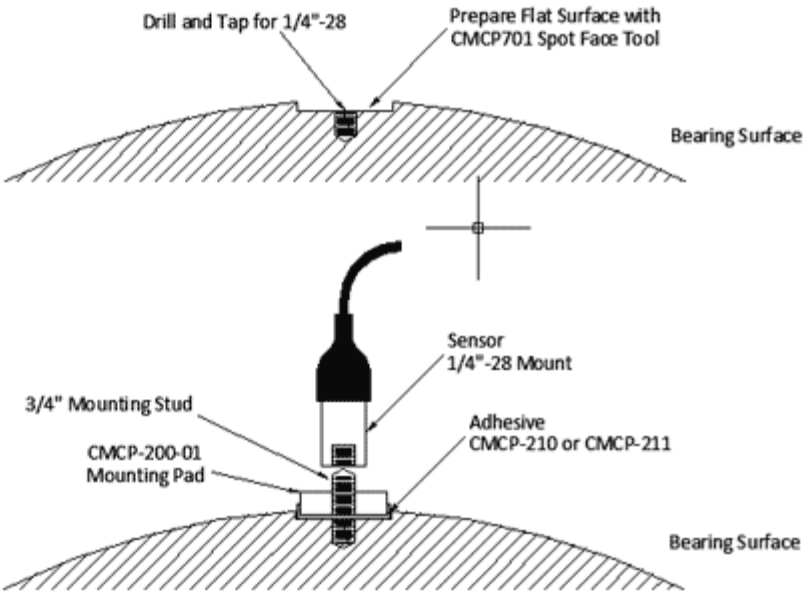
Mounting Pad Mount w/Adhesive: (Preferred)

CMCP200-0X Mounting Pad Installation - Stud/Adhesive Mount
Applicable Frequency Range: 6,000 - 10,000 Hz

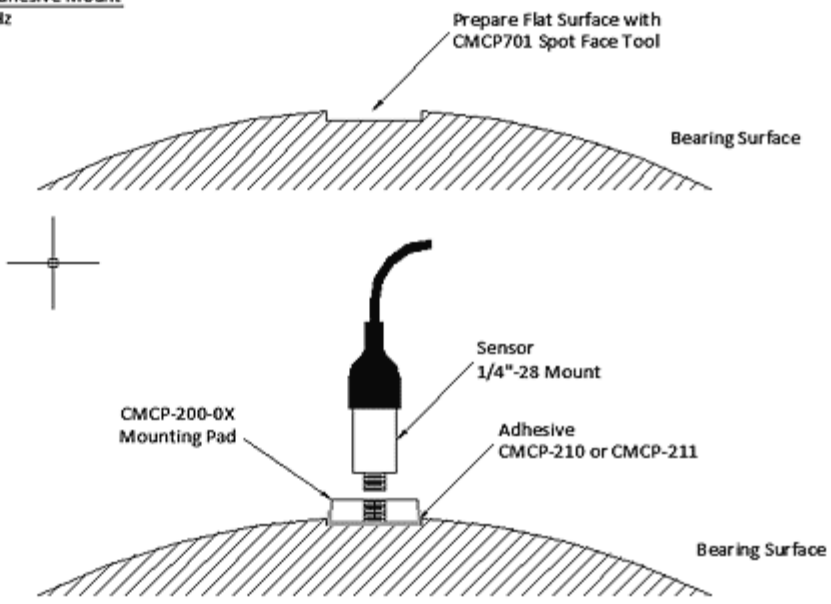
1. Locate Sensor Location
2. Machine Flat Area
3. Using CMCP-701 Kit, Drill and Tap Location for 1/4"-28
4. Remove All Debris and Clean with ODC Free Cleaner
5. Install 1/4"-28 x 3/4" Mounting Stud into Tapped Hole
6. Apply Ahdesive to Mounting Pad
7. Screw Mounting Pad onto Mounting Stud
8. Attach Sensor to Extruding Stud On Top of Mounting Pad



Mounting Pad with Adhesive Mount:

CMCP200-0X Mounting Pad Installation - Adhesive Mount
Applicable Frequency Range: 2,500-4,000 Hz

1. Locate Sensor Location (See Preferred Location Drawing)
2. Machine Flat Area
3. Remove All Debris and Clean with ODC Free Cleaner
4. Secure Mounting Pad with Adhesive



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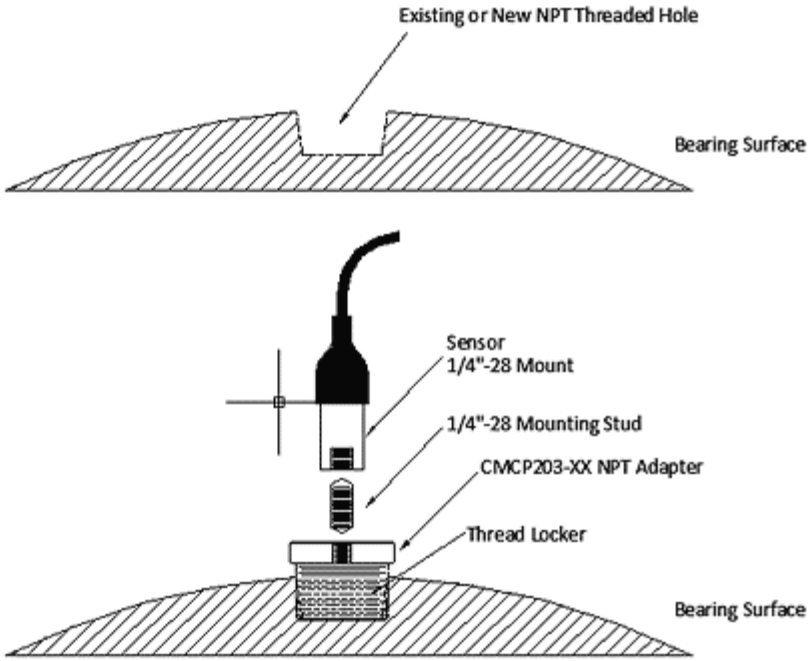
NPT Adapter Mount:

Sensor Installation - NPT Adapter Mount
Applicable Frequency Range: 6,000 - 10,000 Hz

1. Locate Sensor Location
2. If Needed Drill Tap NPT Hole
3. Install CMCP205-XX NPT Adapter Using a Thread Locker
4. Thread Mounting Stud Into CMCP205-XX
5. Install Sensor on Mounting Stud

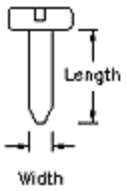


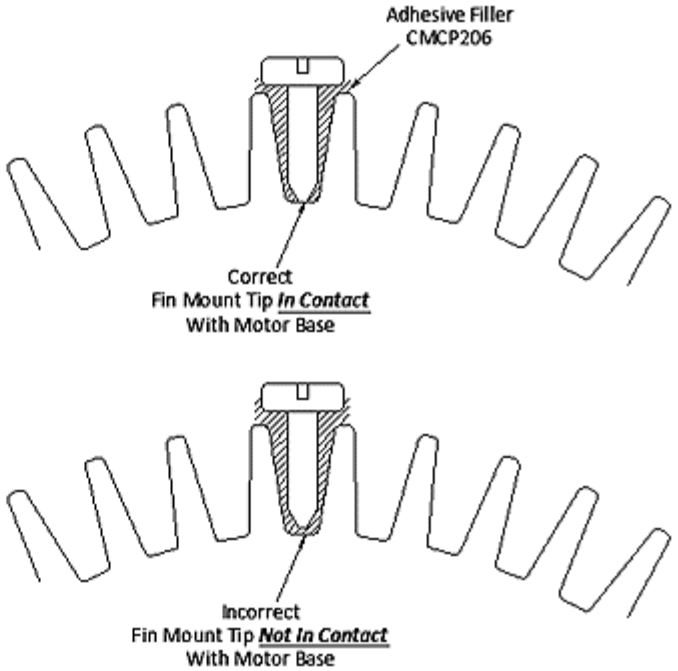
Motor Fin Mount:

CMCP-203 Motor Fin Mount Installation
Applicable Frequency Limit: 4,000Hz

1. Locate Sensor Location Between Motor Fins (See Preferred Location Drawing)
2. Clean Installation Location with an ODC Free Cleaner
3. Insert CMCP-205 Fin Mount With Tip In Contact With Motor
4. Fill Voids with CMCP-206 Adhesive Filler
5. Screw Sensor Onto CMCP-205 After Adhesive Has Dried

Motor Fin Mount Dimensions:
CMCP205-01: 1.25"L x 0.50"W
CMCP205-02: 2.00"L x 0.50"W
CMCP205-03: 1.75"L x 0.25"W
CMCP205-04: 1.00"L x 0.25"W





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Section IV: Cabling:

The instrument wire from the vibration sensor to its transmitter or monitor should be either a twisted pair or triad cable depending on the sensors requirement. These cables should be stranded, twisted, individually insulated, shielded and with an overall jacket. The shields or drain wires must be insulated or isolated from each other and the conduit. The use of multi-conductor cable with a single shield is not suggested due to its susceptibility to induced noise and line interference.

The gauge or thickness of the instrument wire is determined by the distance between the sensor and the transmitter or monitor. Long lengths of cable will deteriorate the signal; this can be a problem when monitoring gear mesh frequencies, blade pass frequencies or rolling element bearing frequencies.

Signal Interference Sources:

Noise or Line Interference can be induced in a Vibration Monitoring System in a number of ways. However, there must first exist a source for the induced noise. There are numerous noise sources available in an industrial or power generation plant:

- AC Power Transients
- AC Power Transients
- Ground Differentials
- Switching Circuits
- High Voltage Circuits
- Improper Load Balance

Noise can be induced in a Vibration Monitoring System through Electrostatic (Capacitive), Electromagnetic (Inductive) or Conductive Coupling (Direct Connection). All noise will be induced in the monitoring system through one or more of its external connections or Field Wiring.

It is critical that conduit be utilized with the sensor cabling and its associated wiring. The use of conduit greatly reduces the possibility of induced noise or line interference on the signals path. The conduit system shall be dedicated to the monitoring system and no other wiring should be in the same conduit. Also, cable trays, wire ways, or instrument trays are an unacceptable alternative to dedicated conduit. Route the conduit as far as possible from any power cables, relay contact cables and motor control cables. If you must cross these cables do so at a 90° angle.

The following table offers a guideline to determine the maximum cable length for different types of sensors. This is based on an ideal installation where the cable is properly grounded and installed in a dedicated conduit system.

Sensor Sensitivity	Maximum Cable Length
100mV/g	100-150’
500mV/g	150-500’
4-20mA Velocity Sensors	>1000’

Sensor Wiring:

A “Single Point Grounding” scheme must be utilized when installing a vibration monitoring system. All grounds must be connected at one location. It is recommended that the grounding point be at the transmitter/monitor end and not at the machine. On most machines or where other machines are being monitored significant ground differentials can be found between sensor locations and machines.

All Instrument Wire shields must be grounded at one end of the cable, and the other end left floating or not connected. The Instrument Wire should be grounded at the Vibration Monitoring System. If the shield is not grounded, the shield will become an antenna increasing induced noise on the signal path. If the shield is grounded at both ends, it will allow ground current (ground loop noise) to flow through the shield, seriously increasing signal noise.

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Sensors with Built In Cables:

Cable Part Number	Description	Color Code
CMCP1100-XX CMCP1100S-XX	Low Cost Accelerometer with Integral Cable	Red (+) Black (-) Shield/Drain
CMCP1100HT-XX	High Temperature Low Cost Accelerometer with Integral Cable	White (+) Black (-) Shield/Drain

Sensors with Built In Cables:

Cable Part Number	Description	Color Code
CMCP602L-XX-XX	Accelerometer Extension Cable 2 Pin, Standard Cable	Red (A) Black (B) Shield/Drain
CMCP602H-XX-XX	Accelerometer Extension Cable 2 Pin, High Temperature Cable	White (A) Black (B) Shield/Drain
CMCP603L-XX-XX CMCP603H-XX-XX	Accelerometer Extension Cable 3 Pin.	Red (A) Black (B) White (C) Shield/Drain

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