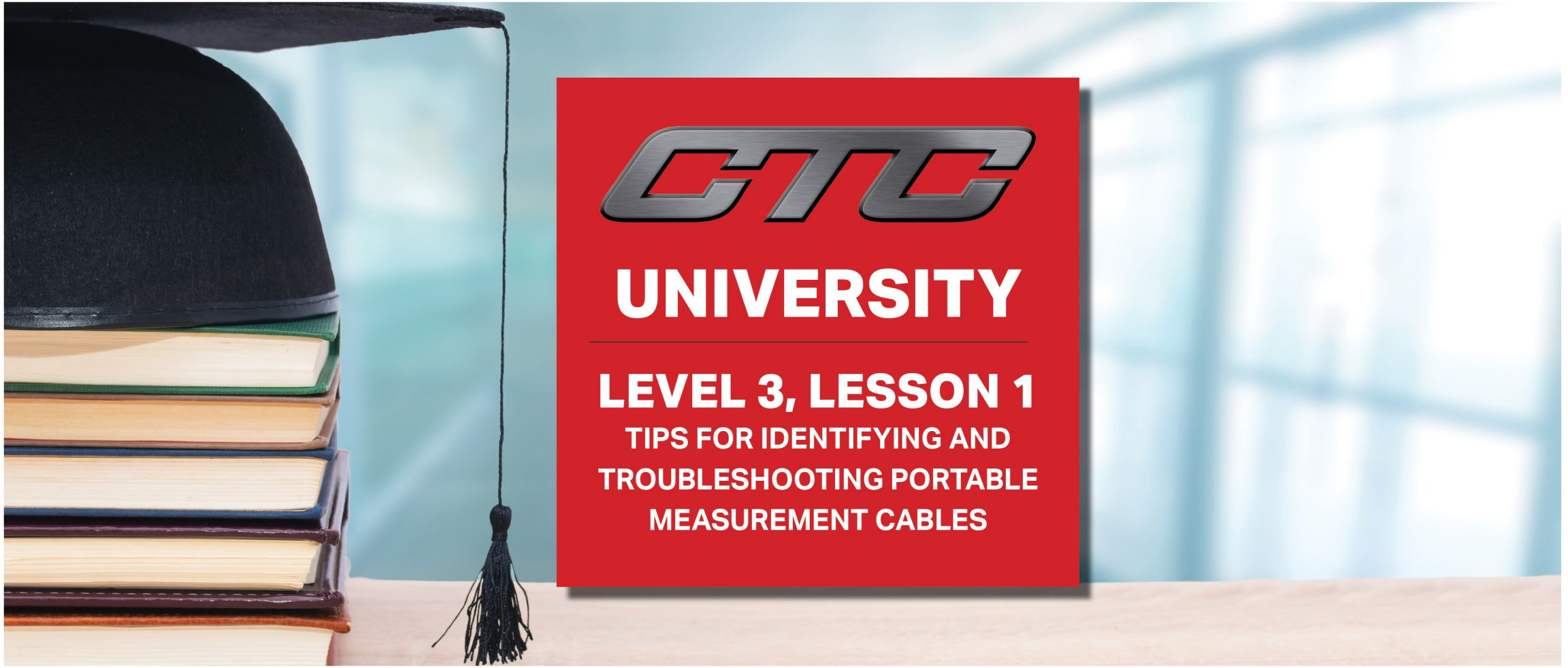


CTC UNIVERSITY

LEVEL 3, LESSON 1

TIPS FOR IDENTIFYING AND TROUBLESHOOTING PORTABLE MEASUREMENT CABLES

Introduction

Welcome to **Level 3, Lesson 1 – Tips For Identifying And Troubleshooting Portable Measurement Cables**, part of CTC's free online vibration analysis training series.

We hope you enjoyed and benefitted from the previous course and will continue to build your vibration analysis knowledge as you progress through Level 3.

Tips For Identifying And Troubleshooting Portable Measurement Cables is created and presented by CTC for complimentary educational use only. This training presentation may not be edited or used for any other purpose without express written consent from CTC.

Training Objectives

Upon completion of this lesson, you will:

1. *Understand what to look for and how to isolate the problem with vibration analysis cables*
2. *Understand how preventing problems with cables contributes to the prevention of other problems in the future*

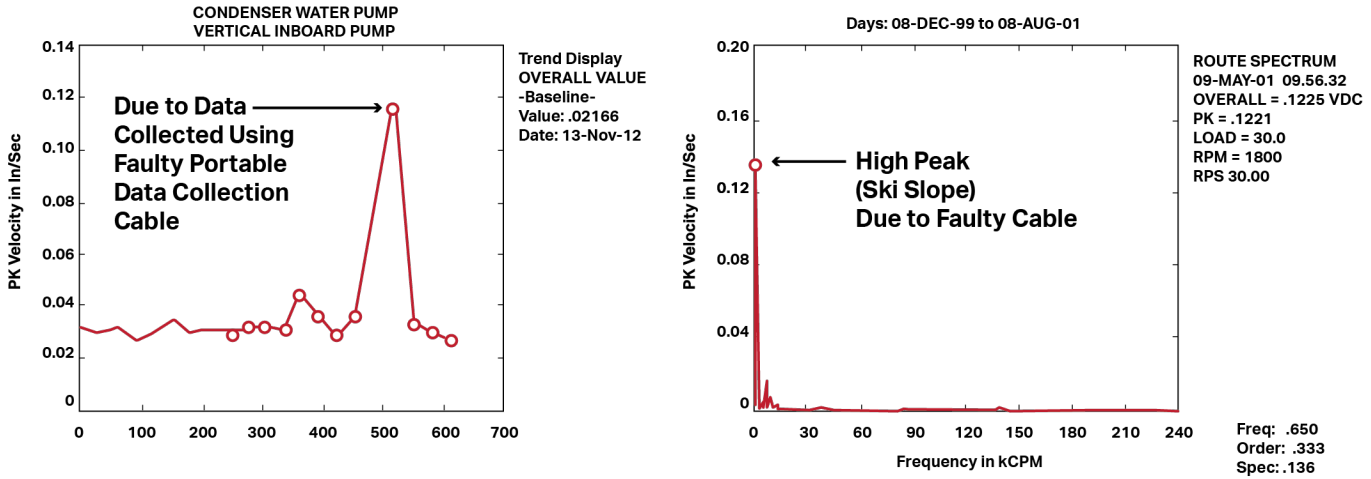
Hardware Problems

Typical issues with vibration analysis hardware include:

Collecting measurement points all day and downloading the information only to find that the data is unusable.

Downloading the data into a database and not being able to remove the measurement point because of a suspect reading (see diagram on right).

The system shows erroneous readings while collecting data with a cable and your spare cable is located miles away.

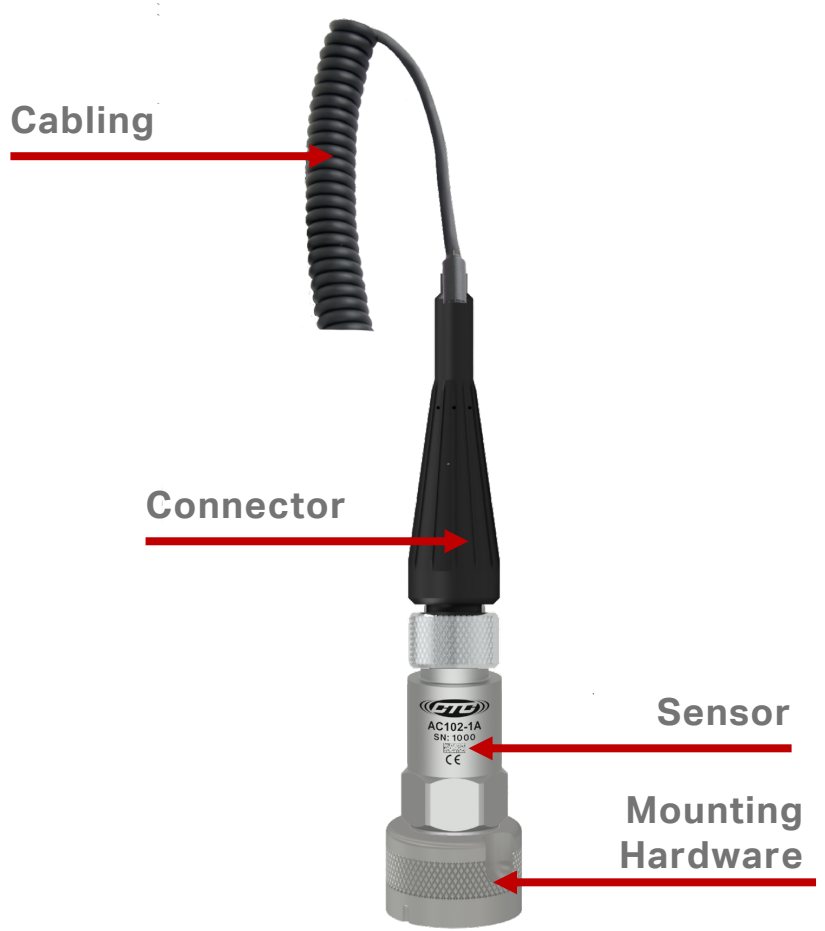


Portable Data Cables

The cabling provides a path for the accelerometer to output to the data collector.

It also creates a path for powering the accelerometer.

Connectors attach the cable from the accelerometer to the data collector or a junction box.



Troubleshooting Tips And Techniques

Identify the problem using fault ID / visual inspection of the cables. It is very important to understand what the problem is and to identify what exactly the fault is.

A few questions to consider:

What types of error(s) are being observed?

Are there any nicks, cuts, scratches, or burn marks anywhere on the cable?

Is there any corrosion on the connector sockets?

Troubleshooting Chart

Use the chart to determine a fault by matching the situation to what is being observed in the field:

Situation	Cause(s)	Corrective Actions	Notes / Remarks
Normal operation (baseline, reference)	N/A	N/A	Taken from an HP Feed Water Pump, 50 Hz
Sensor not present	Problem with electronics of accelerometer or cable not attached to sensor.	Check cable for continuity and ensure cable is attached to sensor. If yes, suspect sensor and contact the manufacturer.	Data collectors will not collect data if a sensor cannot be detected.
High peak reading / ski slope	Cut/burnt outer jacket of cable. Loose internal solder joint in connector. Broken / damaged insert of accelerometer connector.	If it is a loose connector or broken insert, replacing the damaged end may be the only corrective action needed. For damaged cable, the entire cable must be replaced.	Ski slope can vary in degree. Note: other possible causes could be accelerometer shock / overload if a magnet mount was used, and not enough time was allowed for sensor to stabilize.

Troubleshooting Chart

Situation	Cause(s)	Corrective Actions	Notes / Remarks
Flat frequency response	Flat frequency response is due to the extreme scaling of the data due to the ski slope effect. Same cause as high peak reading / ski slope apply here.	If it is a loose connector or broken insert, replacing the damaged end may be the only corrective action needed. For damaged cable, the entire cable must be replaced.	Due to the resolution of the graph due to the high ski slope, it looks like there is no higher frequency influences – they are still there, they just can't be resolved due to the auto-ranging of the data collector.
High overall readings	The high overall readings can be attributed to a damaged or loose connector or damaged cable.	If it is a loose connector or broken insert, replacing the damaged end may be the only corrective action needed. For damaged cable, the entire cable must be replaced.	See notes section from high peak reading / ski slope, and/or flat frequency response, if applicable.
Fluctuation observed in overall readings	Damaged or loose connector or damaged cable.	Repair or replace connector(s) or entire cable assembly.	Indication of cable problem, of which time waveform or spectrum data would indicate if not caught prior to storing data.

Troubleshooting Chart

Situation	Cause(s)	Corrective Actions	Notes / Remarks
High single-point trend observed during trend analysis	Faulty cable (damaged connector insert) caused false high vibration reading that was still under the set alarm limits of the analyst.	If you suspect a problem, re-take the measurement point, or observe for any increase in vibration amplitude by using the real-time function of the data collector, if available. If you are still experiencing a problem, or if it is at a higher rate, repair or replace the cable.	Because it was under the set alarm limits, the analyst was not alerted that it could have been a problem, so the data was stored. Upon the following reading (after the cable has been replaced), the data went back to normal.

Further Explanation Of Causes

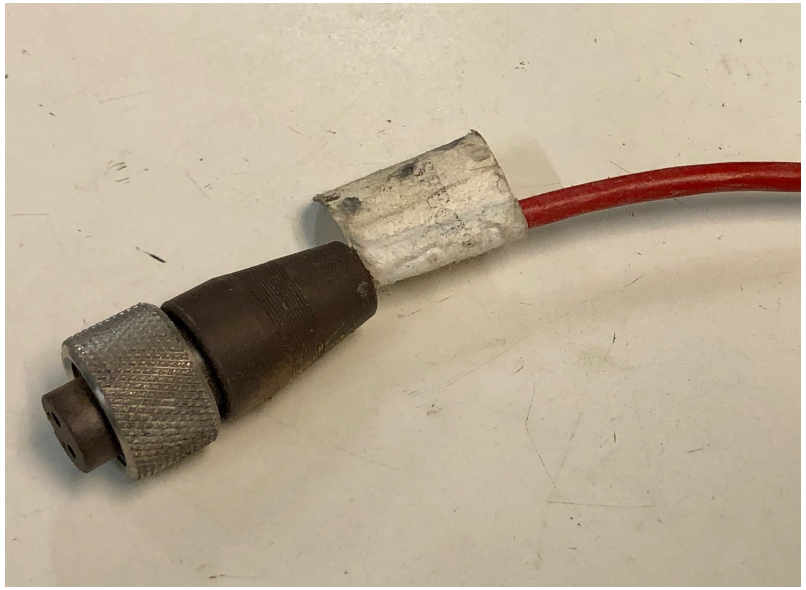
Connector problems:

Broken Connector Insert

This is very common for two socket connectors using a hard plastic isolation insert. Constant handling of cables and sensors weakens the inserts, leading to cracks or inserts completely falling out. Once the insert is damaged or gone, interference can show on either of the pins from the accelerometer, causing very high overall readings and suspect data.

Looseness of Solder Joints

This is harder to pinpoint. The indicator is generally the presence of erratic or intermittent readings while moving the cable or wire. Since the solder joints for some connectors are potted with adhesive, the solder joint cannot be observed or reviewed without destroying the connector.



Further Explanation Of Causes

Damaged cable:

Cut or Burnt Cables

This causes the shielding of the cable to become exposed and could cut or burn one of the twisted-shielded pair of wires inside the cable. This in turn causes contamination of the signal, which can cause fluctuations of the signal observed by the data collector. These fluctuations commonly create the ski-slope effect seen in spectrums.

Extending Cable Life – Tips on Preparing For Cable Faults

Have Spare Cables On Hand

- Ensure you have spare cabling on hand to switch out faulty or failing cables and for troubleshooting purposes

Maintenance / Inspection Of Cable And Connectors

- Keep cable assemblies free of dirt, oil, grease, or other contaminant build up
- Clean out connector contacts and ensure contacts / pins are not showing signs of corrosion
- Ensure cables are not cut, nicked, or burnt
- Ensure elongation of coiled cables is kept to a minimum

Extending Cable Life – Tips on Preparing For Cable Faults

Care During Use

- Ensure cables are not placed on or near hot surfaces, such as steam pipes or hot equipment with surface temperature >250 °F (or the temperature rating of the cable)
- Note: if data will be collected around hot equipment, contact your supplier for a special high temperature cable assembly

Cable Manufacturer Warranty

- Choose a cable manufacture that has high quality cables that are built for extended life and that have a lifetime warranty, like CTC

Extending Cable Life – Tips on Preparing For Cable Faults

Proactive Connector Development

- Proper strain relief and connector reinforcements are very important to the extension of the cable life. Custom strain reliefs for connectors are available that relieve the stresses on the solder joints of the connector and the cable. Filling the rear cavity of a connector with an adhesive helps structurally reinforce the connectors, preventing exposure to the environment and potential damage.

- Material changes are also important to consider – to help alleviate problems with broken socket inserts, a soft neoprene isolation material (insert) can be used instead of the hard plastic isolation material that cracks and breaks easily

Conclusion

The condition of your cabling has a direct impact on the quality of data collected. Many false alarms and/or time spent trying to track down a machine fault that really isn't there can be avoided if you know what to look for when observing data that seems unusual. A good first step is to isolate the problem and start looking at possible causes and solutions.

Typical Observed Data

- High overall vibrations for measurement
- Significant changes in recorded vibration
- Ski sloping of data in the spectrum at points < 1 Hz (60 CPM) and/or intermittent signals as indicated by the data collector

Typical Causes

- Damaged cable (burnt or cut)
- Damaged connector (socket isolation material/insert)
- Looseness of solder joints

Typical Solutions

- Repair cable
- Replace cable

Why Choose CTC?

- Superior durability
- Accuracy and performance
- Industry's best lead times
- Knowledgeable staff
- Industry leading warranties

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