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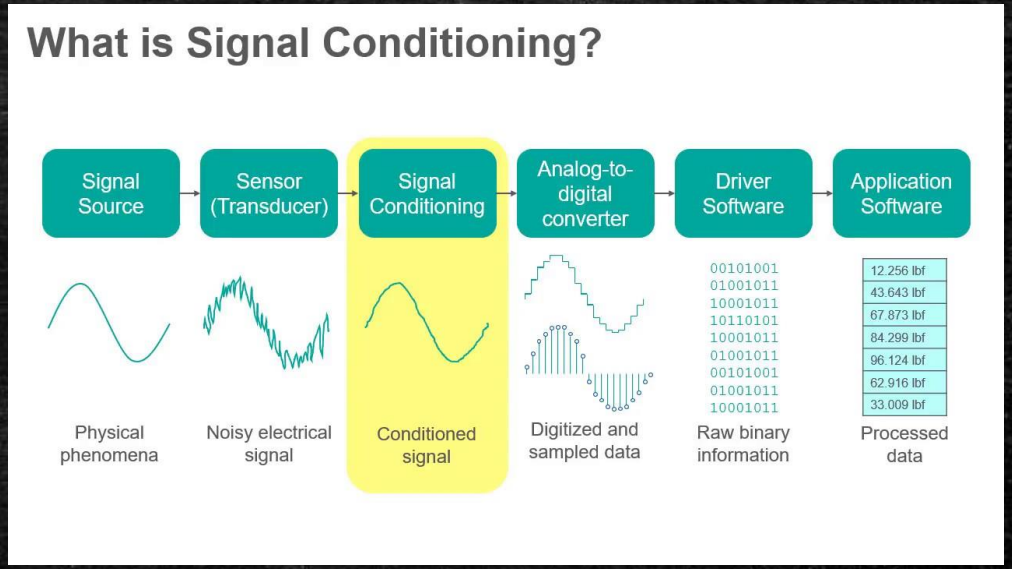
Signal conditional circuit

Signal conditional circuit

- Signal conditioning is a process of data acquisition, and an instrument called a signal conditioner is used to perform this process.
- This instrument converts one type of electrical or mechanical signal (input-signal) into another (output-signal).
- The purpose is to amplify and convert this signal into an easy to read and compatible form for data-acquisition or machine-control.
- A signal conditioner helps to provide precise measurements, which are essential for accurate data acquisition and machine-control.
- These instruments can perform an additional number of different functions.

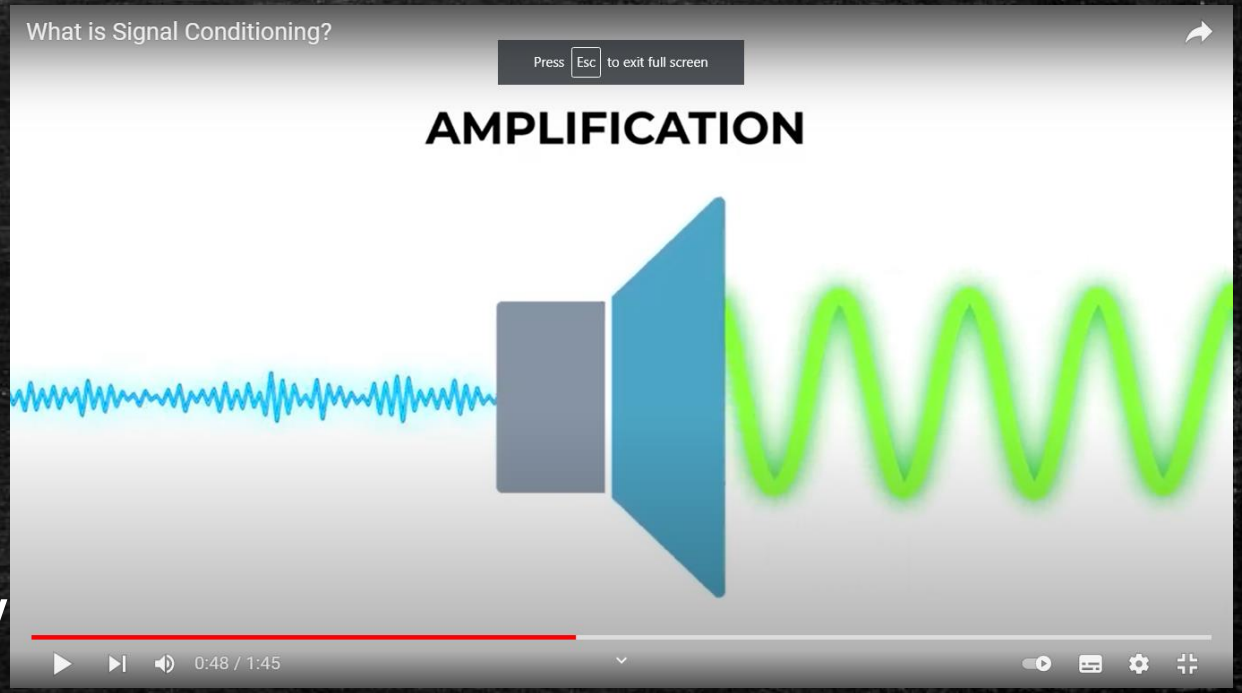
Functions of a Signal Conditioner

- **Amplification**
- **Isolation**
- **Linearization**
- **Filtering**
- **Excitation**
- **Cold-Junction Compensation**



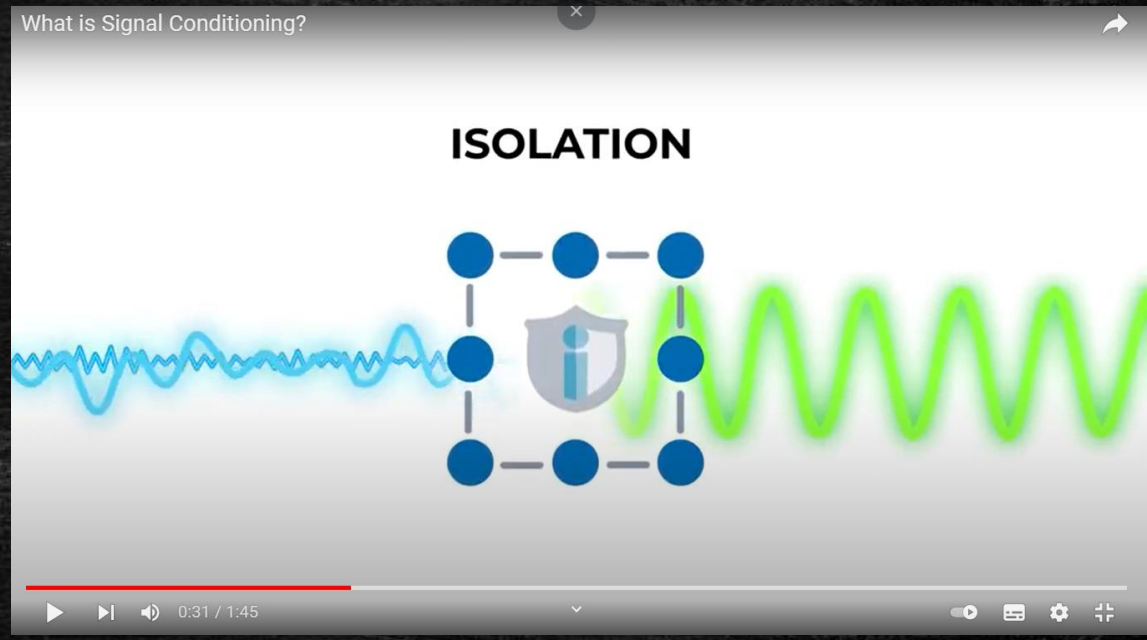
Amplification

- Amplification is when the overall magnitude of a signal is increased – thus increasing the measurement resolution as well as the sensitivity of the signal.
- Strategically placed external signal conditioners can magnify the voltage level before it can be affected by environmental noise.
- Converting a 0-10mV signal to a 0-10V signal is an example of amplification.
- Thermocouples and strain gauges are sensors that typically require amplification.



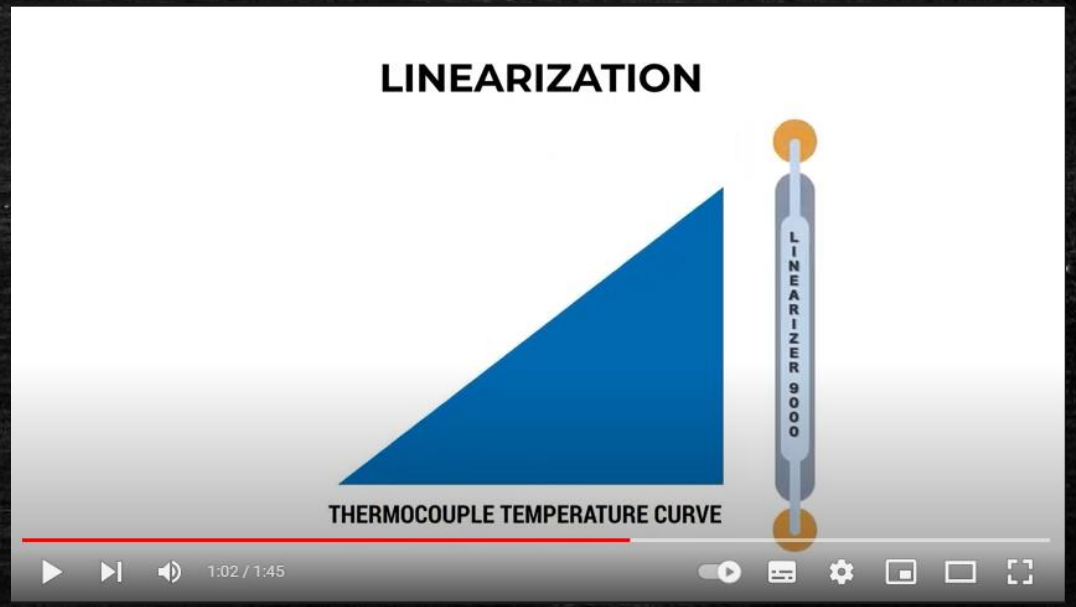
Isolation

- Input signals outside the range of a digitizer can cause serious damage to sensitive equipment. Isolation breaks the galvanic path between the input and output signal. By breaking the galvanic path, unwanted signals on the input line are prevented from passing through to the output.
- The input is normally transferred to the output by converting it to an optical or magnetic signal then it is reconstructed on the output.
- Isolation is also used to prevent ground loops. If a sensor is on a different ground plane from the measurement sensor, such as a thermocouple mounted on an engine, isolation may also be needed.



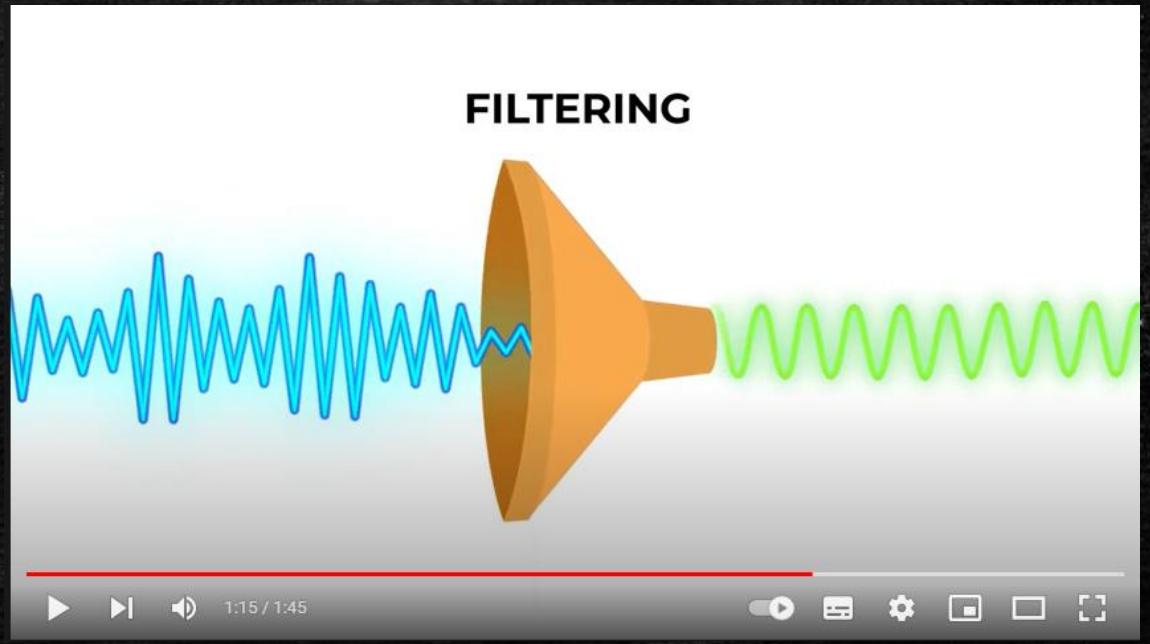
Linearization

- Linearization is the action of converting a non-linear input signal to a linear output signal – and is necessary when sensors produce signals that are not linearly related to the physical measurement.
- A thermocouple is an example of a sensor that requires linearization



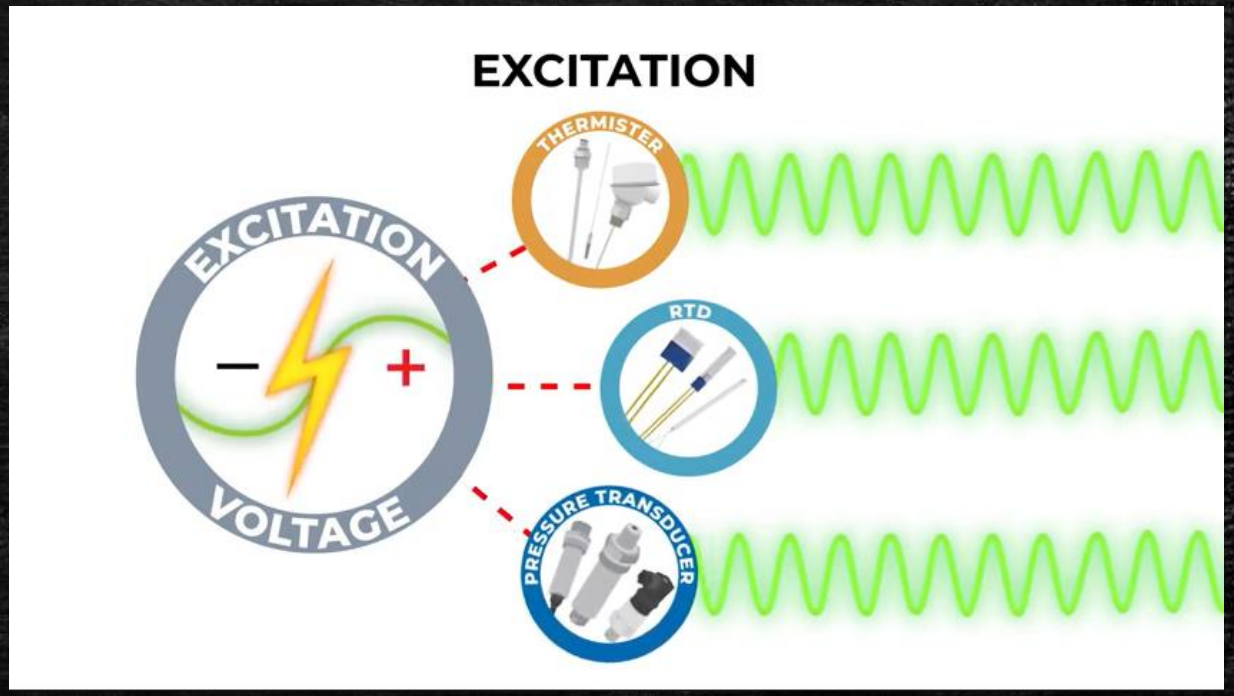
Filtering

Not all of the signal frequency spectrum contains valid data. In fact, some frequencies – like those found in a 50-60 Hz AC power lines – can cause unwanted noise in the signal. This is where filtering is used to eliminate those unwanted frequencies for a clean and consistent signal.



Excitation

- Excitation voltage is required for the operation of an active sensor such as a thermistor, an RTD, or a pressure sensor.
- The stability and accuracy of the excitation signal directly affects the stability and accuracy of the sensor.



Cold-Junction compensation[CJC]

- Cold-junction Compensation (CJC) is used for thermocouples – and is required to ensure accurate measurements.
- CJC adjusts the thermocouple signal for fluctuations in room temperature and improves measurement accuracy.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