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# Using Ferrite Cores to Suppress Electromagnetic Interference

## For Digital Weight Indicators

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### What is a ferrite core?

Ferrite cores, sometimes called ferrite suppressors, are used to suppress electromagnetic interference (EMI) high frequency noise levels in electronic signals created by electromagnetic devices. Ferrite cores are an important tool for protecting equipment in environments where electromagnetic interference can be a problem. The ferrite core accomplishes this by collecting the energy and converting it to heat in order to dissipate it. Ferrite cores are among the most inexpensive means to reduce EMI in an environment involving pre-existing electronic cabling.

The electromagnetic properties of ferrite materials can be affected by operating conditions such as field strength, frequency and time.

Ferrite components are used to attenuate EMI and can be extremely effective if used correctly and are used in the following situations:

- Blocking of EMI from effects of strong conducted interference originating from radio transmitters and other sources
- Blocking of EMI originating from digital electronics emissions (conducted emissions)

The best way to minimize the EMI noise when installing an instrument is to follow the manufacturer's recommendations. Most weight indicators have been designed and tested to comply with rigorous emissions and immunity standards. To comply with those standards, some indicators will require shielded cables grounded at the connector, some may ground to the enclosure, and some may require ferrite cores installed on the cables.

### How do I select a ferrite core?

There are several factors to take into account when choosing ferrite cores.

- Impedance (measure of opposition to flow of current) at the required frequency up to 500 MHz.
- Core size, material composition and dimensions.
- Wire wrap for inside diameter, x1, x2, x3 etc. Each winding increases the impedance.
- Location of core in accordance with the issue that is being addressed.
- Common-Mode or Differential-Mode. See "How to Choose Ferrite Components for EMI Suppression" page 130 - 132 at Fair-Rite Corporation <http://www.fair-rite.com/newfair/pdf/CUP%20Paper.pdf><sup>1</sup>.

The material data sheets from Fair-Rite Corporation (<http://www.fair-rite.com/newfair/materials.htm><sup>1</sup>) can also help with a ballpark approach. The following table shows an impedance example range.

Impedance ( Z )			
Frequency	25 MHz	100 MHz	300 MHz
Nominal (REF)	150 ohms	280 ohms	400 ohms
Minimum	-	224 ohms	-

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## How do I install a ferrite core?

To reduce susceptibility to radiated electromagnetic fields, RLWS recommends using the Common-Mode approach. For most applications, install a ferrite inside the indicator enclosure for both load cell and serial cables.

*Note: The procedure on the next page uses RLWS Part Number 66730 Cylindrical EMI Suppression Ferrite Core (280 Ohm impedance and 100 MHz frequency).*

Once you have disconnected the power and removed the backplate to the enclosure body, use the following procedure to install the ferrite core.

1. Strip cable insulation and shielding per cable grounding instructions. Ensure there are sufficient cable lengths to loop once around the ferrite, before reaching the cable connectors inside of the indicator (shown in Figure 2). Tighten grounding clamp nuts.

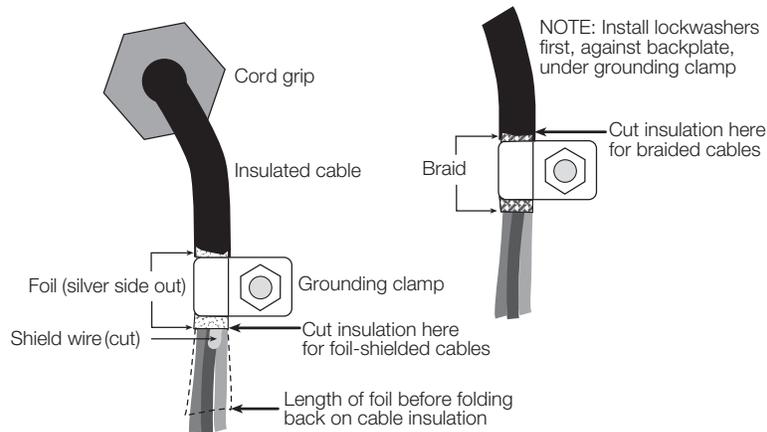


Figure 1. Grounding Clamp Attachments

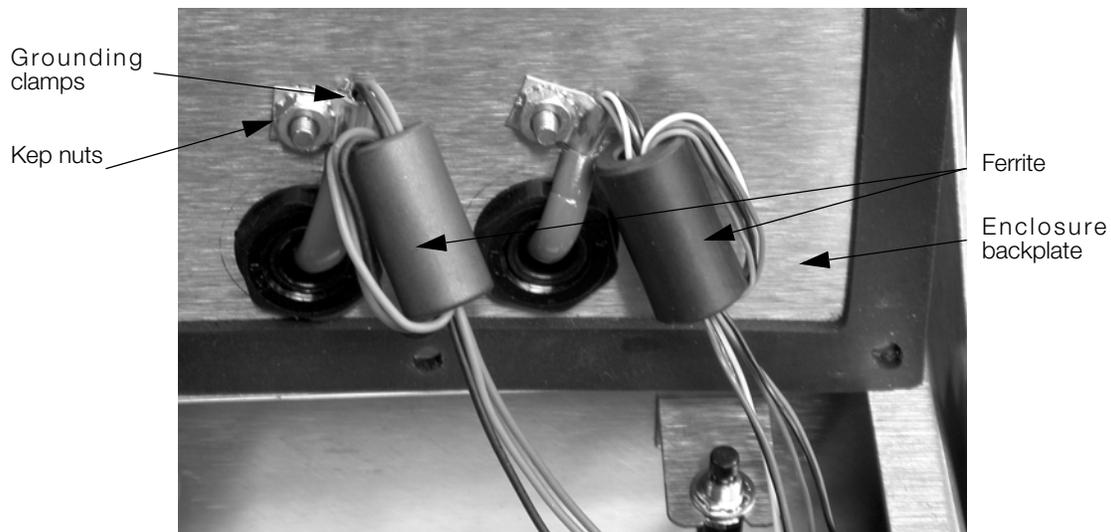


Figure 2. Loop Diagram of Ferrite

2. Loop wires once around the ferrite (see Figure 2). This should be done as close to the enclosure entry as possible. Finish installation using cable mounts and ties to secure cables inside of indicator enclosure.
3. Once cabling is complete, position the applicable backplate over the enclosure and reinstall the backplate screws.

*Please contact Rice Lake Weighing Systems for proper ferrite core recommendations with our products.*