



Happy New Year to everyone and welcome to Tech-Aware 8: NER Monitoring Systems and Fault Finding.

Two scenarios have been highlighted over the last couple of months regarding NER systems and monitoring of these systems using Startco SE-330AU / SE-330 NER monitors. An important point to note in both these cases, is the Littelfuse NER monitors were performing the protection function exactly as they were designed to do!

To assist in ensuring your NER system is installed, calibrated and have a fully functional system from commissioning onwards, we have outlined some clear points below to ensure safe and correct operation:

- 1) After the NER has been located and installed, **perform a nut and bolt check over ALL NER connections both from the field wiring, the NER monitoring system AND with the NER itself**. NER connections can work loose during transport from the manufacturer and during installation. A simple 10 minute nut and bolt check over all connections will ensure a stable NER resistance and monitoring circuit for the NER monitor. A loose connection will cause the NER monitor to register a changing resistance. As this resistance exceeds the calibrated value, the monitor will TRIP, disconnecting the supply.
- 2) Ensure the Neutral connection to the transformer **AND** the NER monitoring circuit connection to the star point are connected such that disconnecting the Neutral from the transformer for maintenance **WILL** also disconnect the monitoring circuit of the NER monitor. Hence, a connection arrangement is preferred such that the sensing circuit is open circuited when the neutral is disconnected **OR** the procedure for disconnecting the supply neutral **INCLUDES** disconnection of the NER sensing circuit. This will prevent the transformer being Turned ON with the neutral **disconnected**. In the event that the neutral is **NOT** reconnected and the sensing circuit and neutral are **STILL TIED TOGETHER** at the same point, the NER monitor will **NOT** register the open circuit neutral from the transformer. **If the sensing circuit and the neutral are both open circuit, the NER monitor will trip in 12 seconds of closing the circuit breaker to re-apply power.**
- 3) In a similar fashion, whilst the SE-330xx NER monitoring manual does provide an alternative connection for the sensing circuit at the top of the NER, this connection point will **NOT** register an open circuit Neutral at the transformer. The preferred connection for monitoring circuit is at the transformer as in 2) above. This is not always possible due to cable lengths and physical location of the transformer and NER / sensing resistor, hence the alternative connection point for the sensing circuit at the top of the NER. (SE-330AU manual, Figure 3, Page 6, Note: 3)
- 4) Ensure the sensing circuit cable is rated for system voltage and clearances. During an earth fault / leakage, the star point and star point connection to the NER **AND** the NER Sensing Circuit will rise to phase voltage / $\sqrt{3}$. I.e.: On a 3.3kV system the star point / neutral and NER can be subject to $3300/1.732 = 1905$ V, hence the cabling to the sensing resistor (Terminal N) should be rated accordingly. (SE-330AU manual, Figure 3, Page 6). Note: the Sensing resistor to Neutral connection is **NOT** a neutral conductor. As current



through the sensing circuit to neutral is always less than 250mA, a 1.5 mm² cable insulated to system voltage is more than adequate.

- 5) Utilise an appropriate earth leakage CT for the NER monitor. The SE-330xx NER monitors use an earth leakage CT and provide earth leakage protection for the system, detected through the neutral. In the case of the SE-330AU, this unit is AS2081-2002 compliant. Hence, a CT located in the neutral can be set to low level earth leakage protection levels and co-ordinated with other system devices.
- 6) The SE-330xx utilises both the NER sensing circuit resistance measurement **AND** the NER earth leakage to calculate the NER Vn (Voltage at the neutral) value of voltage. Hence all three forms of protection are in operation when an earth leakage CT is included.
- 7) When the NER system is fully installed and ready for operation, perform a “Calibration” of the system as per the manual. (SE-330AU: Revision: 3A, Section 2.2: Calibration)
- 8) Follow instructions as detailed in the SE-330xx manual:
 - a. SE-330AU: Revision: 3A, Section 3, Page 5: Installation
 - b. SE-330AU: Revision: 3A, Figure 3, Page 6: Connection Diagram
 - c. SE-330AU: Revision: 3A, Section 5: Troubleshooting
 - d. SE-330AU: Revision: 3A, Section 9: **Test Procedures.**
- 9) As a system check before applying power to the system: supply control power to the SE-330xx. Disconnect the star point – at the star point – which “should” also open circuit the sensing circuit (as per 2) above). Ensure the SE-330xx Trips in 12 seconds.

Section 9: Test Procedures for the SE-330xx include:

- a) Calibration Tests
- b) ‘Vn’ Voltage Test
- c) Sensing Resistor Test
- d) Analogue output Test and.....
- e) Earth Leakage performance Test

Littelfuse (Startco) achieve maximum performance and protection operations of these relays, as with ALL Littelfuse Startco relays, by setting the highest quality and manufacturing standards in their products. This includes:

- Conformal coating of PCB’s in the relays
- Heat soaking of EVERY relay at 60°C for 72 hours
- ALL products carry a **5 Year Warranty**
- ALL Motor Protection and Feeder Protection relays carry a **10 year warranty**

Hence, the risk of relay or product failures in the first instance are extremely minimal.



We have not included the either SE-330 or SE-330xx manual as an attachment to save upload / download speed. If you would like a copy of the manual, please reply with your details as an email attachment will be forwarded to you separately.

We hope you have found this information of value to your company. Please do not hesitate to contact Startco Pty Ltd should you have any questions regarding NER Monitoring on IT systems or any other issue relating to protection relays, installation or site complications.

Thank you