FLUKE®

Field checking loop-powered isolators using the Fluke 787 ProcessMeter™

Application Note

The loop-powered isolator is one of the most prevalent devices in use in 4–20 mA control loops today. Another high-usage loop isolating device is the two-wire isolating transmitter. The testing and troubleshooting procedures for the loop-powered isolator and the two-wire isolating transmitter are different between devices and need to be understood by persons performing operational checks on these units in the field.

Loop-powered isolators vs. two-wire isolating transmitters

Loop-powered isolators

The main purpose of a loop isolator is to eliminate potential or existing ground loops in control systems while repeating the control signal current to another part of the system. Loop-powered isolators, unlike their close relative the two-wire transmitter, derive their operating power from the "input" side of the isolator (see Figure 1). The "input" side of the loop provides operating power for the loop isolator which requires a "pickup voltage" from 5.5 V to 13.5 V depending on the manufacturer.

The output of the loop isolator is a galvanically isolated mirror image of the input side current. The compliance voltage associated with the output is greatly reduced from that of the input side and ranges around 7.5 V. This produces a total loop loading capability of 350 Ω. This limited loop drive capability is the primary limitation of the loop isolator.

Two-wire transmitters

Isolating two-wire transmitters provide the same isolating functionality as loop isolators with the added advantage that many provide signal conditioning for a variety of inputs such as thermocouple, frequency, dc current, RTD, strain gage, and other process inputs. The power supplied to a two-wire transmitter is connected to the output side of the transmitter. The two-wire transmitter modulates the current from the power supply between 4–20 mA, proportional to the input. Typical power supplies for two-wire transmitters range from 24 V to 96 V. Power supplies of this size allow a significant loop load capability on the output.

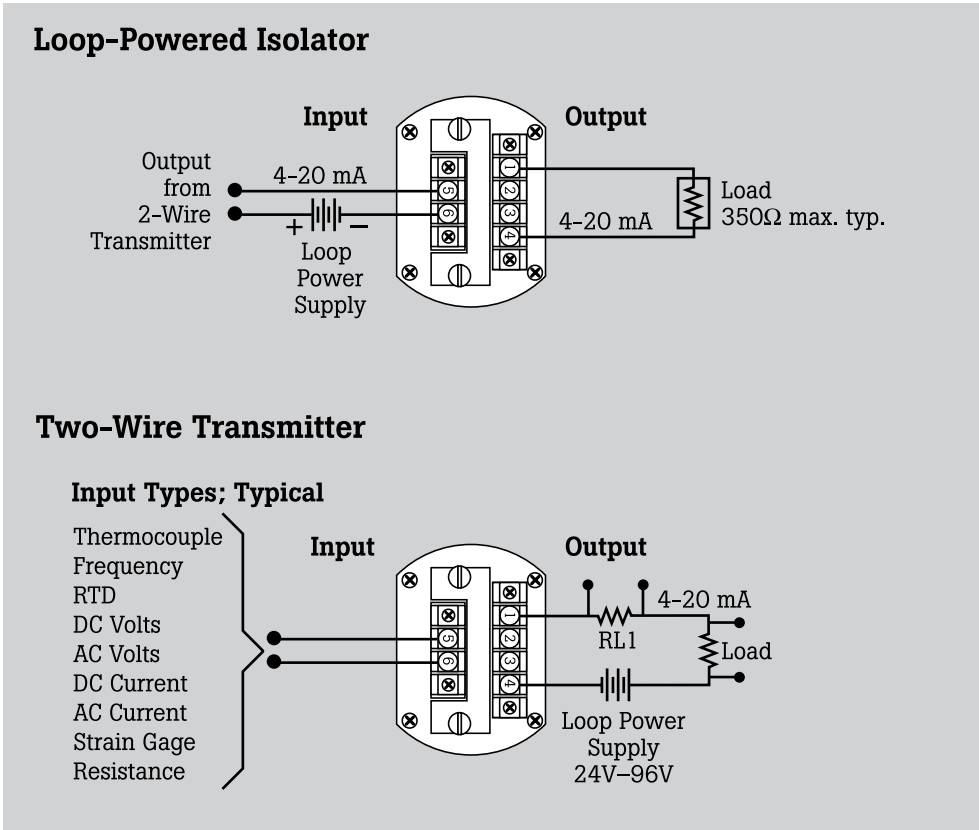

Figure 1.

Field checking a loop-powered isolator

The Fluke 787 ProcessMeter has a unique current simulate feature that, when connected to an external power source, will allow you to precisely control current between 0 mA and 24 mA.

When field checking a loop-powered isolator, the two-wire loop transmitter supplying signal current to the isolator for the loop may be removed and the Fluke 787 connected in simulate mode to control loop current (Figure 2).

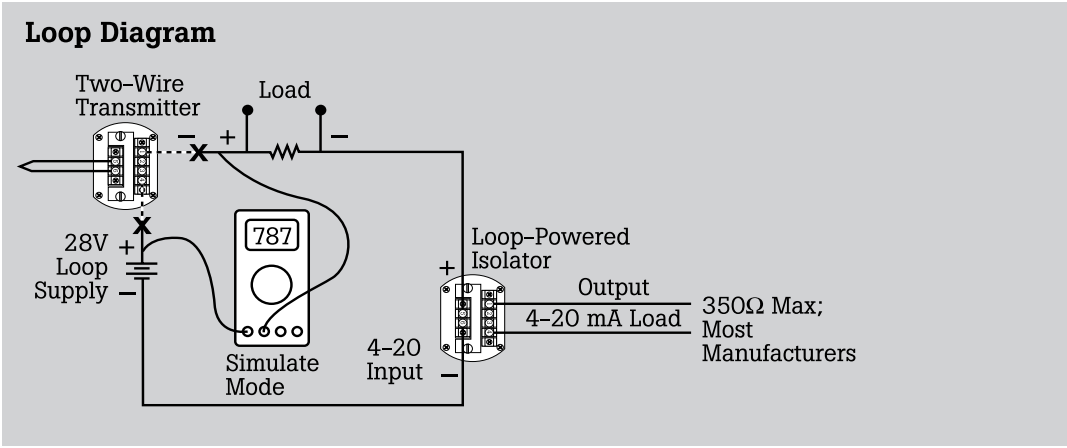

Figure 2.

Connecting the Fluke 787

1. Disconnect the main loop transmitter and connect the Fluke 787 to the loop with the test leads plugged into the "Simulate" terminals of the 787 (see Figure 2).
2. Set the Fluke 787 to the Output mode. OUTPUT mA
   The Fluke 787 will toggle the default startup mode from 0–20 mA to 4–20 mA by holding the RANGE switch down for 2 seconds while turning the 787 on. To determine which mode you are in after turning on the 787, short the test leads together. The zero current level, either 0 or 4 mA, will display on the readout.
   The 787 is now outputting a precise 4 mA and is providing operating power to the input of the loop-powered isolator.
3. Place a Fluke 87, set in the mA measurement mode, in the output side of the isolator to monitor output current (see Figure 2).
4. Adjust the Zero control for a reading of 4.00 mA on the output meter.
5. Step the input current to 20 mA using the MIN MAX button and adjust the span control to read 20 mA on the output meter connected to the isolator.
6. Step input current down to 4 mA using the button and check for a zero shift, adjust if nesessary
7. At this point basic zero and span adjustments are complete.

Check linearity

The Fluke 787 can easily be used to check linearity of your loop Isolator using the % step buttons MIN MAX . Pushing these buttons when in the output mode increases or decreases the output current in 25 % steps. In the 4–20 mA current mode these intermediate steps are at 8 mA (25 %), 12 mA (50 %), and 16 mA (75 %).

To check linearity of the isolator, push the associated % step buttons up and down and confirm that the DMM connected to the output of the isolator is reading the same value as is shown on the Fluke 787 display. A variation from expected values should be compared to the linearity limits stated by the manufacturer of the loop-powered isolator.

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