



November 22, 2010

JF-1A FUEL CONDUCTIVITY SENSOR
Technical Application Note 10-006

**Power/Ground Requirements for JF-1A, when 4-20 mA
and Serial Data Ports are used simultaneously**

Background

In some applications of the JF-1A both the current ports and serial data ports are used. In these applications the user must take care to ensure that input voltage ratings are not exceeded and that power supplies do not create multiple ground paths through the instrument. These issues can either result in improper readings from the sensor, or result in damage to the sensor output electronics.

JF-1A has 3 Distinct Outputs

Conductivity: is output as a 4-20 mA signal. This 2-Wire port is also used to supply power to the instrument when used alone. The current that flows in the loop is proportional to the conductivity read by the meter.

Temperature: is output as a 4-20 mA signal. This 2-Wire port does not power the instrument, so it cannot be used alone. The current that flows in the loop is proportional to the temperature read by the meter. (The loop needs its own external power supply).

Serial data: This 4-Wire port allows the connection of a RS-232 equipped computer to access both the conductivity and temperature data from the instruments serial port. As this is a four wire port. Power to run the instrument can also be applied via this port to operate the instrument. The power input is OR'ed with the conductivity current output port listed above.

General Power Requirements

Power input to the JF-1A is required in order for the instrument to operate properly. If multiple output data sources from the JF-1A are to be used then the sensor needs multiple power inputs. In all cases, it is very important that power inputs are wired correctly to the JF-1A; harm can come to the sensor due to improper power levels or



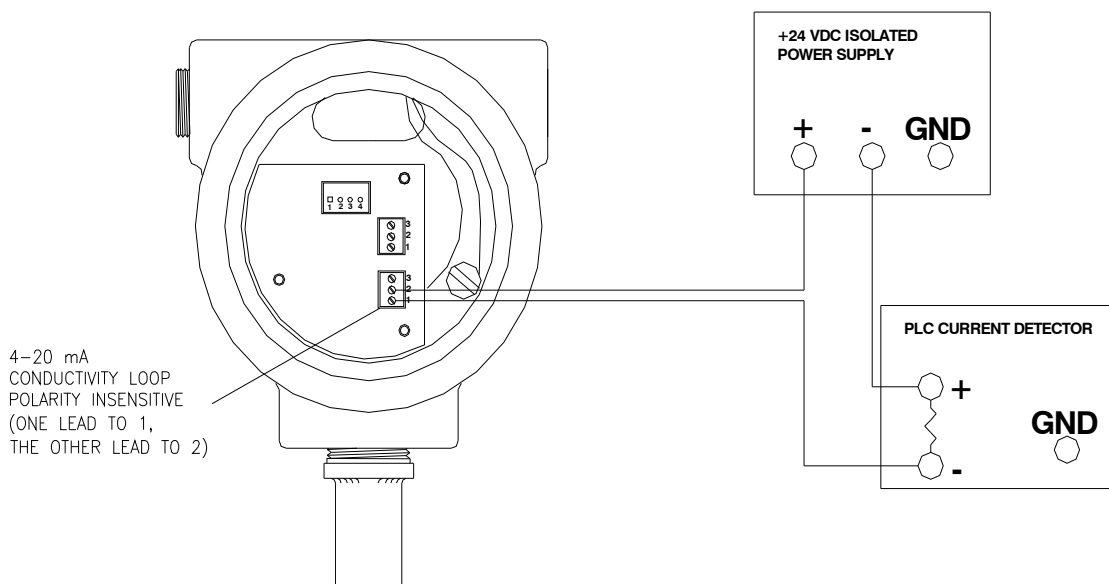
connection of multiple grounds that may be at different voltages.

Definition: Power isolation. Power is isolated when it is fully floating with respect to ground and/or other power sources. I.E. if two isolated power supplies are in use, you cannot measure the voltage of one with the return lead of the voltage measuring device attached to the other.

All power sources used with the JF-1A should be isolated both from ground, but, also from each other. Be cautious of common grounds (tie points) in PLC analog input channels; consult your PLC user's manual.

Example 1 JF-1A Conductivity Current Device Loop:

This is the standard configuration, a 24 VDC isolated power supply supplies loop power and a 250 ohm sense resistor is used to sense the conductivity current in the loop (convert the current to a voltage in the PLC). The JF-1A derives its power for its operation from the loop current supply. **Note:** both the supply and loop current detector are normally isolated from ground .



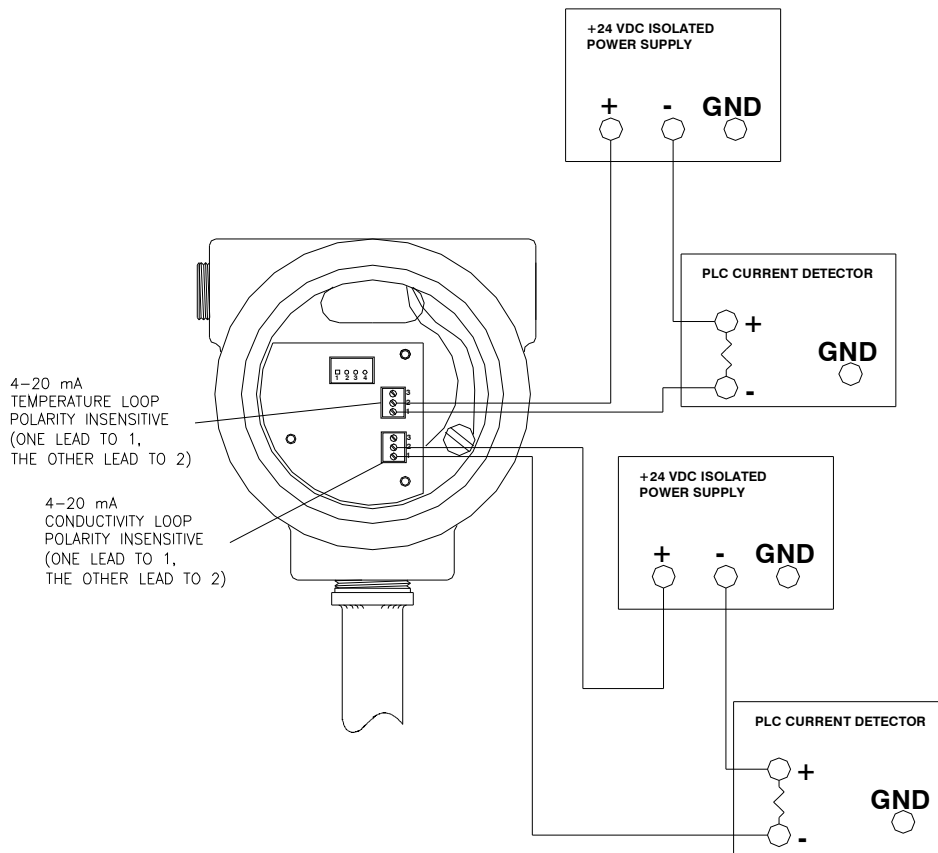


Example 2

JF-1A Conductivity Current Device Loop, with a secondary Temperature Current Loop:

As in example 1 a 24 VDC isolated power supply supplies loop power and a 250 ohm sense resistor is used to sense the current in the conductivity loop (convert the current to a voltage in the PLC). As in example 1 the JF-1A derives its power for its operation from the loop current supply. Note both the supply and loop current detector are normally isolated from ground.

A second fully isolated 24 VDC supply is needed for the temperature current loop. This is required as the conductivity loop which powers the JF-1A has established a "virtual" common voltage point. If the user is to establish another connection between the two loops then the virtual loop ground is corrupted and neither loop current will be correctly set by the JF-1A, and, under extreme circumstances may result in damage to the JF-1A current output devices. A common method to avoid this problem is to install a 4 - 20 mA to 4 - 20 mA isolator in the Temperature loop (Example http://www.api-usa.com/pdf/api/api_lpi-1_lpi-2.pdf).



Example 3

JF-1A Conductivity Current Device Loop, with a secondary Temperature Current loop, and a connection for a serial data link:

As in example 1, a 24 VDC isolated power supply supplies loop power and a 250 ohm sense resistor is used to sense the current in the conductivity loop (convert the current to a voltage in the PLC). As in example 1 the JF-1A derives its power for its operation from the loop current supply. Note both the supply and loop current detector are normally isolated from ground.

As in example 2, a second fully isolated 24 VDC supply is needed for the temperature current loop. This is required as the conductivity current loop has established a "virtual" common voltage point. If the user is to establish another connection between the two loops then the virtual loop connection is corrupted and neither loop current will be correctly set by the JF-1A, and, under extreme circumstances may result in damage to the JF-1A current output devices.



Finally a third connection is made through an RS-232 isolator to allow connection to the RS-232 data port. The isolator again prevents the data ground from interfering with the virtual ground needed by the two current loops operating at the same time.

Note: the power is not needed to be applied to the power pin on the 4 wire connector as power for the instrument operation is already provided via the Conductivity Current Loop.

