

Connecting your own Power Supply to a Bartington Magnetic Field Sensor

Instrumentation

Bartington Instruments, single or three-axis fluxgate magnetic field sensor.

Objectives

Successfully power the magnetic sensor with your own power supply and measure the output correctly, taking into account any excitation breakthrough that might be present.

Background

There are a wide range of power supply units/data acquisition units supplied by Bartington Instruments that can be used to power most of the magnetic sensors that are available, however some users may find it desirable to use their own power supply. This may be either for ease of use, to lower cost, or to integrate the magnetometer into a larger system. By considering the several factors pointed out in this application note, users will be able to successfully remove any spurious noise that is present in their own power solution.

Please note that adequate performance of the sensors cannot be guaranteed if used with products not supplied by Bartington Instruments.

Powering the Sensors

The power supply should provide a voltage output corresponding to the value specified in the individual product data sheet. For example when using the Mag-03 this is $\pm 12\text{V}$. Asymmetric supplies may be used provided that the minimum and maximum voltages are not exceeded for either polarity. Be aware that if the voltage supplied is lower than the specified voltage then the full scale of the

magnetometer will be reduced, although it will maintain a linear response.

In the case of low noise sensors, the lowest noise level can only be achieved if using a power supply with a ripple of a few mV or less.

Current requirements for each magnetometer will vary and users should refer to the individual product datasheets for information on current consumption. There is an additional current drawn in proportion to the measured field, this is drawn from the positive or negative supply depending on the direction of the field.

Bartington Instruments sensors are designed with low impedance outputs so they can be operated over long cables when interfaced with high impedance data acquisition systems. See individual product datasheets for specific impedance values.

Excitation Breakthrough

As part of the normal operation of fluxgate sensors, an excitation signal is applied to the fluxgate cores. Some of this signal will be detected by the sensor pick-up coil, and so will also appear on the output of the sensor. This is referred to as the 'Excitation Breakthrough' in the sensor data sheets. The frequency of this breakthrough is inherent to each sensor and needs to be removed from the output signal.

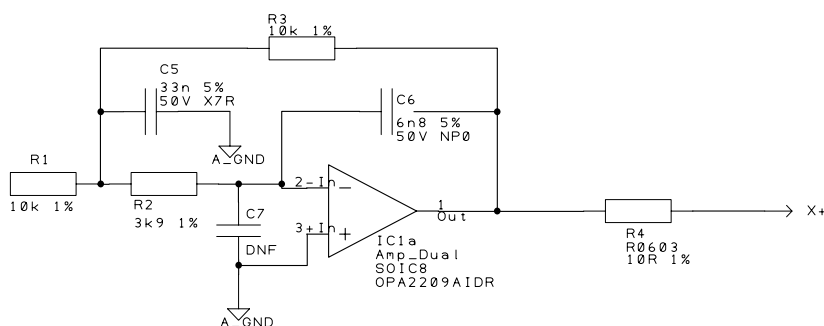
Bartington Instruments power supplies and acquisition units have an integrated analogue low-pass filter that removes this breakthrough. An alternative solution is to digitise the signal and then apply a digital filter. This would require the analogue signal to be sampled at a frequency of at least twice that of the of excitation breakthrough.

Application Note

The magnitude and frequency of the excitation breakthrough varies depending on the sensor. Please refer to the product datasheet for sensor specific values.

Recommended Filter Example for Analogue Sensors

The circuit diagram below shows an example low pass filter that could be used to remove the excitation breakthrough from one axis of the sensor output. An analogue filter such as this would be required on each axis of a Bartington Instruments magnetic sensor, unless a digital filter is implemented following analogue to digital conversion of the signal.



Filter values for different 3dB cut-off frequencies can be found in the table below:

	5kHz	1.5kHz	500Hz	200Hz
C5	10n	33n	100n	250n
C6	2n2	6n8	22n	56n
-5% @	3.7kHz	1.2kHz	350Hz	140Hz
Attenuation @ 16Hz	19dB	38dB	58dB	74dB