

3-Component Fluxgate Magnetometer System Operational Notes

Draft



**ElectroMagnetic
Imaging
Technology
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The EMIT Fluxgate Magnetometer System consists of a sensor mounted on a platform and a control box. The sensor and control box are connected by a cable.

General Notes

Measuring TEM signals with a magnetometer is not particularly different to measuring them with a coil sensor. You can expect to see TEM decays and profiles of similar shapes.

The main advantage of measuring B (rather than dB/dt) is that any slowly-decaying signal (eg target response) in the presence of a more rapidly-decaying signal (eg host response) can be observed earlier in time in a B measurement than in a dB/dt measurement.

All 3 components of the sensor have equivalent instrument noise.

You should ensure that standard component direction and polarity conventions are observed. In this sense, the 3-component fluxgate system is no different to a 3-component coil system such as an RVR-3. The platform is designed to be horizontal. X and Y components are intended to be horizontal and Z component is intended to be vertical. For an in-loop measurement, Z should give a positive response at early times (and probably for the complete decay). If it does not then you can either reverse the transmitter polarity or the polarity of connections between the control box and receiver – see below. By convention, X points along the survey line. For an E-W line you should point X East. For a N-S line, point X North. Y will be directed so that X,Y,Z form a right-handed set. If you have reversed the sense of the control box to receiver connection for Z then you should also do it for X and Y.

The fluxgate sensor is powered by batteries in the control box. These batteries are of sufficient size to operate the system for well in excess of a survey day.

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Connections

Ensure the cable from the sensor is connected to the control box (“Fluxgate” label). This connection is a screw-on connector.

Connect the “OUTPUT” X,Y & Z fluxgate signals from the control box to the receiver with 4mm banana-banana cables as per an RVR or other sensor. A typical setup might have the “Z” output (vertical component) signal going into channel 1 on the receiver, “X” into channel 2 and “Y” into channel 3. If you wish to run multiple gains on a particular component (you probably will for most applications) then adjust accordingly. However it is suggested that a maximum receiver gain used is x20.

Do not connect the “MONITOR” signals to the receiver – the “MONITOR” signals are higher noise outputs designed to be used with a multi-meter – see below.

You should connect the fluxgate system ground (“GND”) to the analog ground of the receiver.

Operation of SMARTem Software

Here I will describe only parameters that are of specific importance to fluxgate measurements. It is assumed that others will be well understood.

Surv Setup Menu

Survey Type – set to In-Loop or Fixed-Loop as required.

Timing Setup Menu

Base Frequency – Expect to use settings of around 1 Hz for nickel prospects, perhaps less. A good scheme to compromise between production and data quality may be 0.5 - 1 Hz base frequency and 64 stacks. Perhaps lower base frequency if you expect very good conductors. You can do one or more repeats of the measurement as usual.

Sampling Rate – Suggested 25 kHz. This allows up to 4 channels to be collected simultaneously. If you are only interested in late times then you may wish to drop the sampling rate to 20 kHz or 10 kHz.

Stacks – see above.

Chan Setup Menu

Select channels and gains as required. A MAXIMUM GAIN OF 20 IS SUGGESTED. Exceeding this value may result in problems with saturation of the receiver channel and corruption of data.

File Setup Menu

Record raw and stacked files as necessary.

Processing Setup

Ant.Delay(msec) could be set to 0.050 - I do not have a firm value for this setting yet and will update this ASAP.

Collecting Data

Stacked and processed data recorded and displayed on the SMARTem in normal fixed or moving-loop modes is in units of $\mu\text{V}/\text{A}$. You can expect that noise levels on a typical fluxgate data set may be approximately $0.2\mu\text{V}/\text{A}$ or perhaps less depending on current and number of stacks.

For reference, the conversion of voltage out of the fluxgate system into meaningful units is as follows.

$$1 \text{ pT field at sensor} = 2.857 \text{ uV into receiver, or}$$

$$1 \text{ uV into receiver} = 0.35 \text{ pT at sensor}$$

At Completion of Survey

Switch off the control box.

Data is written to a .dat file as usual. You may convert to more meaningful units such as pT/A using Maxwell.

At the completion of data collection please charge the batteries in the control box with the supplied chargers. Supplied are 2 x 12V chargers. A green LED on the charger chassis indicates batteries are charged.

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