

## SECTION 2

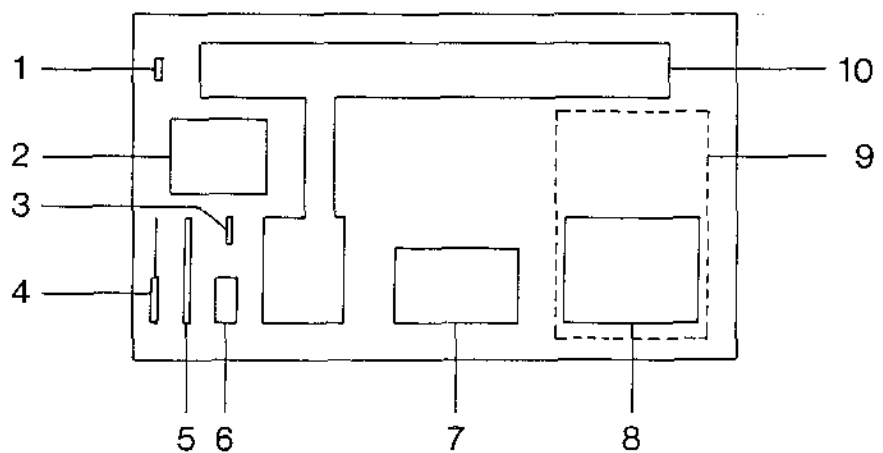
# ASSEMBLY INSTRUCTIONS

### 2-1 Unpacking

As you unpack the gradiometer, check that the parts shown in Figure 2-1 are all there, and that nothing has been damaged during transportation. The cable for data output and hand held external log key are extra accessories only supplied with the FM18 and FM36.

There are several different versions of the battery charger for different electrical standards. Check that the voltage shown on the charger label is correct for your country. If it is not do not attempt to use it - contact Geoscan Research.

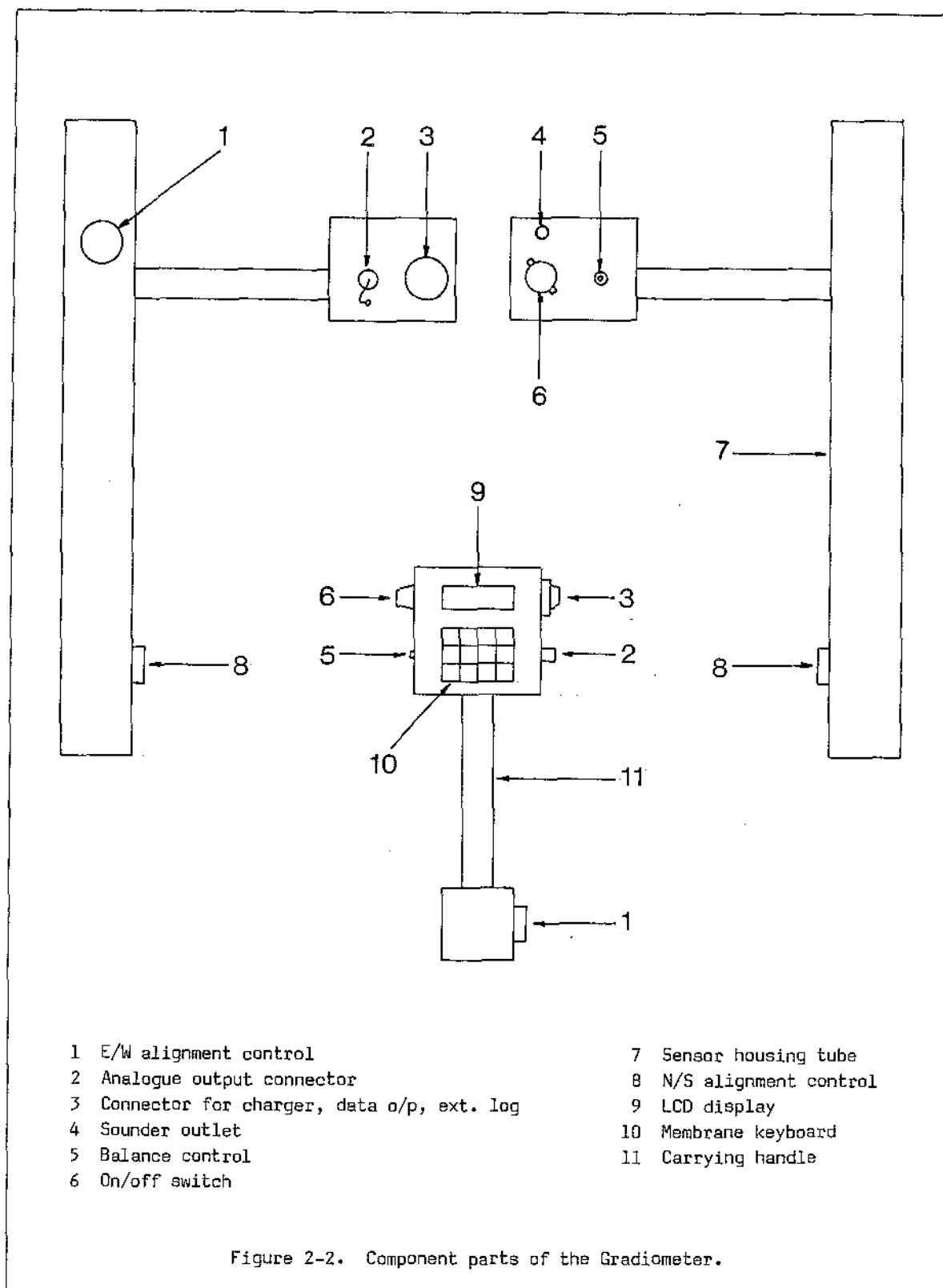
The gradiometers are supplied with Nickel-Cadmium rechargeable batteries already fitted. They will have been charged prior to shipment but may have lost much of their charge in storage. Therefore, to avoid damage, it is advisable to fully charge the batteries, as described in section 3-9, before switching on the gradiometer for the first time.



- |                               |                              |
|-------------------------------|------------------------------|
| 1 Case keys                   | 6 Spare battery pack holder  |
| 2 Cable for data output       | 7 battery charger            |
| 3 Spare alignment control cap | 8 Hand held external log key |
| 4 Screwdriver                 | 9 Manual                     |
| 5 Two trimmer tools           | 10 Gradiometer               |

Figure 2-1. Carrying Case, Gradiometer and Accessories.

## 2-2 Physical layout of the Gradiometer



The names of the parts of the gradiometer are shown in figure 2-2. A brief guide to their function follows below and more detail is given in subsequent sections of the Users Guide. Do not adjust these controls until you have read the detailed sections thoroughly.

#### **(1) and (8) E/W and N/S alignment controls**

These two controls are used to accurately align the axis of the two fluxgate sensors which are contained within the sensor housing tube (7). Accurate alignment of the fluxgate sensors is critical for good performance and correct adjustment of these controls will mean that, no matter which direction the gradiometer is facing with respect to the earth's magnetic field, the display will show the same reading. Although these controls are designed to be adjustable do not attempt to do this until you have read section 3 thoroughly. They have been adjusted before shipment to their correct setting and tampering with the controls at this stage will mean that subsequent alignment of the fluxgate sensors will take much longer to achieve.

#### **(2) Analogue output connector**

The analogue output follows the display reading and may be used to drive a chart recorder to provide a record of the reading changes. Alternatively if the gradiometer is an FM9, which does not have its own integral logger, then this output may be fed into an external data logger, such as the DL10, to record the readings.

#### **(3) Connector for charger, data output, and external log**

This is a six-way connector that has four functions. Firstly, it is used to output stored data to a computer. Secondly, the lead of the hand-held external LOG key plugs into this connector. Thirdly it may be used for the input of pulses from an external distance encoder. Fourthly the battery charger lead plugs into this connector and allows the batteries to be recharged without undoing the case. The FM9 has only the last function.

#### **(4) Sounder outlet**

The piezo-electric sounder or buzzer is used to provide audio feedback whenever a key is depressed or (FM18 and FM36 only) when readings are logged.

#### **(5) Balance control**

The balance control is used to precisely match the sensitivities of the two fluxgate sensors. It is adjusted in conjunction with the fluxgate alignment controls (1) and (8). This control is necessary for the alignment controls to be correctly adjusted.

#### **(6) On/off switch**

This switch is used to turn the power on or off. When in the off position the battery pack is disconnected from the internal electronics but connected to connector (3) for recharging.

#### **(7) Sensor housing tube**

The sensor housing tube provides protection for the sensors. With the alignment control sealing caps in place it provides a waterproof housing for the two sensors which are positioned at the top and bottom of the tube. It also has a thermal jacket which shields the sensors from the effects of the sun and wind chill and so helps to reduce drift.

#### **(9) LCD display**

The liquid crystal display is used to indicate the instrument reading, instrument status and menu options. On the FM18 and FM36 it also displays the current logging position.

#### **(10) Membrane Keyboard**

The waterproof membrane keyboard is used to control various instrument functions including range switching, setting zero, display mode, menu options, and logging facilities.

### **2-3 Battery Types**

#### **(1) Rechargeable Nickel-Cadmium Batteries**

The gradiometers are supplied fitted with 8 1.2V Nicad Batteries, physical size AA, capacity 500mAh. The batteries should have a long life providing the charging and storage instructions of section 3-9 are followed, and should not require replacing for several years. If the batteries do eventually need replacing then follow the procedure described in section 2-4. The I.E.C. (International) designation for the battery size is KRH 15/51. A full charge of the Nicad batteries should power the gradiometer for roughly 12.5 hours.

Rechargeable batteries may be left in the instrument for very long periods, in any state of charge, without permanent deterioration. However switching on the instrument with the battery voltage below the recommended minimum may cause damage to both the instrument and batteries, so make sure the batteries are given a full charge after long periods of non-use **BEFORE** switching on.

#### **(2) Primary batteries**

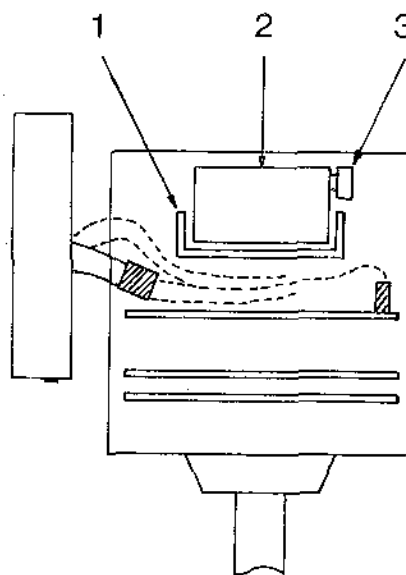
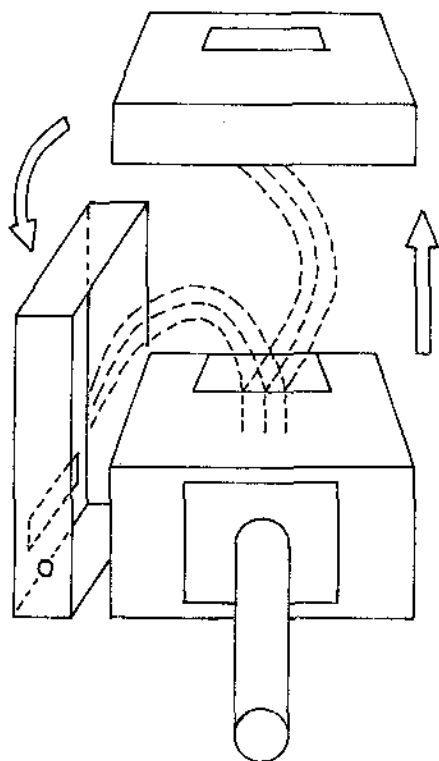
It is strongly recommended that the Nicad rechargeable batteries are used at all times if possible. This is to avoid any possibility of damage to the gradiometer when opening it up to fit batteries and to avoid any water or contamination entering. If however it becomes imperative to fit primary cells, because of low battery charge during a survey, then the procedure described in section 2-4 should be followed. There is a spare holder provided for keeping such a battery back-up ready. Eight 1.5V primary batteries, zinc carbon or alkaline, physical size AA, I.E.C. (International) designation R6 or LR6 will be required. Alkaline batteries such as the Duracell MN1500, capacity 2250mAh, will give a much longer service life than ordinary Zinc-Carbon batteries and are to be preferred. They will power the gradiometer for roughly 45 hours.

## **WARNING**

IF THE INSTRUMENT IS NOT TO BE USED FOR ANY LENGTH OF TIME, OR THE BATTERIES HAVE BEEN EXHAUSTED, THEN PRIMARY BATTERIES SHOULD BE REMOVED TO PREVENT ANY CHEMICAL LEAKAGE FROM DAMAGING THE INSTRUMENT.

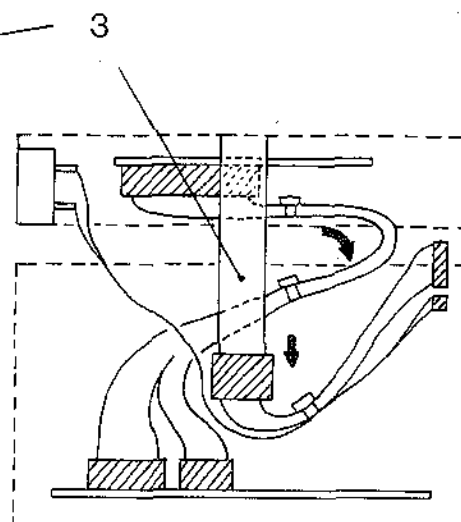
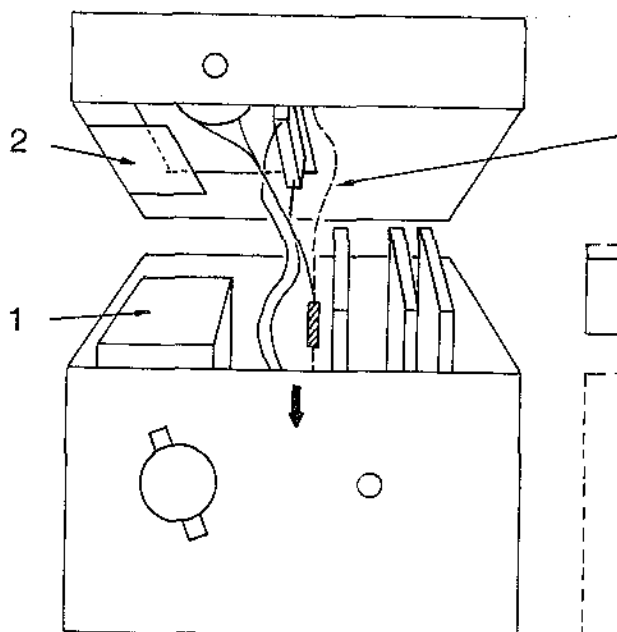
### **2-4 Battery Installation and Replacement**

The battery pack may be replaced by using the following procedure. It may be useful on a first read of the manual to refer to section 2-2 and figure 2-2 for a guide to the physical layout of the gradiometer.



- 1 Battery retaining bracket-A
- 2 Battery Pack
- 3 Battery connector

Figures 2-3 and 2-4. Gaining access to the battery pack.



- 1 Battery pack
- 2 Battery retaining bracket-B
- 3 Transparent ribbon connector

Figures 2-5 and 2-6. Replacing the front panel lid.

1 Switch the Gradiometer off.

2 Undo the four screws on the instrument front panel - there is no need to remove them entirely.

3 Carefully lift the lid about two inches away from the main box and then very gently twist and flip the lid over towards the ON/OFF switch so that the sounder opening is positioned as in figures 2-3 and 2-4.

**Take great care not to strain the wire connections between the lid and main case - loosen the wires gently with your fingers if they become caught.**

4 The battery pack may now be removed from its compartment by pulling up vertically - do not wiggle from side to side so as to push against battery retaining bracket A. The connector to the battery pack can now be unplugged - remove it by pulling on the moulded body and not the leads.

5 To replace the battery pack back in its compartment position the pack so that the battery connector is uppermost and orientated as shown in figure 2-4, and positioned so that the pack is free to pass between the battery retaining bracket. With gentle pressure it should slide in smoothly - take care not to peel the neoprene strips off the battery bracket or main case. Push the battery lead into the case so that it lies below the level of the main case.

6 When replacing the lid great care must be taken to feed the connecting wires between the lid and main case back into their correct positions. Although the wire harness is assembled such that the wire bundles have a natural position lying between the battery compartment and adjacent printed circuit board, a little help is required to get them back into position. Figure 2-6 shows the position of the wire bundles as if they could be viewed through the case from the handle. In particular note that the transparent connector strip from the lid, which has seven silver strips embedded in it, should lie straight and vertical. It will need guiding into place since otherwise it may bend and be trapped between the printed circuit board nearest it and the lid. The other point to note is that wires are not trapped between the top of the battery and battery retaining bracket B set in the lid.

7 Before tightening up the four screws on the instrument front panel, try gently pushing the lid closed with your hand. This will enable you to verify that there are no wires are trapped.

## **2-5 Assembling the Gradiometer for Field Use**

### **(1) FM18 and FM36 gradiometers**

The FM18 and FM36 only require the hand-held external LOG unit to be connected - figure 2-7. The lead of this unit plugs into the connector labelled as (3) in figure 2-2. The waterproof sealing caps must first be undone and this may most easily be achieved by gripping the strap and instrument/cable with one hand and gripping and turning the 'turret' extension of the cap with the other hand. The connector (flying socket) of the hand-held external LOG unit should then be inserted into the FM connector (plug) - there is a small locating pin inside the plug to ensure correct mating. Screw the outer retaining ring into place. Note that it is better to align the fluxgate sensors prior to assembling the gradiometer for field use - consult section 3-5 for alignment instructions.

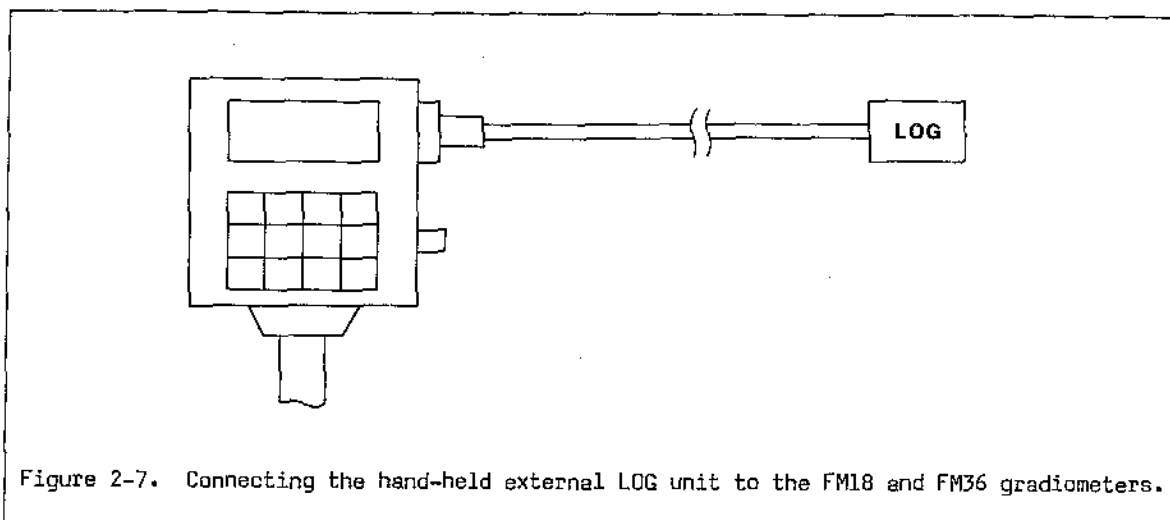


Figure 2-7. Connecting the hand-held external LOG unit to the FM18 and FM36 gradiometers.

## (2) FM9 gradiometer

The FM9 does not have a hand-held external LOG key. Readings can however be logged using the DL10 Data-Logger. In this case you will require a lead, part number 029-006, which is 3m long, to connect between the analogue output of the FM9 ( labelled as (2) in figure 2-2 ) and the analogue input of the DL10 which is the short flying lead - see figure 2-8.

## WARNING

DO NOT UNDER ANY CIRCUMSTANCES PLUG THE SHORT FLYING LEAD OF THE DL10 DIRECTLY INTO THE FM CONNECTOR LABELLED AS (3) IN FIGURE 2-2. IF YOU DO IT WILL RESULT IN DAMAGE TO BOTH THE FM AND DL10.

The connectors at the DL10 end have waterproof sealing caps. These are removed and the connectors mated as described above for the FM18/FM36. The connectors at the Gradiometer end are standard 50 ohm BNC types.

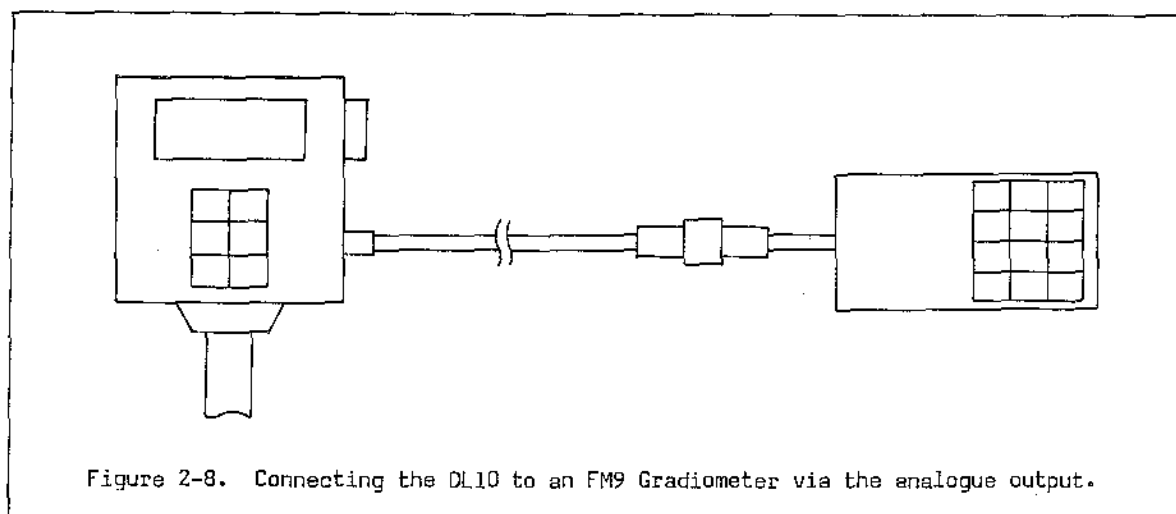


Figure 2-8. Connecting the DL10 to an FM9 Gradiometer via the analogue output.

