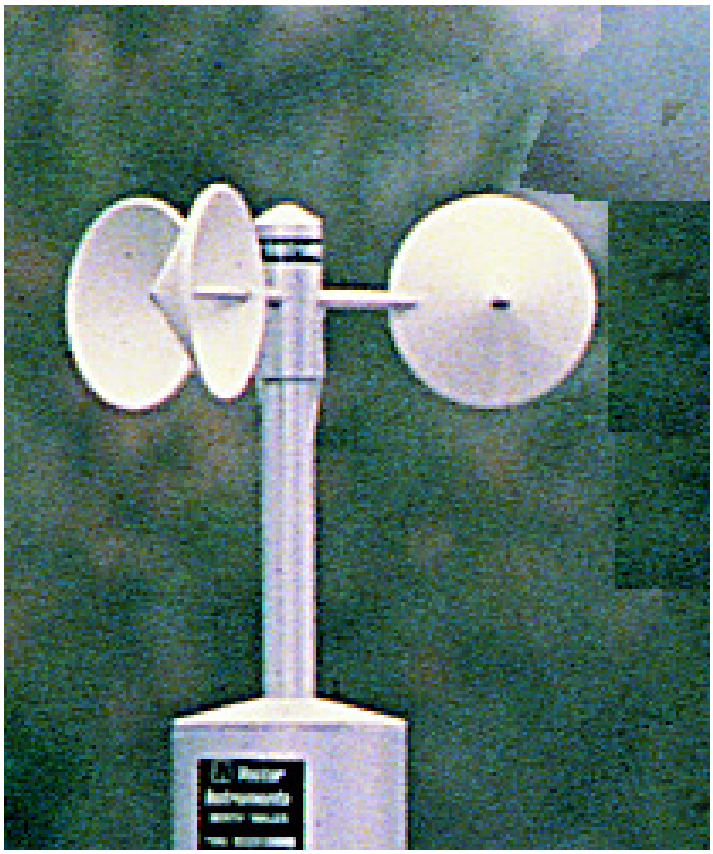
User Manual for the

Anemometer

type AN1



AN1-UM-3

DELTA-T DEVICES

ABOUT THIS MANUAL

Use this manual to help you install and use the type AN1 anemometer.

COPYRIGHT

Revised: Jan 1996

In this Manual, all references to loggers and weather stations relate to the Delta-T Logger DL2, its software LS2, the WS01 Weather Station, and the sensor codes used with them. The references also apply to the DL2E and its derivatives.

For use with the DL3000 logger, you must refer to the DL3000 documentation. It contains the specific connection details and sensor type codes used by the DL3000. General information concerning the performance and installation of the sensor and contained in this manual remains relevant.

Anemometer

Delta-T Serial Number :	AN1.	_____	
Unit Serial No:	Rotor	_____	
	Body	_____	
Rotor Calibration Factor :		_____	rpm/meter per second
Conversion Factor :		_____	Hz/m/s

CONTENTS

INTRODUCTION

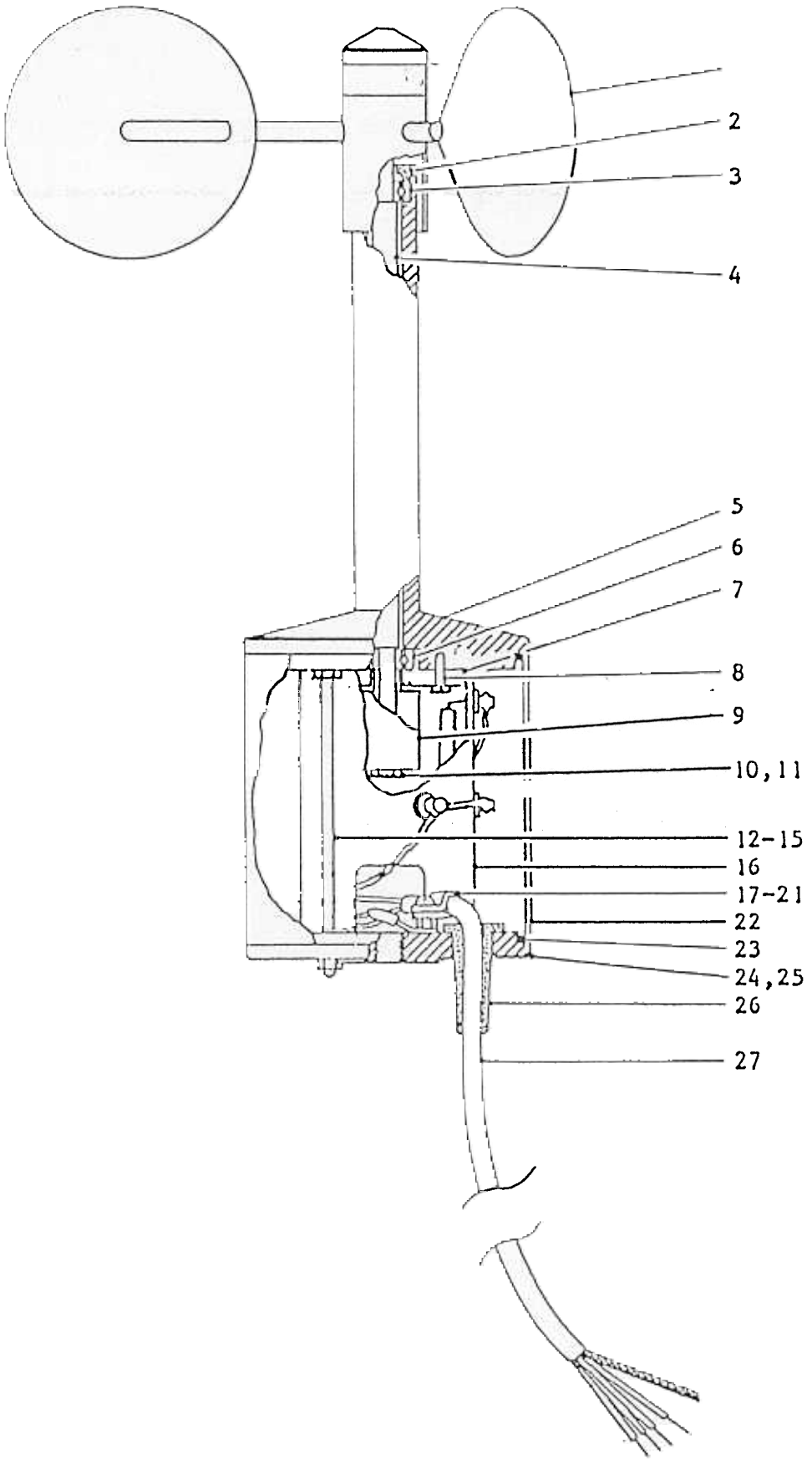
The AN1 anemometer is a reliable and rugged anemometer with a good reputation amongst our customers. The rotor cups are made out of ABS plastic, giving strength and sensitivity. Two stainless steel ball-race bearings support the rotor spindle. A magnet on the spindle causes a mercury-wetted reed switch to make and break contact once per revolution of the rotor.

The contacts are bounce-free, simplifying connection to electronic circuits, and no power is required apart from that necessary to detect contact closure. The rotor is tested by comparison with an N.P.L. calibrated rotor, and a calibration figure is provided.

Construction is from anodised aluminium alloys, stainless steels, and weather resistant plastics for all exposed parts. The bearing is a stainless steel shaft running in two precision corrosion resistant ball-races. It is protected from the entry of moisture droplets and dust. The result is an instrument suitable for permanent exposure to the weather.

THE ANEMOMETER

The part numbers are referred to on page 12



ASSEMBLY INSTRUCTIONS

1) Remove white protector tube, hold anemometer slightly out of vertical and lightly push on rotor until positive location is obtained.

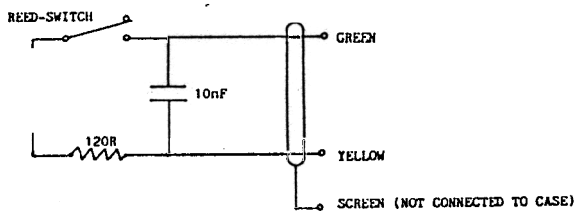
To remove the rotor, first invert the instrument, press on the hub to release an internal gravity-sensitive catch, and allow to slide off. Avoid use of excessive force.

2) Mount the anemometer using a 0.25 inch BSW or UNC screw into the base, ensuring that the screw does not project more than 0.3 inches into the instrument. Alternatively, for portable applications, a 6° taper mounting is available.

Mount vertically for accurate results. Note that the mercury reed-switch will not operate continuously at more than 15° from the vertical.

3) Connect the output lines directly to a pulse counter or frequency measuring equipment, no pulse shaper being necessary for short lines as the contacts are bounce-free.

A shunt or filter may be necessary to suppress a.c. pick-up from long lines if high input resistance sensitive counters are used. The cable may be extended up to 100m total length of similar screened cable (DEF61-12 part 4). Note that the anemometer includes a series resistor and parallel capacitor. The anemometer should not be used to directly switch heavy currents such as electromagnetic counters.

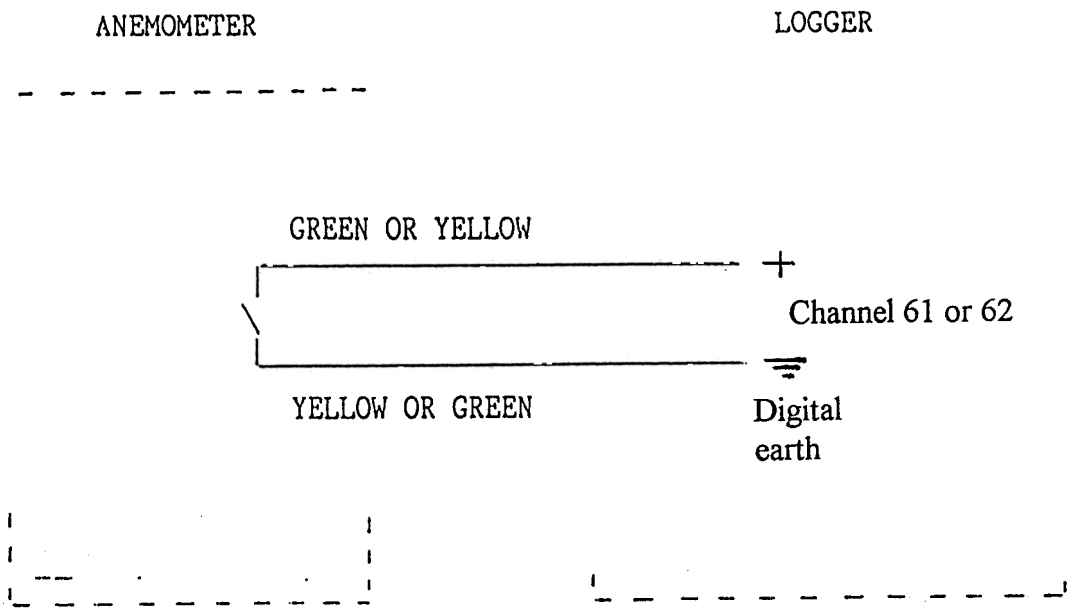


Note

This instrument contains a magnetic reed switch partly filled with mercury. If subject to shock or vibration during transit, the mercury may become distributed in globules which sometimes affects normal operation.

The mercury should therefore be driven down into its reservoir before using the instrument by shaking downwards whilst holding the instrument in an approximately vertical position.

WIRING CONNECTIONS



The screen should be connected to the Logger digital earth, provided it is not connected to the anemometer body.. It should not be connected to both, otherwise there is a possibility of errors from earth loops.

CONFIGURING THE DELTA-T LOGGER

The windvane is slightly unusual in that it does not have, or need, an entry in the Delta-T Logger sensor library. Instead it is completely defined by what is entered in the configuration.

The conversion factor can be calculated from the manufacturer's calibration factor 'R', specified in units of rpm/meter per second, and dividing by 60.

Example:

Rotor calibration, 'R' = 47.5 rpm/meter per second

Conversion factor = R/60 = 47.5/60 = 0.7916 Hz/m/s

The appropriate conversion factor for your particular anemometer can be obtained as described above from the calibration certificate supplied with the instrument.

SAMPLING INTERVAL

A sampling interval of 10 minutes or longer is recommended in order to eliminate rounding errors associated with the logger's internal integer arithmetic.

The user will observe, when inspecting the sensor output via the liquid crystal display (LCD) on the front panel of the logger, that the resolution appears to be quite poor, ± 2.5 m/s for example. This is caused by the short 1 second sampling interval which is automatically selected when the logger displays the anemometer reading on the LCD. The predicted resolution when sampling at 5 second intervals is 0.25 m/s, and is negligible with 10 minute sampling.

SPECIFICATIONS

Performance:	Threshold 0.2 m/s Max. speed over 75 m/s. Accuracy *1% of reading (10–55 m/s), 2% of reading (>55 m/s). Distance constant 2.3 m.
Calibration:	0.80 revolutions per metre nominal (1 pulse per 1.25 meters).
Temp. Range:	–30 to +70°C.

* 0.1 m/s (0.3–10 m/s)

MECHANICAL SPECIFICATIONS

Size:	Height 200mm, Case dia. 55mm, attached screened cable 3m.	
Rotor:	Standard 150mm dia. 3–cup rotor.	
Weight:	Total 350g including standard cable.	
Fixing:	Rotor:	Novel gravity sensitive fastener for rapid attachment and release.
	Anemometer:	Standard tripod screw (0.25" BSW/UNC), taper adaptor also available. Note that mounting must be within 15° of vertical.

ELECTRICAL SPECIFICATIONS

Switching Voltage:	100 volts DC max.
Switching Current:	40 mA. max.
Switch Rating:	4 Watts max. (DC resistive).
Duty Cycle:	50% ± 5% up-to 50 m/s. ± 10% up to 75 m/s.
Impedance:	120 ohms series resistor plus 10 nF capacitor across line for interference suppression.
Switch Bounce:	Nil.
Min. Current:	Nil (life not reduced by use in dry circuits).
Switch Life:	Rated 25 x 10^9 operations minimum (>20 years).

SAMPLE DATA SHEET

ROTOR CALIBRATION DATA	(Type R30 unless specified)
Date:	Copy: ☐ Type: ☐
Rotor Serial Number:	Re-cal: ☐
Rotal Calibration, 'R': ..	rpm / metre per second

Rotor Characteristics	Type R30	Type R60
Number of Cups:	3	6
Configuration:	In-line	Staggered
Cup Material:	ABS, plastics	Expanded polystyrene
Maximum Wind Speed:	75m/s	25m/s
Duty:	All weather continuous exposure	Fragile - limited life in rain and high winds
Response (distance constant):	5m	1m

Operation

Both types of rotor are fitted with a unique gravity-sensitive fastening device in which the rotor is positively locked onto the spindle by pressing the hub with a force of approx. 1.5Kg.F with the anemometer approximately vertical.
The rotor can be removed only by inverting the instrument, pressing the hub in and releasing. Avoid use of excessive force which may damage the bearings in the anemometer.

Calibration

Rotors are calibrated at a speed of 9m/s to an accuracy of ±1% (±2% for the R60 rotor) by comparison with a standard rotor calibrated by the National Maritime Institute (formerly NPL).

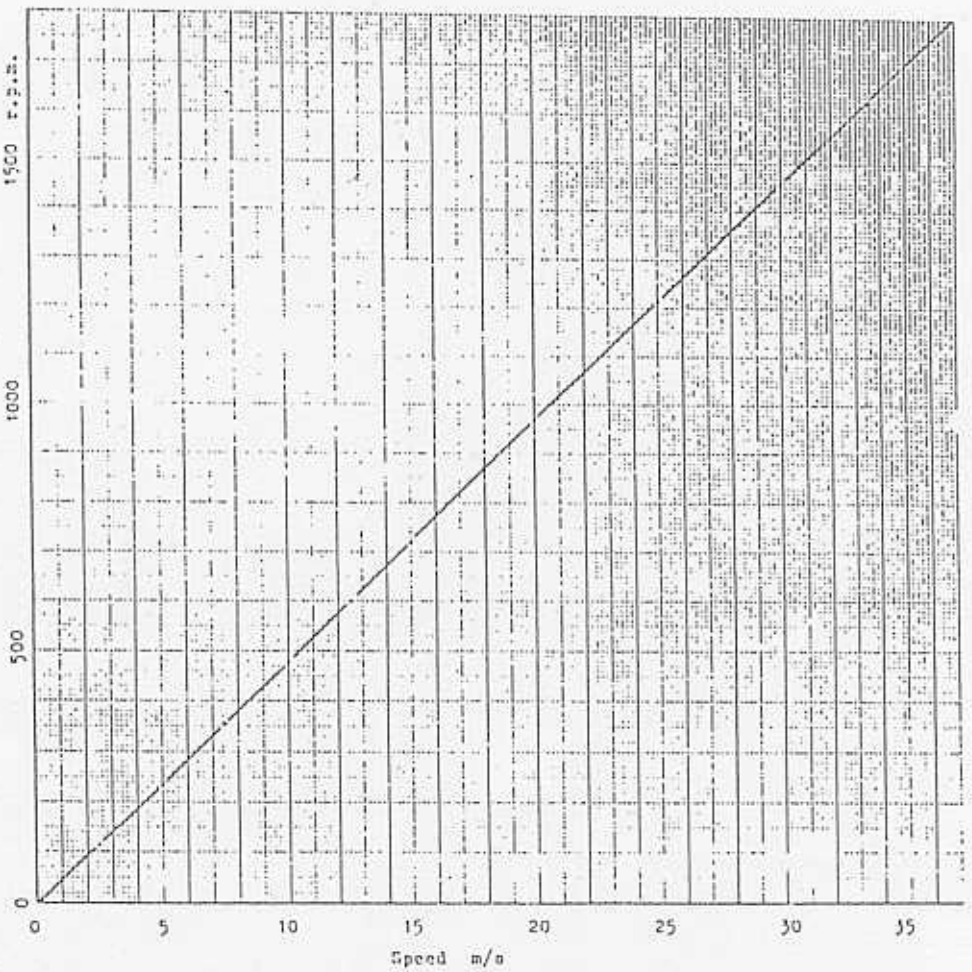
Correction to be applied to 'R' at speeds other than 9m/s for a linear curve through the origin are shown in the following table (see also overleaf).

Speed m/s	Correction %
9	0
15	1.2
20	2.2
35	2.9
50	3.0

Conversion Factors

To obtain rpm/knot use R x 0.5147 (nautical mile/hour, 1nm = 6080 ft.)
To obtain rpm/mph use R x 0.447

A TYPICAL CALIBRATION CURVE FOR THE ROTOR



Correction to be applied to speed from linear curve through calibration point at selected speed range.

Speed m/s	Correction m/s		
	Range: 7.5m/s	Range: 15m/s	Range: 33.5m/s
2.5	+.09		
5.0	+.07	+.16	+.24
7.5	0	+.14	+.26
10.0	-.12	+.07	+.23
15.0	-.20	0	+.24
25.0		-.35	+.05

RCD-5

MAINTENANCE

The manufacturer recommends the replacement of the bearings every 2 to 3 years. The anemometer may also be damaged by a lightning strike, mechanical damage from flying objects or birds and from falling branches etc. A spares kit, type K2, is available.

Spares Kit K2 : Parts List

1 spare rotor
1 spindle
2 anemometer bearings kits each comprising of 2 bearings plus one rubber seal.
1 spindle protection tube.

REPLACEMENT OF BEARINGS

1. Switch off power, disconnect cable, remove instrument from mounting, invert and remove rotor by pressing hub and releasing. Replace spindle protector tube (31).
2. Clean anemometer and rotor using a damp cloth or soapy water (do not immerse).
3. Unscrew nuts holding base plate (15) using 5BA (5.5mm AF) nut driver, pull off base plate, body tube and circuit module (16).
4. Remove protector tube, grip spindle end using hand-vice with soft jaws, and unscrew magnetic rotor retaining nut (10) using 6BA (5mm AF) spanner.
5. Remove nut, washer and magnetic rotor (9), unscrew bearing retainer screws (8), and pull out spindle with bearing retainer from below.
6. Remove old seal (2) using small screwdriver, and push out old top bearing from below using spindle, clean all parts.
7. Place lower bearing (6) onto spindle (4) by inserting spindle-end into packet of bearings (to avoid contamination), place bearing retainer (7) over bearing and assemble with top plate. Replace screws (8).
8. Slide on magnetic rotor (9), place washer (11) over special nut (10) and screw on loosely.
9. Slide on top bearing (3), by pushing spindle end into packet; press down using special jig, old (clean) bearing, or small screwdriver (do not apply excessive pressure to inner ring). Ease in the new rubber seal (2).
10. Re-tighten nut (10), lock this nut and screws (8) with a drop of shellac.
11. Replace bottom 'O' ring, top 'O' ring fully up against flange on top plate, push on body tube, insert module (16) with wires attached positioned such that wires on base plate will fall into space provided at bottom of module. If the module is to be changed, a matching magnetic rotor should be obtained. Alternatively, the small magnet between the terminals can be broken free, re-adjusted and fixed using epoxy resin glue. Test for 50% mark/space ratio by connecting anemometer to ohm meter and spinning spindle. The meter should read half-way across the scale. Re-wire green and yellow to outer (lower) two pins.
12. Ensure 'O' ring is in place on base plate (rotate slightly when applying so that it rolls into place), replace base plate.
13. Apply non-drying silicone rubber compound around the studs, replace washers and nuts (15), wipe off excess compound.

WIRING CONNECTIONS FOR HEATER OPTION

Heater elements can, as an option, be fitted to the shaft. This will keep the bearings free but may not prevent ice forming on the plastic cups.

Anemometers supplied with a heater element require additional connections to provide the power for heat.

WARNING : DO NOT USE THE DELTA-T LOGGER INTERNAL BATTERY OR THE TYPE LBK1 EXTERNAL BATTERY PACK TO HEAT THE ANEMOMETER.

A large rechargeable car battery *may* be suitable, but generally speaking mains power is necessary, along with a weatherproof 12 V transformer and possibly a thermostat. Solar panels are not considered a suitable power source for heaters.

For intermittent heater operation, the current in the heater element may be switched at preset time intervals and durations using one of the resident relay channels (63 & 64) in the Delta-T Logger.

If this option is chosen, take the following precautions :

The jumper pins behind the relay channel(s) must not be bridged (see diagram below)

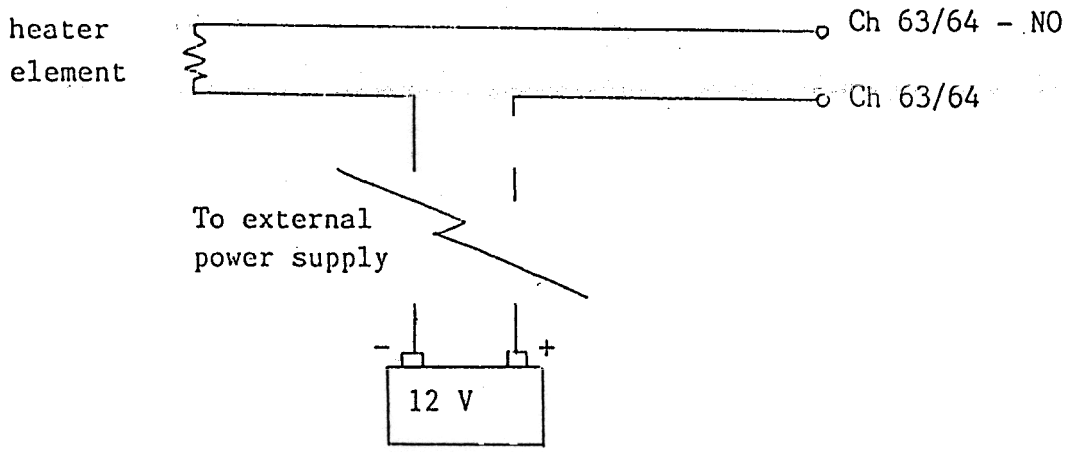
Do not exceed the 1 amp current rating of the relays.

SPECIFICATIONS FOR OPTIONAL HEATER ELEMENT

Maximum input voltage:	12 Volts DC or AC (continuous) *Type HE1* 24 Volts DC or AC " *Type HE2*
Maximum input current:	0.5 Amps : *Type HE1* 0.25 Amps : *Type HE2*
Maximum heater power:	6 Watts
Element resistance:	24 Ohms ±5% : *Type HE1* 96 Ohms ±5% : *Type HE2*
Temperature rise:	5.5°C/W
Maximum allowable temperature:	70 °C
Cable:	2-core round section, 16 strands x 0.2 mm, 5.9 mm OD, 3 metres, unscreened (unless otherwise stated)

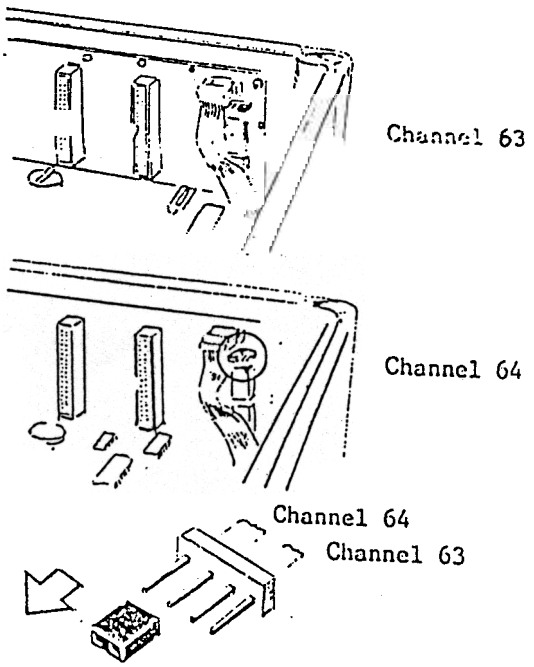
WIRING CONNECTIONS FOR HEATER.

YOU MAY USE THE DELTA-T LOGGER RELAYS, BUT NOT ITS BATTERIES



SHOWING THE LOCATION OF THE INTERNAL JUMPER CONNECTIONS THESE MUST BE REMOVED.

WARNING DO NOT USE THESE WITH A HEATER



GUARANTEE, REPAIRS AND SPARES

Our Conditions of Sale ref: COND/91/11 set out Delta-T's legal obligations on these matters. For your information the following paragraphs summarise Delta-T's position but reference should always be made to our Conditions of Sale which prevail over the following explanation.

Instruments manufactured by Delta-T are guaranteed for one year against defects in manufacture or materials used. The guarantee does not cover damage through misuse or inexpert servicing, or other circumstances beyond our control.

For the U.K. this means that no charges are made for labour, materials or return carriage for guarantee repairs.

For other countries, the guarantee covers free exchange of faulty parts during the guarantee period.

Alternatively, if the equipment is returned to us for guarantee repair, we make no charge for labour or materials but we do charge for carriage and U.K. customs clearance.

We strongly prefer to have such repairs discussed with us first, and if we agree that the equipment does need to be returned, we may at our discretion waive these charges.

SERVICE AND SPARES

We recognise that some users of our instruments may not have easy access to technically specialised backup.

Spare parts for our own instruments can be supplied from our works. These can normally be despatched within 1 working day of receiving an order.

Spare parts and accessories for sensors not manufactured by Delta T, but supplied as part of the weather station, may be obtained from the original manufacturer. We will endeavour to obtain parts if requested, but a certain amount of additional delay is inevitable.

Should it prove necessary, instruments may be returned to our works for servicing. We normally expect to complete repairs of our own instruments within 2 days of receiving the equipment. Other manufacturers' sensors supplied by us and returned for servicing will take longer. They will have to be returned to the original manufacturer for servicing, and may be subject to additional delays of two to four weeks.
Users in countries which have a Delta-T Agent or Technical Representative should contact them in the first instance.