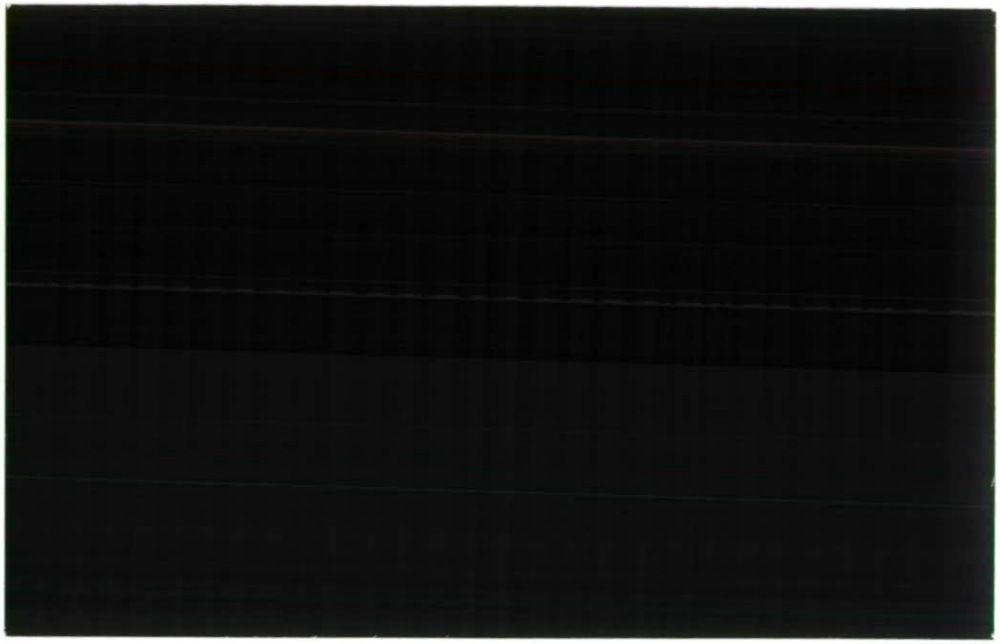
ARCHIVE:

PLEASE DO NOT DESTROY

Institute of Hydrology

1996/077




Natural
Environment
Research
Council

THE DEEP GEOLOGY SITE NEAR HOLMROOK

A report of the servicing carried out on the Automatic Weather Stations and Precipitation Stations.

September 1996

Institute of Hydrology
Crowmarsh Gifford
Wallingford
Oxfordshire
0X10 8BB
UK
Tel: 01491 838800
Fax: 01491 692424
Telex: 849365 Hydrol

A report of the servicing carried out on the Automatic Weather Stations [aws] and the Precipitation Stations [ps] used by Sir Alexander Gibb & Partners Ltd on the Deep Geology Site near Holmrook Cumbria by the Institute of Hydrology.

The Automatic Weather Stations and the Precipitation Stations were serviced in line with the instructions drawn up by the Didcot Instrument Co. the manufacturers of the equipment. A copy of the instructions for the aws are included in Appendix A. The temperature probes and the raingauges on the precipitation stations were calibrated in the same way as the aws as they are similar equipment. The Institute of Hydrology temperature test probe was calibrated against the Indicator F25 digital thermometer. The certificate of calibration is attached as Appendix B. The readings of the temperature probes, the raingauges and the solarimeter before and after recalibration can be seen by referring to Appendix C.

Station name: Lairfold Rigg.[ps]

The raingauge thermometer, the check gauge thermometer, the snow gauge thermometer and the soil thermometer were checked in water at 0 degrees Celsius and at about 20 degrees Celsius. All were within 0.1 of a degree Celsius with the exception of the soil thermometer which was reading -0.3763 degrees low at the zero degrees setting. The offset in the logger program was changed from -0.0929 to 0.32405. The reading was rechecked and was found to be within + or - 0.1 degree Celsius which is the specification.

The raingauge tipping mechanism was checked using a known volume of water at the pro-rata rate of 395 tips /litre. Using a 50 ml syringe, 19 tips were expected on the first try and 20 tips on the second try giving an average of 19.5 tips which works out at 390 tips per litre. This was considered to be as good as we could get in field conditions. The raingauge read 192 tips which was 5 tips low per 500 ml. [197 tips was the aim point] so was slightly outside the specification of 2%.[2.6%]

The snowgauge tipping mechanism was checked using the same method as the raingauge but was giving a reading of 186 tips which was 11 tips low per 500 ml. The stops on the buckets were adjusted and a reading of 197 plus 3 tips [200 tips] per 500 ml was achieved. This reading was within specification.

Station name: Boat How. [ps]

The raingauge thermometer was checked and found to be reading 0.13455 degrees low at zero degrees. The offset in the logger program was changed from -0.2552 to -0.15228 and was then within specification. The setting at 19 degrees was checked and found to be within specification.

The checkgauge thermometer was checked and found to be within specification at zero degrees, but was reading 0.145 degrees high at 19 degrees. The offset in the program was changed from 0.0579 to 0.1. The reading was then within specification.

The snowgauge thermometer was checked and found to be within specification at zero degrees but was reading 0.223 low at 19 degrees. The offset of -0.1521 was replaced with the offset of 0.0. The reading was then within specification.

The soil thermometer was checked and found to be reading 0.395 degrees low at zero degrees so the offset of -0.1611 was replaced with an offset of 0.76 and was then within specification. The setting at 19 degrees was reading 0.848 degrees low so the multiplier was changed from 0.9996 to 1.05. The reading was then checked again and found to be within specification

The raingauge tipping mechanism was checked and found to be reading 176 tips per 500 ml. which was 21 tips low. The stops were reset and were then 197 minus 3 tips per 500 ml, so were within specification.

The snowgauge tipping mechanism was checked and found to be reading 175 tips per 500 ml which was 22 tips low so the stops were reset and then were 197 plus 3 tips per 500 ml so were within specification.

Station name: Farmery.[aws.]

The raingauge thermometer was checked and found to be within specification at zero degrees and reading 0.2 degrees low at 22 degrees so the multiplier of 0.9909 was replaced with 0.995. The readings were then within specification.

The checkgauge thermometer was checked and found to be within specification at zero degrees and reading 0.17 degrees low at 22 degrees so the multiplier of 0.9916 was replaced with 0.9926. The readings were then within specification.

The snowgauge thermometer was checked and found to be reading within specification at zero degrees and reading 0.129 degrees low at 21 degrees so the multiplier of 0.991 was replaced with 0.993. The readings were then within specification.

The soil thermometer was checked and found to be reading 0.215 degrees low at zero degrees so the offset of -2.2513 was replaced with -2.05. The readings were then within specification.

The wet bulb thermometer was checked and found to be reading 0.669 degrees low at zero degrees so the offset of -2.374 was replaced with -1.72. The 21 degree setting was reading 0.703 degrees low so the multiplier of 0.9917 was replaced with a multiplier of 1.01. The readings were then within specification.

The dry bulb thermometer was checked and found to be reading within specification at zero degrees and reading 0.139 degrees low at 20 degrees so the multiplier of 0.992 was replaced with 0.995. The readings were then within specification.

The solarimeter was checked using a reference solarimeter and was found to read 3 watts per metre sq. low in 247 watts per metre sq. averaged over 6 readings. These readings were within the specification of +/- 2%

The raingauge tipping bucket mechanism was checked and found to be reading 177 tips at the 500 ml rate which is 20 tips low so the stops were adjusted and was then 197 minus 3 tips per 500 ml so were then within specification.

The snowgauge tipping mechanism was checked and was found to be reading 184 tips at the 500 ml. rate which is 13 tips low so the stops were adjusted and were then 197 minus 3 tips so were within specification.

The following checks and servicing were carried out on the Farmery and the Grike A.W.S.s.

The anemometer was checked for free rotation of the cups and excessive end float on the bearings. The reed switch was renewed. The sensor showed no physical damage or corrosion.

The wind direction sensor was checked for free rotation of the vane and end float of the bearings. The pointer was revolved through 360 degrees to ensure that the full zero to 360 degree range is obtained. The sensor showed no visible damage or corrosion.

The wind direction sensor on the Grike aws showed some gaps in the direction readings. This sensor will be serviced in the near future.

The net sensor was checked for damage and general condition. The output was not checked because of the lack of a suitable standard for comparison.

Station name: Long Grain.[ps]

The raingauge thermometer was checked and found to be within specification.

The checkgauge thermometer was checked and found to be within specification at zero degrees but was reading 0.17 degrees low at 14 degrees. The multiplier of 0.9978 was replaced with 0.999. The reading was then within specification.

The snowgauge thermometer was checked and found to be within specification at zero degrees. The 14 degree reading was 0.13 degrees low so the multiplier of 0.9978 was replaced with 1.001. The reading was then within specification.

The soil thermometer was checked and found to be reading 0.29 degrees low at zero degrees so the offset of 0.0921 was replaced with 0.30. The reading was then within specification. The 15 degree reading was 0.29 degrees low so the multiplier of 0.998 was replaced with 1.01. The reading was then within specification.

The raingauge tipping mechanism was checked and found to be reading 160 tips per 500 ml which was 37 tips low. The stops were adjusted and the reading was then 197 plus 3 tips per 500 ml. so were within specification.

The snowgauge was checked and found to be reading 110 tips per 500 ml which was 85 tips low. The stops were adjusted and the reading was then 197 minus 2 tips per 500 ml. so were within specification.

The raingauge and the snowgauge on this station were so far out of adjustment that they must have been interfered with some time after leaving the manufacturer.

Station name: Grike. [aws]

The raingauge thermometer was checked and found to be reading 0.32365 degrees low at zero degrees so the offset was changed from -2.2811 to -2.08. The reading at the 22 degrees setting was 0.16 degrees low so the multiplier was changed from 0.9926 to 0.995. Both readings were then checked and found to be within specification.

The checkgauge thermometer was checked and found to be reading 0.3026 degrees low at zero degrees so the offset of -2.1565 was replaced with -1.95. The reading at 22 degrees was found to be 0.12 degrees low so the multiplier of 0.9911 was replaced with 0.995. Both readings were then checked and were found to be within specification.

The snowgauge thermometer was checked and found to be reading 0.20758 degrees low at zero degrees so the offset was changed from -2.3643 to -2.16. The readings were then within specification.

The soil thermometer was checked and found to be reading 0.1157 degrees low at zero degrees so the offset was changed from -2.3213 to -2.05. The readings were then within specification.

The wet bulb thermometer was checked and found to be reading 0.1 degrees low at zero degrees so the offset was changed from -2.1428 to -2.0. The reading at 21 degrees was 0.16 degrees low so the multiplier of 0.9929 was changed to 0.998. The readings were then within specification.

The dry bulb thermometer was checked and found to be reading 0.22 degrees low at zero degrees so the offset was changed from -2.2244 to -2.0. The readings were then within specification.

The solarimeter was checked against a reference solarimeter and was found to be an average of 10 watts per metre sq. high . This was the average of 657 watts per metre sq. taken over 6 readings. These readings were within the specification of +/- 2% .

The raingauge tipping mechanism was checked and found to be reading 210 tips per 500 ml which is 13 tips high. The stops were adjusted and the reading was then 197 minus 3 tips per 500 ml. The readings were then within specification.

The snowgauge tipping mechanism was checked and was found to be reading 170 tips on the 500 ml volume which is 27 tips low so the stops were adjusted and the reading was then 197 minus 1 tip on the 500 ml volume. The reading was then within specification.

Station name: Brayshaw.[ps]

The raingauge thermometer was checked and found to be reading 0.15 degrees high at zero degrees, the offset of 0.118 was replaced with 0.0. The reading was then within specification. The 22 degree setting showed an error of 0.181 low so the multiplier of 0.9987 was replaced with 1.00. The readings were again checked and found to be within specification.

The checkgauge thermometer was checked and found to be within specification at zero degrees but was reading 0.125 low at 22 degrees. The multiplier of 1.0011 was replaced with 1.003. The readings were then checked and found to be within specification.

The snowgauge thermometer was checked and found to be within specification at zero degrees but was reading 0.136 low at 21 degrees so the multiplier of 0.9929 was replaced with 0.996. The readings were then checked and were found to be within specification.

The soil thermometer was checked and found to be reading within specification at zero degrees but was reading 0.184 low at 22 degrees. The multiplier of 0.999 was replaced with a multiplier of 1.009. The readings were then checked and found to be within specification.

The raingauge tipping mechanism was checked and found to be reading 160 tips at the 500 ml rate which is 37 tips low .The stops were reset and were then 197 minus 2 tips per 500 ml so were within specification.

The snowgauge tipping mechanism was checked and found to be reading 185 tips at the 500 ml rate which is 12 tips low.The stops were reset and were then 197 minus 3 tips per 500 ml so were within specification.

Appendix A.

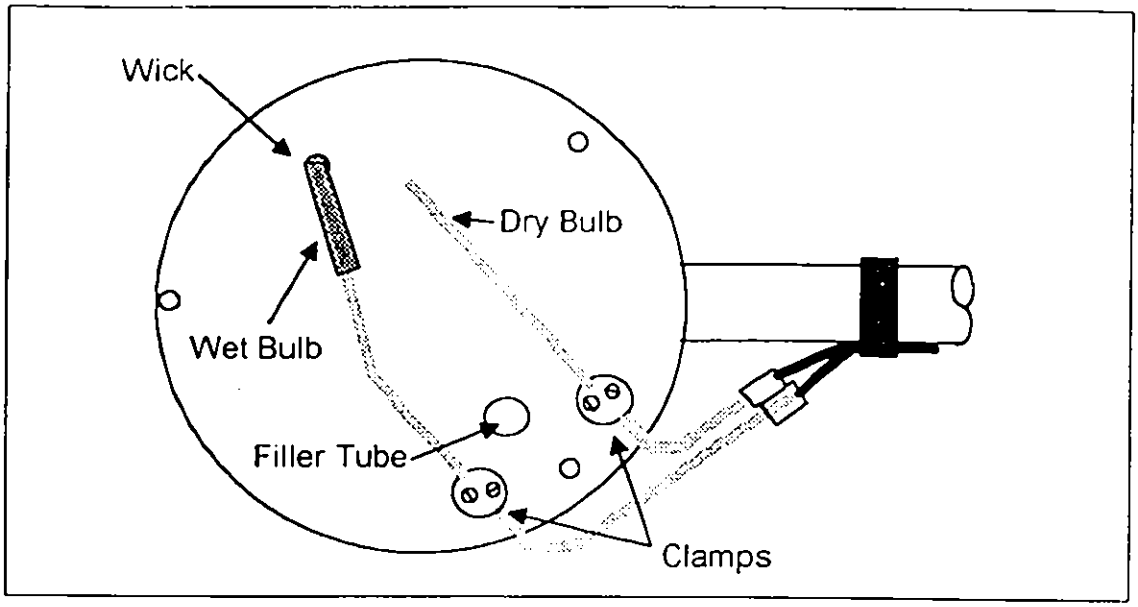
DIDCOT Instrument Co. Ltd.

Precision Weather Station
Routine Servicing instructions

Routine Servicing to be carried out by site personnel.

Monthly intervals :

1. Refill the Temperature screen water reservoir with demineralised water, the water will flow from the wick tube if the reservoir is over filled. This may result in high RH



indication until it evaporates. Fit a new wick, if the existing one appears contaminated or discoloured.

2. Clean the solarimeter dome using a soft cloth or sponge and a mild detergent solution. Check the silica gel desiccant colour, if pink, it should be replenished.
3. Dust the net radiometer domes, using a very soft brush. If the domes are damaged or discoloured they should be replaced immediately. If the black coating on the thermopile is damaged, the sensor should be returned to Didcot for re-coating and calibration. Check the colour of the moisture indicator, if pink, the drier tube should be withdrawn from the crossarm, and the desiccant replenished.
4. Clean the albedometer top & bottom diffusers using a soft cloth or sponge and a mild detergent solution.
5. Remove any debris from the raingauge collector and inspect the filter, this may be cleaned with a stiff brush and a detergent solution.
6. Check the stability of the mast, and sensor security of attachment.

6 month intervals:

1. As for Monthly intervals plus :
2. Replace the wick in the temperature screen.
3. Replace the net radiometer domes, and the silica gel desiccant if indicated.

DIDCOT Instrument Co Ltd Unit 14, Thames View Industrial Park, Abingdon, Oxon, OX14-3UJ Tel +44 (0) 1235- 522345 fax +44(0)1235 553471
For more information see our Web Site at: http://www.compulink.co.uk/dico/

DIDCOT Instruments

Environmental Change Network
Weather Station Annual Servicing

Didcot Instrument Company will undertake the following activities on an annual basis:-

All items recommended in the monthly and six monthly instructions together with the following:

Anemometer

The sensor will be checked for free rotation, and the end float will be checked to ensure it is between 0.1 to 0.5mm. Outside these limits the bearings will be replaced.

The reed switch will be electrically tested to ensure that it is closed for approximately half the revolution of the cups and open for the other half. In the event of an asymmetry exceeding 40/60, the reed switch will be replaced and the test repeated.

Wind Direction Sensor

The sensor will be checked for free rotation, and the end float will be checked to ensure it is between 0.1 to 0.5mm. Outside these limits the bearings will be replaced.

The pointer will be revolved and the the logger readings observed to ensure that the full zero to 360° range is obtained.

In the event of an error exceeding 5° the logger program will be adjusted to correct the error.

Solarimeter

The domes will be cleaned and the data logger reading noted and compared with a reference sensor.

The silica gel desicant will be examined and renewed as necessary.

In the event of an error, the solarimeter will be disconnected from the logger and a voltage equivalent to 1kWm^{-2} will be injected and the logger reading noted. If this test shows an error, the data logger will be faulty and the program will be adjusted to correct the error. The solarimeter will be reconnected to the data logger and checked to ensure that the logger readings are correct.

If necessary, the solarimeter will be removed from site for factory recalibration.

Didcot Instrument Co Ltd Unit 14, Thames View Industrial Park, Abingdon, Oxon, OX14 3UJ UK
Tel+44 (0)1235 522345 Fax: +44 (0)1235 553471 Email: dico@cix.compulink.co.uk
For more Information see our Web Site at: http://www.compulink.co.uk/~dico/

DIDCOT Instruments

Environmental Change Network
Weather Station Annual Servicing

Net Radiometer

The domes and silica gel will be replaced. The data logger readings will be noted, and compared to a reference sensor.

In the event of an error, the Net Radiometer will be disconnected from the logger and injected with a voltage equivalent to $1kWm^{-2}$ and the logger reading noted. If this test shows an error then the data logger will be faulty, and the program will be adjusted to correct the error. The Net Radiometer will be reconnected to the data logger and checked to ensure that the logger readings are correct.

If necessary, the Net Radiometer will be removed from site for factory recalibration.

Thermometers

The thermometers will be removed from the radiation screen, immersed in two temperature baths, at 0°C and 40°C and the data logger output observed. The reading must be within ±0.1°C.

If either or both temperature readings are in error, the test will be repeated with the logger program offsets & multipliers at 0 & 1 noting the actual bath temperatures and indicated temperatures. New offsets & multipliers will be calculated, and the logger program updated.

The water reservoir will be washed out, a new wick fitted and the reservoir refilled with de-mineralised water. The radiation screen will be reassembled, and checked to ensure that the logger readings are correct.

Note: The Thermometers used for this calibration will have calibrations of their own traceable to NAMAS Standard. The temperature of the baths may not be exactly 0 and 40°C, but two widely spaced temperatures near to 0 and 40° will suffice.

Albedometer

The diffusers will be cleaned and the data logger reading noted and compared with a reference sensor.

In the event of an error, the albedometer will be disconnected from the logger and voltages will be injected equivalent to $1kWm^{-2}$ for the top and bottom sensor, with the logger readings being noted. If this test shows an error, the data logger will be faulty and the program will be adjusted to correct the error. The albedometer will be reconnected to the data logger and checked to ensure that the logger readings are correct. If necessry, the albedometer will be removed from site for factory recalibration.

Didcot Instrument Co Ltd Unit 14, Thames View Industrial Park, Abingdon, Oxon, OX14 3UJ UK
Tel+44 (0)1235 522345 Fax : +44 (0)1235 553471 Email: dico@cix.compulink.co.uk
For more information see our Web Site at: http://www.compulink.co.uk/~dico/

DIDCOT Instruments
Environmental Change Network
Weather Station Annual Servicing

Precipitation Detector

The blade will be cleaned and thoroughly dried. The logger reading will be noted and it must be zero.

The blade will be wetted and the reading noted. It must be 0.00278, which equals 10 seconds expressed as a fraction of an hour.

The logger reading will be observed as the blade dries. It must fall to zero when the blade is between 40% and 60% wet. If it is outside these limits the logger program will be adjusted and the tests repeated.

Raingauge

The filter and the collector funnel will be cleaned, the cover removed and the inner funnel, tipping bucket and pivots cleaned.

The gauge will be reassembled and the calibration checked by connecting a digital counter and dripping one litre of water through the gauge over a 45 minute period.

The bucket stops will be adjusted and retested if the error exceeds 1%.

The gauge will be reconnected to the data logger and tested for correct functioning.

Soil Thermometers

If the thermometers are installed in plastic tubes, they will be removed and calibrated in the same manner as the wet and dry thermometers.

Otherwise the logger readings will be observed and only if the readings appear to be in error will the thermometers be extracted for calibration. Because the ground takes a fairly long time to settle after thermometers are reinstalled, we recommend that they are initially installed in plastic tubes from which they can be readily extracted. We would use this method of installation after a field calibration.

Gypsum Block

The logger readings will be noted to ensure they are within the operating range of the sensor.

This device cannot be serviced, or calibrated. If a new block is installed, it will take several weeks to settle to a stable reading.

We recommend the installation of a new block every six months, which should be connected to the logger in place of the older block after three months in the soil.

The older blocks should be left in place rather than disturb the ground by excavating them. Their wires should be cut close to the ground and the surplus removed from site.

Didcot Instrument Co Ltd Unit 14, Thames View Industrial Park, Abingdon, Oxon, OX14 3UJ UK
Tel+44 (0)1235 522345 Fax : +44 (0)1235 553471 Email: dico@cix.compulink.co.uk
For more information see our Web Site at: http://www.compulink.co.uk/~dico/

Watermark Soil Moisture Sensor

The logger reading will be noted and checked to be within the operating range of the sensor.

This device cannot be serviced, or calibrated. However, it has a much longer operating life than the Gypsum Block and is more resistant to frost.

We recommend the installation of a new block every year which should be connected to the logger in place of the older sensor after three months in the soil.

The older sensors can be left in place rather than disturb the ground by excavating them, their wires should be cut close to the ground and the surplus removed from site.

Soil Moisture

If a Gypsum Block is to be replaced with a Watermark Sensor, the logger program will require editing to insert the correct calculations for the new type of sensor. Providing that the Watermark Sensor is installed three months prior to the annual servicing these changes will be carried out on site as part of the service.

Replacement Components

The following items will be supplied as part of the service:
Net Radiometer Domes and O rings
Silica gel
Temperature Screen Wick and De-mineralised water
Anemometer and Raingauge reed switches

Repairs

Any repairs that are required, for example, renewing the anemometer bearings will be at an additional charge for the time and materials.

Recalibration

Sensors removed from site for factory calibration will be charged at the current rate of £37.50 with the exception of Kipp and Zonen Solarimeters which will be returned to the manufacturers. Costs for this will be quoted as necessary. We would not anticipate the need for regular recalibration of the Solarimeter or Net Radiometer unless they are physically damaged.

Didcot Instrument Co Ltd Unit 14, Thames View Industrial Park, Abingdon, Oxon, OX14 3UJ UK
Tel+44 (0)1235 522345 Fax : +44 (0)1235 553471 Email: dico@cix.compulink.co.uk
For more information see our Web Site at: http://www.compulink.co.uk/~dico/

Appendix B.

CERTIFICATE OF CALIBRATION

NAMAS
CALIBRATION
No. 0072

Universal Calibration
LABORATORIES Ltd

UNIVERSAL HOUSE
Romsey Industrial Estate,
Greatbridge Road,
Romsey,
Hants, SO51 0HR

Telephone (01794) 523935
Fax (01794) 523910

DATE OF ISSUE
25 JULY 1996

SERIAL NUMBER
70510T

APPROVED SIGNATORY
C.C-SMITH/M.DONNELLY

Customer: INSTITUTE OF HYDROLOGY
Address: WALLINGFORD
OXFORDSHIRE
OX10 8BB

Order No: T26K024100

Apparatus Tested - DIGITAL THERMOMETER & 2 PROBES

Type No: INDICATOR: P25 PROBES Pt 100
LENGTH: 350 mm DIAMETER: 6 mm

Serial No: INDICATOR 1026-5/440 (06517) (03265) PROBES: 91042/31 91042/32

Calibrated Range/Scale: -20 TO 40°C, 0.001°C RESOLUTION

Manufacturer: ASL

Test Conditions -

Date Instrument Received: 23 JULY 1996

Date Calibration Completed: 25 JULY 1996

Laboratory Temperature: 20 ± 2°C

Laboratory Humidity: 60 ± 10% RH

Reference No: 137233 T344/69

Certified by

The uncertainties are for a confidence probability of not less than 95%

CERTIFICATE OF CALIBRATION

ACCREDITATION NUMBER 0072

SERIAL NUMBER

70510T

SERIAL NO: INDICATOR: 1026-5/440 (06517) (03265) PROBE: 91042/31 CHANNEL: A

THE INSTRUMENT WAS CALIBRATED BY IMMERSING THE PROBE IN CLOSELY CONTROLLED TEMPERATURE REFERENCE ENVIRONMENTS TOGETHER WITH TWO REFERENCE STANDARD INSTRUMENTS HAVING KNOWN AND TRACEABLE VALUES OF UNCERTAINTY.

THE FOLLOWING RESULTS ARE DERIVED FROM THE MEAN VALUES OF A NUMBER OF OBSERVATIONS.

THE PROBE WAS IMMERSED TO A MINIMUM DEPTH OF 200 mm.

TEST TEMPERATURE °C	INSTRUMENT READING °C
- 0.001	0.012
- 20.002	- 20.006
- 0.001	0.010
25.003	25.009
40.009	40.019
- 0.001	0.009

THE UNCERTAINTY ASSOCIATED WITH THE TEST TEMPERATURE DOES NOT EXCEED ± [0.01°C + INSTRUMENT RESOLUTION

THE ABOVE UNCERTAINTY REFERS TO THE MEASUREMENT AND IS NOT INTENDED TO INDICATE THE SPECIFICATION, OR REPEATABILITY OF THE INSTRUMENT.

THE TEMPERATURE SCALE IN USE IS THE INTERNATIONAL TEMPERATURE SCALE OF 1990, ITS - 90.

Test Engineer L Waterman

The uncertainties are for a confidence probability of not less than 95%

Appendix C.

REGIONAL HYDROGEOLOGY – METEOROLOGICAL STATIONS

SENSOR CHECKS – CALIBRATION DATA

STATION NAME : LAIRFOLD RIGG DATE : 3 SEPTEMBER 1996 TABLE 1 REV B

Sensor Type	Test No.	Sensor Reading (degrees C)	Check Reading (degrees C)	Difference (degrees C)	COMMENTS
Raingauge Thermometer T1	Lower 1	0.06197	0.0014	0.06057	
	Upper 1	22.462	22.471	0.009	
Checkgauge Thermometer T2	Lower 1	0.07098	0.0017	0.06928	
	Upper 1	22.537	22.504	0.033	
Snowgauge Thermometer T3	Lower 1	0.0745	0.0011	0.0734	
	Upper 1	22.493	22.494	0.001	
Soil Thermometer T4	Lower 1	-0.3763	-0.0288	0.3475	Replace offset of -0.0929 with 0.32405
	Lower 2	0.04413	0.0008	0.04333	
	Upper 1	22.301	22.364	0.063	

Sensor Type	Test No.	Sensor Reading (tips/500ml water)	Required Reading (tips/500ml water)	Difference	COMMENTS
Raingauge Tipping Mechanism	1	192	197	5	
Snowgauge Tipping Mechanism	1	186	197	11	Adjust tipping stops
	2	200	197	3	

STATION NAME : BOAT HOW DATE : 4 SEPTEMBER 1996

TABLE 2

Sensor Type	Test No.	Sensor Reading (degrees C)	Check Reading (degrees C)	Difference (degrees C)	COMMENTS
Raingauge Thermometer T1	Lower 1	-0.10492	0.02963	0.13455	Replace offset of -0.2552 with 0.00
	Lower 2	0.15228	0.029	0.12328	Replace offset of 0.00 with -0.15228
	Lower 3	-0.0049	0.029	0.0339	
	Upper 1	19.042	19.06	0.018	
Checkgauge Thermometer T2	Lower 1	0.06546	0.04	0.02546	
	Upper 1	19.069	19.214	0.145	Replace offset of 0.0579 with 0.1
	Upper 2	19.205	19.195	0.1	
	Lower 2	0.11	0.044	0.066	
Snowgauge Thermometer T3	Lower 1	-0.08	0.038	0.118	
	Upper 1	19.167	19.39	0.223	Replace offset of -0.1521 with 0.00
	Upper 2	19.628	19.627	0.001	
	Lower 2	-0.02532	0.04	0.06532	
Soil Thermometer T4	Lower 1	-0.355	0.04	0.395	Replace offset of -0.1611 with 0.00
	Lower 2	-0.759	0.04	0.799	Replace offset of 0.00 with 0.76
	Lower 3	-0.05304	0.003	0.05604	
	Upper 1	19.922	20.77	0.848	Replace multiplier of 0.9996 with 1.1
	Lower 4	0.04833	0.04166	0.00667	Replace multiplier of 1.1 with 1.05
	Upper 2	20.624	20.59	0.034	
	Lower 5	-0.03	0.05	0.08	

Sensor Type	Test No.	Sensor Reading (tips/500ml water)	Required Reading (tips/500ml water)	Difference	COMMENTS
Raingauge Tipping Mechanism	1	176	197	21	Adjust tipping stops
	2	194	197	3	
Snowgauge Tipping Mechanism	1	175	197	22	Adjust tipping stops
	2	200	197	3	

STATION NAME : FARMERY DATE : 4 SEPTEMBER 1996 TABLE 3

Sensor Type	Test No.	Sensor Reading (degrees C)	Check Reading (degrees C)	Difference (degrees C)	COMMENTS
Raingauge Thermometer T1	Lower 1	-0.058	0.004	0.062	
	Upper 1	21.8	22	0.2	Replace multiplier of 0.9909 with 0.992
	Upper 2	21.77	21.93	0.16	Replace multiplier of 0.992 with 0.994
	Upper 3	21.778	21.9	0.122	Replace multiplier of 0.994 with 0.995
	Upper 4	21.783	21.832	0.049	
	Lower 2	-0.07	0.002	0.072	
Checkgauge Thermometer T2	Lower 1	-0.076	0.05	0.126	
	Upper 1	21.85	22.02	0.17	Replace multiplier of 0.9916 with 0.9926
	Upper 2	21.935	22.03	0.095	
	Lower 2	-0.01	0.076	0.086	
Snowgauge Thermometer T3	Lower 1	-0.06	0.01	0.07	
	Upper 1	21.818	21.947	0.129	Replace multiplier of 0.991 with 0.993
	Upper 2	21.93	22.01	0.08	
	Lower 2	-0.06717	0.01	0.07717	
Soil Thermometer T4	Lower 1	-0.195	0.02	0.215	Replace offset of -2.2513 with -2.05
	Lower 2	-0.033	0.03	0.063	
	Upper 1	22.09	22.06	0.03	
Wet Thermometer	Lower 1	-0.674	-0.005	0.669	Replace offset of -2.374 with 0.00
	Lower 2	1.7077	0.03926	1.66844	Replace offset of 0.00 with -1.72
	Lower 3	-0.02706	0.02985	0.05691	
	Upper 1	20.501	21.204	0.703	Replace multiplier of 0.9917 with 1.00
	Upper 2	22.74	21	1.74	Replace multiplier of 1.00 with 1.01
	Upper 3	20.95	20.92	0.03	
	Lower 4	0.07	0.047	0.023	
Dry Thermometer	Lower 1	-0.05419	0.0476	0.10179	
	Upper 1	20.66	20.799	0.139	Replace multiplier of 0.992 with 0.995
	Upper 2	20.66	20.76	0.1	
	Lower 2	-0.026	0.0466	0.0726	

Sensor Type	Test No.	Sensor Reading (watts/sq m)	Check Reading (watts/sq m)	Difference (watts/sq m)	Comments
Solarimeter	1	241	240	1	
	2	240	244	4	
	3	247	248	1	
	4	294	296	2	
	5	232	235	3	
	6	217	224	7	

Sensor Type	Test No.	Sensor Reading (tips/500ml water)	Required Reading (tips/500ml water)	Difference	COMMENTS
Raingauge Tipping Mechanism	1	177	197	20	Adjust tipping stops
	2	194	197	3	
Snowgauge Tipping Mechanism	1	184	197	13	Adjust tipping stops
	2	194	197	3	

STATION NAME : LONG GRAIN DATE: 5 SEPTEMBER 1996 TABLE 4

Sensor Type	Test No.	Sensor Reading (degrees C)	Check Reading (degrees C)	Difference (degrees C)	COMMENTS
Raingauge Thermometer T1	Lower 1	0.034	0.02	0.014	
	Upper 1	14.51	14.58	0.07	
Checkgauge Thermometer T2	Lower 1	0.02919	0.002	0.02719	
	Upper 1	14.45	14.62	0.17	Replace multiplier of 0.9978 with 0.999
	Upper2	14.64	14.67	0.03	
	Lower 2	0.063	0.065	0.002	
Snowgauge Thermometer T3	Lower 1	0.02812	0.04	0.01188	
	Upper 1	14.36	14.49	0.13	Replace multiplier of 0.9978 with 0.9999
	Upper 2	14.45	14.57	0.12	Replace multiplier of 0.9999 with 1.001
	Upper 3	14.56	14.56	0	
	Lower 2	0.02	0.04	0.02	
Soil Thermometer T4	Lower 1	−0.21	0.08	0.29	Replace offset of 0.0921 with 0.00
	Lower 2	−0.3579	0.03	0.3879	Replace offset of 0.00 with 0.30
	Lower 3	0.03	0.04	0.01	
	Upper 1	15.41	15.7	0.29	Replace multiplier of 0.998 with 1.01
	Upper 2	15.682	15.7	0.018	
	Lower 4	−0.0117	0.08	0.0917	

Sensor Type	Test No.	Sensor Reading (tips/500ml water)	Required Reading (tips/500ml water)	Difference	COMMENTS
Raingauge Tipping Mechanism	1	160	197	37	Adjust tipping stops
	2	200	197	3	
Snowgauge Tipping Mechanism	1	110	195	85	Adjust tipping stops
	2	195	197	2	

STATION NAME : GRIKE DATE : 5 SEPTEMBER 1996 TABLE 5 REV A

Sensor Type	Test No	Sensor Reading (degrees C)	Check Reading (degrees C)	Difference (degrees C)	COMMENTS
Raingauge Thermometer T1	Lower 1	-0.28365	0.04	0.32365	Replace offset of -2.2811 with -2.08
	Lower 2	-0.04238	0.02	0.06238	
	Upper 1	21.92	22.08	0.16	Replace multiplier of 0.9926 with 0.995
	Upper 2	21.89	21.97	0.08	
	Lower 3	0.0526	0.001	0.0516	
Checkgauge Thermometer T2	Lower 1	-0.2626	0.04	0.3026	Replace offset of -2.1565 with -1.95
	Lower 2	-0.0362	0.01	0.0462	
	Upper 1	22.35	22.47	0.12	Replace multiplier of 0.9911 with 0.995
	Upper 2	22.3	22.34	0.04	
	Lower 3	-0.016	0.08	0.096	
Snowgauge Thermometer T3	Lower 1	-0.19758	0.01	0.20758	Replace offset of -2.3643 with -2.16
	Lower 2	0.027	0.03	0.003	
	Upper 1	21.56	21.6	0.04	
Soil Thermometer T4	Lower 1	-0.025	0.0907	0.1157	Replace offset of -2.3213 with -2.05
	Lower 2	0.04	0.044	0.004	
	Upper 1	20.87	20.92	0.05	
Wet Thermometer					Replace offset of -2.1428 with -2.00
	Lower 1	-0.068	0.032	0.1	
	Upper 1	21.19	21.35	0.16	Replace multiplier of 0.9929 with 0.994
	Upper 2	21.29	21.48	0.19	Replace multiplier of 0.994 with 0.998
	Upper 3	21.35	21.4	0.05	
	Lower 2	-0.02	0.04	0.06	
Dry Thermometer					Replace offset of -2.2244 with -2.00
	Lower 1	0.03206	0.03239	0.00033	
	Upper 1	21.29	21.36	0.07	

Sensor Type	Test No.	Sensor Reading (watts/sq m)	Check Reading (watts/sq m)	Difference (watts/sq m)	COMMENTS
Solarimeter	1	756	744	12	
	2	586	599	13	
	3	659	668	9	
	4	561	563	2	
	5	729	712	17	
	6	689	691	2	

Sensor Type	Test No.	Sensor Reading (tips/500ml water)	Required Reading (tips/500ml water)	Difference	COMMENTS
Raingauge Tipping Mechanism	1	210	197	13	Adjust tipping stops
	2	194	197	3	
Snowgauge Tipping Mechanism	1	170	197	27	Adjust tipping stops
	2	196	197	1	

STATION NAME : BRAYSHAW DATE : 6 SEPTEMBER 1996

TABLE 6

Sensor Type	Test No.	Sensor Reading (degrees C)	Check Reading (degrees C)	Difference (degrees C)	COMMENTS
Raingauge Thermometer T1	Lower 1	0.15	0.015	0.135	Replace offset of 0.118 with 0.00
	Lower 2	-0.01	0.01	0.02	
	Upper 1	22.979	23.16	0.181	Replace multiplier of 0.9987 with 1.00
	Upper 2	22.946	23	0.054	
	Lower 3	-0.01	0.04	0.05	
Checkgauge Thermometer T2	Lower 1	-0.0296	0.03	0.0596	
	Upper 1	22.635	22.76	0.125	Replace multiplier of 1.0011 with 1.003
	Upper 2	22.669	22.7	0.031	
Snowgauge Thermometer T3	Lower 1	0.08238	0.025	0.05738	
	Upper 1	20.944	21.08	0.136	Replace multiplier of 0.9929 with 0.996
	Upper 2	20.95	21.96	0.01	
	Lower 2	0.08295	0.077	0.00595	
Soil Thermometer T4	Lower 1	0.0692	0.028	0.0412	
	Upper 1	22.156	22.34	0.184	Replace multiplier of 0.999 with 1.002
	Upper 2	22.16	22.29	0.13	Replace multiplier of 1.002 with 1.009
	Upper 3	22.218	22.199	0.019	
	Lower 2	0.0131	0.04	0.0269	

Sensor Type	Test No.	Sensor Reading (tips/500ml water)	Required Reading (tips/500ml water)	Difference	COMMENTS
Raingauge Tipping Mechanism	1	160	197	37	Adjust tipping stops
	2	195	197	2	
Snowgauge Tipping Mechanism	1	185	197	12	Adjust tipping stops
	2	194	197	3	