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Institute of
Oceanographic Sciences
Deacon Laboratory

INTERNAL DOCUMENT No. 298

A user's guide to the MultiMet Sensor and Calibration Facility

R W Pascal A L Williams & R Ahmed

1991

Natural Environment Research Council

INSTITUTE OF OCEANOGRAPHIC SCIENCES
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ABSTRACT

The report describes the operating instructions and procedures for the MultiMet Sensor Management and Calibration Facility. This includes a description of the Meteological database METDB, and the Sensor Management database which organises the large number of sensors required by the Multimet System. Calibration procedures and policies are also described for the various types of sensors used.

KEYWORDS

ISSUING ORGANISATION

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MULTIMET SENSOR MANAGEMENT

AND

CALIBRATION FACILITY

INTRODUCTION

The aim of this report is to describe and provide operating instructions for the MultiMet Sensor Management and Calibration Facility. Section 1 provides details of the system fundamentals and structure. Section 2 describes the operating procedures. An appendix provides information needed for maintaining the system including listings of the programs.

The Temperature Controlled Tank at present lives in the calibration room, where it has a good stable environment, enabling accurate calibrations. A TANDON 386 PC is used to control the tank with the addition of a STRAWBERRY TREE I/O card. The I/O card reads the data from the sensors and also controls the tank, the F25 precision thermometer is read via the RS423 port. The PC also has the prime database as it is generally updated from the tank software. It was decided that the various software programs should be integrated into one SENSOR MANAGEMENT package. This package called MultiMet Sensor Management, is a menu driven program, making it as user friendly as possible.

The Sensor Management package performs four functions :-

a) Access to METDB database
b) Controlling the Calibration Tank
c) Generation of Calibration Certificates
d) Sensor Management

All the above functions can be accessed by the use of menu driven software, which are interlinked to create one package. The first menu is automatically displayed when the PC is turned on, making sure all software is loaded correctly. It provides the following options.

Main Menu

a) Calibration Menu

This loads a second menu which gives the choice of calibration software ie tank or manual input.

b) Allocation Menu

This loads the first menu of the sensor management software.

c) Metdb

Metdb SHELLS out of GWBASIC and loads PIPEDREAM so that the database can be accessed.

d) Quit

Returns the user back to DOS.

PART 1 SYSTEM FUNDAMENTALS

1.1 METBD

Metdb is a database of meteorological sensors, it was compiled on PIPEDREAM, a word processing/ spreadsheet/ database program. Each sensor on the database is allocated a MultiMet number (xxx), and has the following files :-

List file - "SSMMnnnn.L"
Details file - "Details.xxx"
History file - "History.xxx"
Calibration files - "SSJJJYY1.xxx"

Where SS= Sensor type code TT - Psychrometer
MM= Manufacturer's code VI - Vector Instruments
nnnn= Serial number 1029
xxx= MultiMet number 100
JJJ= Julian day number
YY= Year number
l= Repetition letter A - Z

The List file is a list of Details file, History file, and Calibration files, an example of for temperature sensor VI1029 is
:-
List file name TTVI1029.L
Contents

\ametdb\metdb_da\DETAILS.100
\ametdb\metdb_da\HISTORY.100
\ametdb\metdb_da\TW19590a.100
\ametdb\metdb_da\TD19590a.100
\ametdb\metdb_da\TW19590b.100
\ametdb\metdb_da\TD19590b.100

Note that two calibrations performed on the same day for a sensor will generate Calibration files of the same name except for the Repetition letter.

PIPEDREAM reads and links the contents of a List file together, enabling the various files to be treated almost as one.The History file is updated every time a calibration is performed on the sensor, when the sensor is deployed, and when it returns from a cruise. Access to the METDB database on PIPEDREAM allows the user to examine the files for any sensor by Shelling out of GWBASIC into PIPEDREAM. This is a little bit slow, so for prolonged investigation into the database it is best to enter PIPEDREAM from DOS.

1.2 CALIBRATIONS

The Calibration Tank is used to calibrate temperature sensors by immersing the sensor in water of a set temperature, measured by a precision thermometer. The tank calibration software controls the tank and steps it through various temperatures set by the user. During a calibration the PC takes simultaneous readings of both the sensors and the precision thermometer as the tank reaches a stable temperature. On completion of the calibration, both the History and List files are automatically updated. All data points and a polynomial least squares fit, generating up to four coefficients, are written to a new Calibrations file.

Calibration Menu

There are three basic functions accessed via the calibration menu, these are :-

a) Tank calibrations of any temperature sensors

b) Manual input for wind speed and temperature sensor data, generating calibration coefficients and updating the database.

c) Generation of calibration certificates.

Tank Calibrations

To run the tank calibration software select the Calibration Menu from the Main Menu, this then gives the option of "TANK", which loads the control software. All calibrations performed by this method are automatically entered into the database, with both List files and History files being updated. This does require however, that the sensors already exist on the database.

Manual Input

When calibrations are performed outside of I.O.S. they generally need processing to produce calibration coefficients, also the database will require updating. To perform this task there is a manual input option where the raw calibration data is input via a program editor. There are two programs to choose from, one for wind speed sensors and one for

temperature sensors, both of which generate a polynomial least squares fit. Again the database is fully updated, therefore all sensors must exist on the database, as the program will check and detect an error. Both programs are menu driven enabling the user to select the type of sensor to be calibrated.

Calibration Certificates

This software compares any two selected calibrations from one sensor, and preforms a comparison between them. This is useful in testing the latest calibration with an earlier one, to see whether the sensor has a stable calibration. Calibration Certificates can be produced any time that they are required. To run this program the user can select either wind speed or temperature from the Calibration Menu, as both programs will give the certificate option. The type of sensor requiring a certificate is chosen when the Calibration Certificate program is executed.

1.3 MULTIMET SENSOR MANAGEMENT

Due to the large number of sensors, about 70-80, it is necessary to have some means by which to keep track of where they all are, and in what state. The MultiMet Sensor Management system has its own list of sensors and their MultiMet numbers, these are stored in a random access file called Sensors.dat. Each sensor in the file is tagged with a letter R, D or M, this give's an indication of the condition of sensor.

R = Sensor has current Calibration (READY)
D = Sensor is Deployed (DEPLOYED)
M = Sensor requires new Calibration (MAINTENANCE)

This effectively makes three lists, and when any sensor is moved from one list to another the sensors History file is updated. The entry consists of the date and a suitable comment, also the user can add further comments if required.The software also displays which sensors are in which list, along with the sensors History file, enabling the user to choose which is the best sensor for the task he has in mind.

Allocation Menu

This menu gives access to the sensor management software and allows new sensors to be entered into the database. The objective is to record any change in a sensor status, such as a sensor being returned from a deployment. There are three categories for the sensor management and one for new sensors, these are :-

a) Calibrated Sensors

Calibrated sensors refers to a list of sensors that have a current calibration and are ready for deployment.

b) Deployed Sensors

Deployed sensors is a list of sensors currently deployed.

c) Sensors Requiring Calibration

Sensors requiring calibration is a list of sensors recently returned from deployment and needing post calibrations, or for sensors that still require some form of maintenance.

d) New Sensor Entries

For creating a new database entry and allocating a MultiMet number to the new sensor.

e) Dump to Printer Sensor List

This option allows the user to print out all sensors of each type, including their status and MultiMet numbers.

Selecting Sensors For Deployment

From the Main Menu select the Allocation Menu, move the cursor to CALIBRATED SENSORS and press <RETURN>. Now a choice of sensor types is displayed, select the appropriate sensor type, such as air temperature. The program now displays a list of air temperature sensors that have valid calibrations and are available for deployment. The cursor keys enable the user to scroll through the list and select a particular sensor. When this is done the History file for that sensor is displayed. This enables the user to check the past history of the sensor, and make sure that it is suitable for the required use. The sensor can be de-selected if it is not suitable, or by entering </>, it will be removed from the calibrated sensor list and entered into the deployed sensor list. The History file is updated with the comment " sensor deployed", the user can also add further comments such as where the sensors is to be deployed etc. The program then returns the user back to the Select Sensor Type Menu, so that another sensor can be chosen, or return to the Allocation Menu.

Sensors Returning From Deployment

From the Main Menu select the Allocation Menu, move the cursor to DEPLOYED SENSORS and press <RETURN>. Now a choice of sensor types is displayed, select the appropriate sensor type, such as air temperature. The program now displays a list of air temperature sensors that are currently deployed. The cursor keys enable the user to scroll through the list and select the sensor that has just returned. When this is done the History file for that sensor is displayed. This enables the user to check where the sensor has come from and any other relevant comments. The sensor can be de-selected if it is the wrong one, or by entering </>, it will be removed from the deployed sensor list and entered into the sensors requiring calibration list. The History file is updated with the comment, "sensor returned to maintenance", the user can also add further comments such as what state the sensor is in, i.e. whether it is working or not, etc. The program then returns the user back to the Select Sensor Type Menu, so that another sensor can be chosen or return back to the Allocation Menu.

Sensors Made Available For Deployment

From the Main Menu select the Allocation Menu, move the cursor to SENSORS REQUIRING CALIBRATION and press <RETURN>. Now a choice of sensor types is displayed, select the appropriate sensor type, such as air temperature. The program now displays a list of air temperature sensors that are currently under maintenance. The cursor keys enable the user to scroll through the list and select the sensor that has just been refurbished and has a current calibration. When this is done the History file for that sensor is displayed. This enables the user to check wether the sensor has all reported problems corrected. The sensor can be de-selected if this is not so, or by entering </>, it will be removed from the sensor requiring calibration list and entered into the calibrated sensors list. The History file is updated with the comment "sensor now available", the user can also add further comments such as whether a fan will need changing soon, etc. The program then returns the user back to the Select Sensor Type Menu, so that another sensor can be chosen, or return back to the Allocation Menu.

Dump To Printer Sensor List

From the Main Menu select the Allocation Menu, move the cursor to DUMP TO PRINTER SENSOR LIST press <RETURN>. The program then displays a SENSOR TYPE menu, selecting a particular type will dump to the printer a list of every sensor in the database of that type. Included in the printed list is the MultiMet number of each sensor, and the sensors status.

New Sensors Entries

When there is a need for a new sensor to be added to the database and a MultiMet number allocated to it, select NEW SENSOR ENTRIES. The program creates a blank Details and History file and inserts them into a List file, later the full details must be added to the files. The Sensor Management file is also updated and the sensor filed under the chosen list.To run the software first select the Allocation Menu from the Main Menu, selecting NEW SENSOR ENTRIES produces a menu of sensor types. Selecting the correct SENSOR TYPE means that the new MultiMet number is chosen in the correct range. The display then shows the new number and asks for the sensor type code, examples of which are shown on the left of the screen, these are always two characters. The user is then prompted for the serial number of the sensor, this is a four digit code preceded by two characters representing the manufactures name (for further details refer to PKT's description in the database handbooks). Finally the user is asked under which list should the sensor be filed R/M/D,

then prompted to press <any key> when all files have been written to disc. The user is then left in the Select Sensor Type Menu, and can return back to the Allocation Menu.

Under the Select Sensor Type Menu, there is also an option to Change MultiMet Allocation, enabling the user to change the details of a sensor as recorded in the MultiMet Sensor Management file. This option has no effect on the current List / Details / History files allocated to that MultiMet number. Possible uses could be to re allocate a MultiMet number to a new sensor, or changing the allocation code without updating the History file.

PART 2 OPERATING PROCEDURES

2.1 CHOOSING A SENSOR

All sensor details and their status are held in the MultiMet Sensor Management files stored in the TANDON 386 PC used for controlling the calibration tank. Therefore by accessing this information the Sensor Management system will produce a list of available sensors of the type required. The system enables the user to scroll through this list, as well as examining the History file of any sensor, so checking its suitability for that particular deployment. When a suitable sensor is located it is selected and so removed from the "sensor available" list and put into the "deployed sensors" list. Comments can be added to the automated update History file, indicating where the sensor is to be deployed. The sensor can now be removed from the racks behind the lift and put into a transportation case, ready for deployment.

The procedure for selecting a sensor for deployment from the Sensor Management system is as follows.

A) Turn on the mains supply at the wall behind the PC and turn on the PC.

B) The PC should be displaying the Main Menu of the Sensor Management system, select the Allocation Menu and move the cursor to "Calibrated Sensors" and press <RETURN>.

C) A choice of sensor types is now displayed, select the appropriate sensor type, such as Air Temperature. The system now displays a list of air temperature sensors that are all ready for deployment.

D) Use the cursor keys to scroll up and down through the list, by pressing <RETURN> a sensor,s History file is displayed on the screen. Pressing <1> will allow another sensor to be examined, or by pressing </> the sensor is finally selected for deployment.

E) The History file is updated with the comment "sensor now deployed", additional comments can be added, such as where the sensor is to be deployed.

F) From the Sensor Type Menu return back to the Allocation Menu, and from there to the Main Menu.

H) Go to sensor storage area and remove selected sensor from shelf, and store in transportation box ready for deployment..

2.2 RETURNING A SENSOR

Sensors should be returned to the area behind the lift, removed from their travel boxes and stored in their correct locations on the racks. If possible a wash in fresh water to remove any salt would be advantageous. The Sensor Management filing system should be updated by removing the Returned sensors from the Deployed list. Comments can be entered on the current state of the sensor and what repairs if any need doing. The sensor requires a post deployment calibration as soon as practically possible. When calibrating sensors it is possible to have a mix of sensor types in the tank at the same time, assuming the same temperature ranges are required by all sensors.

Psychrometers

Psychrometers are calibrated in our own calibration tank, therefore little delay should be necessary before a post calibration is completed. The following steps should be taken to complete a post calibration.

a) Dismantle the psychrometer by removing the lower half of the case and detaching the water bottle holder from the lid. This requires two screws to be undone from the lid, and the wick to be removed from the wet bulb element. If the wick is in a bad condition it should be replaced, or boiled to clean and remove all salt.

b) Turn on the mains supply at the wall behind the PC. Check that the Tank, Cooler, F25, Interface power supply, and the Tandon PC all have their supplies turned on. Also check that the tank control box is switched to PC.

c) Visually inspect the fan for any signs of corrosion and attach the fan power test lead to the psychrometer. With a 12 volt supply the current consumption should be about 0.2 A. If the fan fails to rotate or is particularly noisy, then it should be replaced after the calibration is completed.

d) Place the psychrometer in the tank, as near to the F25 probe as possible, using the support bars. The maximum number of psychrometers to be calibrated at one time is six.

e) The PC should be displaying the Main Menu of the Sensor Management software. Select the Calibration menu, followed by "TANK". This will run the tank control software.

f) Enter your name, then on the displayed menu, check that the arrow is pointing to psychrometers. Enter the number of sensors to be calibrated. Press the ESC key to move on.

g) Enter in the serial number of the sensor to be calibrated such as VI1029. This will display the details about that sensor, such as which electronics tube it belongs with. Now connect the psychrometer to the correct set of electronics. Press ESC when all sensors have been entered in this way.

h) The program now tells the user which sensor should be connected to which channel. Each cable coming from the interface box is labelled with its channel number, and this can be plugged into the electronics tube. As each sensor is connected, the channel number and frequency output from the sensor are displayed on the screen. Check that this is correct, i.e. in the range of 1500 - 2000 Hz for a psychrometer, for each channel. This updates about every 10 sec, therefore it will take a little while before the readings are stable.

i) Press <RETURN> to continue, this will move on to the temperature range and steps. <RETURN> will enter the default values of 0 - 35 DEG step 5, a calculated duration time for the calibration will now be displayed. If this is acceptable then continue by pressing <RETURN>.

The tank software will now perform the calibration without any further user input, storing the data in a temporary file. On completion, the relevant files for METDB database are created or updated, such as List file, History file and Calibration files.

SST

Again SST sensors are calibrated in our own tank and therefore can be calibrated without any delay.

a) Thoroughly wash both the SST rope and the electronics tube to remove all salt.

b) Remove all weights from the rope, check for corrosion on screws etc.

c) Turn on the mains supply at the wall behind the PC. Check that the Tank, Cooler, F25, Interface power supply, and the Tandon PC all have their supplies turned on. Also check that the tank control box is switched to PC.

d) Place the rope or up to four sets of sensors, in to the tank, as close to the F25 probe as possible.

e) The PC should be displaying the main menu of the Sensor Management software. Select the Calibration menu, followed by TANK. This will run the tank control software.

f) Enter your name, then on the displayed menu, check that the arrow is pointing to SST'S. Enter the number of sensors to be calibrated. Press the ESC key to move on.

g) Enter in the serial number of the sensor to be calibrated such as OI0005. This will display the details about that sensor, such as which electronics tube it belongs with. Now connect the SST sensor to the correct set of electronics. Press ESC when all sensors have been entered in this way.

h) The program now tells the user which sensor should be connected to which channel. Each cable coming from the interface box is labelled with its channel number, and this can be plugged into the electronics tube. As each sensor is connected, the channel number and frequency output from the sensor are displayed on the screen. Check that this is correct ie in the range of 1500 - 2000 Hz for an SST sensor, for each channel. This updates about every 10 sec, therefore it will take a little while before the readings are stable.

i) Press <RETURN> to continue, this will move on to the temperature range and steps. <RETURN> will enter the default values of 0 - 35 DEG step 5, a calculated duration time for the calibration will now be displayed. If this is acceptable then continue by pressing <RETURN>.

The tank software will now perform the calibration without any further user input, storing the data in a temporary file. On completion, the relevant files for METDB database are created or updated, such as List file, History file and Calibration files.

Wind speed (manual entries)

All wind speed sensors are calibrated at the Met Office at Bracknell, therefore there may be some delay before calibrations are done. This makes it all the more essential that the sensors

are washed and cleaned before being stored in their correct slots on the racks.On return from the Met Office the data needs to be assimilated into the database and proper calibrations calculated. This is achieved by the following steps.

a) Turn on the mains supply at the wall behind the PC, then switch on the Tandon PC.

b) The PC should be displaying the main menu of the Sensor Management software. Select the Calibration menu, followed by WIND SPEED.

c) The wind speed calibration program displays major types of wind sensors such as Cup Anemometer, select the relevant type.

d) Input date of calibration ie date measurements were taken at the Met Office. If unknown use the default date.

e) Enter your name.

f) Enter the drive letter that database is held on, i.e. D:. This is also the default setting which is correct for the Tank PC.

g) Enter the calibration standard, this is usually the TESTOVENT when the measurements were taken at the Met Office.

h) Enter any comments.

i) Follow instructions for entering sensor details such as serial number, etc.

j) Details from database are now displayed, check that correct sensor has been chosen.

k) Calibration data is now input via an editor provided by the program.

l) On completion of data entry, the coefficients are calculated and the database is automatically updated.

m) Program returns the user back to the Main Menu.

Temperature Sensors (manual entry)

Generally temperature sensors are calibrated using the TANK system (see Psychrometers for details). When this is not the case and a set of calibration measurements need to be manually entered and the coefficients calculated, follow the steps below.

a) Turn on the mains supply at the wall behind the PC, then switch on the Tandon PC.

b) The PC should be displaying the main menu of the Sensor Management software. Select the Calibration menu, followed by TEMPERATURE.

c) The temperature calibration program displays major types of temperature sensors such as Psychrometer, select the relevant type.

d) Input date of calibration, i.e. date measurements were taken. If unknown use the default date.

e) Enter your name.

f) Enter the drive letter that database is held on ie D:. This is also the default setting which is correct for the Tank PC.

g) Enter the calibration standard, this is usually the TESTOVENT when the measurements were taken at the Met Office.

h) Enter any comments.

i) Follow instructions for entering sensor details such as serial number, etc.

j) Details from database are now displayed, check that correct sensor has been chosen.

k) Calibration data is now input via an editor provided by the program.

l) On completion of data entry, the coefficients are calculated and the database is automatically updated.

m) Program returns the user back to the Main Menu.

2.3 VISITING THE MET OFFICE

When calibrating Wind Speed sensors it is usual to use a wind tunnel, but I.O.S. does not have this facility. The nearest usable wind tunnel is at the Met Office at Bracknell, and is therefore used for any calibrations of this kind. The normal procedure is to take measurements of the frequency output of the sensors at set wind speed values from 5 - 35 m/s. This is measured on a counter or DVM depending on whether the output is frequency or analog, and the wind speed is measured on the Met Office TESTOVENT. These figures are then entered into the database, and coefficients calculated, by using the manual entry for wind speeds in the MultiMet Sensor Management system.(see 2.2 Returning a Sensor for more details)

The normal procedure is as follows:-

Prior to visit

A) Phone the Met Office to arrange a convenient time to visit.

Phone No. 0344 420242

Contact PAUL JOY

B) Check with transport that an I.O.S. car is available.

C) Select the sensors for calibration by using the MultiMet Management system.

D) Remove selected sensors from storage racks and pack into suitable travelling boxes.

Items to take

A) Each sensor type will require a stand to mount the sensor in the tunnel.

Vector	Met Office stand available
Young	Metal right angle stand for generator only
Young Monitor AQ	Spigot stand to mount whole sensor.

B) Counter and DVM to measure output from sensors.

C) Notebook for writing results in.

On Return

A) Put sensors back in their correct position on the storage racks.

B) Enter calibrations into database. Refer to "2.2 Returning a Sensor" for more explicit details on this procedure.

C) Enter into a sensor's History file any significant details, discovered during the calibration, such as sticky bearing etc.

APPENDIX 1

MULTIMET SENSOR DATABASE - Specifications

The database will be maintained using PIPEDREAM.
ALL FILES WILL BE TEXT FILES SAVED FROM PIPEDREAM WITH THE "TAB" OPTION SELECTED. Such files can be imported directly into dBase III or Microsoft Word.

Each sensor will be known by an eight character "Sensor ID" and will also have a three character MultiMet Number allocated sequentially as the sensors are purchased.

Sensors ID's will be of form SSMMnnnn

where
SS = sensor type
MM = manufacturer
nnnn = sensor number (derived from the manufacturers serial no.)

Sensor Type (SS)
The suggested sensor types are

(wind velocity)

WS	Wind Speed (eg Cup anemometer)
WW	Wind velocity (eg Propeller Vane instrument)
WD	Wind direction (eg Vane)

(ships velocity)

VS	Vessel's speed
VH	Vessel's head

(air temperature and humidity)

TD	Dry Bulb Temperature
TW	Wet Bulb Temperature
TT	Psychrometer (wet + dry bulb)
HU	Relative humidity device (eg Humicap)

(sea surface temperature)

SF	Sea surface temperature (Fish)

SP	Sea surface temperature (Soap)
SR	Sea surface temperature (Radiometer)
ST	Sea surface temperature (eg Hull contact)

(others)

RS	Short Wave Radiation (eg Kipp solarimeter)
RL	Long Wave Radiation (eg Eppley Pyranometer)
AP	Air Pressure
PD	Precipitation detector
PG	Precipitation gauge
AC	Accelerometer

Manufacturers Code (MM)

The suggested manufacturers codes are

BG	Brookes & Gatehouse
DC	Digicourse
DE	Delta-T Devices
DI	Didcot Instruments
EP	Eppley
IO	IOS designed/built
KZ	Kipp & Zonen
SU	Sundstrand
VA	Vaisala
VI	Vector Instruments
YG	R M Young

Sensor Numbers (nnnn)

The four digit numbers should be equal to the manufacturers serial number (eg for Vector Instruments) or to the last four digits of that serial number. Where no serial number is given (eg R M Young) the sensor number may reflect the order of purchase, or the MultiMet number may be used.

File Structure

In describing the file structure the example used will be a Vector Instruments Psychrometer Serial number 1029 having MultiMet number 123.

The structure described will hold for the Z88, IBM PC and Master 128, it can be converted for use under ADFS (eg on Master 128 or Archimedes) by using the MOVE.EXE on the Master 512.

Files will all be stored at a single directory level, extensions will be used to distinguish between files.

File	Contents
*.HLP	"readme" text files describing the database structure.
*.L	pipedream list files
SSMMnnnn.L	pipedream list file for a given sensor
Details.L	(for example) list file allowing all sensors details to be printed
CUM33.L	(for example) list file allowing calibrations for a particular cruise to be printed

File	Contents
Sensors.txt	Master file containing list of MultiMet Numbers, sensor ID's and sensor serial numbers.

MultiMet Number	Sensor ID	Serial Number
123	TTVI1029	1029

Details.mmm (where mmm is the MultiMet number, eg details.123) contains the information which generally is constant for each type of sensor. for example, sensors type, cost, spare parts, etc.

History.mmm Information on calibration and usage of the sensors.

SSddmmyy.mmm (where SS is the sensor type and ddmmyy is the calibration date). These files contain information for a given calibration. thus for the psychrometer there will be files

TD011187.123, TW011187.123,
TD100689.123, TW100689.123 say.

EXAMPLE LIST FILE

FOR THE ABOVE EXAMPLE THE LINK FILE "TDVI1019.L" would contain ...

Details.123
History.123
TD011187.123
TW011187.123
TD100689.123
TW100689.123

APPENDIX 2

CALIBRATION POLICY FOR WIND SPEED AND TEMPERATURE SENSORS

SENSOR DEPLOYMENT

1. For Individual Cruise

Sensors should be calibrated within one month of cruise commencement or completion. Where the transportation overheads exceed this period, calibration should be as close as possible to this time scale to minimise the time between post and pre calibrations.

2. Multiple Cruise Campaign

Sensors should be calibrated within month prior to deployment, where the transportation allows.

Sensors should not be deployed for periods exceeding 4 months.

When sensors are removed there should be overlap in deployment time between sensors of identical types, to allow calibration checks to be made in-situ. Therefore not all of identical sensor types should be removed at one routine service during a campaign, but replacement should be rotated between sensor suites/deployment sites.

Returned sensors should be post calibrated within one month of removal from data collection, where transport allows.

3. Sensors removed because of calibration problems

These should be calibrated within one month of removal from data collection, transportation allowing.

CALIBRATION DETAILS

1. All sensors before deployment must be entered into the database with all associated files :-

List file
History file
Calibration file

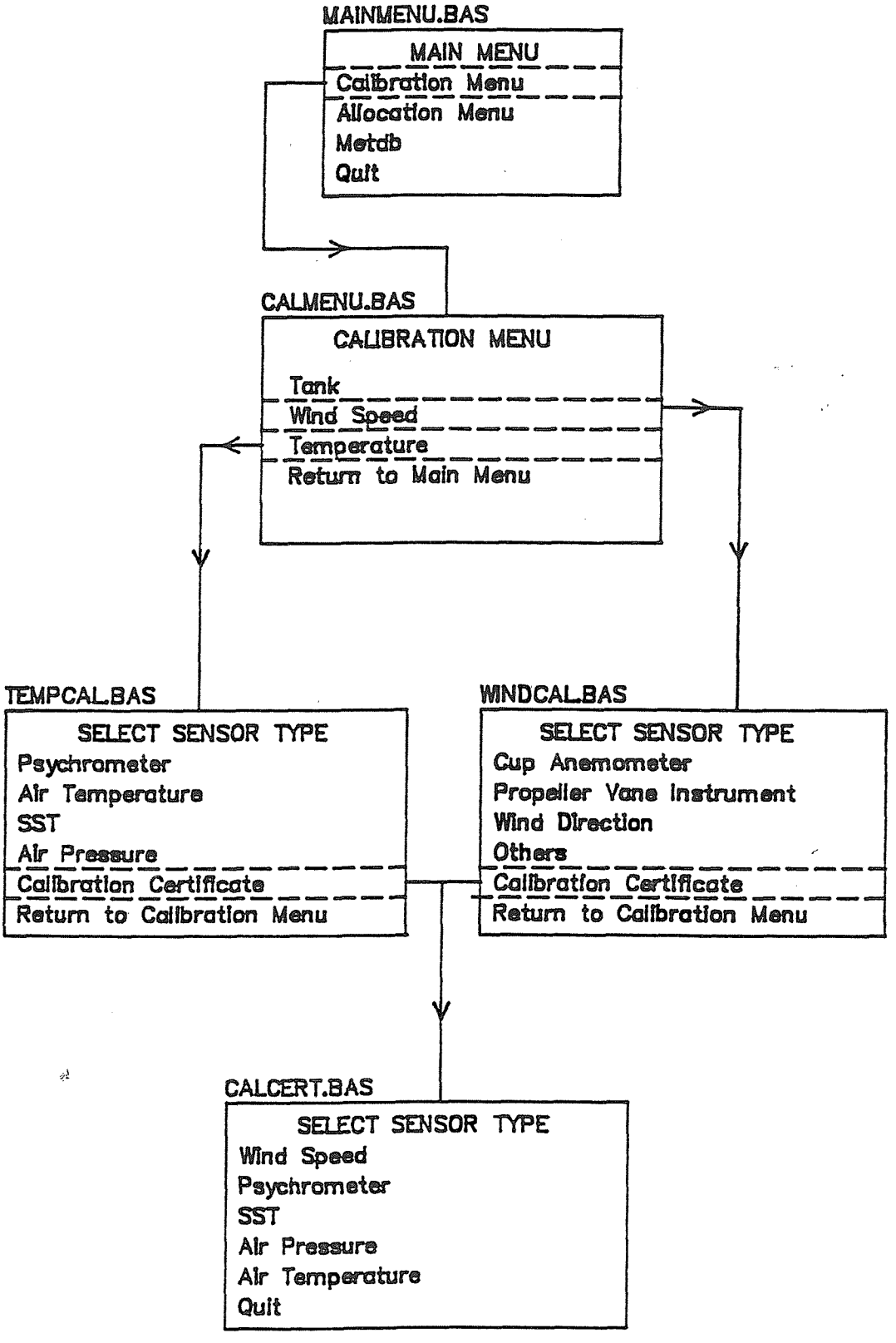
2. Pre-deployment calibrations should be supplied to scientist concerned after calibration as a print out of the calibration file.

3. Post deployment calibrations should be supplied to scientist concerned after re-calibration as a CALIBRATION CERTIFICATE between the pre and post calibrations.

Any calibration differences outside sensor specification should be detailed and explained.

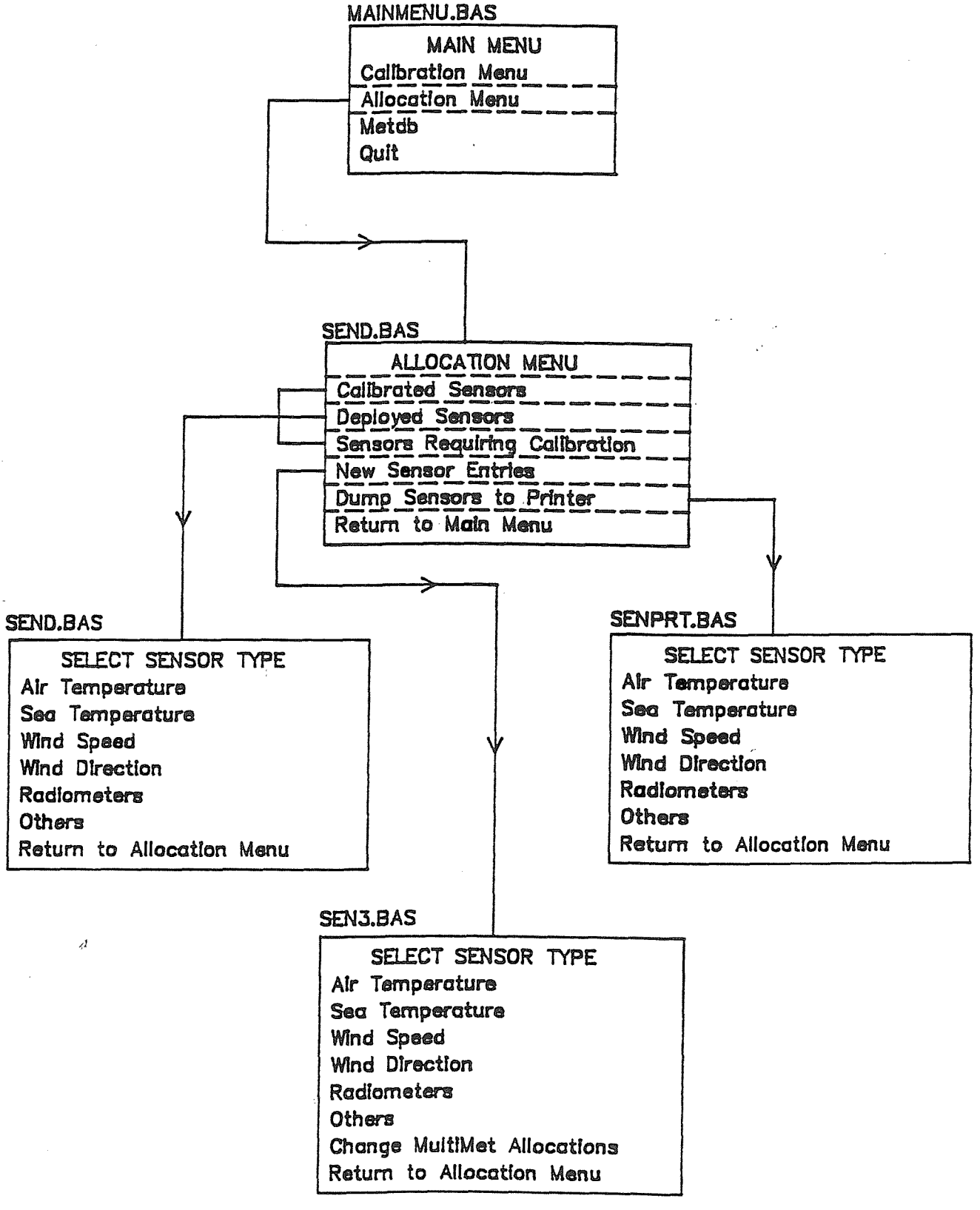
APPENDIX 3.1

CALIBRATION SYSTEM



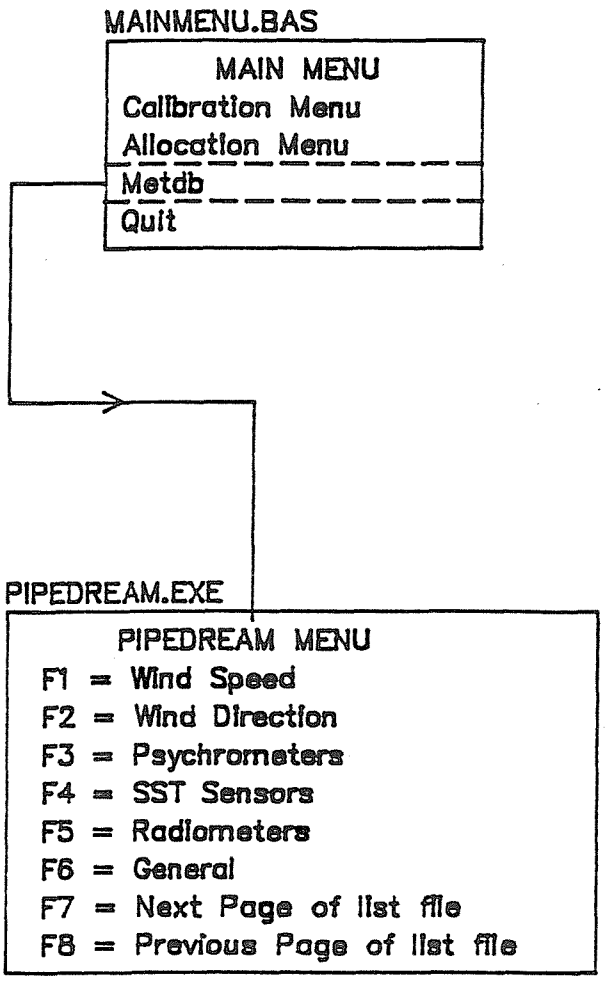
APPENDIX 3.2

MULTIMET SENSOR MANAGEMENT SYSTEM



APPENDIX 3.3

METDB DATABASE



APPENDIX 4

```
1000 REM ************************************************************************
1010 REM ******************** MAINMENU.BAS by RWP 8/11/90 ***********************
1020 REM ************************************************************************
1040 REM
1041 REM ===== Set error trap.....
1042 REM
1043 ON ERROR GOTO 40000
1044 REM
1045 REM ===== Call subroutine to set up Ctrl Esc key trap.....
1046 REM
1047 GOSUB 14000
1048 KEY OFF
1049 SCREEN 9
1056 REM
1057 REM ===== Set up user menu....
1058 REM
1059 COLOR 7,1: CLS
1060 REM
1061 REM ===== Draw up menu box.....
1065 REM
1067 LINE (5,5)-(635,345),,B
1090 LINE (180,83)-(480,266),2,BF
1100 LINE (185,88)-(475,261),64,B
1110 LOCATE 8,26:PRINT"           MAIN MENU             "
1120 LOCATE 10,26:PRINT"                                 "
1130 LOCATE 12,26:PRINT" Calibration Menu               ";CHR$(27);" "
1140 LOCATE 14,26:PRINT" Allocation Menu                 "
1142 LOCATE 16,26:PRINT" Metdb                           "
1145 LOCATE 18,26:PRINT" Quit                            "
1150 LOCATE 21,8:PRINT" Move arrow to required sensor type and press <RETURN> when finished"
1160 LOCATE 22,26 : PRINT"Move around using cursor keys"
1161 COLOR 12,1:LOCATE 23,6:PRINT" To Return to previous Menu at ant point Press CTRL ESC and then
RETURN"
1162 COLOR 3:LOCATE 4,29:PRINT "MULTIMET SENSOR MANAGEMENT"
1165 REM
1170 REM ===== Define the cursor keys.....
1175 REM
1180 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
1185 X=12:Y=59:KY$=" "
1190 REM
1191 REM ===== Set up pointer box in menu.....
1192 REM
1193 COLOR 7,1
1195 Y1 = 153
1198 GOSUB 20000
1200 LOCATE X,Y
1202 REM
1205 REM ===== Reading input from keyboard....
1207 REM
1210 WHILE KY$<>CHR$(13)
1220   KY$=INKEY$
```

```
1270   IF (KY$=DN$) AND ((X>=12)AND(X<=16)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1280   IF (KY$=UP$) AND ((X>=14)AND(X<=18)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1290 WEND
1292 IF X=16 THEN SHELL"d:":SHELL"CD\PIPE":SHELL"PD"
1293 IF X=18 THEN SYSTEM
1295 IF X=12 THEN RUN"calmenu"
1296 IF X=14 THEN RUN"senD"
1297 GOTO 1059
1300 END
14000 REM
14002 REM ------------------------------------------------------
14005 REM ----- Subroutine to set up key trap for Ctrl Esc -----
14007 REM ------------------------------------------------------
14010 REM
14014 REM
14016 REM ===== Define keys to include all possible combinations of CAPS LOCK
14017 REM       and NUM LOCK.....
14018 REM
14020 KEY 15,CHR$(&H64)+CHR$(1)
14030 KEY 16,CHR$(&H44)+CHR$(1)
14040 KEY 17,CHR$(&H24)+CHR$(1)
14050 KEY 18,CHR$(&H4)+CHR$(1)
14060 REM
14064 REM ===== Direct all escape key combinations to line 65300 .....
14066 REM
14070 ON KEY (15) GOSUB 65300
14080 ON KEY (16) GOSUB 65300
14090 ON KEY (17) GOSUB 65300
14100 ON KEY (18) GOSUB 65300
14110 REM
14115 REM ===== Turn all escape key combinations on.....
14117 REM
14120 KEY (15) ON
14130 KEY (16) ON
14140 KEY (17) ON
14150 KEY (18) ON
14200 RETURN
20000 REM
20010 REM ------------------------------------------------------------
20020 REM ----- Subroutine for drawing & flashing pointer box in menu -----
20030 REM ------------------------------------------------------------
20040 REM
20050 REM ===== First overwrite old box.....
20060 REM
20070 LINE (199,Y1)-(464,Y1+15),2,B
20100 REM ===== Now draw box and flash at new position.....
20110 REM
20120 IF (KY$ = DN$) THEN Y1 = Y1 + 28 ELSE IF (KY$ = UP$) THEN Y1 = Y1 - 28
20140 FOR COL = 9 TO 15
20150 LINE (199,Y1)-(464,Y1+15),COL,B
```

```
20160 NEXT COL
20170 LINE (199,Y1)-(464,Y1+15),12,B
20500 RETURN
40000 REM
40002 REM ---------------------------------------
40005 REM ----- Error checking subroutines -----
40007 REM ---------------------------------------
40010 REM
40020 REM
40022 REM ===== Check for errors during file opening.....
40024 REM
40030 IF ERR = 53 THEN GOSUB 40100: RESUME 1040
40032 IF ERR = 52 THEN GOSUB 40200: RESUME 1480
40034 IF ERR = 71 THEN GOSUB 40300: RESUME 1520
40036 IF ERR = 72 THEN GOSUB 40400
40038 IF (ERR = 5 OR ERR = 11) THEN GOSUB 40500: RESUME 65300
40040 IF ERR = 76 THEN GOSUB 40600: RESUME 65300
40050 STOP
40100 REM
40105 REM ===== File not found.....
40110 REM
40115 LINE (50,196)-(330,250),3,BF
40120 COLOR 12,1: LOCATE 15,11: PRINT " Sensor not found in database "
40130 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40140 BEEP
40190 RETURN
40200 REM
40205 REM ===== Invalid filename.....
40210 REM
40215 LINE (50,196)-(330,250),3,BF
40220 COLOR 12,1: LOCATE 15,14: PRINT " Invalid filename used "
40230 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40240 BEEP
40290 RETURN
40300 REM
40305 REM ===== Drive not ready.....
40310 REM
40315 LINE (50,196)-(330,250),3,BF
40320 COLOR 12,1: LOCATE 15,15: PRINT " Drive ";DRIVE$;"\ not ready "
40330 COLOR 15,1: LOCATE 16,13: PRINT " Press return when ready "
40340 BEEP
40350 ANSWER$ = ""
40360 WHILE (ANSWER$ <> CHR$(13))
40370       ANSWER$ = INKEY$
40380 WEND
40390 RETURN
40400 REM
40405 REM ===== Disk media error.....
40410 REM
40420 LINE (50,196)-(330,250),3,BF
40430 COLOR 12,1: LOCATE 15,11: PRINT " Error with hardware or disk "
40440 COLOR 15,1: LOCATE 16,17: PRINT " Program halted "
```

```
40490 RETURN
40500 REM
40502 REM ===== Illegal function call.....
40505 REM
40510 COLOR 12,8: LOCATE 17,33: PRINT "Insignificant data"
40520 LOCATE 18,26: PRINT "Could not calculate coefficients"
40530 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40540 WHILE (INKEY$ = "")
40550 WEND
40555 CLS
40560 REM
40562 REM ===== Exit program and return to operating system.....
40565 REM
40590 RETURN
40600 REM
40602 REM ===== Path not found.....
40605 REM
40610 CLS
40620 COLOR 12,1:LOCATE 17,24: PRINT "Could not find database on drive ";DRIVE$
40630 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40640 WHILE (INKEY$ = "")
40650 WEND
40655 CLS
40660 REM
40662 REM ===== Exit program and return to operating system.....
40665 REM
40690 RETURN
50000 REM
50100 REM DRAW GREEN BOX
50105 REM CLS
50110 COLOR 15,1
50120 FOR N=1 TO 150 STEP 2
50130 LINE (BB%-N,160-N)-(BB%+N,160+N),2,BF
50140 NEXT N
50200 RETURN
65300 REM
65302 REM ------------------------------------------------------------------
65305 REM ----- Subroutine for execution when Ctrl Esc has been pressed -----
65307 REM ------------------------------------------------------------------
65310 REM
65320 CLS
65330 SCREEN 0,0,0
65340 LOCATE 14,9: PRINT "Program Execution Halted..... Returning to operating system"
65345 LOCATE 16,29: PRINT "---Press Any Key---"
65350 WHILE (INKEY$ = "")
65360 WEND
65370 SYSTEM
```

```
1000 REM ************************************************************************
1010 REM ******************* CALMENU.BAS by RWP 8/11/90 ***********************
1020 REM ************************************************************************
1040 REM
1041 REM ===== Set error trap.....
1042 REM
1043 ON ERROR GOTO 40000
1044 REM
1045 REM ===== Call subroutine to set up Ctrl Esc key trap.....
1046 REM
1047 GOSUB 14000
1048 KEY OFF
1049 SCREEN 9
1056 REM
1057 REM ===== Set up user menu....
1058 REM
1059 COLOR 7,1: CLS
1060 REM
1061 REM ===== Draw up menu box.....
1065 REM
1067 LINE (5,5)-(635,345),,B
1090 LINE (180,83)-(480,266),2,BF
1100 LINE (185,88)-(475,261),64,B
1110 LOCATE 8,26:PRINT"       CALIBRATION MENU          "
1120 LOCATE 10,26:PRINT"                                 "
1130 LOCATE 12,26:PRINT" Tank                           ";CHR$(27);" "
1140 LOCATE 14,26:PRINT" Wind Speed                       "
1142 LOCATE 16,26:PRINT" Temperature                      "
1145 LOCATE 18,26:PRINT" Return to Main Menu              "
1150 LOCATE 21,8:PRINT" Move arrow to required sensor type and press <RETURN> when finished"
1160 LOCATE 22,26 : PRINT"Move around using cursor keys"
1162 COLOR 3:LOCATE 4,29:PRINT "MULTIMET SENSOR MANAGEMENT"
1165 REM
1170 REM ===== Define the cursor keys.....
1175 REM
1180 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
1185 X=12:Y=59:KY$=" "
1190 REM
1191 REM ===== Set up pointer box in menu.....
1192 REM
1193 COLOR 7,1
1195 Y1 = 153
1198 GOSUB 20000
1200 LOCATE X,Y
1202 REM
1205 REM ===== Reading input from keyboard....
1207 REM
1210 WHILE KY$<>CHR$(13)
1220   KY$=INKEY$
1270   IF (KY$=DN$) AND ((X>=12)AND(X<=16)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1280   IF (KY$=UP$) AND ((X>=14)AND(X<=18)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1290 WEND
```

```
1292 IF X=16 THEN RUN"TEMPCAL"
1293 IF X=18 THEN RUN "MAINMENU"
1295 IF X=12 THEN RUN"Tank"
1296 IF X=14 THEN RUN"WINDCAL"
1297 GOTO 1059
1300 END
14000 REM
14002 REM ------------------------------------------------------
14005 REM ----- Subroutine to set up key trap for Ctrl Esc -----
14007 REM ------------------------------------------------------
14010 REM
14014 REM
14016 REM ===== Define keys to include all possible combinations of CAPS LOCK
14017 REM       and NUM LOCK.....
14018 REM
14020 KEY 15,CHR$(&H64)+CHR$(1)
14030 KEY 16,CHR$(&H44)+CHR$(1)
14040 KEY 17,CHR$(&H24)+CHR$(1)
14050 KEY 18,CHR$(&H4)+CHR$(1)
14060 REM
14064 REM ===== Direct all escape key combinations to line 65300 .....
14066 REM
14070 ON KEY (15) GOSUB 65300
14080 ON KEY (16) GOSUB 65300
14090 ON KEY (17) GOSUB 65300
14100 ON KEY (18) GOSUB 65300
14110 REM
14115 REM ===== Turn all escape key combinations on.....
14117 REM
14120 KEY (15) ON
14130 KEY (16) ON
14140 KEY (17) ON
14150 KEY (18) ON
14200 RETURN
20000 REM
20010 REM ------------------------------------------------------------------
20020 REM ----- Subroutine for drawing & flashing pointer box in menu -----
20030 REM ------------------------------------------------------------------
20040 REM
20050 REM ===== First overwrite old box.....
20060 REM
20070 LINE (199,Y1)-(464,Y1+15),2,B
20100 REM ===== Now draw box and flash at new position.....
20110 REM
20120 IF (KY$ = DN$) THEN Y1 = Y1 + 28 ELSE IF (KY$ = UP$) THEN Y1 = Y1 - 28
20140 FOR COL = 9 TO 15
20150 LINE (199,Y1)-(464,Y1+15),COL,B
20160 NEXT COL
20170 LINE (199,Y1)-(464,Y1+15),12,B
20500 RETURN
40000 REM
40002 REM ---------------------------------------
40005 REM ----- Error checking subroutines -----
40007 REM ---------------------------------------
```

```
40010 REM
40020 REM
40022 REM ===== Check for errors during file opening.....
40024 REM
40030 IF ERR = 53 THEN GOSUB 40100: RESUME 1040
40032 IF ERR = 52 THEN GOSUB 40200: RESUME 1480
40034 IF ERR = 71 THEN GOSUB 40300: RESUME 1520
40036 IF ERR = 72 THEN GOSUB 40400
40038 IF (ERR = 5 OR ERR = 11) THEN GOSUB 40500: RESUME 65300
40040 IF ERR = 76 THEN GOSUB 40600: RESUME 65300
40050 STOP
40100 REM
40105 REM ===== File not found.....
40110 REM
40115 LINE (50,196)-(330,250),3,BF
40120 COLOR 12,1: LOCATE 15,11: PRINT " Sensor not found in database "
40130 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40140 BEEP
40190 RETURN
40200 REM
40205 REM ===== Invalid filename.....
40210 REM
40215 LINE (50,196)-(330,250),3,BF
40220 COLOR 12,1: LOCATE 15,14: PRINT " Invalid filename used "
40230 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40240 BEEP
40290 RETURN
40300 REM
40305 REM ===== Drive not ready.....
40310 REM
40315 LINE (50,196)-(330,250),3,BF
40320 COLOR 12,1: LOCATE 15,15: PRINT " Drive ";DRIVE$;"\ not ready "
40330 COLOR 15,1: LOCATE 16,13: PRINT " Press return when ready "
40340 BEEP
40350 ANSWER$ = ""
40360 WHILE (ANSWER$ <> CHR$(13))
40370       ANSWER$ = INKEY$
40380 WEND
40390 RETURN
40400 REM
40405 REM ===== Disk media error.....
40410 REM
40420 LINE (50,196)-(330,250),3,BF
40430 COLOR 12,1: LOCATE 15,11: PRINT " Error with hardware or disk "
40440 COLOR 15,1: LOCATE 16,17: PRINT " Program halted "
40490 RETURN
40500 REM
40502 REM ===== Illegal function call.....
40505 REM
40510 COLOR 12,8: LOCATE 17,33: PRINT "Insignificant data"
40520 LOCATE 18,26: PRINT "Could not calculate coefficients"
40530 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40540 WHILE (INKEY$ = "")
40550 WEND
```

```
40555 CLS
40560 REM
40562 REM ===== Exit program and return to operating system.....
40565 REM
40590 RETURN
40600 REM
40602 REM ===== Path not found.....
40605 REM
40610 CLS
40620 COLOR 12,1:LOCATE 17,24: PRINT "Could not find database on drive ";DRIVE$
40630 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40640 WHILE (INKEY$ = "")
40650 WEND
40655 CLS
40660 REM
40662 REM ===== Exit program and return to operating system.....
40665 REM
40690 RETURN
50000 REM
50100 REM DRAW GREEN BOX
50105 REM CLS
50110 COLOR 15,1
50120 FOR N=1 TO 150 STEP 2
50130 LINE (BB%-N,160-N)-(BB%+N,160+N),2,BF
50140 NEXT N
50200 RETURN
65300 REM
65302 REM ------------------------------------------------------------------
65305 REM ----- Subroutine for execution when Ctrl Esc has been pressed -----
65307 REM ------------------------------------------------------------------
65310 REM
65320 CLS
65330 SCREEN 0,0,0
65340 LOCATE 14,9: PRINT "Program Execution Halted..... Returning to MAIN MENU"
65345 LOCATE 16,29: PRINT "---Press Any Key---"
65350 WHILE (INKEY$ = "")
65360 WEND
65370 RUN "MAINMENU"
```

```
10 REM ****************************************
20 REM ***  PROGRAM TANK.BAS - May 1990 *******
25 REM ***  By A. Williams ********************
30 REM ****************************************
35 REM ** Facility for detecting errors **
36 REM ON ERROR GOTO 7080
60 REM ** Dimension all the arrays for the coefficient calculations **
70 DIM X(40),Y(40),A#(15),B#(15),S#(15),G#(15),U#(15),Q#(40),P#(40),C#(40),STDERR(8),II(40)
80 REM ** Need to declare vars/arrays to allow for 160 channels & I/O's **
90 SN%=8:SM%=159:DIM B(159),A%(159)
100 REM ** First step is to get all the sensor details **
110 GOSUB 5230
120 REM *** Input a temp cycle and display a profile ***
130 REM ** First set up screen to get the details **
140 CLS
150 LINE (15,15)-(625,335),3,BF
160 LINE (20,20)-(620,330),64,B
170 LOCATE 5,27:PRINT " Temperature cycle program "
180 LOCATE 6,23:PRINT " Please enter the following details "
190 LINE (100,110)-(540,290),8,BF
200 LINE (105,115)-(535,285),7,B
205 REM ** STAT = start temperature **
206 REM ** STOT = stop temperature **
207 REM ** STPT = temperature step **
210 LOCATE 11,22:PRINT " Enter a start temperature          "
220 LOCATE 12,22:PRINT "  (Default <ENTER> = 0 degs)        "
230 LOCATE 11,51:INPUT STAT
240 IF STAT=VAL(CHR$(13)) THEN STAT=0:LOCATE 11,52:PRINT STAT;
250 LOCATE 14,22:PRINT " Enter a stop temperature           "
260 LOCATE 15,22:PRINT "  (Default <ENTER> = 35 degs)       "
270 LOCATE 14,51:INPUT STOT
280 IF STOT=VAL(CHR$(13)) THEN STOT=35:LOCATE 14,52:PRINT STOT;
290 LOCATE 17,22:PRINT " Enter the temperature step         "
300 LOCATE 18,22:PRINT "  (Default <ENTER> = 5 degs)        "
310 LOCATE 17,51:INPUT STPT
320 IF STPT=VAL(CHR$(13)) THEN STPT=5:LOCATE 17,52:PRINT STPT;
330 REM ** now calculate and plot a temp profile **
340 REM * work out estimated time/date of completion *
350 REM * first get initial temp of tank *
355 REM ** Open RS232 communications port **
360 OPEN "COM1:300,N,8,1" AS #3
370 CLS:LOCATE 12,21:PRINT " Please wait....initialising F25..... "
375 REM ** Reset F25 to its original state **
380 WRITE#3,"C"+CHR$(10):FOR T=1 TO 20000:NEXT T
385 REM ** Disable controls on front panel **
390 WRITE#3,"L1"+CHR$(10):FOR T=1 TO 20000:NEXT T
395 REM ** Select the A probe **
400 WRITE#3,"P0"+CHR$(10):FOR T=1 TO 20000:NEXT T
405 REM ** Set the units to degrees celcius **
410 WRITE#3,"U0"+CHR$(10):FOR T=1 TO 20000:NEXT T
415 REM ** Set the resolution to 3 decimal places **
420 WRITE#3,"R1"+CHR$(10):FOR T=1 TO 20000:NEXT T
425 REM ** Get a temperature reading **
430 FOR T=0 TO 25000:NEXT T:WRITE#3,"T"+CHR$(10)
```

```
435 IF LOC(3)>=9 THEN INPUT #3,TEMP$ ELSE GOTO 430
440 REM ** set up second screen to display profile **
450 CLS
455 REM ** CD$ = current date, CT$ = current time **
460 CD$=DATE$:CT$=TIME$
470 MONTH=VAL(LEFT$(CD$,2)):DAY=VAL(MID$(CD$,4,2)):YEAR=VAL(RIGHT$(CD$,4))
480 HOUR=VAL(LEFT$(CT$,2)):MINUTE=VAL(MID$(CT$,4,2)):SECOND=VAL(RIGHT$(CT$,2))
485 REM ** CT = current temperature, ASLSTART = 1st temperature reading taken **
490 CT=VAL(MID$(TEMP$,2,7)):ASLSTART=CT
500 LINE(5,5)-(635,345),7,B
510 LINE(40,20)-(600,200),8,BF
520 LINE(45,25)-(595,195),7,B
530 REM * draw the axes *
550 PSET(100,160):LINE-(570,160)
560 PSET(100,40):LINE-(100,170)
570 REM ** Label the axes **
571 REM ** TIKY = No tick marks on the y-axis, RCP = cursor position **
575 TIKY=4:RCP=12
580 LABEL=STAT:INCR=(STOT-STAT)/TIKY
590 FOR I=0 TO TIKY
600  PSET(97,160-(2*(14*I))):LINE STEP(0,0)-STEP(5,0)
610  LOCATE RCP-(I*2),8:PRINT CINT(LABEL):LABEL=LABEL+INCR
620 NEXT I
630 REM * work out time to reach start temp *
635 REM ** LENGTHX = length of the x-axis in minutes **
640 LENGTHX=0 : ARRDIM=((STOT-STAT)/STPT) : INDEX=0 : LASTLENX=0
645 REM ** REACHED() = time in minutes taken to reach each demand temp **
646 REM ** STABALISED() = time in minutes taken to reach demand and stabalise **
650 DIM REACHED(ARRDIM) : DIM STABALISED(ARRDIM)
660 PSET(100,160-((112/(STOT-STAT))*(CT-STAT)))
670 FOR TEMP = STAT TO STOT STEP STPT
680   IF CT > TEMP THEN GOSUB 1650 ELSE GOSUB 1790
690   LASTLENX=LENGTHX
700   INDEX=INDEX+1
710   CT = TEMP
720 NEXT TEMP
730 REM ** Plot the profile **
740 COLOR 14,1
750 FOR L=0 TO ((STOT-STAT)/STPT)
760   LINE-((REACHED(L)*(465/LENGTHX))+100,160-((112/(STOT-STAT))*(L*STPT))),,,&HCCCC
770   LINE-((STABALISED(L)*(465/LENGTHX))+100,160-((112/(STOT-STAT))*(L*STPT))),,,&HCCCC
780 NEXT L
790 COLOR 7,1
800 REM * These commands will plot the 'x' mark on the x-axis which shows the *
801 REM * time the calibration sequence will begin *
810 PSET((STABALISED(0)*(465/LENGTHX))+97,157):LINE-((STABALISED(0)*(465/LENGTHX))+103,163)
820 PSET((STABALISED(0)*(465/LENGTHX))+97,163):LINE-((STABALISED(0)*(465/LENGTHX))+103,157)
830 REM * print the information *
840 LOCATE 13,15:PRINT " ";CT$;" "
850 LOCATE 13,35:PRINT "   =";START$;" "
860 PSET(278,172):LINE-(284,178)
870 PSET(278,178):LINE-(284,172)
880 LOCATE 13,60:PRINT STOPT$;" "
890 PSET(565,157):LINE-(565,163)
```

```
900 LOCATE 16,12:PRINT "X-axis : TIME            Y-axis : TEMPERATURE"
910 LOCATE 18,9:PRINT "Current time - ";CT$
920 LOCATE 20,9:PRINT "Approx start time - ";START$
930 LOCATE 22,9:PRINT "Approx finish time - ";STOPT$
940 LOCATE 18,48:PRINT "Current temp : ";ASLSTART;"C"
950 LOCATE 20,48:PRINT "Start temp : ";STAT;"C"
960 LOCATE 22,48:PRINT "Stop temp : ";STOT;"C"
970 VIEW PRINT 24 TO 24
975 REM ** Ask if the setup is suitable **
980 LOCATE 24,15:INPUT "Is this setup suitable (Y/N)";K$
990 VIEW PRINT
1000 IF ((K$="y")OR(K$="Y")) THEN CLS ELSE IF ((K$="n")OR(K$="N")) THEN CLEAR:GOTO 120 ELSE
BEEP:GOTO 970
1010 REM *** If OK then proceed with calibration ***
1020 CLS:LOCATE 12,15:PRINT "Proceeding with calibration......please wait....";
1030 FOR T=1 TO 10000:NEXT T
1040 REM *** set up the screen ***
1050 GOSUB 1930
1060 REM ** set the start point on the graph **
1070 FOR T=0 TO 25000:NEXT T:WRITE#3,"T"+CHR$(10)
1075 IF LOC(3)>=9 THEN INPUT #3,TEMP$ ELSE GOTO 1070
1080 CT=VAL(MID$(TEMP$,2,7)):X=90
1090 PSET(90,274-((224/(STOT-STAT))*(CT-STAT)))
1100 REM * Loop round all the demands *
1110 FOR DEMAND=STAT TO STOT STEP STPT
1115   REM ** Convert temp demand to value acceptable by D/A **
1120   ENT%=(DEMAND+5)*80
1130   GOSUB 2400
1135   REM ** Set the first condition **
1140   CONDITION=ABS(CT-DEMAND)
1150   REM ** Decide whether heating or cooling and plot data while **
1151   REM ** first condition is met **
1160   IF CT>=DEMAND THEN BEEP:STATUS$="Cooling bath..":LOCATE 2,38:PRINT STATUS$;:WHILE
CONDITION>.5:GOSUB 2240:CONDITION=ABS(CT-DEMAND):WEND
1170   IF CT<=DEMAND THEN BEEP:STATUS$="Heating bath..":LOCATE 2,38:PRINT STATUS$;:WHILE
CONDITION>.5:GOSUB 2240:CONDITION=ABS(CT-DEMAND):WEND
1180   REM ** now check for second condition **
1190   GOSUB 2240 : TEST2=CT : OK=0
1200   WHILE (OK<>5)
1210      TEST1=TEST2
1220      GOSUB 2240
1230      TEST2=CT
1240      IF STATUS$="Cooling bath.." THEN IF (TEST2-TEST1)<-.003 THEN OK=OK+1
1250      IF STATUS$="Heating bath.." THEN IF (TEST2-TEST1)<.01 THEN OK=OK+1
1260   WEND
1270   REM ** now wait for bath to stabilise (5 mins) **
1280   BEEP:STATUS$="Stabilising...":LOCATE 2,38:PRINT STATUS$;
1290   CT$=TIME$ : MINUTE=VAL(MID$(CT$,4,2))
1295   REM ** STABMIN = minute unit when bath will be satalised **
1300   STABMIN=MINUTE+5
1310   IF STABMIN>59 THEN STABMIN=STABMIN-60
1320   WHILE MINUTE<>STABMIN
1330      GOSUB 2240
1340      CT$=TIME$ : MINUTE=VAL(MID$(CT$,4,2))
```

```
1350   WEND
1360   REM *** take readings from psychrometres ***
1370   GOSUB 2720
1380   REM ** write the readings and F25 temp to file **
1390   FOR FILNUM=1 TO TOTSEN
1400      OPEN FILARR$(FILNUM) FOR APPEND AS #1
1410      PRINT #1,USING "#####.###_ ";(30000-A%(CONNECTION(FILNUM)))/T1;:PRINT #1,"   ";:PRINT
#1,CT
1415      CLOSE #1
1420      REM ** need to write freq's to screen aswell **
1425      IF FILNUM > 10 THEN XLOC=FILNUM-2 ELSE XLOC=FILNUM+8
1430      LOCATE XLOC,59:PRINT (CONNECTION(FILNUM))+1;:LOCATE XLOC,64 : PRINT
USING"#####.###";(30000-A%(CONNECTION(FILNUM)))/T1;
1450    NEXT FILNUM
1460 NEXT DEMAND
1470 VIEW PRINT:CLS:CLOSE#3 : REM ** i.e. close communication port **
1480 REM ** Now calculate the coefficients using a routine from CALEDIT.BBC **
1490 LOCATE 12,18:PRINT "Please wait, calculating coefficients...":FOR TTIM=1 TO 8000:NEXT TTIM
1495 CLS
1500 FOR LOOP=1 TO TOTSEN
1510    FILE$=FILARR$(LOOP)
1515    GOSUB 3450
1520 NEXT LOOP
1521 DIM NUMBER$(30)
1522 REM ** Now need to copy over the temp files to the database **
1523 FOR LOOP=1 TO TOTSEN
1524    TEMPFILE$=FILARR$(LOOP) : LFILE$=LSTFILE$(LOOP)
1525    GOSUB 7170
1526 NEXT LOOP
1531 REM ** ask if output to printer required **
1532 LOCATE 10,15:PRINT "Do you wish to print out the callibration files ";
1533 LOCATE 10,63:INPUT K$
1534 IF ((K$="y")OR(K$="Y")) THEN LPTFLAG=1 ELSE IF ((K$="n")OR(K$="N")) THEN LPTFLAG=0 ELSE
BEEP:GOTO 1533
1535 IF LPTFLAG=1 THEN FOR LOOP=1 TO TOTSEN : SHLCMD$="print "+FILARR$(LOOP) : SHELL SHLCMD$ : NEXT
LOOP
1540 CLS : LOCATE 12,14:PRINT"Callibration finished...results written to database"
1550 END
1560 REM *** End of main program...all routines follow on from here ***
1570 REM ************************************************************************
1580 REM *** Routine to work out time for heating/cooling ***
1590   MINUTE=MINUTE+1
1600   IF MINUTE>59 THEN MINUTE=0 : HOUR=HOUR+1
1610   IF HOUR>23 THEN HOUR=0 : DAY=DAY+1
1620   LENGTHX=LENGTHX+1
1630 RETURN
1640 REM ------------------------------------------------------------------------
1650 REM *** routine to cool ***
1660 WHILE CT > TEMP
1670   CT=CT-.13
1680   GOSUB 1580
1690 WEND
1700 REACHED(INDEX)=LENGTHX
1710 STABTIME=LENGTHX+5
```

```
1720 WHILE LENGTHX < STABTIME
1730   GOSUB 1580
1740 WEND
1750 STABALISED(INDEX)=LENGTHX
1760 START$=STR$(HOUR)+":"+STR$(MINUTE)+":"+STR$(SECOND)
1770 RETURN
1780 REM ------------------------------------------------------------------------
1790 REM *** routine to heat ***
1800 WHILE CT < TEMP
1810   CT=CT+.6
1820   GOSUB 1580
1830 WEND
1840 REACHED(INDEX)=LENGTHX
1850 STABTIME=LENGTHX+5
1860 WHILE LENGTHX < STABTIME
1870   GOSUB 1580
1880 WEND
1890 STABALISED(INDEX)=LENGTHX
1900 STOPT$=STR$(HOUR)+":"+STR$(MINUTE)+":"+STR$(SECOND)
1910 RETURN
1920 REM ------------------------------------------------------------------------
1930 REM *** Routine to set up the screen to ***
1940 REM *** display real-time temperature ***
1950 SCREEN 9:COLOR 7,1:CLS
1960 VIEW PRINT 2 TO 23
1970 LOCATE 2,28:PRINT"Status : ";:LOCATE 2,38:PRINT STATUS$;
1980 LINE(205,9)-(425,31),7,B
1990 LINE(5,5)-(635,345),7,B
2000 REM ** Draw the axes **
2020 PSET(90,280):LINE-(90,40)
2030 REM ** Draw dotted lines where demands are **
2040 FOR DOTLINE=STAT TO STOT STEP STPT
2050   LINE(90,274-((224/(STOT-STAT))*(DOTLINE-STAT)))-(400,274-((224/(STOT-STAT))*(DOTLINE-
STAT))),,,&HCCCC
2060 NEXT DOTLINE
2070 REM ** Label y-axis **
2075 REM ** TIKY = no tick marks on y-axis, RCP = cursor position **
2080 TIKY=8:RCP=20
2090 LABEL=STAT:INCR=(STOT-STAT)/TIKY
2100 FOR I=0 TO TIKY
2110   PSET(87,274-(2*(14*I))):LINE STEP(0,0)-STEP(5,0)
2120   LOCATE (RCP-(I*2)),5
2130   PRINT USING "+##.#";LABEL
2140   LABEL=LABEL+INCR
2150 NEXT I
2160 LOCATE 23,16:PRINT "Demand temp : ";
2170 LOCATE 23,41:PRINT "Actual temp (F25) : ";
2180 REM ** now draw the box that shows freq readings **
2190 LINE (450,65)-(590,260),7,B
2200 LOCATE 6,62 : PRINT TIME$;
2205 LOCATE 7,59 : PRINT"EFT";STOPT$
2210 LOCATE 8,59 : PRINT "Ctr     Freq";
2220 RETURN
2230 REM ------------------------------------------------------------------------
```

```
2240 REM *** Routine to plot data and get another reading ***
2250   REM * need to check if x > 400 and if so refresh the graph *
2260   X=X+1
2270   IF X>400 THEN GOSUB 1930: X=90 :PSET(X,274-((224/(STOT-STAT))*(CT-STAT)))
2280   IF STATUS$="Cooling bath.." THEN COLOR 9,1
2290   IF STATUS$="Heating bath.." THEN COLOR 12,1
2300   IF STATUS$="Stabilising..." THEN COLOR 10,1
2310   LINE-(X,274-((224/(STOT-STAT))*(CT-STAT)))
2320   COLOR 7,1
2330   LOCATE 23,30:PRINT USING "##.#";DEMAND;:LOCATE 23,61:PRINT USING"##.###";CT;
2340   LOCATE 6,62 : PRINT TIME$;
2345   REM ** Take next reading from F25 **
2350   FOR T=0 TO 25000:NEXT T:WRITE#3,"T"+CHR$(10)
2360   IF LOC(3)>=9 THEN INPUT #3,TEMP$ ELSE GOTO 2350
2370   CT=VAL(MID$(TEMP$,2,7))
2380 RETURN
2390 REM ------------------------------------------------------------------------
2400 REM *** Routine to to issue a demand to the A/D converter ***
2410 REM ** Call initial setup routine **
2420 GOSUB 3270
2430 GOSUB 2510: REM Set channels 1-8 and 16-21 as outputs
2440 E$=HEX$(ENT%)
2450 HL%=LEN(E$)
2460 GOSUB 2570: REM Convert number to binary in a%(array)
2470 C$=CHR$(79) + CHR$(0):A%(20)=0:CALL AM1(A%(0),B(0),C$): REM Output to D/A convertor
2480 A%(20)=1:CALL AM1(A%(0),B(0),C$): REM Latch reading in D/A
2490 RETURN
2500 REM ** Routine to set channels 1-8 and 16-21 as outputs **
2510 C$=CHR$(83)+CHR$(0)
2520 FOR I%=0 TO 7:A%(I%)=1:NEXT
2530 FOR I%=15 TO 20:A%(I%)=1:NEXT
2540 CALL AM1(A%(0),B(0),C$)
2550 RETURN
2560 REM ** Routine to convert number to binary **
2570 FOR CH%=1 TO 3: REM hex byte number
2580 IF CH%>HL% THEN CH$="0" ELSE CH$=MID$(E$,HL%-CH%+1,1)
2590 IF CH%<3 THEN OF%=4*(CH%-1) ELSE OF%=16: REM OF% is channel offset
2600 VCH%=ASC(CH$)-48
2610 IF VCH%>9 THEN VCH%=VCH%-7: REM decimal value of hex char.
2620 :
2630 FOR B%=3 TO 0 STEP -1: REM convert hex char. to binary
2640 BV%=2^B%
2650 BT%=INT(VCH%/(BV%)):VCH%=VCH%-BT%*BV%
2660 A%(OF%+B%)=BT%
2670 NEXT B%
2680 :
2690 NEXT CH%
2700 RETURN
2710 REM ------------------------------------------------------------------------
2720 REM *** Routine to get frequency values from the sensors ***
2730 REM *** Call initial setup routine ***
2740 GOSUB 3270
2750 T1=10:REM ** Sets counter gate duration in seconds **
2760 REM ** Set up the counters **
```

```
2770 GOSUB 3190
2780 REM ** Set the initial counting values **
2790 GOSUB 3010
2800 REM ** Start counting **
2810 GOSUB 3090
2820 REM ** Test for end of freq measurment **
2830 FOR I=1 TO 10000
2840   C$="x"+CHR$(0):A%(0)=&H651D:B(0)=4
2850   CALL AM1(A%(0),B(0),C$):REM Test for count in progress
2860   IF (A%(0) AND &H1)=0 THEN I=10000
2870 NEXT
2880 REM ** Read the counter **
2890 C$="V"+CHR$(0):CALL AM1(A%(0),B(0),C$)
2970 RETURN
2980 REM
2990 REM *** Set the values at which the counters start counting ***
3000 REM ** set ctr3 div 50*T1, ctr4 div 65536, ctrs5-7 div 30000 **
3010 C$="U"+CHR$(0)
3020 A%(2)=50*T1:A%(3)=-25536
3030 FOR I=4 TO 23
3040   A%(I)=30000
3050 NEXT I
3060 CALL AM1(A%(0),B(0),C$)
3070 RETURN
3080 REM *** Routine to initiate the counting process ***
3090 C$="X"+CHR$(0)
3100 FOR I=4 TO 23
3110   A%(I)=&H6E1E
3120 NEXT I
3130 A%(3)=&H651E
3140 A%(2)=&HC41E
3150 B(0)=0
3160 CALL AM1(A%(0),B(0),C$)
3170 RETURN
3180 REM *** Routine to set up counters/timers ***
3190 C$="X"+CHR$(0)
3200 A%(2)=&H6018:A%(3)=&H6018
3210 FOR I=4 TO 23
3220   A%(I)=&H6818
3230 NEXT I
3240 B(0)=0:CALL AM1(A%(0),B(0),C$)
3250 RETURN
3260 REM ------------------------------------------------------------------
3270 REM *** INITIAL SETUP SUBROUTINE ***
3280 ' The following data for the machine code is improved over the example
3290 '      in the manual.  This code checks for the presence of the driver
3300 '      before trying to use it.
3310 DATA
&H50,&HE8,&H18,&H00,&H3D,&HFF,&HFF,&H74,&H0C,&H58,&HFA,&HB8,&H59,&H47,&HCD,&H60,&H90,&H90,&HCA,&H06
&H00,&HB8,&HFF,&HFF,&H5D,&HCA,&H06,&H00,&H56,&H06,&HB8,&H00,&H00,&H8E,&HC0,&H26,&HA1,&H80,&H01,&H3D
&H00,&H00,&H74,&H1A,&H8B,&HF0,&H26
3320 DATA
&HA1,&H82,&H01,&H3D,&H00,&H00,&H74,&H0F,&H8E,&HC0,&H26,&H8A,&H04,&H3C,&H3D,&H75,&H06,&H07,&H5E,&HB8
&H00,&H00,&HC3,&HB8,&HFF,&HFF,&H07,&H5E,&HC3,0
```

```
3330 :
3340 ADDR=&H1703: REM Address of card + 3
3350 REM APROG$ and APROG1$ MUST be the first strings defined.
3360 DEF SEG:APROG$=SPACE$(80):APROG1$=SPACE$(80):REM Strings will contain routines to CALL driver
3370 A%=VARPTR(APROG$):AX%=VARPTR(APROG1$)
3380 AM1=PEEK(A%+1)+PEEK(A%+2)*256:AM2=PEEK(AX%+1)+PEEK(AX%+2)*256
3390 RESTORE 3310
3400 FOR A=0 TO 76
3410   READ A%:POKE A+AM1,A%:POKE A+AM2,A%:REM Install routines to CALL driver
3420 NEXT:POKE AM2+19,16:POKE AM2+26,16
3430 RETURN
3440 REM ------------------------------------------------------------------
3450 REM *** This routine has to run under GWBASIC/d so that the ***
3460 REM *** mathematical routines can use double precision numbers ***
3470 REM access data file and read in data
3480 N=4 : REM * Set 3 degrees of fit *
3490 Z=0 : O=1 : K=12
3500 O9#=1E-18 : O8#=1E+18 : O7#=9.999999E+35 : O6#=1E-36
3510 :
3520 :
3530 REM zero data arrays
3540 FOR I%=0 TO 40 : X(I%)=0:Y(I%)=0:II(I%)=0 : NEXT I%
3550 :
3560 REM get the data file
3580 OPEN FILE$ FOR INPUT AS #1
3590 :
3600 REM ** Read in data **
3610 REM ** First skip the header **
3620 FOR SKIP=1 TO 12 : INPUT#1,SCRAP$ : NEXT SKIP
3630 COUNT%=0
3640 WHILE (NOT(EOF(1)))
3650   COUNT%=COUNT%+1
3660   INPUT#1,X(COUNT%),Y(COUNT%)
3670   II(COUNT%)=COUNT%
3680 WEND
3690 IF COUNT%<>M THEN M=COUNT%
3700 MF=M
3710 :
3720 CLOSE#1
3725 REM ** Now open the same file for writing the results to **
3730 OPEN FILE$ FOR APPEND AS #2
3740 :
3750 REM * Initialise standard error array to missing values *
3760 FOR I%=1 TO 8 : STDERR(I%)=9999 : NEXT I%
3770 :
3780 REM calculates the means for the data
3790 T7#=Z:T7#=Z:T8#=Z:W7#=Z
3800 :
3810 FOR I%=1 TO MF
3820 W7#=W7#+X(II(I%)):T7#=T7#+Y(II(I%)):T8#=T8#+Y(II(I%))^2
3830 NEXT
3840 T9#=(MF*T8#-T7#^2)/(MF^2-MF)
3850 :
3860 GOSUB 4210
```

```
3870 GOSUB 4810
3880 REM ** Print out all the results **
3950 :
3970 FOR L=1 TO MF
3980 Q8#=Y(II(L))-C#(L)
4000 PRINT #2,USING "###.###_ ";C#(L);:PRINT #2,"    ";:PRINT #2,USING "###.###_ ";Q8#
4010 IF C#(L)=0 THEN PRINT #2,"INFINITE"
4020 NEXT L
4030 :
4040 PRINT #2,"Std error of estimate for Y = ";:PRINT #2,USING "#.###";STDERR(N-1)
4060 REM print out coefficients
4070 PRINT #2,""
4100 PRINT #2,"Term      Coefficient"
4110 :
4120 FOR J=1 TO N
4130 I2=J-1 : TERM$="C"+RIGHT$(STR$(I2),1)
4140 PRINT #2,TERM$;
4150 PRINT #2,"       ";U#(J)
4160 NEXT
4170 :
4180 CLOSE #2
4190 RETURN
4200 REM
4210 REM *** Routine arith1 ( Copied from CALEDIT.BBC ) ***
4220 :
4230 FOR I%=1 TO MF:P#(I%)=Z:Q#(I%)=O:NEXT
4240 FOR I%=1 TO 11:A#(I%)=Z:B#(I%)=Z:S#(I%)=Z:NEXT
4250 E1#=Z:F1#=Z:W1#=MF:N4=K:I=1:K1=2
4260 :
4270 IF N=0 THEN GOTO 4330
4280 K1=N4
4290 :
4300 REM program loops to next line
4310 W#=Z
4320 :
4330 FOR L=1 TO MF:W#=W#+Y(II(L))*Q#(L):NEXT
4340 :
4350 S#(I)=W#/W1#
4360 IF I-N4>=0 THEN GOTO 4790
4370 IF I-MF>=0 THEN GOTO 4790
4380 E1#=Z
4390 FOR L=1 TO MF
4400   A9#=ABS(Q#(L))
4410   IF A9#<O9# THEN GOTO 4550
4420   X9#=ABS(X(II(L)))
4430   IF X9#<O6# THEN GOTO 4510
4440   L2#=.434295*LOG(X9#)+(2*.434295*LOG(A9#))
4450   IF L2#<36 THEN GOTO 4540
4460   REM  SO X&Q TOO BIG FOR X*Q^2
4470   E1#=O7#
4480   L2#=36
4490   L=MF+1
4500   GOTO 4550
4510   IF A9#<1 THEN GOTO 4550
```

```
4520   IF A9#<O8# THEN GOTO 4540
4530   REM SO  Q TOO BIG FOR Q^2
4540   E1#=E1#+X(II(L))*A9#^2
4550 NEXT
4560 IF L2#-(.434295*LOG(W1#))>-36 THEN GOTO 4590
4570 E1#=0
4580 GOTO 4600
4590 E1#=E1#/W1#
4600 A#(I+1)=E1#
4610 W#=Z
4620 FOR L=1 TO MF
4630   V#=(X(II(L))-E1#)*Q#(L)-F1#*P#(L)
4640   P#(L)=Q#(L)
4650   Q#(L)=V#
4660   V9#=ABS(V#)
4670   IF V9#<O9# THEN GOTO 4730
4680   IF V9#<O8# THEN GOTO 4720
4690   W#=O7#
4700   L=MF+1
4710   GOTO 4730
4720   W#=W#+V#*V#
4730 NEXT
4740 F1#=W#/W1#
4750 B#(I+2)=F1#
4760 W1#=W#
4770 I=I+1
4780 GOTO 4310
4790 RETURN
4800 REM
4810 REM *** Routine arith2 ( Copied from CALEDIT.BBC ) ***
4820 :
4830 FOR L=1 TO 13:G#(L)=Z:NEXT
4840 :
4850 G#(2)=O
4860 FOR J=1 TO N
4870   S1#=Z
4880   FOR L=2 TO N+1
4890     IF L=2 THEN GOTO 4910
4900     G#(L)=G#(L)-A#(L-1)*G#(L-1)-B#(L-1)*G#(L-2)
4910     S1#=S1#+S#(L-1)*G#(L)
4920   NEXT
4930   U#(J)=S1#
4940   L=N+1
4950   FOR I2=2 TO N
4960     G#(L)=G#(L-1)
4970     L=L-1
4980   NEXT
4990   G#(2)=Z
5000 NEXT
5010 :
5020 PRINT " "
5030 T=Z
5040 FOR L=1 TO MF
5050   C#(L)=Z
```

```
5060   J=N
5070   FOR I2=1 TO N
5080     C#(L)=(C#(L)*X(II(L)))+U#(J)
5090     J=J-1
5100   NEXT
5110   T3#=Y(II(L))-C#(L)
5120   T#=T#+T3#^2
5130 NEXT
5140 IF MF<>N THEN GOTO 5170
5150 T5#=0
5160 GOTO 5180
5170 T5#=T#/(MF-N)
5180 Q7#=1-T#/(T9#*(MF-1))
5190 :
5200 DETERM = INT(Q7#*10000)/10000
5210 STDERR(N-1)=SQR(T5#)
5220 RETURN
5230 REM ------------------------------------------------------------------
5240 REM *** Routine to get all the sensor details ***
5260 REM * Set up screen *
5270 KEY OFF
5280 SCREEN 9:COLOR 7,1:CLS
5290 LINE (5,5)-(635,345),,B
5300 LOCATE 4,25:PRINT"Psychrometer Calibration"
5310 LOCATE 5,24:PRINT "Control and Logging program"
5315 REM ** USERNAME$ = name of present operator for filing purposes **
5320 LOCATE 7,18 : INPUT"Please enter your user name ";USERNAME$
5330 LINE (180,110)-(400,240),2,BF
5340 LINE (185,115)-(395,235),64,B
5345 REM ** P = no. psychrometers, S = no. SST's **
5346 REM ** A = no. air temp's, O = no. other sensors **
5350 P=0:S=0:A=0:O=0
5360 LOCATE 10,26:PRINT" Psychrometers   ->";P
5370 LOCATE 12,26:PRINT" SST's             ";S
5380 LOCATE 14,26:PRINT" Air Temps         ";A
5390 LOCATE 16,26:PRINT" Others            ";O
5400 LOCATE 20,10:PRINT"Enter number of sensors and press <ESC> when finished"
5410 LOCATE 21,22 : PRINT"Move around using cursor keys"
5420 REM * Get all the details *
5425 REM ** DN$ = scan code to detect arrow down key **
5426 REM ** UP$ = scan code to detect up arrow key **
5430 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
5440 X=10:Y=46:KY$=" "
5450 LOCATE X,Y
5460 WHILE KY$<>CHR$(27)
5470   KY$=INKEY$
5480   IF (X=10) AND ((KY$<>UP$)AND(KY$<>DN$)AND(KY$<>CHR$(27))) THEN LOCATE X,46:PRINT KY$;
5490   IF (X=12) AND ((KY$<>UP$)AND(KY$<>DN$)AND(KY$<>CHR$(27))) THEN LOCATE X,46:PRINT KY$;
5500   IF (X=14) AND ((KY$<>UP$)AND(KY$<>DN$)AND(KY$<>CHR$(27))) THEN LOCATE X,46:PRINT KY$;
5510   IF (X=16) AND ((KY$<>UP$)AND(KY$<>DN$)AND(KY$<>CHR$(27))) THEN LOCATE X,46:PRINT KY$;
5520   IF (KY$=DN$) AND ((X>=10)AND(X<=14)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-3:PRINT"-
>";
5530   IF (KY$=UP$) AND ((X>=12)AND(X<=16)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-3:PRINT"-
>";
```

```
5540 WEND
5550 REM ** now scan the screen for the values **
5560 P=VAL(CHR$(SCREEN(10,46)))
5570 S=VAL(CHR$(SCREEN(12,46)))
5580 A=VAL(CHR$(SCREEN(14,46)))
5590 O=VAL(CHR$(SCREEN(16,46)))
5595 REM ** Check if no. of sensors within specified limits **
5600 IF (P>6) OR (S>4) OR (A>2) OR (O>2) THEN BEEP : LOCATE 24,6 : PRINT "Max no  of sensors =
6,4,2,2 respectively...please re-enter" : FOR LOOP=1 TO 11000 : NEXT LOOP : CLEAR : GOTO 5280
5605 REM ** TOTSEN = total number of sensors to be calibrated **
5610 TOTSEN=(P*2)+S+A+O : REM * Wet and dry sensor for each psychrometer *
5620 REM *** deal with all the sensor group seperately ***
5625 REM ** CP() = array to hold cursor positions for screen setup purposes **
5626 REM ** ID$() = array to hold the id's of every sensor **
5627 REM ** CH2$() = array to hold data read in from the 'details.mmn' files **
5628 REM ** FILARR$() = array to hold filenames of each new sensor cal. file **
5629 REM ** CONNECTION() = array to hold counter connection nos. for each sensor
5630 REM ** LSTFILE$() = array to hold filenames of each sensor list file **
5631 REM
5635 DIM CP(P+S+A+O):DIM ID$(P+S+A+O):DIM CH2$(12):DIM FILARR$(TOTSEN):II=1:NUMSEN=1 : DIM
CONNECTION(TOTSEN) : CONNUM=1 : DIM LSTFILE$(TOTSEN) : IX=1
5640 REM ** Initialise the array that holds the id's **
5650 FOR INDEX=1 TO (P+S+A+O)
5660   ID$(INDEX)="       "
5670 NEXT INDEX
5675 REM ** ZZZ = common variable holding the number of each sensor **
5680 REM ** first the psychrometers **
5690 IF P<>0 THEN ZZZ=P : STLOOP=1 : SPLOOP=P : SENSOR$=" Psychrometer " : FILNM$="tt" : CLS :
LOCATE 12,15 : PRINT "Enter the psychrometer details...." : FOR LOOP=1 TO 10000 : NEXT : GOSUB 5980
5700 REM ** now deal with the sst's **
5710 IF S<>0 THEN ZZZ=S : STLOOP=P+1 : SPLOOP=P+S : SENSOR$=" SST          " : FILNM$="sp" : CLS :
LOCATE 12,15 : PRINT "Enter the SST details...." : FOR LOOP=1 TO 10000 : NEXT : GOSUB 5980
5720 REM ** thirdly, deal with the air temperatures **
5730 IF A<>0 THEN ZZZ=A : STLOOP=P+S+1 : SPLOOP=P+S+A : SENSOR$=" Air temp     " : FILNM$="td" : CL
: LOCATE 12,15 : PRINT "Enter the air temp details...." : FOR LOOP=1 TO 10000 : NEXT : GOSUB 5980
5740 REM ** lastly, deal with any other sensors **
5750 IF O<>0 THEN ZZZ=O : STLOOP=P+S+A+1 : SPLOOP=P+S+A+O : SENSOR$=" Others       " : CLS : LOCATE
12,15 : PRINT "Enter the other sensor details...." : FOR LOOP=1 TO 10000 : NEXT : GOSUB 5980
5760 REM *** now tell the user which connections to make ***
5770 CLS : NUMSEN=1
5780 LOCATE 2,10 : PRINT"Please make the following connections :";
5790 FOR I=1 TO P
5800   LOCATE I+3,5:PRINT"Psychrometer ";I;"  Sensor ";ID$(NUMSEN);"  Connect to counters
";(I*2)+2+1;(I*2)+3+1;
5810   CONNECTION(CONNUM)=(I*2)+2:CONNECTION(CONNUM+1)=(I*2)+3:NUMSEN=NUMSEN+1:CONNUM=CONNUM+2
5820 NEXT I
5830 FOR I=1 TO S
5840   LOCATE I+P+4,5:PRINT"SST          ";I;"  Sensor ";ID$(NUMSEN);"  Connect to counter
";I+15+1;
5850   CONNECTION(CONNUM)=I+15:NUMSEN=NUMSEN+1:CONNUM=CONNUM+1
5860 NEXT I
5870 FOR I=1 TO A
5880   LOCATE I+P+S+5,5:PRINT"Air temp     ";I;"  Sensor ";ID$(NUMSEN);"  Connect to counter
";I+19+1;
```

```
5890   CONNECTION(CONNUM)=I+19:NUMSEN=NUMSEN+1:CONNUM=CONNUM+1
5900 NEXT I
5910 FOR I=1 TO O
5920   LOCATE I+P+S+A+6,5:PRINT"Others       ";I;"  Sensor ";ID$(NUMSEN);"  Connect to counter
";I+21+1;
5930   CONNECTION(CONNUM)=I+21:NUMSEN=NUMSEN+1:CONNUM=CONNUM+1
5940 NEXT I
5941 AA=CSRLIN
5945 LOCATE AA+2,10:PRINT"Press <RETURN> at anytime to continue";
5946 LOCATE AA+4,5:PRINT"Current counter readings :";
5950 WHILE INKEY$<>CHR$(13)
5951   GOSUB 2720
5952   FOR FILNUM=1 TO TOTSEN
5953   IF FILNUM>7 THEN YPOS=35:SUBT=7 ELSE YPOS=7:SUBT=0
5954   LOCATE AA+5+FILNUM-SUBT,YPOS:PRINT CONNECTION(FILNUM)+1;"     ";:PRINT USING
"#####.###";(30000-A%(CONNECTION(FILNUM)))/T1
5955   NEXT FILNUM
5956 WEND
5960 RETURN : REM ** i.e. return to the main program at line 60 **
5970 REM ------------------------------------------------------------------------
5980 REM ** Routine to get the details of each different sensor type **
6000 REM ** setup screen **
6010 J=STLOOP
6020 GOSUB 6170
6030 REM *** get all the sensor details ***
6040 WHILE J<=SPLOOP
6050   LOCATE CP(J),4:PRINT" ->";
6060   LOCATE CP(J),37:INPUT ID$(NUMSEN)
6070   GOSUB 6350
6080   NUMSEN=NUMSEN+1
6090   REM ** Now redraw the screen **
6100   GOSUB 6170
6110   J=J+1
6120 WEND
6130 WHILE INKEY$<>CHR$(27):WEND
6140 CLS
6150 RETURN
6160 REM ------------------------------------------------------------------------
6170 REM ** set up the screen **
6180 X1=10:Y1=10:X2=380:Y2=350:I2=STLOOP
6190 COLOR 7,1:CLS
6200 LOCATE 4,51:PRINT "Enter ID for each sensor ";
6210 LOCATE 5,51:PRINT "followed by <RETURN>"
6220 LOCATE 6,53:PRINT "eg. VI1006";
6230 LOCATE 8,51:PRINT "Press <ESC> when finished";
6240 FOR I=1 TO ZZZ
6250   LINE (X1,((Y2/ZZZ)*(I-1))+5)-(X2,((Y2/ZZZ)*I)-5),3,BF
6260   LINE (X1+5,(((Y2/ZZZ)*(I-1))+5)+5)-(X2-5,(((Y2/ZZZ)*I)-5)-5),64,B
6270   CPOS=((((Y2/ZZZ)*I)-((Y2/ZZZ)*(I-1)))/2)+((Y2/ZZZ)*(I-1))
6280   CP(I2)=CINT((CPOS/14)+.5)
6290   COLOR 2,1:LOCATE CP(I2),8:PRINT SENSOR$;I;
6300   COLOR 7,1:LOCATE CP(I2),26:PRINT " Sensor ID : ";ID$(I2);
6310   I2=I2+1
6320 NEXT I
```

```
6330 RETURN
6340 REM ------------------------------------------------------------------------
6350 REM *** draw the window to show all details ***
6360 GOSUB 6740
6370 LOCATE 6,17:PRINT SENSOR$;J;
6380 LOCATE 6,38:PRINT " Sensor ID : ";ID$(NUMSEN);" ";
6390 REM ** first get the multimet number (held in MMN$ ) **
6400 MMN$=""
6405 REM ** Construct the filename **
6410 FILE1$="d:\ametdb\"+FILNM$+ID$(NUMSEN)+".l"
6411 IF FILNM$="tt" THEN LSTFILE$(IX)=FILE1$:LSTFILE$(IX+1)=FILE1$:IX=IX+2 ELSE
LSTFILE$(IX)=FILE1$:IX=IX+1
6420 OPEN FILE1$ FOR INPUT AS #1
6425 REM ** TEMP$ = temporary var, CH$ = text taken from the file **
6430 WHILE (NOT(EOF(1)))
6440   INPUT#1,TEMP$:IF TEMP$<>"" THEN CH$=TEMP$:MMN$=RIGHT$(CH$,3)
6450 WEND
6460 REM ** get today's JDAY for copmarison with any existing ones in DB **
6470 DAY=VAL(MID$(DATE$,4,2)):MONTH=VAL(LEFT$(DATE$,2)):YEAR$=RIGHT$(DATE$,2)
6480 REM ** convert to jday **
6490 JDAY$=STR$(VAL(MID$("000031059090120151181212243273304334",((MONTH-1)*3)+1,3))+DAY)
6500 JDAY$=RIGHT$(JDAY$,3)
6510 REM ** TEMP$,TEMP2$ = temporary vars **
6515 REM ** VCODE$ = file version code, CURJDAY$ = jday of most recent cal file
6520 TEMP$=RIGHT$(CH$,5) : VCODE$=LEFT$(TEMP$,1)
6530 TEMP2$=RIGHT$(CH$,10) : CURJDAY$=LEFT$(TEMP2$,3)
6535 REM ** Test for a version code and if JDAY is same then increment it **
6536 REM ** ASVAL = ascii value of version code **
6540 IF ASC(VCODE$) < 65 THEN ASVAL=65 ELSE IF CURJDAY$=JDAY$ THEN ASVAL=ASC(VCODE$)+1 ELSE ASVAL=6
6550 VCODE$=CHR$(ASVAL)
6560 REM ** now get the remaining details **
6570 X=1
6580 FILE2$="d:\ametdb\metdb_da\details."+MMN$
6590 OPEN FILE2$ FOR INPUT AS #2
6600 WHILE (NOT(EOF(2)))
6610   INPUT#2,CH2$(X):X=X+1
6620 WEND
6630 LOCATE 8,17:PRINT " Multimet No : ";MMN$;" ";
6640 LOCATE 10,17:PRINT CH2$(10);
6650 LOCATE 12,17:PRINT CH2$(6);
6660 CLOSE #1,#2
6670 REM ** Check whether it it the required sensor **
6680 REM ** If so then write the details to a file **
6690 LOCATE 16,17:PRINT " Is this the required sensor (Y/N)  ";
6700 LOCATE 16,53:INPUT K$
6710 IF ((K$="y")OR(K$="Y")) THEN GOSUB 6820 : RETURN ELSE IF ((K$="n")OR(K$="N")) THEN J=J-1 :
NUMSEN=NUMSEN-1 : RETURN ELSE BEEP : GOTO 6700
6720 RETURN
6730 REM ------------------------------------------------------------------------
6740 REM *** Routine to draw the window ***
6750 AA=320 : BB=175
6760 FOR CC=1 TO 125 STEP 2
6770   LINE ((AA-CC)-95,BB-CC)-((AA+CC)+95,BB+CC),8,BF
6780 NEXT CC
```

```
6790 LINE (105,55)-(535,295),7,B
6800 RETURN
6810 REM ------------------------------------------------------------------------
6820 REM ** Routine to check what to write to files **
6825 REM ** FILNM$ = instrument type for filname purposes **
6826 REM ** STYPE$ = sensor type **
6827 REM ** ELEC$ = sensor electronics number **
6830 IF FILNM$="tt" THEN STYPE$="td" : ELEC$=RIGHT$(CH2$(10),3) : GOSUB 6870 : STYPE$="tw" :
TEMP$=RIGHT$(CH2$(10),9) : ELEC$=LEFT$(TEMP$,4) : GOSUB 6870
6840 IF FILNM$="sp" THEN STYPE$="sp" : ELEC$=RIGHT$(CH2$(10),3) : GOSUB 6870
6850 RETURN
6860 REM ------------------------------------------------------------------------
6870 REM ** Routine to open a data file and write the relevant details **
6880 REM ** Open the new file **
6890 FILE3$="c:\"+STYPE$+JDAY$+YEAR$+VCODE$+"."+MMN$
6900 FILARR$(II)=FILE3$ : IF TOTSEN>II THEN II=II+1
6910 OPEN FILE3$ FOR OUTPUT AS #3
6920 PRINT #3,"Multimet Sensor Calibration File"
6930 PRINT #3,""
6940 PRINT #3,"Sensor ID : ";STYPE$;ID$(J)
6950 PRINT #3,"Electronics : ";ELEC$
6960 PRINT #3,"Date : ";DATE$
6970 PRINT #3,"Operator : ";USERNAME$
6980 PRINT #3,"Standard : F25 S3422"
6990 PRINT #3,""
6991 PRINT #3,"Poly. deg : 3"
6992 PRINT #3,"Equation : hex=hex/6.25"
6993 PRINT #3,"Equation : val=C0+C1*hex+C2*hex^2+C3*hex^3+C4*hex^4"
6994 PRINT #3,""
7000 CLOSE #3
7060 RETURN
7070 REM ------------------------------------------------------------------------
7080 REM *** Error routine ***
7090 REM ** First, find type of error **
7100 REM * File not found *
7110 IF ERR=53 THEN LOCATE 8,17:PRINT " No such sensor found in database ":BEEP:J=J-1:NUMSEN=NUMSEN
1:CLOSE:LOCATE 16,17:PRINT" Press <RETURN> to continue ";:WHILE INKEY$<>CHR$(13):WEND:RESUME 6720
7120 REM * Disk not ready - Path not found *
7130 IF (ERR=71) OR (ERR=76) THEN LOCATE 8,17:PRINT" Please ensure that the database is ":LOCATE
9,17:PRINT" ready for access ":BEEP:J=J-1:NUMSEN=NUMSEN-1:CLOSE:LOCATE 16,17:PRINT" Press <RETURN>
to continue ";:WHILE INKEY$<>CHR$(13):WEND:RESUME 6720
7140 REM * Device I/O error - Device timeout *
7150 IF (ERR=57) OR (ERR=24) THEN BEEP:CLS:LOCATE 12,21:PRINT"An error has occured....press <RETURN
to re-initialise F25":CLOSE:RESUME 360
7160 REM ------------------------------------------------------------------------
7170 REM *** Routine to convert temporary files to multimet database ***
7180 REM *** files and update the list and history files ***
7210 OPEN TEMPFILE$ FOR INPUT AS #1
7215 MMF$="d:\ametdb\metdb_da\"+RIGHT$(TEMPFILE$,12)
7216 OPEN MMF$ FOR OUTPUT AS #2
7217 PRINT #2,"%CO:A,12,72%"
7220 REM ** Get the first 11 lines as they stay the same **
7230 FOR I=1 TO 11
7240   INPUT #1,TEMP$
```

```
7250   PRINT #2,TEMP$
7260 NEXT I
7270 REM ** Now get the coefficients **
7280 WHILE LEFT$(TEMP$,4)<>"Term"
7290   INPUT #1,TEMP$
7300 WEND
7310 PRINT #2,TEMP$
7320 WHILE NOT(EOF(1))
7330   INPUT #1,TEMP$
7340   PRINT #2,TEMP$
7350 WEND
7360 PRINT #2,"C4":PRINT #2,"C5":PRINT #2,"C6":PRINT #2,"C7"
7370 PRINT #2,"          Freq.        Temp.        Y-Cal        Diff"
7380 REM ** File pointer is at end therefore close file to reset it **
7390 CLOSE #1
7400 OPEN TEMPFILE$ FOR INPUT AS #1
7410 REM ** Skip the first 12 lines **
7420 FOR I=1 TO 12
7430   INPUT #1,TEMP$
7440 NEXT I
7450 REM ** Now get the remaining values **
7460 J=1:INPUT #1,NUMBER$(J)
7470 WHILE LEFT$(NUMBER$(J),3)<>"Std"
7480   J=J+1
7490   INPUT #1,NUMBER$(J)
7500 WEND
7510 FOR I=1 TO (J-1)/2
7520   PRINT #2,"Cal:     ";:PRINT #2,NUMBER$(I);"        ";NUMBER$(I+((J-1)/2))
7530 NEXT I
7531 PRINT #2,NUMBER$(J)
7535 PRINT #2,"%P0%"
7536 PRINT #2,"%CO:B,12,60%%CO:C,12,48%%CO:D,12,36%%CO:E,12,24%%CO:F,12,12%
7540 CLOSE #1 : CLOSE #2
7550 REM ** Append the list files in the database **
7560 TEMPNAME$=RIGHT$(MMF$,22)
7570 OPEN LFILE$ FOR APPEND AS #1
7580 PRINT #1,TEMPNAME$
7590 CLOSE #1
7600 REM ** Update the history file in the database **
7610 FILE4$="d:\ametdb\metdb_da\history."+RIGHT$(TEMPFILE$,3)
7620 OPEN FILE4$ FOR APPEND AS #1
7630 PRINT #1,""
7640 PRINT #1,DATE$;"      Auto Callibrated"
7650 CLOSE #1
7660 RETURN
```

```
1000 REM ************************************************************************
1005 REM ******************* SEND.BAS by RWP 8/11/90 ****************************
1010 REM ************************************************************************
1011 REM ------------------------
1012 REM ----- Main program -----
1015 REM ------------------------
1017 REM
1020 REM ===== Declare all arrays.....
1021 REM
1024 DIM FREQ$(20) , WIND$(20) , CALFILE$(100)
1026 DIM X(40), Y(40), II(40)
1028 DIM P#(40), Q#(40)
1030 DIM A#(40), B#(40), S#(40), G#(40)
1035 DRIVE$="D:":PT%=1
1040 REM
1041 REM ===== Set error trap.....
1042 REM
1043 ON ERROR GOTO 40000
1044 REM
1045 REM ===== Call subroutine to set up Ctrl Esc key trap.....
1046 REM
1047 GOSUB 14000
1048 KEY OFF
1049 SCREEN 9
1056 REM
1057 REM ===== Set up user menu....
1058 REM
1059 COLOR 7,1: CLS
1060 REM
1061 REM ===== Draw up menu box.....
1065 REM
1067 LINE (5,5)-(635,345),,B
1090 LINE (180,55)-(480,266),2,BF
1100 LINE (185,60)-(475,261),64,B
1106 LOCATE 6,26:PRINT"        ALLOCATION MENU          "
1110 LOCATE 8,26:PRINT" Calibrated Sensors            "CHR$(27);" "
1120 LOCATE 10,26:PRINT" Deployed Sensors               "
1130 LOCATE 12,26:PRINT" Sensors Requiring Calibration  "
1140 LOCATE 14,26:PRINT" New Sensor Entries             "
1143 LOCATE 16,26:PRINT" Dump to printer sensor list    "
1145 LOCATE 18,26:PRINT" Return to Main Menu            "
1150 LOCATE 21,8:PRINT" Move arrow to required sensor type and press <RETURN> when finished"
1160 LOCATE 22,26 : PRINT"Move around using cursor keys"
1162 COLOR 3,1
1163 LOCATE 3,30:PRINT "MULTIMET SENSOR MANAGEMENT"
1165 REM
1170 REM ===== Define the cursor keys.....
1175 REM
1180 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
1185 X=8:Y=59:KY$=" "
1190 REM
1191 REM ===== Set up pointer box in menu.....
1192 REM
1193 COLOR 7,1
```

```
1195 Y1 = 97
1198 GOSUB 20000
1200 LOCATE X,Y
1202 REM
1205 REM ===== Reading input from keyboard....
1207 REM
1210 WHILE KY$<>CHR$(13)
1220   KY$=INKEY$
1270   IF (KY$=DN$) AND ((X>=8)AND(X<=16)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1280   IF (KY$=UP$) AND ((X>=10)AND(X<=18)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1290 WEND
1291 IF X=8 THEN LT$="R"
1292 IF X=10 THEN LT$="D"
1293 IF X=12 THEN LT$="M"
1294 IF X=14 THEN RUN"SEN3"
1295 IF X=16 THEN RUN"senprt"
1296 IF X=18 THEN RUN"MAINMENU"
1298 GOTO 1500
1300 END
1500 REM -SETUP SELECT SENSOR TYPE MENU
1550 COLOR 7,1:CLS
1661 REM ===== Draw up menu box.....
1667 LINE (5,5)-(635,345),,B
1690 LINE (180,55)-(480,266),2,BF
1700 LINE (185,60)-(475,261),64,B
1705 LOCATE 6,26:PRINT" Air Temperature              "CHR$(27);" "
1710 LOCATE 8,26:PRINT" Sea Temperature                "
1720 LOCATE 10,26:PRINT" Wind Speed                    "
1730 LOCATE 12,26:PRINT" Wind Direction                "
1740 LOCATE 14,26:PRINT" Radiometers                   "
1742 LOCATE 16,26:PRINT" Others                        "
1745 LOCATE 18,26:PRINT" Return to Allocation Menu     "
1750 LOCATE 21,8:PRINT" Move arrow to required sensor type and press <RETURN> when finished"
1760 LOCATE 22,26 : PRINT"Move around using cursor keys"
1763 COLOR 3,1
1765 LOCATE 3,33:PRINT "SELECT SENSOR TYPE"
1770 REM ===== Define the cursor keys.....
1780 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
1785 X=6:Y=59:KY$=" "
1791 REM ===== Set up pointer box in menu.....
1793 COLOR 7,1
1795 Y1 = 69
1798 GOSUB 20000
1800 LOCATE X,Y
1805 REM ===== Reading input from keyboard....
1810 WHILE KY$<>CHR$(13)
1820   KY$=INKEY$
1870   IF (KY$=DN$) AND ((X>=6)AND(X<=16)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1880   IF (KY$=UP$) AND ((X>=8)AND(X<=18)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1885 WEND
```

```
1890 IF X=6 THEN CODE%=100:GOSUB 12000
1891 IF X=8 THEN CODE%=200:GOSUB 12000
1892 IF X=10 THEN CODE%=300:GOSUB 12000
1893 IF X=12 THEN CODE%=400:GOSUB 12000
1894 IF X=14 THEN CODE%=500:GOSUB 12000
1895 IF X=16 THEN CODE%=1:GOSUB 12000
1897 IF X=18 THEN GOTO 1059
1898 GOTO 1059
6140 LOCATE 16,26:PRINT" Enter New Sensor                "
12000 REM
12010 REM ----- Subroutine for menu to select two calibration files -----
12020 REM ------------------------------------------------------------------
12030 TOTAL=0
12034 OPEN "R",#1,"SENSORS.DAT",9
12036 FIELD #1,2 AS T$,6 AS S$,1 AS L$
12037 IF CODE%=1 THEN CT=98 ELSE CT=99
12038 FOR MULTI%=CODE% TO CODE%+CT
12040 GET #1,MULTI%
12042 IF L$<>LT$ THEN GOTO 12048
12044 TOTAL=TOTAL+1
12046 CALFILE$(TOTAL)=T$+S$+"."+STR$(MULTI%)
12048 NEXT MULTI%
12049 CLOSE#1
12050 REM ===== Draw menu.....
12060 REM
12070 COLOR 3,1
12080 CLS
12081 LINE (1,10)-(270,30),15,B
12082 IF LT$="R" THEN LOCATE 2,2:PRINT"SENSORS AVAILABLE FOR DEPLOYMENT"
12084 IF LT$="D" THEN LOCATE 2,4:PRINT"SENSORS CURRENTLY DEPLOYED"
12086 IF LT$="M" THEN LOCATE 2,2:PRINT"SENSORS CURRENTLY IN MAINTANANCE"
12088 COLOR 15,1
12090 LINE (20,40) - (250,340),15,B
12100 PAINT (100,200),2,15
12110 N = 3
12120 ROW = 3
12130 IF TOTAL < 10 THEN TOP = 1 ELSE TOP = TOTAL - 9
12140 FOR N = TOP TO TOTAL
12150       ROW = ROW + 2
12160       LOCATE ROW,10: PRINT " ";CALFILE$(N);" "
12170 NEXT N
12180 LINE (300,50) - (500,75),15,B
12190 PAINT (400,60),4,15
12200 REM
12210 REM ===== Set pointers for cal files 1 and 2.....
12220 REM
12230 C1 = TOTAL
12240 POINTER = TOTAL
12250 IF TOTAL > 10 THEN ROW = 23 ELSE ROW = POINTER * 2 + 3
12260 LOCATE 5,45: PRINT " ";CALFILE$(C1);" "
12280 COLOR 12,1: LOCATE 5,42: PRINT "1:"
12310 GOSUB 12470
12315 IF KY$=CHR$(27) THEN GOTO 12440
12320 REM ===== Read input from keyboard.....
```

```
12322 REM LINE (30,10)-(220,30),15,B
12330 REM
12332 REM IF LT$="R" THEN LOCATE 2,7:PRINT"SENSOR NOW DEPLOYED"
12334 REM IF LT$="D" THEN LOCATE 2,3:PRINT"SENSOR RETURNED TO MAINTANANCE"
12336 REM IF LT$="M" THEN LOCATE 2,7:PRINT"SENSOR NOW AVAILABLE"
12340 KY$ = ""
12350 IROW1 = 20
12360 WHILE KY$ <> "/" AND KY$<>CHR$(27)
12370       KY$ = INKEY$
12380       IF KY$ = "1" THEN GOSUB 12470: C1 = POINTER
12400 WEND:C1=POINTER
12405 IF ASC(KY$)=27 THEN GOTO 12440
12410 KY$ = ""
12420 OPEN "R",#1,"SENSORS.DAT",9
12424 FIELD #1,2 AS T$,6 AS S$,1 AS L$
12426 LSET T$=LEFT$(CALFILE$(C1),2)
12428 LSET S$=MID$(CALFILE$(C1),3,6)
12430 IF LT$="R" THEN LSET L$="D"
12432 IF LT$="D" THEN LSET L$="M"
12434 IF LT$="M" THEN LSET L$="R"
12436 CODE%=VAL(RIGHT$(CALFILE$(C1),3))
12438 PUT#1,CODE%
12440 CLOSE#1
12450 IF KY$>< CHR$(27) THEN GOSUB 65000
12460 RETURN
12470 REM
12480 REM ------------------------------------------------------------------
12490 REM ----- Subroutine to allow user to choose a calibration file -----
12500 REM ------------------------------------------------------------------
12510 REM
12520 REM
12530  PAINT (400,10),1,15:GOSUB 30000
12540 COLOR 10,1
12550 LOCATE 8,35: PRINT "Use UP DOWN keys to move cursor"
12560 COLOR 12,1
12570 LOCATE 10,35: PRINT "Press RETURN to make selection"
12580 REM ===== Define up down keys.....
12590 REM
12600 DN$ = CHR$(0) + CHR$(80)
12610 UP$ = CHR$(0) + CHR$(72)
12620 REM
12630 REM ===== Scan keyboard for Return and Up Down keys.....
12640 REM
12650 KY$ = ""
12660 COL = 12
12670 GOSUB 13100
12680 WHILE (KY$ <> CHR$(13) AND KY$ <> CHR$(27))
12690       KY$ = INKEY$
12700       IF (KY$ = UP$ AND POINTER > 1) THEN IF (ROW = 5) THEN GOSUB 12840 :COL = 12:GOSUB 13100
ELSE COL = 15:GOSUB 13100: POINTER = POINTER - 1: ROW = ROW - 2: COL = 12 :GOSUB 13100
12710       IF (KY$ = DN$ AND POINTER < TOTAL) THEN IF (ROW = 23) THEN GOSUB 12970: COL = 12: GOSUB
13100 ELSE COL = 15: GOSUB 13100: POINTER = POINTER + 1: ROW = ROW + 2: COL = 12: GOSUB 13100
12720 WEND
12725 IF KY$= CHR$(27) THEN GOTO 12839
```

```
12730 COL = 15: GOSUB 13100
12740 KY$ = ""
12750 GOSUB 30000
12760 COLOR 10,1
12770 LOCATE 1,35: PRINT "Enter / to select the required sensor"
12790 COLOR 12,1
12800 LOCATE 2,35: PRINT "Press 1 to change the sensor"
12805 LOCATE 3,35: PRINT "to one of those shown on the left."
12807 MULTIMET$=RIGHT$(CALFILE$(POINTER),3)
12810 FOR I= 1 TO 3: X$=MID$(MULTIMET$,I,1):IF X$=" " THEN MULTIMET$=RIGHT$(MULTIMET$,(3-I))
12811 NEXT I
12812 IF LEN(MULTIMET$)=1 THEN MULTIMET$="00"+MULTIMET$
12813 IF LEN(MULTIMET$)=2 THEN MULTIMET$="0"+MULTIMET$
12815 FF$=DRIVE$+"\ametdb\metdb_da\history."+MULTIMET$
12816 OPEN FF$ FOR INPUT AS #3:XF=0
12818 LINE (260,90)-(630,330),15,B
12822 FOR I = 0 TO 5: INPUT#3,AF$:NEXT:COLOR 10,1
12823 WHILE EOF(3)>-1
12824 INPUT #3,AF$
12825 FOR I=1 TO LEN(AF$):TT$=MID$(AF$,I,1):IF TT$=CHR$(9) THEN TT$="  "
12826 IF I MOD 45=0 THEN XF=XF+1
12827 LOCATE 8+XF,34+I MOD 45:PRINT TT$;
12830 NEXT I
12834 XF=XF+1:IF XF>15 THEN XF= 0: GOSUB 30000
12837 WEND
12838 CLOSE#3
12839 RETURN
12840 REM
12850 REM ------------------------------------------------
12860 REM ----- Subroutine to scroll screen up one place -----
12870 REM ------------------------------------------------
12880 REM
12890 LR = ROW
12900 POINTER = POINTER - 1
12910 COLOR 15,1
12920 FOR LOOP = POINTER TO POINTER + 9
12930       LOCATE LR,10: PRINT " ";CALFILE$(LOOP);" "
12940       LR = LR + 2
12950 NEXT LOOP
12960 RETURN
12970 REM
12980 REM ------------------------------------------------
12990 REM ----- Subroutine to scroll down one place -----
13000 REM ------------------------------------------------
13010 REM
13020 LR = ROW
13030 POINTER = POINTER + 1
13040 COLOR 15,1
13050 FOR LOOP = POINTER TO POINTER-9 STEP -1
13060       LOCATE LR,10: PRINT " ";CALFILE$(LOOP);" "
13070       LR = LR - 2
13080 NEXT LOOP
13090 RETURN
13100 REM
```

```
13110 REM ------------------------------------------------------------------
13120 REM ----- Subroutine to write name of calfile in a specified colour -----
13130 REM ------------------------------------------------------------------
13140 REM
13150 REM
13160 REM ===== Write cal file in large menu box.....
13170 REM
13180 COLOR COL,1
13190 LOCATE ROW,10: PRINT " ";CALFILE$(POINTER);" "
13200 REM
13210 REM ===== Write cal file in small menu box.....
13220 REM
13230 LOCATE 5,45: PRINT " ";CALFILE$(POINTER);" "
13240 RETURN
14000 REM
14002 REM ------------------------------------------------------
14005 REM ----- Subroutine to set up key trap for Ctrl Esc -----
14007 REM ------------------------------------------------------
14010 REM
14014 REM
14016 REM ===== Define keys to include all possible combinations of CAPS LOCK
14017 REM       and NUM LOCK.....
14018 REM
14020 KEY 15,CHR$(&H64)+CHR$(1)
14030 KEY 16,CHR$(&H44)+CHR$(1)
14040 KEY 17,CHR$(&H24)+CHR$(1)
14050 KEY 18,CHR$(&H4)+CHR$(1)
14060 REM
14064 REM ===== Direct all escape key combinations to line 65300 .....
14066 REM
14070 ON KEY (15) GOSUB 65300
14080 ON KEY (16) GOSUB 65300
14090 ON KEY (17) GOSUB 65300
14100 ON KEY (18) GOSUB 65300
14110 REM
14115 REM ===== Turn all escape key combinations on.....
14117 REM
14120 KEY (15) ON
14130 KEY (16) ON
14140 KEY (17) ON
14150 KEY (18) ON
14200 RETURN
20000 REM
20010 REM ------------------------------------------------------------------
20020 REM ----- Subroutine for drawing & flashing pointer box in menu -----
20030 REM ------------------------------------------------------------------
20040 REM
20050 REM ===== First overwrite old box.....
20060 REM
20070 LINE (199,Y1)-(464,Y1+15),2,B
20100 REM ===== Now draw box and flash at new position.....
20110 REM
20120 IF (KY$ = DN$) THEN Y1 = Y1 + 28 ELSE IF (KY$ = UP$) THEN Y1 = Y1 - 28
20140 FOR COL = 9 TO 15
```

```
20150 LINE (199,Y1)-(464,Y1+15),COL,B
20160 NEXT COL
20170 LINE (199,Y1)-(464,Y1+15),12,B
20500 RETURN
30000 REM
30010 REM ---------------------------------------
30020 REM ------ SUBROUTINE TO REFRESH SCREEN ----
30030 REM ---------------------------------------
30040 PAINT (400,280),PT%,15
30050 IF PT%=1 THEN PT%=0 ELSE PT%=1
30060 RETURN
40000 REM
40002 REM -------------------------------------
40005 REM ----- Error checking subroutines -----
40007 REM -------------------------------------
40010 REM
40020 REM
40022 REM ===== Check for errors during file opening.....
40024 REM
40030 IF ERR = 53 THEN GOSUB 40100: RESUME 12000
40032 IF ERR = 52 THEN GOSUB 40200: RESUME 12000
40034 IF ERR = 71 THEN GOSUB 40300: RESUME 12000
40036 IF ERR = 72 THEN GOSUB 40400
40038 IF (ERR = 5 OR ERR = 11) THEN GOSUB 40500: RESUME 65300
40040 IF ERR = 76 THEN GOSUB 40600: RESUME 65300
40050 STOP
40100 REM
40105 REM ===== File not found.....
40110 REM
40115 LINE (50,196)-(330,250),3,BF
40120 COLOR 12,1: LOCATE 15,11: PRINT " Sensor not found in database "
40130 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40140 BEEP
40190 RETURN
40200 REM
40205 REM ===== Invalid filename.....
40210 REM
40215 LINE (50,196)-(330,250),3,BF
40220 COLOR 12,1: LOCATE 15,14: PRINT " Invalid filename used "
40230 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40240 BEEP
40290 RETURN
40300 REM
40305 REM ===== Drive not ready.....
40310 REM
40315 LINE (50,196)-(330,250),3,BF
40320 COLOR 12,1: LOCATE 15,15: PRINT " Drive ";DRIVE$;"\ not ready "
40330 COLOR 15,1: LOCATE 16,13: PRINT " Press return when ready "
40340 BEEP
40350 ANSWER$ = ""
40360 WHILE (ANSWER$ <> CHR$(13))
40370       ANSWER$ = INKEY$
40380 WEND
40390 RETURN
```

```
40400 REM
40405 REM ===== Disk media error.....
40410 REM
40420 LINE (50,196)-(330,250),3,BF
40430 COLOR 12,1: LOCATE 15,11: PRINT " Error with hardware or disk "
40440 COLOR 15,1: LOCATE 16,17: PRINT " Program halted "
40490 RETURN
40500 REM
40502 REM ===== Illegal function call.....
40505 REM
40510 COLOR 12,8: LOCATE 17,33: PRINT "Insignificant data"
40520 LOCATE 18,26: PRINT "Could not calculate coefficients"
40530 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40540 WHILE (INKEY$ = "")
40550 WEND
40555 CLS
40560 REM
40562 REM ===== Exit program and return to operating system.....
40565 REM
40590 RETURN
40600 REM
40602 REM ===== Path not found.....
40605 REM
40610 CLS
40620 COLOR 12,1:LOCATE 17,24: PRINT "Could not find database on drive ";DRIVE$
40630 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40640 WHILE (INKEY$ = "")
40650 WEND
40655 CLS
40660 REM
40662 REM ===== Exit program and return to operating system.....
40665 REM
40690 RETURN
50000 REM
50100 REM DRAW GREEN BOX
50105 REM CLS
50110 COLOR 15,1
50120 FOR N=1 TO 150 STEP 2
50130 LINE (BB%-N,160-N)-(BB%+N,160+N),2,BF
50140 NEXT N
50200 RETURN
65000 REM
65002 REM ----------------------------------------
65005 REM ----- Subroutine to update database -----
65007 REM ----------------------------------------
65010 REM
65015 REM ===== If Psychrometers has been chosen then change ID back to TT.....
65020 REM
65030 IF (ID$ = "TW" OR ID$ = "TD") THEN ID$ = "TT"
65045 REM
65046 REM ===== Write name of new calibration file to ametdb directory.....
65047 REM
65050 REM FILE1$ = DRIVE$ + "\AMETDB\" + ID$ + SENSNUM$ + ".L"
65055 REM LOCATE 16,5: PRINT "Updating sensor file : ";FILE1$
```

```
65060 REM OPEN FILE1$ FOR APPEND AS #1
65070 REM PRINT #1,RIGHT$(FILE$,22)
65080 REM CLOSE #1
65090 REM
65095 REM ===== Write to history file date of calibration.....
65100 REM
65105 GOSUB 30000:M$=""
65106 LOCATE 8,35:PRINT "ENTER COMMENTS OR CR"
65107 LOCATE 10,35:INPUT;M$
65110 FILE2$ = DRIVE$+"\AMETDB\METDB_DA\HISTORY." + MULTIMET$
65115 LOCATE 12,35: PRINT "Updating history file : "
65117 LOCATE 14,35: PRINT FILE2$
65120 OPEN FILE2$ FOR APPEND AS #2
65130 DAY$ = MID$(DATE$,4,2)
65140 MONTH$ = LEFT$(DATE$,2)
65141 YEAR$=RIGHT$(DATE$,4)
65143 IF LT$="R" THEN TEXT$="SENSOR DEPLOYED"
65144 IF LT$="D" THEN TEXT$="SENSOR RETURNED TO MAINTANANCE"
65145 IF LT$="M" THEN TEXT$="SENSOR NOW AVAILABLE"
65150 PRINT #2, DAY$ + "/" + MONTH$ + "/" + YEAR$+"    "+TEXT$
65152 PRINT #2,M$
65160 CLOSE #2
65170 LOCATE 16,35: PRINT "---Press Any Key for Menu---"
65180 WHILE (INKEY$ = "")
65190 WEND
65200 RETURN
65300 REM
65302 REM ------------------------------------------------------------------
65305 REM ----- Subroutine for execution when Ctrl Esc has been pressed -----
65307 REM ------------------------------------------------------------------
65310 REM
65320 CLS
65330 SCREEN 0,0,0
65340 LOCATE 14,9: PRINT "Program Execution Halted..... Returning to MAINMENU"
65345 LOCATE 16,29: PRINT "---Press Any Key---"
65350 WHILE (INKEY$ = "")
65360 WEND
65370 RUN "MAINMENU"
```

```
1000 REM ************************************************************************
1010 REM ****************** SEN3.BAS by RWP 8/11/90 ****************************
1020 REM ************************************************************************
1040 REM
1041 REM ===== Set error trap.....
1042 REM
1043 ON ERROR GOTO 40000
1044 REM
1045 REM ===== Call subroutine to set up Ctrl Esc key trap.....
1046 REM
1047 GOSUB 14000
1048 KEY OFF
1049 SCREEN 9
1056 REM
1057 REM ===== Set up user menu....
1058 REM
1059 COLOR 7,1: CLS
1060 REM
1061 REM ===== Draw up menu box.....
1065 REM
1067 LINE (5,5)-(635,345),,B
1090 LINE (180,53)-(480,294),2,BF
1100 LINE (185,58)-(475,289),64,B
1110 LOCATE 6,26:PRINT" Air Temperature               ";CHR$(27);" "
1120 LOCATE 8,26:PRINT" Sea Temperature                 "
1130 LOCATE 10,26:PRINT" Wind Speed                     "
1140 LOCATE 12,26:PRINT" Wind Direction                 "
1142 LOCATE 14,26:PRINT" Radiometers                    "
1143 LOCATE 16,26:PRINT" Others                         "
1144 LOCATE 18,26:PRINT" Change mutlimet allocation     "
1145 LOCATE 20,26:PRINT" Return to Allocation Menu      "
1150 LOCATE 22,8:PRINT" Move arrow to required sensor type and press <RETURN> when finished"
1160 LOCATE 23,26 : PRINT"Move around using cursor keys"
1162 COLOR 3:LOCATE 3,33:PRINT "SELECT SENSOR TYPE       "
1165 REM
1170 REM ===== Define the cursor keys.....
1175 REM
1180 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
1185 X=6:Y=59:KY$=" "
1190 REM
1191 REM ===== Set up pointer box in menu.....
1192 REM
1193 COLOR 7,1
1195 Y1 = 69
1198 GOSUB 20000
1200 LOCATE X,Y
1202 REM
1205 REM ===== Reading input from keyboard....
1207 REM
1210 WHILE KY$<>CHR$(13)
1220   KY$=INKEY$
1270   IF (KY$=DN$) AND ((X>=6)AND(X<=18)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
```

```
1280   IF (KY$=UP$) AND ((X>=8)AND(X<=20)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1290 WEND
1291 IF X=6 THEN METNO=100:GOSUB 30000
1292 IF X=8 THEN METNO=200:GOSUB 30000
1293 IF X=10 THEN METNO=300:GOSUB 30000
1294 IF X=12 THEN METNO=400:GOSUB 30000
1295 IF X=14 THEN METNO=500:GOSUB 30000
1296 IF X=16 THEN METNO=1:GOSUB 30000
1297 IF X=18 THEN METNO=9999:GOSUB 30000
1298 IF X=20 THEN RUN "SEND"
1299 GOTO 1059
1300 END
14000 REM
14002 REM ------------------------------------------------------
14005 REM ----- Subroutine to set up key trap for Ctrl Esc -----
14007 REM ------------------------------------------------------
14010 REM
14014 REM
14016 REM ===== Define keys to include all possible combinations of CAPS LOCK
14017 REM       and NUM LOCK.....
14018 REM
14020 KEY 15,CHR$(&H64)+CHR$(1)
14030 KEY 16,CHR$(&H44)+CHR$(1)
14040 KEY 17,CHR$(&H24)+CHR$(1)
14050 KEY 18,CHR$(&H4)+CHR$(1)
14060 REM
14064 REM ===== Direct all escape key combinations to line 65300 .....
14066 REM
14070 ON KEY (15) GOSUB 65300
14080 ON KEY (16) GOSUB 65300
14090 ON KEY (17) GOSUB 65300
14100 ON KEY (18) GOSUB 65300
14110 REM
14115 REM ===== Turn all escape key combinations on.....
14117 REM
14120 KEY (15) ON
14130 KEY (16) ON
14140 KEY (17) ON
14150 KEY (18) ON
14200 RETURN
20000 REM
20010 REM ------------------------------------------------------------------
20020 REM ----- Subroutine for drawing & flashing pointer box in menu -----
20030 REM ------------------------------------------------------------------
20040 REM
20050 REM ===== First overwrite old box.....
20060 REM
20070 LINE (199,Y1)-(464,Y1+15),2,B
20100 REM ===== Now draw box and flash at new position.....
20110 REM
20120 IF (KY$ = DN$) THEN Y1 = Y1 + 28 ELSE IF (KY$ = UP$) THEN Y1 = Y1 - 28
20140 FOR COL = 9 TO 15
20150 LINE (199,Y1)-(464,Y1+15),COL,B
```

```
20160 NEXT COL
20170 LINE (199,Y1)-(464,Y1+15),12,B
20500 RETURN
30000 SHELL"setkbd capslock=on":GOSUB 30150
30001 IF METNO=1 THEN GOSUB 30300
30002 IF METNO=100 THEN GOSUB 30400
30003 IF METNO=200 THEN GOSUB 30500
30004 IF METNO=300 THEN GOSUB 30600
30005 IF METNO=400 THEN GOSUB 30700
30006 IF METNO=500 THEN GOSUB 30800
30007 IF METNO=9999 THEN GOSUB 30900:GOTO 30045
30010 OPEN "R",#1,"SENSORS.DAT",9
30020 FIELD #1,2 AS T$,6 AS S$,1 AS L$
30021 GET#1,METNO:IF L$<>"R" AND L$<>"M" AND L$<>"D" GOTO 30030
30022 WHILE L$="R" OR L$="M" OR L$="D"
30026 METNO=METNO+1
30027 GET#1,METNO
30028 WEND
30029 LOCATE 2,14:PRINT "Incorrect entry PRESS <ESC> and start again"
30030 LOCATE 5,40:PRINT "MultiMet NO.";METNO
30035 HIST$="Y"
30040 IF CODE%>999 GOTO 30130
30045 MM$="":MANU$="":SEN$="":LC$=""
30050 LOCATE 7,40:PRINT"SENSOR TYPE CODE ? ";
30052 WHILE MM$<> CHR$(13)
30054 MM$=INPUT$(1)
30055 IF MM$=CHR$(13) THEN GOTO 30058
30056 IF MM$=CHR$(27) THEN HIST$="N":GOTO 30130
30057 PRINT MM$;:MANU$=MANU$+MM$
30058 WEND:MM$=""
30059 LOCATE 12,6:PRINT"Typical Serial no.VI1234"
30060 LOCATE 9,40:PRINT"SENSOR SERIAL NO. ? ";
30062 WHILE MM$<> CHR$(13)
30064 MM$=INPUT$(1)
30065 IF MM$=CHR$(13) THEN GOTO 30068
30066 IF MM$=CHR$(27) THEN HIST$="N":GOTO 30130
30067 PRINT MM$;:SEN$=SEN$+MM$
30068 WEND
30070 LOCATE 11,40:PRINT "LOCATION CODE R/M/D ? ";
30072 LC$=INPUT$(1):PRINT LC$
30073 IF LC$=CHR$(27) THEN HIST$="N":GOTO 30130
30075 IF LC$<>"R" AND LC$<>"M" AND LC$<> "D" THEN LOCATE 11,62:PRINT" ":GOTO 30070
30080 LSET T$=MANU$
30090 LSET S$=SEN$
30100 LSET L$=LC$
30110 PUT #1,METNO
30130 CLOSE#1
30135 IF HIST$="Y" THEN GOSUB 60000
30140 GOTO 1059
30150 CLS
30160 LINE (30,10)-(600,340),7,BF
30170 LINE (35,15)-(595,335),8,B
30180 COLOR 15,1
30190 LINE (290,50)-(590,320),8,BF
```

```
30200 LINE (280,40)-(580,310),2,BF
30210 LINE (290,50)-(570,300),4,B
30220 RETURN
30300 REM
30310 LOCATE 5,6:PRINT " Other Sensors"
30320 LOCATE 7,6:PRINT " AC -  Accelerometers"
30330 LOCATE 8,6:PRINT " AP -  Air Pressure"
30340 LOCATE 9,6:PRINT " HU -  Relative Humidity"
30350 LOCATE 10,6:PRINT " PD -  Precipitation gauge"
30390 RETURN
30400 REM
30410 LOCATE 5,6:PRINT " Air Temperature Sensors"
30420 LOCATE 7,6:PRINT " TT -  Psychrometers"
30430 LOCATE 8,6:PRINT " TD -  Dry Bulb Temperatures"
30440 LOCATE 9,6:PRINT " TW -  Wet Bulb Temperatures"
30490 RETURN
30500 REM
30510 LOCATE 5,6:PRINT " Sea Temperature Sensors"
30520 LOCATE 7,6:PRINT " SP -  SOAP"
30530 LOCATE 8,6:PRINT " SF -  FISH"
30590 RETURN
30600 REM
30610 LOCATE 5,6:PRINT " Wind Speed Sensor"
30620 LOCATE 7,6:PRINT " WS -  Cup Anemometer"
30630 LOCATE 8,6:PRINT " WW -  Propellar Vane"
30690 RETURN
30700 REM
30710 LOCATE 5,6:PRINT " Wind Direction Sensors"
30720 LOCATE 7,6:PRINT " WD -  Wind Vane"
30790 RETURN
30800 REM
30810 LOCATE 5,6:PRINT " Radiation Sensor"
30820 LOCATE 7,6:PRINT " RS -  Short Wave eg Kipp"
30830 LOCATE 8,6:PRINT " RL -  Long Wave eg Eppley"
30890 RETURN
30900 REM
30910 REM ENTER MUTIMET NUMBER
30920 REM
30930 LOCATE 5,40:INPUT "Enter MultiMet NO.";METNO
30940 OPEN "R",#1,"SENSORS.DAT",9
30950 FIELD #1,2 AS T$,6 AS S$,1 AS L$
30960 GET#1,METNO
30972 LOCATE 5,6:PRINT"CURRENT STATUS"
30974 LOCATE 7,6:PRINT"SENSOR TYPE",T$
30976 LOCATE 9,6:PRINT"SENSOR SERIAL NO.",S$
30978 LOCATE 11,6:PRINT"LOCATION CODE",L$
30980 HIST$="N"
30990 RETURN
40000 REM
40002 REM ------------------------------------
40005 REM ----- Error checking subroutines -----
40007 REM ------------------------------------
40010 REM
40020 REM
```

```
40022 REM ===== Check for errors during file opening.....
40024 REM
40030 IF ERR = 53 THEN GOSUB 40100: RESUME 1040
40032 IF ERR = 52 THEN GOSUB 40200: RESUME 1299
40034 IF ERR = 71 THEN GOSUB 40300: RESUME 1520
40036 IF ERR = 72 THEN GOSUB 40400
40038 IF (ERR = 5 OR ERR = 11) THEN GOSUB 40500: RESUME 65300
40040 IF ERR = 76 THEN GOSUB 40600: RESUME 65300
40050 STOP
40100 REM
40105 REM ===== File not found.....
40110 REM
40115 LINE (50,196)-(330,250),3,BF
40120 COLOR 12,1: LOCATE 15,11: PRINT " Sensor not found in database "
40130 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40140 BEEP
40190 RETURN
40200 REM
40205 REM ===== Invalid filename.....
40210 REM
40215 LINE (50,196)-(330,250),3,BF
40220 COLOR 12,1: LOCATE 15,14: PRINT " Invalid filename used "
40230 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40240 BEEP
40290 RETURN
40300 REM
40305 REM ===== Drive not ready.....
40310 REM
40315 LINE (50,196)-(330,250),3,BF
40320 COLOR 12,1: LOCATE 15,15: PRINT " Drive ";DRIVE$;"\ not ready "
40330 COLOR 15,1: LOCATE 16,13: PRINT " Press return when ready "
40340 BEEP
40350 ANSWER$ = ""
40360 WHILE (ANSWER$ <> CHR$(13))
40370       ANSWER$ = INKEY$
40380 WEND
40390 RETURN
40400 REM
40405 REM ===== Disk media error.....
40410 REM
40420 LINE (50,196)-(330,250),3,BF
40430 COLOR 12,1: LOCATE 15,11: PRINT " Error with hardware or disk "
40440 COLOR 15,1: LOCATE 16,17: PRINT " Program halted "
40490 RETURN
40500 REM
40502 REM ===== Illegal function call.....
40505 REM
40510 COLOR 12,8: LOCATE 17,33: PRINT "Insignificant data"
40520 LOCATE 18,26: PRINT "Could not calculate coefficients"
40530 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40540 WHILE (INKEY$ = "")
40550 WEND
40555 CLS
40560 REM
```

```
40562 REM ===== Exit program and return to operating system.....
40565 REM
40590 RETURN
40600 REM
40602 REM ===== Path not found.....
40605 REM
40610 CLS
40620 COLOR 12,1:LOCATE 17,24: PRINT "Could not find database on drive ";DRIVE$
40630 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40640 WHILE (INKEY$ = "")
40650 WEND
40655 CLS
40660 REM
40662 REM ===== Exit program and return to operating system.....
40665 REM
40690 RETURN
50000 REM
50100 REM DRAW GREEN BOX
50105 REM CLS
50110 COLOR 15,1
50120 FOR N=1 TO 150 STEP 2
50130 LINE (BB%-N,160-N)-(BB%+N,160+N),2,BF
50140 NEXT N
50200 RETURN
60000 REM ------------------------------------------------------
60010 REM ------ GENERATE LIST,HISTORY AND DETAILS FILES -------
60020 REM ------          FOR NEW SENSORS               -------
60030 REM ------------------------------------------------------
60040 METNO$=RIGHT$(STR$(METNO),LEN(STR$(METNO))-1)
60050 IF LEN(METNO$)=1 THEN METNO$="00"+METNO$
60060 IF LEN(METNO$)=2 THEN METNO$="0"+METNO$
60080 HIST$="COPY D:\AMETDB\METDB_DA\HISTORY D:\AMETDB\METDB_DA\HISTORY."+METNO$
60085 DETL$="COPY D:\AMETDB\METDB_DA\DETAILS D:\AMETDB\METDB_DA\DETAILS."+METNO$
60090 SHELL HIST$
60091 LOCATE 13,7:PRINT "HISTORY FILE GENERATED  "
60095 SHELL DETL$
60096 LOCATE 15,7:PRINT "DETAILS FILE GENERATED  "
60100 OPEN "D:\AMETDB\"+T$+SEN$+".L" FOR OUTPUT AS #1
60110 PRINT#1,"\METDB_DA\DETAILS."+METNO$
60120 PRINT#1,"\METDB_DA\HISTORY."+METNO$
60130 CLOSE#1
60136 LOCATE 17,7:PRINT"LIST FILE GENERATED"
60138 LOCATE 19,7:PRINT "PRESS ANY KEY TO CONTINUE"
60150 KY$=INKEY$
60155 IF KY$="" THEN GOTO 60150
60200 RETURN
65300 REM
65302 REM ------------------------------------------------------------------
65305 REM ----- Subroutine for execution when Ctrl Esc has been pressed -----
65307 REM ------------------------------------------------------------------
65310 REM
65320 CLS
65330 SCREEN 0,0,0
65340 LOCATE 14,9: PRINT "Program Execution Halted..... Returning to MAINMENU"
```

```
65345 LOCATE 16,29: PRINT "---Press Any Key---"
65350 WHILE (INKEY$ = "")
65360 WEND
65370 RUN "MAINMENU"
```

```
5 REM ************************************************************************
6 REM ********************** WINDCAL.BAS by RAF 17/5/90 **********************
7 REM ************************************************************************
10 REM ===== Version 1.0  17/05/90
20 REM =====    This program was written in G W BASIC by Refayet Ahmed.
30 REM =====    The program provides an easy and efficient way to obtain
40 REM ===== coefficients required to calibrate wind sensors.
50 REM =====    It also creates a data file which is written into the database.
60 REM ===== Details of the wind sensor data file are:
70 REM =====                    Sensor ID
80 REM =====                    Current Julian Day of calibration
90 REM =====                    Operator's name
100 REM =====                   Standard calibrated against
110 REM =====                   Coefficient terms and values
120 REM =====                   Table of the data produced
130 REM =====     The program allows the calibration of three types of wind
140 REM ===== sensors : Cup anemometors, Propeller vane instruments and
150 REM ===== Wind direction instruments. Along with these options is also
160 REM ===== the option of 'Others' which may be selected if the instrument
170 REM ===== to be calibrated is not one of the options. In this case the user
180 REM ===== must input the first two letters of the sensor ID when asked for.
190 REM =====     The calibration data is inputted by the user via an editor
200 REM ===== provided by the program.
210 REM =====     The editor is called as a subroutine and is located between
220 REM ===== lines 30000 - 31000. The functions within the editor are also
230 REM ===== called as subroutines.
240 REM =====     The coefficients of the equation used for the calibration are
250 REM ===== in a subroutine between lines 60000 - 61880. This part of the
260 REM ===== program was imported from another called 'bathcon7' (written by
270 REM ===== Adrain Williams). A few changes were made to this routine. Mainly
280 REM ===== in the format in which the output is written to the calibration
290 REM ===== file.
300 REM
310 REM ===== Version 1.1   04/06/90
320 REM =====      New version allows drive to be specified. Stored as DRIVE$.
330 REM ===== Also date can be specified. All these specifictions are asked for
340 REM ===== at the begining of the program. The execution of this part of the
350 REM ===== program is in the subroutine between lines 15000 - 15450.
360 REM
370 REM ===== Version 1.2   14/06/90
380 REM =====      This version asks for all the specifications after the sensor390 rem ===== has
been chosen from the main menu.
400 REM =====      An addition to the main menu has been made. The user may now
410 REM ===== request a calibration certificate. This is accomodated in a
420 REM ===== subroutine between lines 12000 - 12490. This subroutine calls upon
430 REM ===== another GW Basic program called #######.BAS which makes a
440 REM ===== comparason between the two most recent calibration files and
450 REM ===== produces a printout. When the program #######.BAS has finished
460 REM ===== it returns the user back to the calling program (either
470 REM ===== WINDCAL.BAS or BATHCON.BAS).
480 REM
490 REM R.W.P 24/7/90
500 REM MAIN MENU NOW ALLOWS THE USER TO RETURN TO THE CALIBRATION MENU WHICH CALLED THIS PROGRAM
ORIGINALLY
```

```
1000 REM ------------------------
1010 REM ----- Main program -----
1015 REM ------------------------
1017 REM
1020 REM ===== Declare all arrays.....
1021 REM
1024 DIM FREQ$(20) , WIND$(20)
1026 DIM X(40), Y(40), II(40)
1028 DIM P#(40), Q#(40)
1030 DIM A#(40), B#(40), S#(40), G#(40)
1040 REM
1041 REM ===== Set error trap.....
1042 REM
1043 ON ERROR GOTO 40000
1044 REM
1045 REM ===== Call subroutine to set up Ctrl Esc key trap.....
1046 REM
1047 GOSUB 14000
1048 KEY OFF
1049 SCREEN 9
1056 REM
1057 REM ===== Set up user menu....
1058 REM
1059 COLOR 7,1: CLS
1060 REM
1061 REM ===== Draw up menu box.....
1065 REM
1067 LINE (5,5)-(635,345),,B
1070 LOCATE 3,25:PRINT "Wind Sensor Calibration Program"
1090 LINE (180,83)-(480,266),2,BF
1100 LINE (185,88)-(475,261),64,B
1110 LOCATE 8,26:PRINT" Cup Anemometer                ";CHR$(27);" "
1120 LOCATE 10,26:PRINT" Propeller Vane Instrument       "
1130 LOCATE 12,26:PRINT" Wind Direction                  "
1140 LOCATE 14,26:PRINT" Others                          "
1142 LOCATE 16,26:PRINT" Calibration Certificate         "
1145 LOCATE 18,26:PRINT" Return to Calibration Menu      "
1150 LOCATE 21,8:PRINT" Move arrow to required sensor type and press <RETURN> when finished"
1160 LOCATE 22,26 : PRINT"Move around using cursor keys"
1165 REM
1170 REM ===== Define the cursor keys.....
1175 REM
1180 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
1185 X=8:Y=59:KY$=" "
1190 REM
1191 REM ===== Set up pointer box in menu.....
1192 REM
1193 COLOR 7,1
1195 Y1 = 97
1198 GOSUB 20000
1200 LOCATE X,Y
1202 REM
1205 REM ===== Reading input from keyboard....
1207 REM
```

```
1210 WHILE KY$<>CHR$(13)
1220   KY$=INKEY$
1270   IF (KY$=DN$) AND ((X>=8)AND(X<=16)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1280   IF (KY$=UP$) AND ((X>=10)AND(X<=18)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1290 WEND
1295 REM
1300 REM ===== Determine which sensor has been chosen from the menu and go to
1301 REM       subroutine which assigns sensor name & ID code .....
1305 REM ===== Line 10000 ---- Subroutine for Cup anemometer
1306 REM       Line 10500 ---- Subroutine for Propeller vane instrument
1307 REM       Line 11000 ---- Subroutine for Vane
1308 REM       Line 11500 ---- Subroutine for Other sensors
1309 REM       Line 65300 ---- Subroutine to exit program
1310 REM
1320 IF X = 8 THEN GOSUB 10000 ELSE IF X=10 THEN GOSUB 10500 ELSE IF X = 12 THEN GOSUB 11000 ELSE I
X = 14 THEN GOSUB 11500 ELSE IF X = 16 THEN GOSUB 12000 ELSE GOSUB 65300
1330 REM
1332 REM ===== Call subroutine to get user details.....
1334 REM
1340 GOSUB 15000
1400 REM
1401 REM ===== Obtain sensor number from user.....
1405 REM
1410 COLOR 12,1 : CLS
1420 LOCATE 4,51 : PRINT "Enter sensor number";
1425 COLOR 7,1
1430 LOCATE 6,53 : PRINT "e.g. VI1992";
1440 LOCATE 8,51 : PRINT "Press ";
1442 COLOR 12,1
1444 PRINT "<RETURN>";
1446 COLOR 7,1
1448 PRINT " when finished"
1450 LINE (10,5)-(380,345),3,BF
1460 LINE (15,10)-(375,340),64,B
1470 COLOR 2,1 : LOCATE 10,((51-LEN (SENSOR$))/2) : PRINT SENSOR$;
1480 COLOR 7,1 : LOCATE 13,15 : PRINT " Sensor ID :          "
1490 LOCATE 13,28 : INPUT SENSNUM$
1500 REM
1501 REM ===== Open file in database to obtain multimet number.....
1502 REM
1510 FILE1$ = DRIVE$ + "\AMETDB\" + ID$ + SENSNUM$ + ".L"
1520 OPEN FILE1$ FOR INPUT AS #1
1540 IF EOF(1) THEN CLS : COLOR 4,14:LOCATE 16,16 : PRINT "EMPTY FILE IN DATA BASE!!!   PROGRAM
HALTED" : STOP
1542 WHILE (NOT EOF(1))
1545       INPUT #1,BLANK$
1546       IF BLANK$ <> "" THEN RECORD$ = BLANK$
1547 WEND
1550 MULTIMET$ = RIGHT$(RECORD$,3)
1560 REM
1561 REM ===== Obtain todays date from the internal clock and convert to
1562 REM       Julian day.....
```

```
1563 REM
1570 DAY = VAL(DAY$)
1580 MONTH = VAL(MONTH$)
1600 JDAY$ = STR$(VAL(MID$("000031059090120151181212243273304334",((MONTH-1)*3)+1,3))+DAY)
1610 JDAY$ = RIGHT$(JDAY$,3)
1620 REM
1630 REM ===== If there is no version code on the file then set one.....
1635 REM ===== If the Julian day on the file is the same as the present day
1636 REM       then increment the version code.....
1640 REM
1650 VCODE$ = RIGHT$(RECORD$,5)
1660 CURJDAY$ = LEFT$(RIGHT$(RECORD$,10),3)
1670 IF ASC(VCODE$) < 65 THEN ASVAL=65 ELSE IF CURJDAY$=JDAY$ THEN ASVAL = ASC(VCODE$)+1 ELSE ASVAL
= 65
1680 VCODE$ = CHR$(ASVAL)
1700 REM
1705 REM ===== Obtain the details of the sensor from the data base and check
1706 REM       with the user if the correct sensor has been chosen.....
1710 REM
1715 CLS
1720 COLOR 15,1
1820 FILE2$ = DRIVE$ + "\AMETDB\METDB_DA\DETAILS." + MULTIMET$
1830 OPEN FILE2$ FOR INPUT AS #2
1835 N = 5
1840 WHILE NOT(EOF(2))
1850      INPUT #2,RECORD$
1860      N = N + 1
1870      LOCATE N,18: PRINT RECORD$
1880 WEND
1890 COLOR 12,1
1900 LOCATE 23,22 : PRINT "Is this the required sensor? (y/n) :";
1905 ANSWER$ = ""
1910 WHILE (ANSWER$ <> "N" AND ANSWER$ <> "Y")
1915 ANSWER$ = INKEY$
1920 REM
1921 REM ===== If not required sensor then close the files and return to
1922 REM       line 1400 where user inputs sensor number again.....
1925 REM
1930 IF (ANSWER$ = "N" OR ANSWER$ = "n") THEN CLOSE #1:CLOSE #2 :GOTO 1400
1940 REM
1942 REM ===== Accept upper or lower case "y"....
1945 REM
1950 IF ANSWER$ = "y" THEN ANSWER$ = "Y"
1955 WEND
1958 CLOSE #1,#2
1960 CLS
1965 REM
1966 REM ===== Build up filename to which to write.....
1967 REM
1970 FILE$ = DRIVE$ + "\AMETDB\METDB_DA\" + ID$ + JDAY$ + YEAR$ + VCODE$ + "." + MULTIMET$
2000 REM
2002 REM ===== Call subroutine for editor to enter data.....
2005 REM
2010 GOSUB 30000
```

```
2020 REM
2025 REM ===== Clear screen and print message.....
2030 REM
2040 CLS
2050 COLOR 12,8
2060 LOCATE 10,33: PRINT " PLEASE WAIT "
2065 COLOR 15,8
2070 LOCATE 12,27: PRINT " Calculating Coefficients "
3000 REM
3002 REM ===== Call subroutine to calclate coefficients.....
3005 REM
3010 GOSUB 60000
3100 REM
3105 REM ===== Call subroutine to update data base .....
3110 REM
3120 GOSUB 65000
3150 REM
3155 REM ===== Return to main menu again.....
3160 REM
3170 GOTO 1056
9999 END
10000 REM
10002 REM ----------------------------------------
10005 REM ----- Subroutine for Cup Anemometer -----
10010 REM ----------------------------------------
10020 ID$ = "WS"
10030 SENSOR$ = "Cup Anemometer"
10499 RETURN
10500 REM
10505 REM ------------------------------------------------
10510 REM ----- Subroutine for Propeller Vane Instrument -----
10520 REM ------------------------------------------------
10530 ID$ = "WW"
10540 SENSOR$ = "Propeller Vane Instrument"
10999 RETURN
11000 REM
11005 REM ------------------------------
11010 REM ----- Subroutine for Vane -----
11015 REM ------------------------------
11020 ID$ = "WD"
11030 SENSOR$ = "Vane"
11040 RETURN
11500 REM
11505 REM ----------------------------------------
11510 REM ----- Subroutine for other instruments -----
11515 REM ----------------------------------------
11517 CLS
11520 LOCATE 15,22
11530 INPUT "Enter sensor type code :-";ID$
11540 LOCATE 16,22
11550 INPUT "Enter sensor name :-";SENSOR$
11560 RETURN
12000 REM
12002 REM ------------------------------------------------
```

```
12005 REM ----- Subroutine for Calibration Certificate -----
12007 REM ------------------------------------------------
12010 REM
12015 COMMON PROG$,FILE1$,DRIVE$,ID$
12020 PROG$ = "WINDCAL.BAS"
12025 IF FILE1$ = "" THEN CHAIN "CALCERT.BAS",1000
12030 CHAIN "CALCERT.BAS",1500
12490 RETURN
14000 REM
14002 REM ------------------------------------------------------
14005 REM ----- Subroutine to set up key trap for Ctrl Esc -----
14007 REM ------------------------------------------------------
14010 REM
14014 REM
14016 REM ===== Define keys to include all possible combinations of CAPS LOCK
14017 REM       and NUM LOCK.....
14018 REM
14020 KEY 15,CHR$(&H64)+CHR$(1)
14030 KEY 16,CHR$(&H44)+CHR$(1)
14040 KEY 17,CHR$(&H24)+CHR$(1)
14050 KEY 18,CHR$(&H4)+CHR$(1)
14060 REM
14064 REM ===== Direct all escape key combinations to line 65300 .....
14066 REM
14070 ON KEY (15) GOSUB 65300
14080 ON KEY (16) GOSUB 65300
14090 ON KEY (17) GOSUB 65300
14100 ON KEY (18) GOSUB 65300
14110 REM
14115 REM ===== Turn all escape key combinations on.....
14117 REM
14120 KEY (15) ON
14130 KEY (16) ON
14140 KEY (17) ON
14150 KEY (18) ON
14200 RETURN
15000 REM
15002 REM ----------------------------------------
15005 REM ----- Subroutine to get user details -----
15007 REM ----------------------------------------
15010 REM
15020 CLS
15030 COLOR 15,8
15035 WHILE (USERDATE$ <> "/")
15040 REM
15045 REM ===== Obtain current date from internal clock.....
15047 REM
15049 WHILE DAY$ = ""
15050       DAY$ = MID$(DATE$,4,2)
15060       MONTH$ = LEFT$(DATE$,2)
15070       YEAR$ = RIGHT$(DATE$,2)
15072 WEND
15075 REM
15076 REM ===== Obtain date from user.....
```

```
15077 REM
15080       LOCATE 15,25: PRINT "Enter date dd/mm/yy "
15085       LOCATE 16,25: PRINT "Or enter / for default of ";DAY$;"/";MONTH$;"/";YEAR$;":
"
15090       LOCATE 16,60: INPUT USERDATE$
15100       IF (USERDATE$ = "/") THEN GOTO 15200
15110       DAY$ = LEFT$(USERDATE$,2)
15120       MONTH$ = MID$(USERDATE$,4,2)
15130       YEAR$ = RIGHT$(USERDATE$,2)
15140 REM
15145 REM ===== Check if the date was entered in correct format.....
15150 REM
15160       IF (VAL(DAY$) < 1 OR VAL(DAY$) > 31) OR (VAL(MONTH$) < 1 OR VAL(MONTH$) > 12) OR
(VAL(YEAR$) < 80 OR VAL(YEAR$) > 99) THEN USERDATE$= "":BEEP  ELSE USERDATE$ = "/"
15200 WEND
15205 USERDATE$ = ""
15210 REM
15215 REM ===== Obtain username.....
15220 REM
15225 CLS
15227 DEFAULT$ = USERNAME$
15228 IF DEFAULT$ <> "" THEN LOCATE 16,25: PRINT "Enter / for ";DEFAULT$
15230 LOCATE 15,25: INPUT "Please enter your username :";USERNAME$
15235 IF USERNAME$ = "/" THEN USERNAME$ = DEFAULT$
15240 CLS
15250 REM
15255 REM ===== Obtain drive on which database is held.....
15260 REM
15265 WHILE (USERDRIVE$ <> "/")
15270       LOCATE 15,20: PRINT "Enter name of drive on which database is held"
15280       LOCATE 16,20: PRINT "Enter / for default drive D:              "
15290       LOCATE 16,48: INPUT USERDRIVE$
15300       IF USERDRIVE$ = "/" THEN DRIVE$ = "D:": GOTO 15450
15310 REM
15315 REM ===== Check if drive has been specified correctly.....
15320 REM
15330       IF USERDRIVE$ = "" THEN USERDRIVE$ =" ":BEEP
15350       IF ((LEN(USERDRIVE$) > 1) AND (MID$(USERDRIVE$,2,1) <> ":")) THEN USERDRIVE$ = " ": BEE
15360       IF ((LEN(USERDRIVE$) > 2) AND (MID$(USERDRIVE$,3,1) <> "\")) THEN USERDRIVE$ = " ": BEE
15370       IF LEN(USERDRIVE$) > 3 THEN USERDRIVE$ = " ": BEEP
15380       DRIVECODE = ASC(LEFT$(USERDRIVE$,1))
15390       IF (DRIVECODE >= 65 AND DRIVECODE <= 69) OR (DRIVECODE >= 97 AND DRIVECODE <= 101) THEN
DRIVE$ = CHR$(DRIVECODE) + ":": USERDRIVE$ = "/" ELSE BEEP
15450 WEND
15500 REM
15502 REM ===== User enters standard to which sensor is calibrated against.....
15505 REM
15510 CLS
15520 LOCATE 15,10: PRINT "Enter the standard to which the sensor is calibrated against"
15530 LOCATE 16,15: PRINT "Enter / for default standard of TESTOVENT"
15540 LOCATE 16,57: INPUT STANDARD$
15545 IF STANDARD$ = "/" THEN STANDARD$ = "TESTOVENT"
15550 REM
15552 REM ===== User enters any comments.....
```

```
15555 REM
15560 CLS
15570 LOCATE 15,20: PRINT "Enter any comments   (60 chars only)"
15580 LOCATE 16,20: PRINT "Enter / for blank"
15590 LOCATE 16,39: INPUT COMMENT$
15600 IF COMMENT$ = "/" THEN COMMENT$ = ""
15700 RETURN
20000 REM
20010 REM ------------------------------------------------------------
20020 REM ----- Subroutine for drawing & flashing pointer box in menu -----
20030 REM ------------------------------------------------------------
20040 REM
20050 REM ===== First overwrite old box.....
20060 REM
20070 LINE (199,Y1)-(464,Y1+15),2,B
20100 REM ===== Now draw box and flash at new position.....
20110 REM
20120 IF (KY$ = DN$) THEN Y1 = Y1 + 28 ELSE IF (KY$ = UP$) THEN Y1 = Y1 - 28
20140 FOR COL = 9 TO 15
20150 LINE (199,Y1)-(464,Y1+15),COL,B
20160 NEXT COL
20170 LINE (199,Y1)-(464,Y1+15),12,B
20500 RETURN
30000 REM
30005 REM ------------------------------------------------
30010 REM ----- Subroutine for entering and editing data -----
30015 REM ------------------------------------------------
30020 REM
30030 REM ===== Set up screen.....
30035 REM
30050 LINE (5,5)-(315,345),15,B
30060 LINE (321,0)-(640,350),3,BF
30070 COLOR 15,1: LOCATE 2,45: PRINT " Enter the calibration data "
30080 LOCATE 4,45: PRINT " Enter / when finished "
30085 COLOR 12,1: LOCATE 6,45: PRINT " NOTE: ";
30090 COLOR 15,1: PRINT "Max No of data pairs = 20 "
30110 TOTAL = 1
30115 ROW = 4
30120 REM
30130 REM ===== Enter frequency and actual wind speed data pairs.....
30140 REM
30145 COLOR 4,1:LOCATE 2,3: PRINT "No   Frequency    Actual Wind Speed"
30147 WHILE (FREQ$(TOTAL) <> "/")
30150       COLOR 12,1: LOCATE 2,8: PRINT "Frequency"
30155       COLOR 7,1:LOCATE ROW,2:PRINT TOTAL
30160       LOCATE ROW,9: INPUT FREQ$(TOTAL)
30170       COLOR 4,1: LOCATE 2,8: PRINT "Frequency"
30180       IF FREQ$(TOTAL) = "/" THEN GOTO 30230
30190       COLOR 12,1: LOCATE 2,21: PRINT "Actual Wind Speed"
30200       COLOR 7,1: LOCATE ROW,24: INPUT WIND$(TOTAL)
30210       COLOR 4,1: LOCATE 2,21: PRINT "Actual Wind Speed"
30220       TOTAL = TOTAL + 1: ROW = ROW + 1
30225       IF TOTAL = 21 THEN FREQ$(TOTAL) = "/"
30230 WEND
```

```
30240 FREQ$(TOTAL) = ""
30250 TOTAL = TOTAL - 1
30500 REM
30502 REM ===== List data and show editor options.....
30505 REM
30510 CLS
30520 LINE (5,5)-(315,345),15,B
30530 LINE (321,0)-(635,345),15,B
30535 PAINT (400,200),2,30
30540 COLOR 4,1:LOCATE 2,3: PRINT "No   Frequency    Actual Wind Speed"
30545 COLOR 7,1
30550 FOR N = 1 TO TOTAL
30560 LOCATE N+3,2: PRINT N
30570 LOCATE N+3,8: PRINT USING "####.###";VAL (FREQ$(N))
30580 LOCATE N+3,25: PRINT USING "####.###";VAL (WIND$(N))
30600 NEXT N
30610 FOR N = 1 TO 100
30620 LINE (450-N,150-N)-(450+N,150+N),8,BF
30650 NEXT N
30660 COLOR 15,1
30680 LOCATE 7,51: PRINT "Change   'C'"
30690 LOCATE 9,51: PRINT "Add      'A'"
30700 LOCATE 11,51: PRINT "Delete   'D'"
30710 LOCATE 13,51: PRINT "Re-enter 'R'"
30720 LOCATE 15,51: PRINT "Finish   'F'"
30730 LOCATE 20,45: PRINT " Press one of keys shown "
30740 LOCATE 21,45: PRINT "   for required option   "
30750 REM
30752 REM ===== Read users keystroke from and call appropriate subroutine.....
30755 REM
30760 REM ===== Line 32000 ----- Subroutine to change a data entry.
30762 REM       Line 33000 ----- Subroutine to add to the data.
30764 REM       Line 34000 ----- Subroutine to delete a data entry.
30766 REM       Line 35000 ----- Subroutine to confirm re entry of all data.
30768 REM       Line 30500 ----- Point where data is shown and editor options
30770 REM                        are listed.
30772 REM       Line 30050 ----- Begining of present subroutine where all the
30774 REM                        data is entered.
30776 REM       Line 30120 ----- Point where data is entered.
30780 REM
30800 KY$ = ""
30810 WHILE (KY$<>"F" AND KY$<>"f")
30820       KY$ = INKEY$
30830       IF (KY$ = "C" OR KY$ = "c") THEN GOSUB 32000: GOTO 30500
30840       IF (KY$ = "A" OR KY$ = "a") THEN GOSUB 33000: GOTO 30120
30850       IF (KY$ = "D" OR KY$ = "d") THEN GOSUB 34000: GOTO 30500
30860       IF (KY$ = "R" OR KY$ = "r") THEN GOSUB 35000: IF ANSWER$ = "Y" THEN GOTO 30050 ELSE GOT
30500
30870 WEND
31000 RETURN
32000 REM
32002 REM ------------------------------------------------------------
32005 REM ----- Subroutine to change data entry from editor menu -----
32007 REM ------------------------------------------------------------
```

```
32010 REM
32100 FOR N = 1 TO 50
32110 LINE (300,150-N)-(600,150+N),3,BF
32120 NEXT N
32150 COLOR 12,1: LOCATE 9,43: PRINT " Enter number ( 1 -";TOTAL;") which "
32160 LOCATE 10,47: PRINT " you wish to change:-    "
32170 COLOR 15,1: LOCATE 10,68: INPUT CHANGE$
32180 IF (VAL(CHANGE$) < 1 OR VAL(CHANGE$) > TOTAL) THEN BEEP: GOTO 32150
32190 CHANGE = VAL (CHANGE$)
32195 LOCATE 12,47: PRINT " Enter the changes now "
32200 LOCATE CHANGE+3,2: PRINT CHANGE;"                                    "
32210 COLOR 12,1: LOCATE 2,8: PRINT "Frequency"
32220 COLOR 15,1: LOCATE CHANGE+3,9: INPUT FREQ$(CHANGE)
32230 COLOR 4,1: LOCATE 2,8: PRINT "Frequency"
32240 COLOR 12,1:LOCATE 2,21: PRINT "Actual Wind Speed"
32250 COLOR 15,1: LOCATE CHANGE+3,24: INPUT WIND$(CHANGE)
32300 RETURN
33000 REM
33002 REM ----------------------------------------
33005 REM ----- Subroutine to add to the data -----
33007 REM ----------------------------------------
33010 REM
33100 FOR N = 1 TO 50
33110 LINE (300,150-N)-(600,150+N),3,BF
33120 NEXT N
33130 COLOR 12,1: LOCATE 10,48: PRINT " Add to the data now "
33140 LOCATE 12,47:PRINT " Enter / when finished "
33145 TOTAL = TOTAL + 1
33150 RETURN
34000 REM
34002 REM ----------------------------------------------
34005 REM ----- Subroutine to delete a data entry -----
34007 REM ----------------------------------------------
34010 REM
34100 FOR N = 1 TO 50
34110 LINE (300,150-N)-(600,150+N),3,BF
34120 NEXT N
34130 COLOR 12,1: LOCATE 10,43: PRINT "   Enter number of data pair "
34140 LOCATE 11,43: PRINT "   to be deleted ( 1 -";TOTAL;")     "
34150 COLOR 15,1: LOCATE 11,69: INPUT DEL$
34160 DEL = VAL (DEL$)
34170 IF (DEL < 1 OR DEL > TOTAL) THEN BEEP: GOTO 34150
34180 COLOR 12,1: LOCATE 13,48: PRINT " Are you sure!!! (y/n) "
34190 ANSWER$ = ""
34200 WHILE (ANSWER$ <> "Y" AND ANSWER$ <> "y")
34210       ANSWER$ = INKEY$
34220       IF (ANSWER$ = "N" OR ANSWER$ = "n") THEN RETURN
34230 WEND
34240 FOR N = DEL TO TOTAL-1
34250 FREQ$(N) = FREQ$(N+1)
34260 WIND$(N) = WIND$(N+1)
34270 NEXT N
34280 TOTAL = TOTAL - 1
34290 ROW = ROW - 1
```

```
34500 RETURN
35000 REM
35002 REM ------------------------------------------------------------
35005 REM ----- Subroutine to confirm and allow re-entry of all data -----
35007 REM ------------------------------------------------------------
35010 REM
35100 FOR N = 1 TO 65
35110 LINE (290,170-N)-(625,170+N),3,BF
35120 NEXT N
35130 COLOR 12,1: LOCATE 9,50: PRINT " PLEASE NOTE!!! "
35140 COLOR 15,1: LOCATE 11,39: PRINT " Proceeding further with this option "
35150 LOCATE 12,39: PRINT "  will result in the deletion of all "
35160 LOCATE 13,39: PRINT "     the data you have just entered. "
35170 COLOR 12,1: LOCATE 15,39: PRINT "Are you sure you wish to continue (y/n)"
35180 ANSWER$ = ""
35190 WHILE (ANSWER$ <> "Y" AND ANSWER$ <> "y")
35200       ANSWER$ = INKEY$
35210       IF (ANSWER$ = "N" OR ANSWER$ = "n") THEN RETURN
35220 WEND
35230 CLS
35240 ANSWER$ = "Y"
35250 RETURN
40000 REM
40002 REM --------------------------------------
40005 REM ----- Error checking subroutines -----
40007 REM --------------------------------------
40010 REM
40020 REM
40022 REM ===== Check for errors during file opening.....
40024 REM
40030 IF ERR = 53 THEN GOSUB 40100: RESUME 1480
40032 IF ERR = 52 THEN GOSUB 40200: RESUME 1480
40034 IF ERR = 71 THEN GOSUB 40300: RESUME 1520
40036 IF ERR = 72 THEN GOSUB 40400
40038 IF (ERR = 5 OR ERR = 11) THEN GOSUB 40500: RESUME 65300
40040 IF ERR = 76 THEN GOSUB 40600: RESUME 65300
40050 STOP
40100 REM
40105 REM ===== File not found.....
40110 REM
40115 LINE (50,196)-(330,250),3,BF
40120 COLOR 12,1: LOCATE 15,11: PRINT " Sensor not found in database "
40130 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40140 BEEP
40190 RETURN
40200 REM
40205 REM ===== Invalid filename.....
40210 REM
40215 LINE (50,196)-(330,250),3,BF
40220 COLOR 12,1: LOCATE 15,14: PRINT " Invalid filename used "
40230 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40240 BEEP
40290 RETURN
40300 REM
```

```
40305 REM ===== Drive not ready.....
40310 REM
40315 LINE (50,196)-(330,250),3,BF
40320 COLOR 12,1: LOCATE 15,15: PRINT " Drive ";DRIVE$;"\ not ready "
40330 COLOR 15,1: LOCATE 16,13: PRINT " Press return when ready "
40340 BEEP
40350 ANSWER$ = ""
40360 WHILE (ANSWER$ <> CHR$(13))
40370       ANSWER$ = INKEY$
40380 WEND
40390 RETURN
40400 REM
40405 REM ===== Disk media error.....
40410 REM
40420 LINE (50,196)-(330,250),3,BF
40430 COLOR 12,1: LOCATE 15,11: PRINT " Error with hardware or disk "
40440 COLOR 15,1: LOCATE 16,17: PRINT " Program halted "
40490 RETURN
40500 REM
40502 REM ===== Illegal function call.....
40505 REM
40510 COLOR 12,8: LOCATE 17,33: PRINT "Insignificant data"
40520 LOCATE 18,26: PRINT "Could not calculate coefficients"
40530 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40540 WHILE (INKEY$ = "")
40550 WEND
40555 CLS
40560 REM
40562 REM ===== Exit program and return to operating system.....
40565 REM
40590 RETURN
40600 REM
40602 REM ===== Path not found.....
40605 REM
40610 CLS
40620 COLOR 12,1:LOCATE 17,24: PRINT "Could not find database on drive ";DRIVE$
40630 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40640 WHILE (INKEY$ = "")
40650 WEND
40655 CLS
40660 REM
40662 REM ===== Exit program and return to operating system.....
40665 REM
40690 RETURN
60000 REM
60001 REM ------------------------------------------------------------
60002 REM ----- Subroutine to calculate coeficients and write to file.....
60003 REM ------------------------------------------------------------
60005 REM
60009 REM *** This routine has to run under GWBASIC/d so that the ***
60010 REM *** mathematical routines can use double precision numbers ***
60020 REM access data file and read in data
60030 N=2 : REM * Set 3 degrees of fit *
60040 Z=0 : O=1 : K=12
```

```
60050 O9#=1E-18 : O8#=1E+18 : O7#=9.999999E+35 : O6#=1E-36
60060 :
60090 :
60100 REM zero data arrays
60110 FOR I%=0 TO 40 : X(I%)=0:Y(I%)=0:II(I%)=0 : NEXT I%
60120 :
60130 FOR LOOP = 1 TO TOTAL
60140       X(LOOP) = VAL (FREQ$(LOOP))
60150       Y(LOOP) = VAL (WIND$(LOOP))
60160       II(LOOP) = LOOP
60170 NEXT LOOP
60180 MF = TOTAL
60290 :
60300 CLOSE#1
60310 OPEN FILE$ FOR APPEND AS #2
60320 :
60330 REM * Initialise standard error array to missing values *
60340 FOR I%=1 TO 8 : STDERR(I%)=9999 : NEXT I%
60350 :
60360 REM calculates the means for the data
60370 T7#=Z:T8#=Z:W7#=Z
60380 :
60390 FOR I%=1 TO MF
60400 W7#=W7#+X(II(I%)):T7#=T7#+Y(II(I%)):T8#=T8#+Y(II(I%))^2
60410 NEXT
60420 T9#=(MF*T8#-T7#^2)/(MF^2-MF)
60430 :
60520 GOSUB 60870
60530 GOSUB 61470
60534 LOCATE 14,5: PRINT "Writing to calibration file : ";FILE$
60540 REM
60542 REM ===== Write details to sensor calibration file.....
60545 REM
60550 PRINT #2,"Multimet Sensor Calibration File"
60555 PRINT #2,
60560 PRINT #2, "Sensor ID:", ID$ + SENSNUM$
60565 PRINT #2, "Electronics:", ELEC$
60570 PRINT #2, "Date:",DAY$;"/";MONTH$;"/";YEAR$
60575 PRINT #2, "Operator:", USERNAME$
60580 PRINT #2, "Standard:", STANDARD$
60585 PRINT #2, "Comments:", COMMENT$
60590 PRINT #2,
60595 PRINT #2, "Poly.deg:",N-1
60600 PRINT #2, "Equation        val=C0+C1*hex+C2*hex^2+C3*hex^3+C4*hex^4"
60605 PRINT #2, "Term    Coefficient"
60610 FOR J = 1 TO N
60615       PRINT #2,"C";RIGHT$(STR$(J-1),1);
60625       PRINT #2, TAB(8);U#(J)
60630 NEXT J
60635 PRINT #2, TAB(13),"Frequ."; TAB(29);"Wind Speed";TAB(49);"Y-cal";TAB(64);"Diff"
60640 RMS# = 0
60645 FOR L = 1 TO MF
60650       Q8# = Y(II(L)) - C#(L)
60655       RMS# = RMS# + Q8#^2
```

```
60656 PRINT #2, "Cal:";
60657       PRINT #2, TAB(13); USING "####.###"; VAL(FREQ$(L));
60660       PRINT #2, TAB(29); USING "####.###"; VAL(WIND$(L)),
60665       PRINT #2, TAB(47); USING "####.###";C#(L);
60667       PRINT #2, TAB(61); USING "####.###";Q8#
60670       IF C#(L) = 0 THEN PRINT #2, "INFINITE"
60675 NEXT L
60680 PRINT #2, "Std error of estimate for Y=";STDERR(N-1)
60840 :
60845 CLOSE #2
60850 RETURN
60860 REM
60870 REM *** Routine arith1 ( Copied from CALEDIT.BBC ) ***
60880 :
60890 FOR I%=1 TO MF:P#(I%)=Z:Q#(I%)=O:NEXT
60900 FOR I%=1 TO 11:A#(I%)=Z:B#(I%)=Z:S#(I%)=Z:NEXT
60910 E1#=Z:F1#=Z:W1#=MF:N4=K:I=1:K1=2
60920 :
60930 IF N=0 THEN GOTO 60990
60940 K1=N4
60950 :
60960 REM program loops to next line
60970 W#=Z
60980 :
60990 FOR L=1 TO MF:W#=W#+Y(II(L))*Q#(L):NEXT
61000 :
61010 S#(I)=W#/W1#
61020 IF I-N4>=0 THEN GOTO 61450
61030 IF I-MF>=0 THEN GOTO 61450
61040 E1#=Z
61050 FOR L=1 TO MF
61060   A9#=ABS(Q#(L))
61070   IF A9#<O9# THEN GOTO 61210
61080   X9#=ABS(X(II(L)))
61090   IF X9#<O6# THEN GOTO 61170
61100   L2#=.434295*LOG(X9#)+(2*.434295*LOG(A9#))
61110   IF L2#<36 THEN GOTO 61200
61120   REM  SO X&Q TOO BIG FOR X*Q^2
61130   E1#=O7#
61140   L2#=36
61150   L=MF+1
61160   GOTO 61210
61170   IF A9#<1 THEN GOTO 61210
61180   IF A9#<O8# THEN GOTO 61200
61190   REM SO  Q TOO BIG FOR Q^2
61200   E1#=E1#+X(II(L))*A9#^2
61210 NEXT
61220 IF L2#-(.434295*LOG(W1#))>-36 THEN GOTO 61250
61230 E1#=0
61240 GOTO 61260
61250 E1#=E1#/W1#
61260 A#(I+1)=E1#
61270 W#=Z
61280 FOR L=1 TO MF
```

```
61290   V#=(X(II(L))-E1#)*Q#(L)-F1#*P#(L)
61300   P#(L)=Q#(L)
61310   Q#(L)=V#
61320   V9#=ABS(V#)
61330   IF V9#<O9# THEN GOTO 61390
61340   IF V9#<O8# THEN GOTO 61380
61350   W#=O7#
61360   L=MF+1
61370   GOTO 61390
61380   W#=W#+V#*V#
61390 NEXT
61400 F1#=W#/W1#
61410 B#(I+2)=F1#
61420 W1#=W#
61430 I=I+1
61440 GOTO 60970
61450 RETURN
61460 REM
61470 REM *** Routine arith2 ( Copied from CALEDIT.BBC ) ***
61480 :
61490 FOR L=1 TO 13:G#(L)=Z:NEXT
61500 :
61510 G#(2)=O
61520 FOR J=1 TO N
61530   S1#=Z
61540   FOR L=2 TO N+1
61550     IF L=2 THEN GOTO 61570
61560     G#(L)=G#(L)-A#(L-1)*G#(L-1)-B#(L-1)*G#(L-2)
61570     S1#=S1#+S#(L-1)*G#(L)
61580   NEXT
61590   U#(J)=S1#
61600   L=N+1
61610   FOR I2=2 TO N
61620     G#(L)=G#(L-1)
61630     L=L-1
61640   NEXT
61650   G#(2)=Z
61660 NEXT
61670 :
61680 PRINT " "
61690 T=Z
61700 FOR L=1 TO MF
61710   C#(L)=Z
61720   J=N
61730   FOR I2=1 TO N
61740     C#(L)=(C#(L)*X(II(L)))+U#(J)
61750     J=J-1
61760   NEXT
61770   T3#=Y(II(L))-C#(L)
61780   T#=T#+T3#^2
61790 NEXT
61800 IF MF<>N THEN GOTO 61830
61810 T5#=0
61820 GOTO 61840
```

```
61830 T5#=T#/(MF-N)
61840 Q7#=1-T#/(T9#*(MF-1))
61850 :
61860 DETERM = INT(Q7#*10000)/10000
61870 STDERR(N-1)=SQR(T5#)
61880 RETURN
65000 REM
65002 REM ----------------------------------------
65005 REM ----- Subroutine to update database -----
65007 REM ----------------------------------------
65010 REM
65020 REM ===== Write name of new calibration file to ametdb directory.....
65025 REM
65050 FILE1$ = DRIVE$ + "\AMETDB\" + ID$ + SENSNUM$ + ".L"
65055 LOCATE 16,5: PRINT "Updating sensor file : ";FILE1$
65060 OPEN FILE1$ FOR APPEND AS #1
65070 PRINT #1,RIGHT$(FILE$,22)
65080 CLOSE #1
65090 REM
65095 REM ===== Write to history file date of calibration.....
65100 REM
65110 FILE2$ = DRIVE$ + "\AMETDB\METDB_DA\HISTORY." + MULTIMET$
65115 LOCATE 18,5: PRINT "Updating history file : ";FILE2$
65120 OPEN FILE2$ FOR APPEND AS #2
65150 PRINT #2, DAY$ + "/" + MONTH$ + "/" + YEAR$ + "        Calibration."
65160 CLOSE #2
65170 LOCATE 20,22: PRINT "---Press Any Key for Main Menu---"
65180 WHILE (INKEY$ = "")
65190 WEND
65200 RETURN
65300 REM
65302 REM ------------------------------------------------------------------
65305 REM ----- Subroutine for execution when Ctrl Esc has been pressed -----
65307 REM ------------------------------------------------------------------
65310 REM MOD(24/7/90) BY R.P TO LOAD CALIBRATION MENU
65315 RUN "CALMENU"
65320 CLS
65330 SCREEN 0,0,0
65340 LOCATE 14,9: PRINT "Program Execution Halted..... Returning to operating system"
65345 LOCATE 16,29: PRINT "---Press Any Key---"
65350 WHILE (INKEY$ = "")
65360 WEND
65370 REM SYSTEM
```

```
5 REM ************************************************************************
6 REM ********************** TEMPCAL.BAS by RAF 17/5/90 **********************
7 REM ************************************************************************
10 REM ===== Version 1.0   22/06/90
20 REM =====     This program was written in GW BASIC by Refayet Ahmed.
30 REM ===== This program is a copy of WINDCAL.BAS version 1.2 but has been
40 REM ===== converted to produce calibration files for temperature sensors
50 REM ===== rather than for wind sensors.
60 REM =====     All that has been changed is the names in the menu and the
70 REM ===== sensor type codes in the subroutine.
80 REM =====     The sensors which the program is able to calibrate are:
90 REM =====             Psychrometers    TT (TW,TD)
100 REM =====            Air Temperatures AT
110 REM =====            SSTs             SP
120 REM =====            Air Pressures    AP
130 REM =====
140 REM =====     One additional difference in this program is that when
150 REM ===== Psychrometers are chosen the user must then also specify
160 REM ===== whether the calibration is wet or dry. Depending on this the
170 REM ===== calibration file will then be logged under TD or TS.
180 REM =====
190 REM  R.W.P 24/7/90
200 REM  modified to return user back to calibration menu
1000 REM ------------------------
1010 REM ----- Main program -----
1015 REM ------------------------
1017 REM
1020 REM ===== Declare all arrays.....
1021 REM
1024 DIM FREQ$(20) , WIND$(20)
1026 DIM X(40), Y(40), II(40)
1028 DIM P#(40), Q#(40)
1030 DIM A#(40), B#(40), S#(40), G#(40)
1040 REM
1041 REM ===== Set error trap.....
1042 REM
1043 ON ERROR GOTO 40000
1044 REM
1045 REM ===== Call subroutine to set up Ctrl Esc key trap.....
1046 REM
1047 GOSUB 14000
1048 KEY OFF
1049 SCREEN 9
1056 REM
1057 REM ===== Set up user menu....
1058 REM
1059 COLOR 7,1: CLS
1060 REM
1061 REM ===== Draw up menu box.....
1065 REM
1067 LINE (5,5)-(635,345),,B
1070 LOCATE 3,25:PRINT "Temperature Sensor Calibration Program"
1090 LINE (180,83)-(480,266),2,BF
1100 LINE (185,88)-(475,261),64,B
```

```
1110 LOCATE 8,26:PRINT" Psychrometer                    ";CHR$(27);" "
1120 LOCATE 10,26:PRINT" Air Temperature                  "
1130 LOCATE 12,26:PRINT" SST                              "
1140 LOCATE 14,26:PRINT" Air pressure                     "
1142 LOCATE 16,26:PRINT" Calibration Certificate          "
1145 LOCATE 18,26:PRINT" Return to Calibration Menu       "
1150 LOCATE 21,8:PRINT" Move arrow to required sensor type and press <RETURN> when finished"
1160 LOCATE 22,26 : PRINT"Move around using cursor keys"
1165 REM
1170 REM ===== Define the cursor keys.....
1175 REM
1180 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
1185 X=8:Y=59:KY$=" "
1190 REM
1191 REM ===== Set up pointer box in menu.....
1192 REM
1193 COLOR 7,1
1195 Y1 = 97
1198 GOSUB 20000
1200 LOCATE X,Y
1202 REM
1205 REM ===== Reading input from keyboard....
1207 REM
1210 WHILE KY$<>CHR$(13)
1220   KY$=INKEY$
1270   IF (KY$=DN$) AND ((X>=8)AND(X<=16)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1280   IF (KY$=UP$) AND ((X>=10)AND(X<=18)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1290 WEND
1295 REM
1300 REM ===== Determine which sensor has been chosen from the menu and go to
1301 REM       subroutine which assigns sensor name & ID code .....
1305 REM ===== Line 10000 ---- Subroutine for Psychrometer
1306 REM       Line 10500 ---- Subroutine for Air Temperature
1307 REM       Line 11000 ---- Subroutine for SST
1308 REM       Line 11500 ---- Subroutine for Air Pressure
1309 REM       Line 12000 ---- Subroutine to produce calibration certificate
1310 REM       Line 65300 ---- Subroutine to exit program
1315 REM
1320 IF X = 8 THEN GOSUB 10000 ELSE IF X=10 THEN GOSUB 10500 ELSE IF X = 12 THEN GOSUB 11000 ELSE I
X = 14 THEN GOSUB 11500 ELSE IF X = 16 THEN GOSUB 12000 ELSE GOSUB 65300
1330 REM
1332 REM ===== Call subroutine to get user details.....
1334 REM
1340 GOSUB 15000
1400 REM
1401 REM ===== Obtain sensor number from user.....
1405 REM
1410 COLOR 12,1 : CLS
1420 LOCATE 4,51 : PRINT "Enter sensor number";
1425 COLOR 7,1
1430 LOCATE 6,53 : PRINT "e.g. VI1992";
1440 LOCATE 8,51 : PRINT "Press ";
```

```
1442 COLOR 12,1
1444 PRINT "<RETURN>";
1446 COLOR 7,1
1448 PRINT " when finished"
1450 LINE (10,5)-(380,345),3,BF
1460 LINE (15,10)-(375,340),64,B
1470 COLOR 2,1 : LOCATE 10,((51-LEN (SENSOR$))/2) : PRINT SENSOR$;
1480 COLOR 7,1 : LOCATE 13,15 : PRINT " Sensor ID :          "
1490 LOCATE 13,28 : INPUT SENSNUM$
1500 REM
1501 REM ===== Open file in database to obtain multimet number.....
1502 REM
1510 FILE1$ = DRIVE$ + "\AMETDB\" + ID$ + SENSNUM$ + ".L"
1520 OPEN FILE1$ FOR INPUT AS #1
1540 IF EOF(1) THEN CLS : COLOR 4,14:LOCATE 16,16 : PRINT "EMPTY FILE IN DATA BASE!!!   PROGRAM
HALTED" : STOP
1542 WHILE (NOT EOF(1))
1545       INPUT #1,BLANK$
1546       IF BLANK$ <> "" THEN RECORD$ = BLANK$
1547 WEND
1550 MULTIMET$ = RIGHT$(RECORD$,3)
1551 REM
1552 REM ===== If the sensor is a psychrometer then change the ID to either
1553 REM ===== TW (wet) or TD (dry).
1554 REM
1555 IF ID$ = "TT" THEN IF COND$ = "WET" THEN ID$ = "TW" ELSE ID$ = "TD"
1560 REM
1561 REM ===== Obtain todays date from the internal clock and convert to
1562 REM       Julian day.....
1563 REM
1570 DAY = VAL(DAY$)
1580 MONTH = VAL(MONTH$)
1600 JDAY$ = STR$(VAL(MID$("000031059090120151181212243273304334",((MONTH-1)*3)+1,3))+DAY)
1610 JDAY$ = RIGHT$(JDAY$,3)
1620 REM
1630 REM ===== If there is no version code on the file then set one.....
1635 REM ===== If the Julian day on the file is the same as the present day
1636 REM       then increment the version code.....
1640 REM
1650 VCODE$ = RIGHT$(RECORD$,5)
1660 CURJDAY$ = LEFT$(RIGHT$(RECORD$,10),3)
1670 IF ASC(VCODE$) < 65 THEN ASVAL=65 ELSE IF CURJDAY$=JDAY$ THEN ASVAL = ASC(VCODE$)+1 ELSE ASVAL
= 65
1680 VCODE$ = CHR$(ASVAL)
1700 REM
1705 REM ===== Obtain the details of the sensor from the data base and check
1706 REM       with the user if the correct sensor has been chosen.....
1710 REM
1715 CLS
1720 COLOR 15,1
1820 FILE2$ = DRIVE$ + "\AMETDB\METDB_DA\DETAILS." + MULTIMET$
1830 OPEN FILE2$ FOR INPUT AS #2
1835 N = 5
1840 WHILE NOT(EOF(2))
```

```
1850       INPUT #2,RECORD$
1860       N = N + 1
1870       LOCATE N,18: PRINT RECORD$
1880 WEND
1890 COLOR 12,1
1900 LOCATE 23,22 : PRINT "Is this the required sensor? (y/n) :";
1905 ANSWER$ = ""
1910 WHILE (ANSWER$ <> "N" AND ANSWER$ <> "Y")
1915 ANSWER$ = INKEY$
1920 REM
1921 REM ===== If not required sensor then close the files and return to
1922 REM       line 1400 where user inputs sensor number again.....
1925 REM
1930 IF (ANSWER$ = "N" OR ANSWER$ = "n") THEN CLOSE #1:CLOSE #2 :GOTO 1400
1940 REM
1942 REM ===== Accept upper or lower case "y"....
1945 REM
1950 IF ANSWER$ = "y" THEN ANSWER$ = "Y"
1955 WEND
1958 CLOSE #1,#2
1960 CLS
1967 REM
1968 REM ===== Build up filename to which to write.....
1969 REM
1970 FILE$ = DRIVE$ + "\AMETDB\METDB_DA\" + ID$ + JDAY$ + YEAR$ + VCODE$ + "." + MULTIMET$
2000 REM
2002 REM ===== Call subroutine for editor to enter data.....
2005 REM
2010 GOSUB 30000
2020 REM
2025 REM ===== Clear screen and print message.....
2030 REM
2040 CLS
2050 COLOR 12,8
2060 LOCATE 10,33: PRINT " PLEASE WAIT "
2065 COLOR 15,8
2070 LOCATE 12,27: PRINT " Calculating Coefficients "
3000 REM
3002 REM ===== Call subroutine to calclate coefficients.....
3005 REM
3010 GOSUB 60000
3100 REM
3105 REM ===== Call subroutine to update data base .....
3110 REM
3120 GOSUB 65000
3150 REM
3155 REM ===== Return to main menu again.....
3160 REM
3170 GOTO 1056
9999 END
10000 REM
10002 REM ---------------------------------------
10005 REM ----- Subroutine for Psychrometer -----
10010 REM ---------------------------------------
```

```
10020 ID$ = "TT"
10030 SENSOR$ = "Psychrometer"
10040 HEADER$ = "Temperature"
10050 REM
10055 REM ===== Ask user for type of Psychrometer (wet or dry)
10060 REM
10070 CLS
10080 LOCATE 12,10: PRINT "Enter type of Psychrometer Wet or Dry"
10090 COLOR 12,1
10100 LOCATE 14,10: PRINT "Press W or D"
10110 KY$ = ""
10120 WHILE (KY$ <> "w" AND KY$ <> "d" AND KY$ <> "W" AND KY$ <> "D")
10125       KY$ = INKEY$
10130       IF (KY$ = "w" OR KY$ = "W") THEN COND$ = "WET"
10140       IF (KY$ = "d" OR KY$ = "D") THEN COND$ = "DRY"
10150 WEND
10499 RETURN
10500 REM
10505 REM ----------------------------------------
10510 REM ----- Subroutine for Air Temperature -----
10520 REM ----------------------------------------
10530 ID$ = "AT"
10540 SENSOR$ = "Air Temperature"
10550 HEADER$ = "Temperature"
10999 RETURN
11000 REM
11005 REM ------------------------------
11010 REM ----- Subroutine for SST -----
11015 REM ------------------------------
11020 ID$ = "SP"
11030 SENSOR$ = "SST"
11040 HEADER$ = "Temperature"
11490 RETURN
11500 REM
11505 REM --------------------------------------
11510 REM ----- Subroutine for Air Pressure -----
11515 REM --------------------------------------
11520 ID$ = "AP"
11530 SENSOR$ = "Air Pressure"
11540 HEADER$ = "Pressure"
11560 RETURN
12000 REM
12002 REM ------------------------------------------------
12005 REM ----- Subroutine for Calibration Certificate -----
12007 REM ------------------------------------------------
12010 REM
12015 COMMON PROG$,FILE1$,DRIVE$
12020 PROG$ = "TEMPCAL.BAS"
12030 IF FILE1$ = "" THEN CHAIN "CALCERT.BAS",1000 ELSE CHAIN "CALCERT.BAS",1500
12490 RETURN
14000 REM
14002 REM ------------------------------------------------------
14005 REM ----- Subroutine to set up key trap for Ctrl Esc -----
14007 REM ------------------------------------------------------
```

```
14010 REM
14014 REM
14016 REM ===== Define keys to include all possible combinations of CAPS LOCK
14017 REM       and NUM LOCK.....
14018 REM
14020 KEY 15,CHR$(&H64)+CHR$(1)
14030 KEY 16,CHR$(&H44)+CHR$(1)
14040 KEY 17,CHR$(&H24)+CHR$(1)
14050 KEY 18,CHR$(&H4)+CHR$(1)
14060 REM
14064 REM ===== Direct all escape key combinations to line 65300 .....
14066 REM
14070 ON KEY (15) GOSUB 65300
14080 ON KEY (16) GOSUB 65300
14090 ON KEY (17) GOSUB 65300
14100 ON KEY (18) GOSUB 65300
14110 REM
14115 REM ===== Turn all escape key combinations on.....
14117 REM
14120 KEY (15) ON
14130 KEY (16) ON
14140 KEY (17) ON
14150 KEY (18) ON
14200 RETURN
15000 REM
15002 REM ----------------------------------------
15005 REM ----- Subroutine to get user details -----
15007 REM ----------------------------------------
15010 REM
15020 CLS
15030 COLOR 15,8
15032 USERDATE$ = ""
15035 WHILE (USERDATE$ <> "/")
15040 REM
15045 REM ===== Obtain current date from internal clock.....
15047 REM
15048 WHILE DAY$ = ""
15050       DAY$ = MID$(DATE$,4,2)
15060       MONTH$ = LEFT$(DATE$,2)
15070       YEAR$ = RIGHT$(DATE$,2)
15072 WEND
15075 REM
15076 REM ===== Obtain date from user.....
15077 REM
15080       LOCATE 15,25: PRINT "Enter date dd/mm/yy "
15085       LOCATE 16,25: PRINT "Or enter / for default of ";DAY$;"/";MONTH$;"/";YEAR$;":
"
15090       LOCATE 16,60: INPUT USERDATE$
15100       IF (USERDATE$ = "/") THEN GOTO 15200
15110       DAY$ = LEFT$(USERDATE$,2)
15120       MONTH$ = MID$(USERDATE$,4,2)
15130       YEAR$ = RIGHT$(USERDATE$,2)
15140 REM
15145 REM ===== Check if the date was entered in correct format.....
```

```
15150 REM
15160       IF (VAL(DAY$) < 1 OR VAL(DAY$) > 31) OR (VAL(MONTH$) < 1 OR VAL(MONTH$) > 12) OR
(VAL(YEAR$) < 80 OR VAL(YEAR$) > 99) THEN USERDATE$= "":BEEP  ELSE USERDATE$ = "/"
15200 WEND
15210 REM
15215 REM ===== Obtain username.....
15220 REM
15225 CLS
15227 DEFAULT$ = USERNAME$
15228 IF DEFAULT$ <> "" THEN LOCATE 16,25: PRINT "Enter / for ";DEFAULT$
15230 LOCATE 15,25: INPUT "Please enter your username :";USERNAME$
15235 IF USERNAME$ = "/" THEN USERNAME$ = DEFAULT$
15240 CLS
15250 REM
15255 REM ===== Obtain drive on which database is held.....
15260 REM
15265 WHILE (USERDRIVE$ <> "/")
15270       LOCATE 15,20: PRINT "Enter name of drive on which database is held"
15280       LOCATE 16,20: PRINT "Enter / for default drive D:              "
15290       LOCATE 16,48: INPUT USERDRIVE$
15300       IF USERDRIVE$ = "/" THEN DRIVE$ = "D:": GOTO 15450
15310 REM
15315 REM ===== Check if drive has been specified correctly.....
15320 REM
15330       IF USERDRIVE$ = "" THEN USERDRIVE$ =" ":BEEP
15350       IF ((LEN(USERDRIVE$) > 1) AND (MID$(USERDRIVE$,2,1) <> ":")) THEN USERDRIVE$ = " ": BEE
15360       IF ((LEN(USERDRIVE$) > 2) AND (MID$(USERDRIVE$,3,1) <> "\")) THEN USERDRIVE$ = " ": BEE
15370       IF LEN(USERDRIVE$) > 3 THEN USERDRIVE$ = " ": BEEP
15380       DRIVECODE = ASC(LEFT$(USERDRIVE$,1))
15390       IF (DRIVECODE >= 65 AND DRIVECODE <= 69) OR (DRIVECODE >= 97 AND DRIVECODE <= 101) THEN
DRIVE$ = CHR$(DRIVECODE) + ":": USERDRIVE$ = "/" ELSE BEEP
15450 WEND
15500 REM
15502 REM ===== User enters standard to which sensor is calibrated against.....
15505 REM
15510 CLS
15520 LOCATE 15,10: PRINT "Enter the standard to which the sensor is calibrated against"
15530 LOCATE 16,15: PRINT "Enter / for default standard of F25 S3633"
15540 LOCATE 16,57: INPUT STANDARD$
15545 IF STANDARD$ = "/" THEN STANDARD$ = "F25 S3633"
15550 REM
15552 REM ===== User enters any comments.....
15555 REM
15560 CLS
15570 LOCATE 15,20: PRINT "Enter any comments   (60 chars only)"
15580 LOCATE 16,20: PRINT "Enter / for blank"
15590 LOCATE 16,39: INPUT COMMENT$
15600 IF COMMENT$ = "/" THEN COMMENT$ = ""
15700 RETURN
20000 REM
20010 REM ------------------------------------------------------------------
20020 REM ----- Subroutine for drawing & flashing pointer box in menu -----
20030 REM ------------------------------------------------------------------
20040 REM
```

```
20050 REM ===== First overwrite old box.....
20060 REM
20070 LINE (199,Y1)-(464,Y1+15),2,B
20100 REM ===== Now draw box and flash at new position.....
20110 REM
20120 IF (KY$ = DN$) THEN Y1 = Y1 + 28 ELSE IF (KY$ = UP$) THEN Y1 = Y1 - 28
20140 FOR COL = 9 TO 15
20150 LINE (199,Y1)-(464,Y1+15),COL,B
20160 NEXT COL
20170 LINE (199,Y1)-(464,Y1+15),12,B
20500 RETURN
30000 REM
30005 REM ------------------------------------------------
30010 REM ----- Subroutine for entering and editing data -----
30015 REM ------------------------------------------------
30020 REM
30030 REM ===== Set up screen.....
30035 REM
30050 LINE (5,5)-(315,345),15,B
30060 LINE (321,0)-(640,350),3,BF
30070 COLOR 15,1: LOCATE 2,45: PRINT " Enter the calibration data "
30080 LOCATE 4,45: PRINT " Enter / when finished "
30085 COLOR 12,1: LOCATE 6,45: PRINT " NOTE: ";
30090 COLOR 15,1: PRINT "Max No of data pairs = 20 "
30110 TOTAL = 1
30115 ROW = 4
30120 REM
30130 REM ===== Enter frequency and actual wind speed data pairs.....
30140 REM
30145 COLOR 4,1:LOCATE 2,3: PRINT "No   Frequency    ";HEADER$
30147 WHILE (FREQ$(TOTAL) <> "/")
30150       COLOR 12,1: LOCATE 2,8: PRINT "Frequency"
30155       COLOR 7,1:LOCATE ROW,2:PRINT TOTAL
30160       LOCATE ROW,9: INPUT FREQ$(TOTAL)
30170       COLOR 4,1: LOCATE 2,8: PRINT "Frequency"
30180       IF FREQ$(TOTAL) = "/" THEN GOTO 30230
30190       COLOR 12,1: LOCATE 2,21: PRINT "Actual Wind Speed"
30200       COLOR 7,1: LOCATE ROW,24: INPUT WIND$(TOTAL)
30210       COLOR 4,1: LOCATE 2,21: PRINT "Actual Wind Speed"
30220       TOTAL = TOTAL + 1: ROW = ROW + 1
30225       IF TOTAL = 21 THEN FREQ$(TOTAL) = "/"
30230 WEND
30240 FREQ$(TOTAL) = ""
30250 TOTAL = TOTAL - 1
30500 REM
30502 REM ===== List data and show editor options.....
30505 REM
30510 CLS
30520 LINE (5,5)-(315,345),15,B
30530 LINE (321,0)-(635,345),15,B
30535 PAINT (400,200),2,30
30540 COLOR 4,1:LOCATE 2,3: PRINT "No   Frequency    Actual ";HEADER$
30545 COLOR 7,1
30550 FOR N = 1 TO TOTAL
```

```
30560 LOCATE N+3,2: PRINT N
30570 LOCATE N+3,8: PRINT USING "####.###";VAL (FREQ$(N))
30580 LOCATE N+3,25: PRINT USING "####.###";VAL (WIND$(N))
30600 NEXT N
30610 FOR N = 1 TO 100
30620 LINE (450-N,150-N)-(450+N,150+N),8,BF
30650 NEXT N
30660 COLOR 15,1
30680 LOCATE 7,51: PRINT "Change   'C'"
30690 LOCATE 9,51: PRINT "Add      'A'"
30700 LOCATE 11,51: PRINT "Delete   'D'"
30710 LOCATE 13,51: PRINT "Re-enter 'R'"
30720 LOCATE 15,51: PRINT "Finish   'F'"
30730 LOCATE 20,45: PRINT " Press one of keys shown "
30740 LOCATE 21,45: PRINT "   for required option   "
30750 REM
30752 REM ===== Read users keystroke from and call appropriate subroutine.....
30755 REM
30760 REM ===== Line 32000 ----- Subroutine to change a data entry.
30762 REM       Line 33000 ----- Subroutine to add to the data.
30764 REM       Line 34000 ----- Subroutine to delete a data entry.
30766 REM       Line 35000 ----- Subroutine to confirm re entry of all data.
30768 REM       Line 30500 ----- Point where data is shown and editor options
30770 REM                        are listed.
30772 REM       Line 30050 ----- Begining of present subroutine where all the
30774 REM                        data is entered.
30776 REM       Line 30120 ----- Point where data is entered.
30780 REM
30800 KY$ = ""
30810 WHILE (KY$<>"F" AND KY$<>"f")
30820       KY$ = INKEY$
30830       IF (KY$ = "C" OR KY$ = "c") THEN GOSUB 32000: GOTO 30500
30840       IF (KY$ = "A" OR KY$ = "a") THEN GOSUB 33000: GOTO 30120
30850       IF (KY$ = "D" OR KY$ = "d") THEN GOSUB 34000: GOTO 30500
30860       IF (KY$ = "R" OR KY$ = "r") THEN GOSUB 35000: IF ANSWER$ = "Y" THEN GOTO 30050 ELSE GOT
30500
30870 WEND
31000 RETURN
32000 REM
32002 REM ------------------------------------------------------------
32005 REM ----- Subroutine to change data entry from editor menu -----
32007 REM ------------------------------------------------------------
32010 REM
32100 FOR N = 1 TO 50
32110 LINE (300,150-N)-(600,150+N),3,BF
32120 NEXT N
32150 COLOR 12,1: LOCATE 9,43: PRINT " Enter number ( 1 -";TOTAL;") which "
32160 LOCATE 10,47: PRINT " you wish to change:-   "
32170 COLOR 15,1: LOCATE 10,68: INPUT CHANGE$
32180 IF (VAL(CHANGE$) < 1 OR VAL(CHANGE$) > TOTAL) THEN BEEP: GOTO 32150
32190 CHANGE = VAL (CHANGE$)
32195 LOCATE 12,47: PRINT " Enter the changes now "
32200 LOCATE CHANGE+3,2: PRINT CHANGE;"                                    "
32210 COLOR 12,1: LOCATE 2,8: PRINT "Frequency"
```

```
32220 COLOR 15,1: LOCATE CHANGE+3,9: INPUT FREQ$(CHANGE)
32230 COLOR 4,1: LOCATE 2,8: PRINT "Frequency"
32240 COLOR 12,1:LOCATE 2,21: PRINT "Actual Wind Speed"
32250 COLOR 15,1: LOCATE CHANGE+3,24: INPUT WIND$(CHANGE)
32300 RETURN
33000 REM
33002 REM ----------------------------------------
33005 REM ----- Subroutine to add to the data -----
33007 REM ----------------------------------------
33010 REM
33100 FOR N = 1 TO 50
33110 LINE (300,150-N)-(600,150+N),3,BF
33120 NEXT N
33130 COLOR 12,1: LOCATE 10,48: PRINT " Add to the data now "
33140 LOCATE 12,47:PRINT " Enter / when finished "
33145 TOTAL = TOTAL + 1
33150 RETURN
34000 REM
34002 REM ----------------------------------------
34005 REM ----- Subroutine to delete a data entry -----
34007 REM ----------------------------------------
34010 REM
34100 FOR N = 1 TO 50
34110 LINE (300,150-N)-(600,150+N),3,BF
34120 NEXT N
34130 COLOR 12,1: LOCATE 10,43: PRINT "   Enter number of data pair "
34140 LOCATE 11,43: PRINT "   to be deleted ( 1 -";TOTAL;")     "
34150 COLOR 15,1: LOCATE 11,69: INPUT DEL$
34160 DEL = VAL (DEL$)
34170 IF (DEL < 1 OR DEL > TOTAL) THEN BEEP: GOTO 34150
34180 COLOR 12,1: LOCATE 13,48: PRINT " Are you sure!!! (y/n) "
34190 ANSWER$ = ""
34200 WHILE (ANSWER$ <> "Y" AND ANSWER$ <> "y")
34210       ANSWER$ = INKEY$
34220       IF (ANSWER$ = "N" OR ANSWER$ = "n") THEN RETURN
34230 WEND
34240 FOR N = DEL TO TOTAL-1
34250 FREQ$(N) = FREQ$(N+1)
34260 WIND$(N) = WIND$(N+1)
34270 NEXT N
34280 TOTAL = TOTAL - 1
34290 ROW = ROW - 1
34500 RETURN
35000 REM
35002 REM ----------------------------------------------------------------
35005 REM ----- Subroutine to confirm and allow re-entry of all data -----
35007 REM ----------------------------------------------------------------
35010 REM
35100 FOR N = 1 TO 65
35110 LINE (290,170-N)-(625,170+N),3,BF
35120 NEXT N
35130 COLOR 12,1: LOCATE 9,50: PRINT " PLEASE NOTE!!! "
35140 COLOR 15,1: LOCATE 11,39: PRINT " Proceeding further with this option "
35150 LOCATE 12,39: PRINT "  will result in the deletion of all "
```

```
35160 LOCATE 13,39: PRINT "     the data you have just entered. "
35170 COLOR 12,1: LOCATE 15,39: PRINT "Are you sure you wish to continue (y/n)"
35180 ANSWER$ = ""
35190 WHILE (ANSWER$ <> "Y" AND ANSWER$ <> "y")
35200       ANSWER$ = INKEY$
35210       IF (ANSWER$ = "N" OR ANSWER$ = "n") THEN RETURN
35220 WEND
35230 CLS
35240 ANSWER$ = "Y"
35250 RETURN
40000 REM
40002 REM ---------------------------------------
40005 REM ----- Error checking subroutines -----
40007 REM ---------------------------------------
40010 REM
40020 REM
40022 REM ===== Check for errors during file opening.....
40024 REM
40030 IF ERR = 53 THEN GOSUB 40100: RESUME 1480
40032 IF ERR = 52 THEN GOSUB 40200: RESUME 1480
40034 IF ERR = 71 THEN GOSUB 40300: RESUME 1520
40036 IF ERR = 72 THEN GOSUB 40400
40038 IF (ERR = 5 OR ERR = 11) THEN GOSUB 40500: RESUME 65300
40040 IF ERR = 76 THEN GOSUB 40600: RESUME 65300
40050 STOP
40100 REM
40105 REM ===== File not found.....
40110 REM
40115 LINE (50,196)-(330,250),3,BF
40120 COLOR 12,1: LOCATE 15,11: PRINT " Sensor not found in database "
40130 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40140 BEEP
40190 RETURN
40200 REM
40205 REM ===== Invalid filename.....
40210 REM
40215 LINE (50,196)-(330,250),3,BF
40220 COLOR 12,1: LOCATE 15,14: PRINT " Invalid filename used "
40230 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40240 BEEP
40290 RETURN
40300 REM
40305 REM ===== Drive not ready.....
40310 REM
40315 LINE (50,196)-(330,250),3,BF
40320 COLOR 12,1: LOCATE 15,15: PRINT " Drive ";DRIVE$;"\ not ready "
40330 COLOR 15,1: LOCATE 16,13: PRINT " Press return when ready "
40340 BEEP
40350 ANSWER$ = ""
40360 WHILE (ANSWER$ <> CHR$(13))
40370       ANSWER$ = INKEY$
40380 WEND
40390 RETURN
40400 REM
```

```
40405 REM ===== Disk media error.....
40410 REM
40420 LINE (50,196)-(330,250),3,BF
40430 COLOR 12,1: LOCATE 15,11: PRINT " Error with hardware or disk "
40440 COLOR 15,1: LOCATE 16,17: PRINT " Program halted "
40490 RETURN
40500 REM
40502 REM ===== Illegal function call.....
40505 REM
40510 COLOR 12,8: LOCATE 17,33: PRINT "Insignificant data"
40520 LOCATE 18,26: PRINT "Could not calculate coefficients"
40530 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40540 WHILE (INKEY$ = "")
40550 WEND
40555 CLS
40560 REM
40562 REM ===== Exit program and return to operating system.....
40565 REM
40590 RETURN
40600 REM
40602 REM ===== Path not found.....
40605 REM
40610 CLS
40620 COLOR 12,1:LOCATE 17,24: PRINT "Could not find database on drive ";DRIVE$
40630 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40640 WHILE (INKEY$ = "")
40650 WEND
40655 CLS
40660 REM
40662 REM ===== Exit program and return to operating system.....
40665 REM
40690 RETURN
60000 REM
60001 REM ------------------------------------------------------------------
60002 REM ----- Subroutine to calculate coeficients and write to file.....
60003 REM ------------------------------------------------------------------
60005 REM
60009 REM *** This routine has to run under GWBASIC/d so that the ***
60010 REM *** mathematical routines can use double precision numbers ***
60020 REM access data file and read in data
60030 N=4 : REM * Set 3 degrees of fit *
60040 Z=0 : O=1 : K=12
60050 O9#=1E-18 : O8#=1E+18 : O7#=9.999999E+35 : O6#=1E-36
60060 :
60090 :
60100 REM zero data arrays
60110 FOR I%=0 TO 40 : X(I%)=0:Y(I%)=0:II(I%)=0 : NEXT I%
60120 :
60130 FOR LOOP = 1 TO TOTAL
60140       X(LOOP) = VAL (FREQ$(LOOP))
60150       Y(LOOP) = VAL (WIND$(LOOP))
60160       II(LOOP) = LOOP
60170 NEXT LOOP
60180 MF = TOTAL
```

```
60290 :
60300 CLOSE#1
60310 OPEN FILE$ FOR APPEND AS #2
60320 :
60330 REM * Initialise standard error array to missing values *
60340 FOR I%=1 TO 8 : STDERR(I%)=9999 : NEXT I%
60350 :
60360 REM calculates the means for the data
60370 T7#=Z:T8#=Z:W7#=Z
60380 :
60390 FOR I%=1 TO MF
60400 W7#=W7#+X(II(I%)):T7#=T7#+Y(II(I%)):T8#=T8#+Y(II(I%))^2
60410 NEXT
60420 T9#=(MF*T8#-T7#^2)/(MF^2-MF)
60430 :
60520 GOSUB 60870
60530 GOSUB 61470
60534 LOCATE 14,5: PRINT "Writing to calibration file : ";FILE$
60540 REM
60542 REM ===== Write details to sensor calibration file.....
60545 REM
60547 PRINT #2, "%CO:A,12,72%"
60550 PRINT #2,"Multimet Sensor Calibration File"
60555 PRINT #2,
60560 PRINT #2, "Sensor ID:", ID$ + SENSNUM$
60565 PRINT #2, "Electronics:", ELEC$
60570 PRINT #2, "Date:",DAY$;"/";MONTH$;"/";YEAR$
60575 PRINT #2, "Operator:", USERNAME$
60580 PRINT #2, "Standard:", STANDARD$
60585 PRINT #2, "Comments:", COMMENT$
60590 PRINT #2,
60595 PRINT #2, "Poly.deg:",N-1
60600 PRINT #2, "Equation        val=C0+C1*hex+C2*hex^2+C3*hex^3+C4*hex^4"
60605 PRINT #2, "Term    Coefficient"
60610 FOR J = 1 TO N
60615       PRINT #2,"C";RIGHT$(STR$(J-1),1);
60625       PRINT #2, TAB(8);U#(J)
60630 NEXT J
60632 PRINT #2, ""
60635 PRINT #2, TAB(13),"Frequ."; TAB(29);HEADER$;TAB(49);"Y-cal";TAB(64);"Diff"
60640 RMS# = 0
60645 FOR L = 1 TO MF
60650       Q8# = Y(II(L)) - C#(L)
60655       RMS# = RMS# + Q8#^2
60656 PRINT #2, "Cal:";
60657       PRINT #2, TAB(13); USING "####.###"; VAL(FREQ$(L));
60660       PRINT #2, TAB(29); USING "####.###"; VAL(WIND$(L)),
60665       PRINT #2, TAB(47); USING "####.###";C#(L);
60667       PRINT #2, TAB(61); USING "####.###";Q8#
60670       IF C#(L) = 0 THEN PRINT #2, "INFINITE"
60675 NEXT L
60680 PRINT #2, "Std error of estimate for Y=";STDERR(N-1)
60690 PRINT #2, "%P0%"
60695 PRINT #2, "%CO:B,12,60%%CO:C,12,48%%CO:D,12,36%%CO:E,12,24%%CO:F,12,12%"
```

```
60840 :
60845 CLOSE #2
60850 RETURN
60860 REM
60870 REM *** Routine arith1 ( Copied from CALEDIT.BBC ) ***
60880 :
60890 FOR I%=1 TO MF:P#(I%)=Z:Q#(I%)=O:NEXT
60900 FOR I%=1 TO 11:A#(I%)=Z:B#(I%)=Z:S#(I%)=Z:NEXT
60910 E1#=Z:F1#=Z:W1#=MF:N4=K:I=1:K1=2
60920 :
60930 IF N=0 THEN GOTO 60990
60940 K1=N4
60950 :
60960 REM program loops to next line
60970 W#=Z
60980 :
60990 FOR L=1 TO MF:W#=W#+Y(II(L))*Q#(L):NEXT
61000 :
61010 S#(I)=W#/W1#
61020 IF I-N4>=0 THEN GOTO 61450
61030 IF I-MF>=0 THEN GOTO 61450
61040 E1#=Z
61050 FOR L=1 TO MF
61060   A9#=ABS(Q#(L))
61070   IF A9#<O9# THEN GOTO 61210
61080   X9#=ABS(X(II(L)))
61090   IF X9#<O6# THEN GOTO 61170
61100   L2#=.434295*LOG(X9#)+(2*.434295*LOG(A9#))
61110   IF L2#<36 THEN GOTO 61200
61120   REM  SO X&Q TOO BIG FOR X*Q^2
61130   E1#=O7#
61140   L2#=36
61150   L=MF+1
61160   GOTO 61210
61170   IF A9#<1 THEN GOTO 61210
61180   IF A9#<O8# THEN GOTO 61200
61190   REM SO  Q TOO BIG FOR Q^2
61200   E1#=E1#+X(II(L))*A9#^2
61210 NEXT
61220 IF L2#-(.434295*LOG(W1#))>-36 THEN GOTO 61250
61230 E1#=0
61240 GOTO 61260
61250 E1#=E1#/W1#
61260 A#(I+1)=E1#
61270 W#=Z
61280 FOR L=1 TO MF
61290   V#=(X(II(L))-E1#)*Q#(L)-F1#*P#(L)
61300   P#(L)=Q#(L)
61310   Q#(L)=V#
61320   V9#=ABS(V#)
61330   IF V9#<O9# THEN GOTO 61390
61340   IF V9#<O8# THEN GOTO 61380
61350   W#=O7#
61360   L=MF+1
```

```
61370   GOTO 61390
61380   W#=W#+V#*V#
61390 NEXT
61400 F1#=W#/W1#
61410 B#(I+2)=F1#
61420 W1#=W#
61430 I=I+1
61440 GOTO 60970
61450 RETURN
61460 REM
61470 REM *** Routine arith2 ( Copied from CALEDIT.BBC ) ***
61480 :
61490 FOR L=1 TO 13:G#(L)=Z:NEXT
61500 :
61510 G#(2)=O
61520 FOR J=1 TO N
61530   S1#=Z
61540   FOR L=2 TO N+1
61550     IF L=2 THEN GOTO 61570
61560     G#(L)=G#(L)-A#(L-1)*G#(L-1)-B#(L-1)*G#(L-2)
61570     S1#=S1#+S#(L-1)*G#(L)
61580   NEXT
61590   U#(J)=S1#
61600   L=N+1
61610   FOR I2=2 TO N
61620     G#(L)=G#(L-1)
61630     L=L-1
61640   NEXT
61650   G#(2)=Z
61660 NEXT
61670 :
61680 PRINT " "
61690 T=Z
61700 FOR L=1 TO MF
61710   C#(L)=Z
61720   J=N
61730   FOR I2=1 TO N
61740     C#(L)=(C#(L)*X(II(L)))+U#(J)
61750     J=J-1
61760   NEXT
61770   T3#=Y(II(L))-C#(L)
61780   T#=T#+T3#^2
61790 NEXT
61800 IF MF<>N THEN GOTO 61830
61810 T5#=0
61820 GOTO 61840
61830 T5#=T#/(MF-N)
61840 Q7#=1-T#/(T9#*(MF-1))
61850 :
61860 DETERM = INT(Q7#*10000)/10000
61870 STDERR(N-1)=SQR(T5#)
61880 RETURN
65000 REM
65002 REM ----------------------------------------
```

```
65005 REM ----- Subroutine to update database -----
65007 REM ----------------------------------------
65010 REM
65015 REM ===== If Psychrometers has been chosen then change ID back to TT.....
65020 REM
65030 IF (ID$ = "TW" OR ID$ = "TD") THEN ID$ = "TT"
65045 REM
65046 REM ===== Write name of new calibration file to ametdb directory.....
65047 REM
65050 FILE1$ = DRIVE$ + "\AMETDB\" + ID$ + SENSNUM$ + ".L"
65055 LOCATE 16,5: PRINT "Updating sensor file : ";FILE1$
65060 OPEN FILE1$ FOR APPEND AS #1
65070 PRINT #1,RIGHT$(FILE$,22)
65080 CLOSE #1
65090 REM
65095 REM ===== Write to history file date of calibration.....
65100 REM
65110 FILE2$ = DRIVE$ + "\AMETDB\METDB_DA\HISTORY." + MULTIMET$
65115 LOCATE 18,5: PRINT "Updating history file : ";FILE2$
65120 OPEN FILE2$ FOR APPEND AS #2
65150 PRINT #2, DAY$ + "/" + MONTH$ + "/" + YEAR$ + "        Calibration."
65160 CLOSE #2
65170 LOCATE 20,22: PRINT "---Press Any Key for Main Menu---"
65180 WHILE (INKEY$ = "")
65190 WEND
65200 RETURN
65300 REM
65302 REM ------------------------------------------------------------------
65305 REM ----- Subroutine for execution when Ctrl Esc has been pressed -----
65307 REM ------------------------------------------------------------------
65310 REM
65315 RUN"calmenu"
65320 CLS
65330 SCREEN 0,0,0
65340 LOCATE 14,9: PRINT "Program Execution Halted..... Returning to operating system"
65345 LOCATE 16,29: PRINT "---Press Any Key---"
65350 WHILE (INKEY$ = "")
65360 WEND
65370 SYSTEM
```

```
5 REM ********************************************************************************
6 REM ************************ CALCERT.BAS by RAF 18/6/90 ********************
7 REM ********************************************************************************
10 REM ===== Version 1.0     18/06/90
15 REM ===== Programmed by Refayet Ahmed in GW BASIC.
17 REM =====
20 REM ===== Calibration Certificate Program.....
25 REM =====
30 REM =====      This program is executed when a calibration certificate is
40 REM ===== asked for by one of two programs, either WINDCAL.BAS or BATHCON.BAS
50 REM =====
60 REM =====      This program produces a sensor calibration certificate which
70 REM ===== is a comparason between two sets of calibration coefficients from
80 REM ===== different calibrations.
85 REM =====
90 REM =====      The certificate which is to be produced is by default that
100 REM ===== of the sensor most recently calibrated. However the user may
110 REM ===== choose a different sensor if required.
115 REM =====
120 REM =====      The variables which are used from the calling program are
130 REM ===== SENSOR$ ----- Name of sensor most recently calibrated.
140 REM ===== PROG$   ----- Name of calling program.
145 REM =====
150 REM =====      The names of the two most recent calibration files are taken
160 REM ===== from the AMETDB directory. (It need not be the two most recent;
170 REM ===== the user may specify the calibration file if required).
175 REM =====
180 REM =====      From each file the coefficients are read. Then for both sets
190 REM ===== of coefficients Y-Cals are calulated using test data. The
200 REM ===== differences between the two sets of Y-Cals are calulated and then
210 REM ===== mean and standard deviation of these differences are calculated.
215 REM =====
220 REM =====      Finally the output is sent to the printer in the form of a
230 REM ===== certificate and execution is returned to the calling program.
240 REM
1000 REM
1005 REM ===== If program is not executed via a chained program then get
1006 REM ===== specifications from user.....
1010 REM
1015 DIM OPTN$(6)
1020 GOSUB 22000
1380 REM
1385 REM ===== Obtain from the user the drive on which the database is held.....
1390 REM
1400 FOR N = 1 TO 50
1402       LINE (300,250-N)-(600,250+N),8,BF
1405 NEXT N
1410 COLOR 12,1
1415 LOCATE 17,44: PRINT " Enter letter of drive on "
1420 LOCATE 18,45: PRINT " which database is held "
1425 COLOR 15,1: LOCATE 20,44: PRINT " Enter / for default (D:) "
1430 DRIVE$ = " "
1435       WHILE (ASC(DRIVE$) < 65 OR ASC(DRIVE$) > 69) AND (ASC(DRIVE$) < 97 OR ASC(DRIVE$) > 101)
AND (DRIVE$ <> "/")
```

```
1440        DRIVE$ = INKEY$
1445        IF DRIVE$ = "" THEN DRIVE$ = " "
1450 WEND
1455 IF DRIVE$ = "/" THEN DRIVE$ = "D"
1457 DRIVE$ = DRIVE$ + ":"
1470 CLS
1500 REM
1510 REM ===== Set up screen in high resolution for graphics.....
1520 REM
1525 KEY OFF
1530 SCREEN 9
1540 CLS
1550 COLOR 15,1: CLS
1560 REM
1570 REM ===== Declare all arrays.....
1580 REM
1590 DIM CALFILE$(20)
1600 DIM COEF1(8), COEF2(8), C(8)
1610 DIM YCAL1(10), YCAL2(10), DIFF(10)
1620 DIM JDAYFILE(20)
1630 DIM HEX(10)
1650 REM
1655 REM ===== Obtain from user sensor name and show default.....
1660 REM
1670 COLOR 12,1
1680 FILE1$ = DRIVE$ + "\ametdb\" + ID$ + SERIAL$ + ".1"
2000 REM
2010 REM ===== Open the sensor file in the AMETDB diectory then read and store
2020 REM ===== names of all calibration files.....
2030 REM
2040 OPEN FILE1$ FOR INPUT AS #1
2045 TOTAL = 1
2050 WHILE NOT(EOF(1))
2060        INPUT #1,RECORD$
2065        CHECK$ = MID$(RECORD$,11,8)
2070        IF RECORD$ <> "" AND CHECK$ <> "HISTORY." AND CHECK$ <> "DETAILS." AND CHECK$ <>
"history." AND CHECK$ <> "details." THEN CALFILE$(TOTAL) = RECORD$: TOTAL = TOTAL + 1
2080 WEND
2085 TOTAL = TOTAL - 1
2087 CLOSE #1
2090 REM
2100 REM ===== Check that at least two calibration files exist.....
2110 REM
2120 IF TOTAL = 0 THEN LOCATE 12,20: PRINT "Cannot produce calibration certificate": LOCATE 13,20:
PRINT "No calibration file exists": GOSUB 50000
2130 IF TOTAL = 1 THEN LOCATE 12,20: PRINT "Cannot produce calibration certificate": LOCATE 13,20:
PRINT "Only one calibration file exists": GOSUB 50000
2132 REM
2133 REM ===== Call subroutine to sort calfiles in accending order of date.....
2134 REM
2135 GOSUB 30000
2140 REM
2150 REM ===== Call subroutine for menu to choose two calibration files.....
2160 REM
```

```
2170 GOSUB 10000
2175 CLS
2180 REM
2185 REM ===== Open the two calibration files.....
2190 REM
2192 CALFILE1$ = DRIVE$ + "\AMETDB" + CALFILE$(C1)
2194 CALFILE2$ = DRIVE$ + "\AMETDB" + CALFILE$(C2)
2200 OPEN CALFILE1$ FOR INPUT AS #1
2210 OPEN CALFILE2$ FOR INPUT AS #2
2220 REM
2225 REM ===== Determine from the sensor id code the number of coefficents.....
2230 REM
2240 IF (LEFT$(ID$,1) = "W" OR LEFT$(ID$,1) = "w") THEN RESTORE 9000: COEFTOT = 2 ELSE RESTORE 9100
COEFTOT = 4
2300 REM
2305 REM ===== Call subroutine to pick out the coefficients from the Cal file...
2310 REM
2320 FILENUM = 1
2330 GOSUB 20000
2340 CLOSE #1
2350 FOR N = 0 TO 8
2355       COEF1(N) = C(N)
2370 NEXT N
2380 FILENUM = 2
2390 GOSUB 20000
2395 CLOSE #2
2400 FOR N = 0 TO 8
2410       COEF2(N) = C(N)
2420 NEXT N
2530 REM
2540 REM ===== Call subroutine to calculate Y-Cals.....
2550 REM
2560 GOSUB 21000
2570 REM
2580 REM ===== Calculate the difference and sum the difference of the Y-cals....
2590 REM
2595 SUMDIFF = 0
2600 FOR N = 1 TO 10
2610       DIFF(N) = YCAL1(N) - YCAL2(N)
2615       SUMDIFF = SUMDIFF + DIFF(N)
2620 NEXT N
2650 REM
2655 REM ===== Calculate the mean and standard deviation.....
2660 REM
2670 MEAN = SUMDIFF/10
2680 REM
2685 REM ===== Show user results.....
2690 REM
2700 CLS
2710 COLOR 15,1
2720 REM
2725 REM ===== Search data for name of sensor.....
2730 REM
2740 RESTORE 9220
```

```
2750 WHILE (ID$ <> CH1$ AND ID$ <> CH2$)
2760       READ CH1$,CH2$,SENSOR$
2770 WEND
2780 PRINT TAB(5);SENSOR$,SERIAL$
2790 PRINT TAB(5);"Cal    ";MID$(CALFILE$(C1),11,8)
2800 FOR N = 0 TO COEFTOT - 1
2810       PRINT TAB(20);"C";N;COEF1(N)
2820 NEXT N
2830 PRINT
2835 PRINT TAB(5);"Cal    ";MID$(CALFILE$(C2),11,8)
2840 FOR N = 0 TO COEFTOT - 1
2850       PRINT TAB(20);"C";N;COEF2(N)
2860 NEXT N
2870 PRINT
2880 PRINT TAB(5);"Freq";TAB(17);"Temp A";TAB(28),"  Temp B","  Diff"
2890 FOR N = 1 TO 10
2900       PRINT TAB(5);HEX(N),YCAL1(N),YCAL2(N),DIFF(N)
2910 NEXT N
2912 PRINT TAB(5);"Mean = ";SUMDIFF/10
2920 COLOR 12,1
2930 LOCATE 24,5: PRINT "Press P to print or RETURN to get back to menu"
2940 KY$ = ""
2950 WHILE KY$ <> CHR$(13)
2960       KY$ = INKEY$
2970       WHILE KY$ = "p" OR KY$ = "P"
2971             LPRINT CHR$(27);CHR$(69);
2972             LPRINT CHR$(27);CHR$(104);CHR$(1);
2974             LPRINT CHR$(27);CHR$(97);CHR$(49);
2975             LPRINT "Calibration Certificate"
2980             LPRINT TAB(17);SENSOR$,SERIAL$: LPRINT
2985             LPRINT: LPRINT CHR$(27);CHR$(119);CHR$(48);
2987             LPRINT CHR$(27);CHR$(97);CHR$(48);
2989             LPRINT CHR$(27);CHR$(14);
2990             LPRINT "Date Produced : ";DATE$: LPRINT
2995             LPRINT TAB(17);"Cal    ";MID$(CALFILE$(C1),11,8)
3000             FOR N = 0 TO COEFTOT - 1
3010                   LPRINT TAB(32);"C";N;COEF1(N)
3020             NEXT N
3030             LPRINT
3032             LPRINT
3035             LPRINT TAB(17);"Cal    ";MID$(CALFILE$(C2),11,8)
3040             FOR N = 0 TO COEFTOT - 1
3050                   LPRINT TAB(32);"C";N;COEF2(N)
3060             NEXT N
3070             LPRINT
3080             LPRINT TAB(17);"Freq";TAB(29);"Temp A";TAB(40),"  Temp B","  Diff"
3090             FOR N = 1 TO 10
3100                   LPRINT TAB(17);HEX(N),YCAL1(N),YCAL2(N),DIFF(N)
3110             NEXT N
3111             LPRINT
3112             LPRINT TAB(17); "Mean = ";SUMDIFF/10
3113             LPRINT CHR$(12);
3115       KY$ = ""
3120       WEND
```

```
3130 WEND
3140 GOSUB 22000
3150 CLS: GOTO 1650
8990 REM
8992 REM ===== Sample data emulating sensor frequiencies.....
8994 REM
9000 DATA 1,4,7,10,13,16,19,22,25,28
9100 DATA 1400,1500,1600,1700,1800,1900,2000,2100,2200,2300
9200 REM
9205 REM ===== Data connecting type of sensor with the id code.....
9210 REM
9220 DATA "WS","ws", "Wind Speed"
9230 DATA "WW","ww", "Wind Velocity"
9240 DATA "WD","wd", "Wind Direction"
9250 DATA "TT","tt", "Psychrometer"
9260 DATA "SP","sp", "SST"
9270 DATA "AT","at", "Air Temperature"
9280 DATA "AP","ap", "Air Pressure"
9999 END
10000 REM
10005 REM ------------------------------------------------------------------
10010 REM ----- Subroutine for menu to select two calibration files -----
10015 REM ------------------------------------------------------------------
10020 REM
10040 REM
10050 REM ===== Draw menu.....
10060 REM
10061 COLOR 15,1
10063 CLS
10070 LINE (20,20) - (250,330),15,B
10080 PAINT (100,200),2,15
10085 N = 3
10087 ROW = 2
10089 IF TOTAL < 10 THEN TOP = 1 ELSE TOP = TOTAL - 9
10090 FOR N = TOP TO TOTAL
10095       ROW = ROW + 2
10100       LOCATE ROW,12: PRINT " ";MID$ (CALFILE$(N),11,8);" "
10120 NEXT N
10130 LINE (300,20) - (500,80),15,B
10140 PAINT (400,40),4,15
10141 REM
10142 REM ===== Set pointers for cal files 1 and 2.....
10143 REM
10145 C1 = TOTAL - 1: C2 = TOTAL
10147 POINTER = TOTAL
10148 IF TOTAL > 10 THEN ROW = 22 ELSE ROW = POINTER * 2 + 2
10150 LOCATE 3,45: PRINT " ";MID$(CALFILE$(C1),11,8);" "
10160 LOCATE 5,45: PRINT " ";MID$(CALFILE$(C2),11,8);" "
10170 COLOR 12,1: LOCATE 3,42: PRINT "1:"
10180 COLOR 12,1: LOCATE 5,42: PRINT "2:"
10185 GOSUB 12180
10190 REM
10200 REM ===== Read input from keyboard.....
10210 REM
```

```
10215 KY$ = ""
10220 WHILE KY$ <> "/"
10230       KY$ = INKEY$
10240       IF KY$ = "1" THEN ROW2 = 3: GOSUB 12000: C1 = POINTER
10250       IF KY$ = "2" THEN ROW2 = 5: GOSUB 12000: C2 = POINTER
10260 WEND
10265 KY$ = ""
10270 REM
10275 REM ===== Check that the two chosen Cal files are not the same.....
10280 REM
10290 IF CALFILE$(C1) = CALFILE$(C2) THEN BEEP: GOTO 10190
11000 RETURN
12000 REM
12005 REM ------------------------------------------------------------------
12010 REM ----- Subroutine to allow user to choose a calibration file -----
12015 REM ------------------------------------------------------------------
12020 REM
12030 REM
12031 PAINT (400,300),0,15
12032 COLOR 10,1
12033 LOCATE 8,35: PRINT "Use UP DOWN keys to move cursor"
12035 COLOR 12,1
12036 LOCATE 10,35: PRINT "Press RETURN to make selection"
12040 REM ===== Define up down keys.....
12050 REM
12060 DN$ = CHR$(0) + CHR$(80)
12070 UP$ = CHR$(0) + CHR$(72)
12080 REM
12090 REM ===== Scan keyboard for Return and Up Down keys.....
12100 REM
12110 KY$ = ""
12113 COL = 12
12115 GOSUB 13000
12120 WHILE KY$ <> CHR$(13)
12130       KY$ = INKEY$
12140       IF (KY$ = UP$ AND POINTER > 1) THEN IF (ROW = 4) THEN GOSUB 12400 :COL = 12:GOSUB 13000
ELSE COL = 15:GOSUB 13000: POINTER = POINTER - 1: ROW = ROW - 2: COL = 12 :GOSUB 13000
12145       IF (KY$ = DN$ AND POINTER < TOTAL) THEN IF (ROW = 22) THEN GOSUB 12500: COL = 12: GOSUB
13000 ELSE COL = 15: GOSUB 13000: POINTER = POINTER + 1: ROW = ROW + 2: COL = 12: GOSUB 13000
12160 WEND
12165 COL = 15: GOSUB 13000
12170 KY$ = ""
12180 PAINT (400,300),1,15
12181 COLOR 10,1
12182 LOCATE 8,35: PRINT "Enter / to produce a calibration certificate"
12183 LOCATE 9,35: PRINT "of the files shown above"
12184 COLOR 12,1
12185 LOCATE 11,35: PRINT "Press 1 or 2 to change the corresponding"
12186 LOCATE 12,35: PRINT "calibration file to one of those shown on"
12187 LOCATE 13,35: PRINT "the left."
12300 RETURN
12400 REM
12401 REM ------------------------------------------------
12402 REM ----- Subroutine to scroll screen up one place -----
```

```
12403 REM ------------------------------------------------
12405 REM
12410 LR = ROW
12415 POINTER = POINTER - 1
12417 COLOR 15,1
12420 FOR LOOP = POINTER TO POINTER + 9
12425       LOCATE LR,12: PRINT " ";MID$(CALFILE$(LOOP),11,8);" "
12430       LR = LR + 2
12435 NEXT LOOP
12440 RETURN
12500 REM
12501 REM ------------------------------------------
12502 REM ----- Subroutine to scroll down one place -----
12503 REM ------------------------------------------
12505 REM
12510 LR = ROW
12520 POINTER = POINTER + 1
12525 COLOR 15,1
12530 FOR LOOP = POINTER TO POINTER-9 STEP -1
12535       LOCATE LR,12: PRINT " ";MID$(CALFILE$(LOOP),11,8);" "
12540       LR = LR - 2
12545 NEXT LOOP
12550 RETURN
13000 REM
13005 REM ------------------------------------------------------------------
13010 REM ----- Subroutine to write name of calfile in a specified colour -----
13015 REM ------------------------------------------------------------------
13020 REM
13030 REM
13040 REM ===== Write cal file in large menu box.....
13050 REM
13060 COLOR COL,1
13070 LOCATE ROW,12: PRINT " ";MID$(CALFILE$(POINTER),11,8);" "
13080 REM
13090 REM ===== Write cal file in small menu box.....
13100 REM
13110 LOCATE ROW2,45: PRINT " ";MID$(CALFILE$(POINTER),11,8);" "
13120 RETURN
14000 REM
14005 REM ------------------------------------------------------------------
14010 REM ----- Subroutine to write initial menu option in specified colour ----
14017 REM ------------------------------------------------------------------
14020 REM
14040 COLOR COL,1
14060 LOCATE ROW,30: PRINT OPTN$(POINTER)
14070 RETURN
20000 REM
20005 REM ------------------------------------------------------------
20010 REM ----- Subroutine to pick out coefficients from the Cal file -----
20015 REM ------------------------------------------------------------
20020 REM
20030 REM
20035 REM ===== Ignore all records untill coefficient record is encountered.....
20040 REM
```

```
20050 WHILE (LEFT$(RECORD$,4)) <> "Term"
20060       INPUT #FILENUM, RECORD$
20070 WEND
20080 REM
20085 REM ===== Put coefficients into array.....
20090 REM
20100 FOR N = 0 TO COEFTOT - 1
20110       INPUT #FILENUM, RECORD$
20120       C(N) = VAL(RIGHT$(RECORD$,LEN(RECORD$)-2))
20130 NEXT N
20140 RETURN
21000 REM
21005 REM ----------------------------------------
21010 REM ----- Subroutine to calculate Y-Cals -----
21015 REM ----------------------------------------
21020 REM
21030 FOR N = 1 TO 10
21040       READ HEX(N)
21050       YCAL1(N) = COEF1(0) + COEF1(1)*HEX(N) + COEF1(2)*HEX(N)^2 + COEF1(3)*HEX(N)^3 +
COEF1(4)*HEX(N)^4
21060       YCAL2(N) = COEF2(0) + COEF2(1)*HEX(N) + COEF2(2)*HEX(N)^2 + COEF2(3)*HEX(N)^3 +
COEF2(4)*HEX(N)^4
21070 NEXT N
21100 RETURN
22000 REM
22002 REM ------------------------------------------------------------------------
22005 REM ----- Subroutine to draw menu and allow user to select options -----
22007 REM ------------------------------------------------------------------------
22010 REM
22020 REM ===== Draw menu screen.....
22030 REM
22040 KEY OFF
22050 SCREEN 9
22055 CLS
22057 LOCATE 5,29:PRINT"CALIBRATION CERTIFICATE"
22060 COLOR 12,1
22070 LINE (210,80)-(415,268),15,B
22080 PAINT (230,100),2,15
22090 LOCATE 23,16: PRINT "Choose the sensor type required for calibration"
22095 COLOR 15,1
22097 RESTORE 22150
22100 FOR ROW = 8 TO 18 STEP 2
22102 POINTER = ROW/2-3
22105       READ OPTN$(POINTER)
22110       LOCATE ROW,30: PRINT OPTN$(POINTER)
22120 NEXT ROW
22130 COLOR 12,1:LOCATE 8,30: PRINT OPTN$(1)
22150 DATA "    Wind Speed     "
22152 DATA "   Psychrometer    "
22154 DATA "        SST        "
22156 DATA "   Air Pressure    "
22158 DATA "  Air Temperature  "
22160 DATA "       Quit        "
22170 KY$ = ""
```

```
22171 REM
22172 REM ===== Define up/down keys.....
22173 REM
22174 DN$ = CHR$(0) + CHR$(80)
22175 UP$ = CHR$(0) + CHR$(72)
22176 REM
22177 REM ===== Scan keyboard for RETURN and UP DOWN keys.....
22178 REM
22179 ROW = 8: POINTER = 1
22180 WHILE KY$ <> CHR$(13)
22190       KY$ = INKEY$
22200       IF (KY$ = DN$ AND ROW < 18) THEN COL = 15: GOSUB 14000: ROW = ROW + 2: POINTER = POINTE
+ 1: COL = 12: GOSUB 14000
22210       IF (KY$ = UP$ AND ROW > 8) THEN COL = 15: GOSUB 14000: ROW = ROW - 2:POINTER = POINTER
1: COL = 12: GOSUB 14000
22250 WEND
22260 REM
22265 REM ===== Determine which sensor has been chosen.....
22270 REM
22275 IF POINTER = 1 THEN ID$ = "ws" ELSE IF POINTER = 2 THEN ID$ = "tt" ELSE IF POINTER = 3 THEN
ID$ = "sp" ELSE IF POINTER = 4 THEN ID$ = "ap" ELSE IF POINTER = 5 THEN ID$ = "at" ELSE IF POINTER
6 THEN GOSUB 36000
22290 REM
22295 REM ===== Obtain serial number from user.....
22300 REM
22305 REM   LINE (160,150)-(495,260),8,BF
22310 FOR N = 1 TO 50
22320       LINE (150,200-N)-(485,200+N),6,BF
22330 NEXT N
22340 COLOR 12,1
22350 LOCATE 13,22: PRINT "Enter the serial number of the sensor"
22360 LOCATE 15,28: PRINT "          "
22370 COLOR 15,1: LOCATE 15,28: INPUT SERIAL$
22380 RETURN
30000 REM
30005 REM ------------------------------------------------------------------
30010 REM ----- Subroutine to sort Cal files in ascending order of date -----
30015 REM ------------------------------------------------------------------
30020 REM
30030 REM
30035 REM ===== If filename is not in JDay format then covert it and put the
30036 REM ===== year in front of the day.....
30040 REM
30050 FOR N = 1 TO TOTAL
30060       VCODE =ASC(MID$(CALFILE$(N),18,1))
30070       IF NOT((VCODE >= 97 AND VCODE <= 122) OR (VCODE >= 65 AND VCODE <= 90)) THEN GOSUB 3500
ELSE JDAY$ = MID$(CALFILE$(N),13,5): YEAR$ =MID$(CALFILE$(N),16,2)
30075 JDAY$ = YEAR$ + LEFT$(JDAY$,3)
30080       JDAYFILE(N) = VAL(JDAY$)
30100 NEXT N
30110 REM
30115 REM ===== Set up loop to keep sorting untill no more swaps have been made.
30120 REM
30130 ISSWAP = 1
```

```
30140 WHILE ISSWAP <> 0
30150       ISSWAP = 0
30160       FOR POSN = 1 TO TOTAL-1
30170             IF JDAYFILE(POSN+1) < JDAYFILE(POSN) THEN GOSUB 35200
30180       NEXT POSN
30190 WEND
30999 RETURN
35000 REM
35005 REM ------------------------------------------------
35010 REM ----- Subroutine to convert date to Julian day -----
35015 REM ------------------------------------------------
35020 REM
35030 DAY = VAL(MID$(CALFILE$(N),13,2))
35040 MONTH = VAL(MID$(CALFILE$(N),15,2))
35050 YEAR$ = MID$(CALFILE$(N),17,2)
35060 JDAY$ = STR$(VAL(MID$("000031059090120151181212243273304334",((MONTH-1)*3)+1,3))+DAY)
35070 JDAY$ = YEAR$ + RIGHT$(JDAY$,3)
35100 RETURN
35200 REM
35205 REM ------------------------------------------------------------
35210 REM ----- Subroutine to swap the position of the calfile names -----
35215 REM ------------------------------------------------------------
35220 REM
35230 REM
35235 REM ===== Swap the JDays.....
35240 REM
35250 SWAP JDAYFILE(POSN),JDAYFILE(POSN+1)
35260 SWAP CALFILE$(POSN),CALFILE$(POSN+1)
35270 ISSWAP = 1
35280 RETURN
36000 REM
36002 REM ------------------------------------
36005 REM ----- Subroutine to quit program -----
36007 REM ------------------------------------
36010 REM
36020 IF PROG$ <> "" THEN CHAIN PROG$
36030 SYSTEM
36040 END
```

```
1000 REM ************************************************************************
1010 REM ****************** SENPRT.BAS by RWP 19/11/90 ************************
1020 REM ************************************************************************
1040 REM
1041 REM ===== Set error trap.....
1042 REM
1043 ON ERROR GOTO 40000
1044 REM
1045 REM ===== Call subroutine to set up Ctrl Esc key trap.....
1046 REM
1047 GOSUB 14000
1048 KEY OFF
1049 SCREEN 9
1056 REM
1057 REM ===== Set up user menu....
1058 REM
1059 COLOR 7,1: CLS
1060 REM
1061 REM ===== Draw up menu box.....
1065 REM
1067 LINE (5,5)-(635,345),,B
1090 LINE (180,53)-(480,266),2,BF
1100 LINE (185,58)-(475,261),64,B
1110 LOCATE 6,26:PRINT" Air Temperature               ";CHR$(27);" "
1120 LOCATE 8,26:PRINT" Sea Temperature                "
1130 LOCATE 10,26:PRINT" Wind Speed                     "
1140 LOCATE 12,26:PRINT" Wind Direction                 "
1142 LOCATE 14,26:PRINT" Radiometers                    "
1143 LOCATE 16,26:PRINT" Others                         "
1144 LOCATE 18,26:PRINT" Return to Allocation Menu      "
1150 LOCATE 22,8:PRINT" Move arrow to required sensor type and press <RETURN> when finished"
1160 LOCATE 23,26 : PRINT"Move around using cursor keys"
1162 COLOR 3:LOCATE 3,27:PRINT "SELECT SENSOR TYPE for PRINTER"
1165 REM
1170 REM ===== Define the cursor keys.....
1175 REM
1180 DN$=CHR$(0)+CHR$(80):UP$=CHR$(0)+CHR$(72)
1185 X=6:Y=59:KY$=" "
1190 REM
1191 REM ===== Set up pointer box in menu.....
1192 REM
1193 COLOR 7,1
1195 Y1 = 69
1198 GOSUB 20000
1200 LOCATE X,Y
1202 REM
1205 REM ===== Reading input from keyboard....
1207 REM
1210 WHILE KY$<>CHR$(13)
1220   KY$=INKEY$
1270   IF (KY$=DN$) AND ((X>=6)AND(X<=16)) THEN LOCATE X,Y-3:PRINT"  ";:X=X+2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
1280   IF (KY$=UP$) AND ((X>=8)AND(X<=18)) THEN LOCATE X,Y-3:PRINT"  ";:X=X-2:LOCATE X,Y-2:PRINT
CHR$(27); : GOSUB 20000
```

```
1290 WEND
1291 IF X=6 THEN METNO=100:GOSUB 30000
1292 IF X=8 THEN METNO=200:GOSUB 30000
1293 IF X=10 THEN METNO=300:GOSUB 30000
1294 IF X=12 THEN METNO=400:GOSUB 30000
1295 IF X=14 THEN METNO=500:GOSUB 30000
1296 IF X=16 THEN METNO=1:GOSUB 30000
1297 IF X=18 THEN RUN "SEND"
1299 GOTO 1059
1300 END
14000 REM
14002 REM ------------------------------------------------------
14005 REM ----- Subroutine to set up key trap for Ctrl Esc -----
14007 REM ------------------------------------------------------
14010 REM
14014 REM
14016 REM ===== Define keys to include all possible combinations of CAPS LOCK
14017 REM       and NUM LOCK.....
14018 REM
14020 KEY 15,CHR$(&H64)+CHR$(1)
14030 KEY 16,CHR$(&H44)+CHR$(1)
14040 KEY 17,CHR$(&H24)+CHR$(1)
14050 KEY 18,CHR$(&H4)+CHR$(1)
14060 REM
14064 REM ===== Direct all escape key combinations to line 65300 .....
14066 REM
14070 ON KEY (15) GOSUB 65300
14080 ON KEY (16) GOSUB 65300
14090 ON KEY (17) GOSUB 65300
14100 ON KEY (18) GOSUB 65300
14110 REM
14115 REM ===== Turn all escape key combinations on.....
14117 REM
14120 KEY (15) ON
14130 KEY (16) ON
14140 KEY (17) ON
14150 KEY (18) ON
14200 RETURN
20000 REM
20010 REM ------------------------------------------------------------------
20020 REM ----- Subroutine for drawing & flashing pointer box in menu -----
20030 REM ------------------------------------------------------------------
20040 REM
20050 REM ===== First overwrite old box.....
20060 REM
20070 LINE (199,Y1)-(464,Y1+15),2,B
20100 REM ===== Now draw box and flash at new position.....
20110 REM
20120 IF (KY$ = DN$) THEN Y1 = Y1 + 28 ELSE IF (KY$ = UP$) THEN Y1 = Y1 - 28
20140 FOR COL = 9 TO 15
20150 LINE (199,Y1)-(464,Y1+15),COL,B
20160 NEXT COL
20170 LINE (199,Y1)-(464,Y1+15),12,B
20500 RETURN
```

```
30000 REM
30010 OPEN "R",#1,"SENSORS.DAT",9
30020 FIELD #1,2 AS T$,6 AS S$,1 AS L$
30048 IF METNO=1 THEN LPRINT:LPRINT"            OTHERS SENSORS"
30050 IF METNO=100 THEN LPRINT:LPRINT"            AIR TEMPERATURE SENSORS"
30052 IF METNO=200 THEN LPRINT:LPRINT"            SEA TEMPERATURE SENSORS"
30054 IF METNO=300 THEN LPRINT:LPRINT"            WIND SPEED SENSORS"
30056 IF METNO=400 THEN LPRINT:LPRINT"            WIND DIRECTION SENSORS"
30058 IF METNO=500 THEN LPRINT:LPRINT"            RADIOMETER SENSORS"
30059 IF METNO=1 THEN CT=98 ELSE CT=99
30060 LPRINT:LPRINT"            MultiMet Nubers ";METNO;"-";METNO+CT,"    DATE ";DATE$
30070 LPRINT:LPRINT"             Met No.     sen type       serial no.    status"
30080 LPRINT"-------------------------------------------------------------------"
30100 FOR I=0 TO CT
30110 GET#1,METNO+I
30120 IF L$="R" OR L$="M" OR L$="D" THEN LPRINT,METNO+I,T$,S$,L$
30130 NEXT I
30140 CLOSE#1
30150 GOTO 1059
40000 REM
40002 REM ---------------------------------------
40005 REM ----- Error checking subroutines -----
40007 REM ---------------------------------------
40010 REM
40020 REM
40022 REM ===== Check for errors during file opening.....
40024 REM
40030 IF ERR = 53 THEN GOSUB 40100: RESUME 1040
40032 IF ERR = 52 THEN GOSUB 40200: RESUME 1480
40034 IF ERR = 71 THEN GOSUB 40300: RESUME 1520
40036 IF ERR = 72 THEN GOSUB 40400
40038 IF (ERR = 5 OR ERR = 11) THEN GOSUB 40500: RESUME 65300
40040 IF ERR = 76 THEN GOSUB 40600: RESUME 65300
40050 STOP
40100 REM
40105 REM ===== File not found.....
40110 REM
40115 LINE (50,196)-(330,250),3,BF
40120 COLOR 12,1: LOCATE 15,11: PRINT " Sensor not found in database "
40130 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40140 BEEP
40190 RETURN
40200 REM
40205 REM ===== Invalid filename.....
40210 REM
40215 LINE (50,196)-(330,250),3,BF
40220 COLOR 12,1: LOCATE 15,14: PRINT " Invalid filename used "
40230 COLOR 15,1: LOCATE 16,17: PRINT " Please try again "
40240 BEEP
40290 RETURN
40300 REM
40305 REM ===== Drive not ready.....
40310 REM
40315 LINE (50,196)-(330,250),3,BF
```

```
40320 COLOR 12,1: LOCATE 15,15: PRINT " Drive ";DRIVE$;"\ not ready "
40330 COLOR 15,1: LOCATE 16,13: PRINT " Press return when ready "
40340 BEEP
40350 ANSWER$ = ""
40360 WHILE (ANSWER$ <> CHR$(13))
40370       ANSWER$ = INKEY$
40380 WEND
40390 RETURN
40400 REM
40405 REM ===== Disk media error.....
40410 REM
40420 LINE (50,196)-(330,250),3,BF
40430 COLOR 12,1: LOCATE 15,11: PRINT " Error with hardware or disk "
40440 COLOR 15,1: LOCATE 16,17: PRINT " Program halted "
40490 RETURN
40500 REM
40502 REM ===== Illegal function call.....
40505 REM
40510 COLOR 12,8: LOCATE 17,33: PRINT "Insignificant data"
40520 LOCATE 18,26: PRINT "Could not calculate coefficients"
40530 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40540 WHILE (INKEY$ = "")
40550 WEND
40555 CLS
40560 REM
40562 REM ===== Exit program and return to operating system.....
40565 REM
40590 RETURN
40600 REM
40602 REM ===== Path not found.....
40605 REM
40610 CLS
40620 COLOR 12,1:LOCATE 17,24: PRINT "Could not find database on drive ";DRIVE$
40630 COLOR 15,8: LOCATE 20,32: PRINT "---Press Any Key---"
40640 WHILE (INKEY$ = "")
40650 WEND
40655 CLS
40660 REM
40662 REM ===== Exit program and return to operating system.....
40665 REM
40690 RETURN
50000 REM
50100 REM DRAW GREEN BOX
50105 REM CLS
50110 COLOR 15,1
50120 FOR N=1 TO 150 STEP 2
50130 LINE (BB%-N,160-N)-(BB%+N,160+N),2,BF
50140 NEXT N
50200 RETURN
65300 REM
65302 REM ------------------------------------------------------------------
65305 REM ----- Subroutine for execution when Ctrl Esc has been pressed -----
65307 REM ------------------------------------------------------------------
65310 REM
```

```
65320 CLS
65330 SCREEN 0,0,0
65340 LOCATE 14,9: PRINT "Program Execution Halted..... Returning to MAINMENU"
65345 LOCATE 16,29: PRINT "---Press Any Key---"
65350 WHILE (INKEY$ = "")
65360 WEND
65370 RUN "MAINMENU"
```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