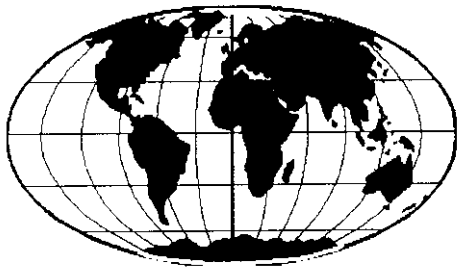
EA 92208

DATAPAQ

Radio Telemetry
User Manual
Version No. 4.0
Issue 1



Datapaq is the world's leading manufacturer of process temperature monitoring instrumentation. The company maintains this leadership by the continual development of its advanced, easy to use 'Tracker' systems.

Europe & Asia
Datapaq Ltd.
Deanland House, 160 Cowley Road
Cambridge, CB4 4GU
England
Phone (+44) (0)1223 423141
Fax (+44) (0)1223 423306
E-mail: sales@datapaq.co.uk
Web: http://www.datapaq.com

North & South America
Datapaq, Inc.
187 Ballardvale Street
Wilmington, MA 01887
USA
Phone (+1) (978) 988 9000
Fax (+1) (978) 988 0666
E-mail: sales@datapaq.com
Web: http://www.datapaq.com

Datapaq part number MA3190A

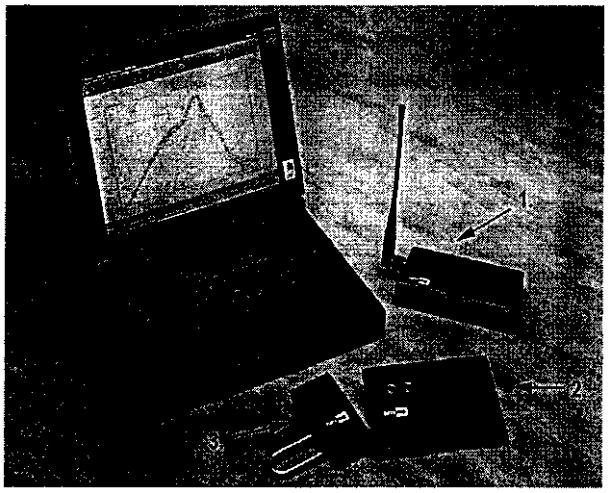
Contents

Radio Telemetry

1.1 Overview

Radio telemetry provides the means of observing the temperatures your product experiences as it passes through the oven, in *real-time*, as it happens; with no physical connection between data logger and analysis software.

1.2 System Elements



Radio telemetry modules.

1. Receiver, 2. Data logger, 3. Transmitter.

In addition to the data logger, which is discussed in Chapter 2, the system hardware comprises radio transmitter, receiver and thermal barrier.

1.2.1 Transmitter

The transmitter module is pending approval to national specifications as follows;

USA FCC Part 90: 1996 Clause 90.217

Specifications

Frequency	464.074 to 464.875 MHz
Effective radiated power	10 mW
Range	200 metres open space, typically 30 metres when in oven.
Temperature range	0 to 70 °C
Humidity	85% RH non condensing

1.2.2 Receiver

The receiver passes the digital data directly to the PC via the Coms cable (supplied). It must be tuned via the dip switches to the same frequency as the radio. It has a signal strength meter and no external controls.

USA FCC Part 15

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

1.2.3 Thermal Barriers

Thermal barriers are available for both standard width and narrow width data loggers.

Barriers for DP9042A, DP9061A and DP9064A Data Loggers

TB2017A

Temp. °C	100	150	200	250	300	400	500	800
Duration (minutes)	24	14	11	9.5	8.5			
Physical Dimensions	Height 25mm		Width 132mm		Length 259.5mm		Weight 0.85kg	
Heatsink	N/A							

TB2018A

Temp. °C	100	150	200	250	300	400	500	800
Duration (minutes)	11	7	4	3.5	2			
Physical Dimensions	Height 18mm		Width 131mm		Length 259.5mm		Weight 0.75kg	
Heatsink	N/A							

Barriers for DP9161A and DP9069A Data Loggers

TB2019A

Temp. °C	100	150	200	250	300	400	500	800
Duration (minutes)	11	7	4	3.5	2			
Physical Dimensions	Height 28mm		Width 84mm		Length 324mm		Weight 0.65kg	
Heatsink	N/A							

TB2022A

Temp. °C	100	150	200	250	300	400	500	800
Duration (minutes)	24	14	11	9.5	8.5			
Physical Dimensions	Height 35mm		Width 84mm		Length 324mm		Weight 0.7kg	
Heatsink	N/A							

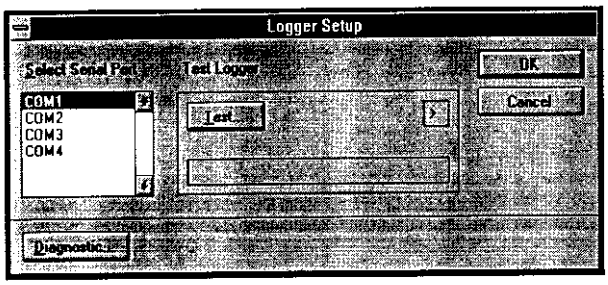
1.3 Setting up and Testing the System

Setting up and testing the system involves testing the radio communication and confirming the default frequency to which the transmitter and receiver are tuned is appropriate. If the level of interference found during testing is unacceptable it may be necessary to select an alternative frequency.

1.3.1 Testing Communications On the Bench

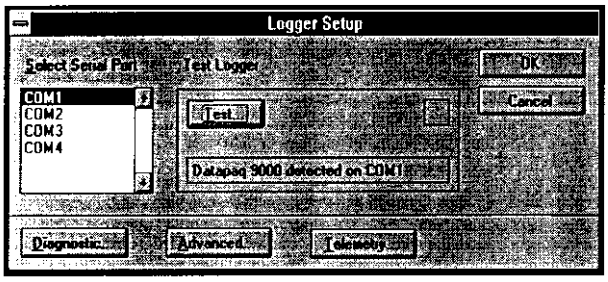
1. Couple the transmitter and data logger using the transmitter's two captive bolts.
2. Using the cable supplied connect the data logger to the appropriate COM port on the computer.
3. Connect the thermocouple probes to the data logger.
4. If not already running, launch the Datapaq Tracker software.

5. From the **Logger** menu, choose **Setup...**.



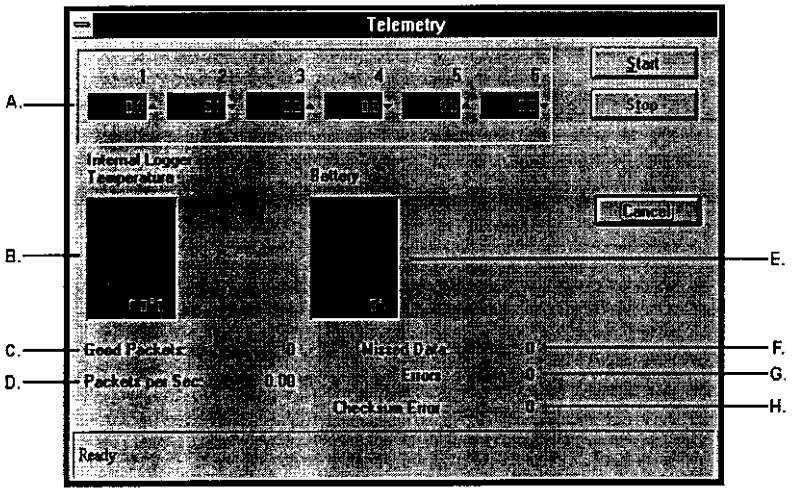
*The **Logger Setup** dialog box appears.*

6. In the **Select Serial Port** list box, select the number of the communication port to which the logger is connected.
7. Click on the **Test...** button.



If the data logger is detected, its type and the COM port to which it is connected are displayed. Additional buttons, Advanced... and Telemetry... appear.

8. Click on the **Telemetry...** button.



*The **Telemetry** dialog box appears.*

A. **Real-time digital displays.**

B. **Internal Logger Temperature**. A color bar graph showing the temperature inside the data logger. Colors are; blue below 25 °C, green from 25 to 60 °C, red above 60 °C. Note, the maximum permissible temperature is 70 °C, above which the logger turns off.

C. **Good Packets**. Counts the valid data received and processed by the software.

D. **Packets per Second**. The rate of data received.

E. **Battery**. A color bar graph indicating the charge status of the logger's battery. Colors are red below 25 °C, otherwise green.

F. **Missed Data**. The number of packets transmitted, but not received.

G. **Errors**. The number of incomplete or invalid packets.

H. **Checksum Error**. The number of valid packets received containing invalid data.

9. Click on the **Start** button. The logger's red Status LED flashes continuously and the message 'Remove comms cable and insert it in the receiver' appears at the bottom of the **Telemetry** dialog box.
10. Disconnect the comms cable from the logger. The logger's green Status LED flashes.
11. Connect the comms cable to the receiver. The receiver's signal strength meter indicates data is being received and live data appears in the **Telemetry** dialog box. Continue monitoring to ensure data transmission is reliable.
12. Re-connect the comms lead to the logger. The logger's Status LED stop flashing and data transmission stops.

1.3.2 Selecting a Frequency

Frequency allocations are defined by national and international regulations. The default frequency may be appropriate, but if this frequency is already in use an alternative can be selected from the following table.

Note: *Both transmitter and receiver must be tuned to the same frequency*

Frequency Allocations

Frequency Allocations - USA

Channel Center Frequency (MHz)	Switch Settings					
	S1/1	S1/2	S1/3	S1/4	S1/5	S1/6
464.075	ON	ON	ON	ON	ON	ON
464.100	ON	ON	ON	ON	ON	OFF
464.125	ON	ON	ON	ON	OFF	ON
464.150	ON	ON	ON	ON	OFF	OFF
464.175	ON	ON	ON	OFF	ON	ON
464.200	ON	ON	ON	OFF	ON	OFF
464.225	ON	ON	ON	OFF	OFF	ON
464.250	ON	ON	ON	OFF	OFF	OFF
464.275	ON	ON	OFF	ON	ON	ON
464.300	ON	ON	OFF	ON	ON	OFF
464.325	ON	ON	OFF	ON	OFF	ON
464.350	ON	ON	OFF	ON	OFF	OFF
464.375	ON	ON	OFF	OFF	ON	ON
464.400	ON	ON	OFF	OFF	ON	OFF
464.425	ON	ON	OFF	OFF	OFF	ON
464.450	ON	ON	OFF	OFF	OFF	OFF
464.475	ON	OFF	ON	ON	ON	ON
464.500	ON	OFF	ON	ON	ON	OFF
464.525	ON	OFF	ON	ON	OFF	ON
464.550	ON	OFF	ON	ON	OFF	OFF
464.575	ON	OFF	ON	OFF	ON	ON
464.600	ON	OFF	ON	OFF	ON	OFF
464.625	ON	OFF	ON	OFF	OFF	ON
464.650	ON	OFF	ON	OFF	OFF	OFF
464.675	ON	OFF	OFF	ON	ON	ON
464.700	ON	OFF	OFF	ON	ON	OFF
464.725	ON	OFF	OFF	ON	OFF	ON
464.750	ON	OFF	OFF	ON	OFF	OFF
464.775	ON	OFF	OFF	OFF	ON	ON
464.800	ON	OFF	OFF	OFF	ON	OFF

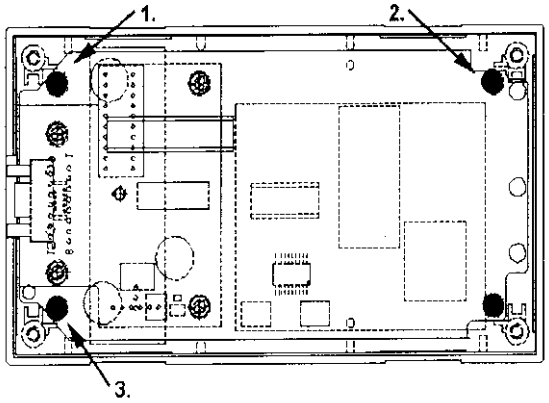
Frequency Allocations - USA, Continued

464.825	ON	OFF	OFF	OFF	OFF	ON
464.850	ON	OFF	OFF	OFF	OFF	OFF

1.3.3 Changing the Frequency

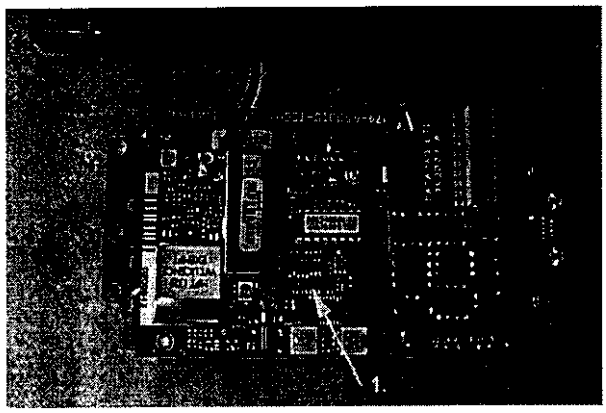
Receiver

1. Select the new frequency.
2. Remove the four self adhesive feet from the bottom of the receiver to reveal the four cover retaining screws. Remove the screws, then the cover.



The receiver with the cover removed showing the three PCB retaining screws.

3. Remove the three PCB retaining screws and carefully rotate the PCB.



The receiver's PCB showing the DIP switch (1.).

4. Set the DIP switch to correspond with the switch settings applicable to the new frequency.
5. Re-assemble the receiver.

Transmitter

Access to the transmitter's DIP switch is via the 'Remove To Set Freq' label on the underside of the transmitter.

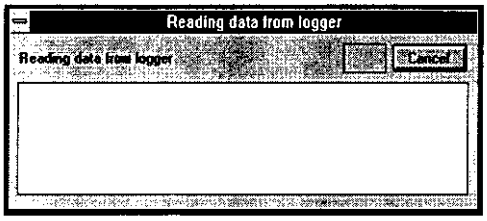
1. Remove the 'Remove To Set Freq' label.
2. Set the DIP switch to correspond with the switch settings applicable to the new frequency.
3. Attach a new 'Remove To Set Freq' label.

1.4 Programming the Data Logger

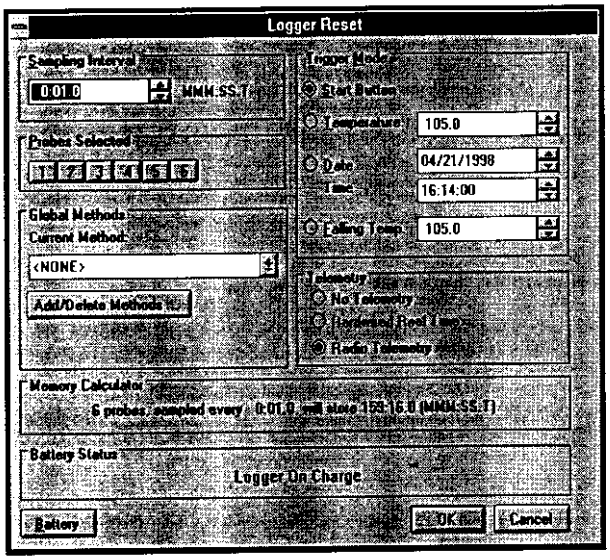
This section supplements the Acquiring Data section of the software manual (which should be referred to for recommendations regarding probe location and attachment) The logger, having been programmed, can be activated to capture a repeat profile by simply pushing the Start button.

1. Couple the transmitter to the data logger using the logger's two captive bolts.
2. Connect the data logger and computer using the cable supplied. Five flashes of the logger's red LED confirms communication with the computer.

3. On the **Standard Toolbar**, click on the **Reset** button.



*The **Reading data from logger** dialog box appears followed by the **Logger Reset** dialog box.*



*The **Logger Reset** dialog box.*

1.4.1 Selecting a Method

Different products require different test methods, but to ensure new data is comparable with historic data, the test method defined to suit the product should be repeated each time a sample of that product is profiled.

Selecting a Method from the Library

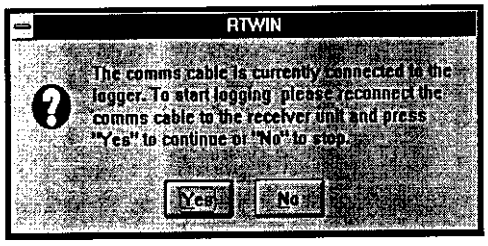
Note: With the exception of methods employing a Date Time trigger where the trigger's Date and Time is adjustable after recall, recalled methods cannot be modified.

1. In the **Logger Reset** dialog box, click on the down arrow in the **Current Method** drop down list box. If the required method is not listed define the method as shown in the Defining Methods section of the Software Manual . Otherwise proceed to Step 2 below.
2. In the **Current Method** drop down list box, click on the appropriate Radio Telemetry Analysis method. This should automatically select the **Radio Telemetry** option from the **Telemetry** options.
3. If the selected method requires a Date Time trigger, type the date and time in the appropriate spin boxes.

Checking Battery Status

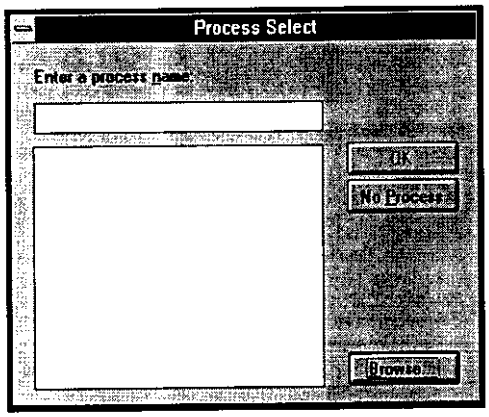
Nickel Metal Hydride batteries discharge slowly even when not in use and will require charging if left for more than three weeks. A full charge can be completed in 2 hours.

1. If connected, remove the charger plug from the comms cable.
2. Click on the **Battery** button.
3. Check the **Battery Status** indication, recharge batteries if necessary.
4. Click **OK**. The **Resetting Logger** dialog box appears, followed by a Warning dialog box.



The Warning dialog box.

5. Disconnect the comms cable from the data logger and connect it to the receiver. Reconnect the charger plug to the comms cable to power the receiver. The radio transmitter starts to transmit data unless the method defines a time or Start button trigger.
6. Click on the **Yes** button.



*The **Process Select** dialog box appears.*

7. In the **Process Select** dialog box select a process. The process cannot be changed during the real time run.

8. Click **OK**. The PC is ready to receive data.

Unless the method defines a manual start via the Start button the data acquisition will start and the oven start will be aligned when the trigger is received.

1.5 Installing the System into the Thermal Barrier

Before proceeding ensure the thermal barrier, and where appropriate, the heatsink have cooled sufficiently since the last test.

A good seal between thermal barrier and thermocouple cables is essential if the data logger is to be protected.

1. Examine the barrier's mating surfaces ensuring they are clean and undamaged.
2. Plug the thermocouples into the Data Logger's numbered sockets, ensuring the probe/socket numbers correspond to those used to define probe numbers and locations.
3. Open the thermal barrier's lid and put the data logger in place ensuring the Start/Stop buttons are visible. Lay the thermocouple cables across the sealing material to exit the barrier at the cutout, ensuring they are side by side and do not cross other cables.
4. If the start of data acquisition is to be manually triggered, push and hold down the green Start button until the green LED flashes at the sampling interval.
4. Close the lid ensuring a good seal around the thermocouple cables.

1.6 Placing the System in the Oven

See section Placing the System into the Oven of the hardware manual.

1.7 Collecting Data in Real Time

Real Time data collection operates in a very similar way to normal operation of the software, however there are some additional features and restrictions in the way the software operates which are described in the following sections.

1.7.1 Analysis Modes

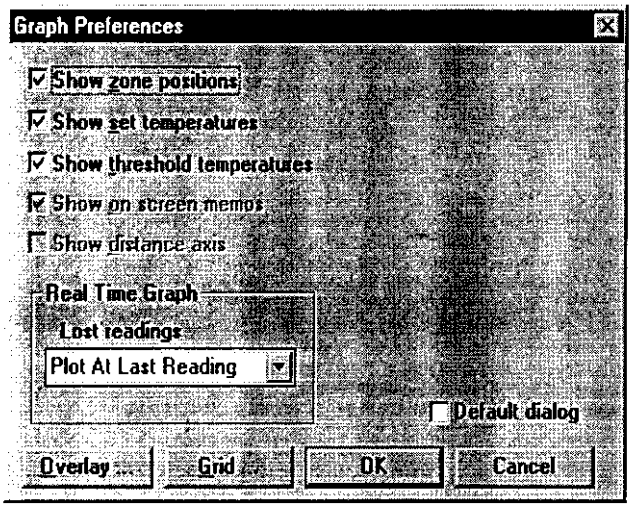
All the analysis modes described in the Software Manual are operational in real-time analysis mode. There are, however, some restrictions on the analysis mode options. These are:

Analysis Modes	
All Modes	Zoom available, but only via the Graph menu Zoom dialog box or holding down the right mouse button to reveal the analysis options
	All data, including any acquired before Oven Start, is included in the analysis calculation therefore calculate by zone cannot be implemented.
	Options selected via the Analysis Options dialog box cannot be changed during data acquisition.
Calculate Peak Differences.	Not available when align probes is selected. See Defining Product and Oven Section of the Software Manual

1.7.2 Graph Options - Lost or Missed Data

In the event that some data is lost during data transmission the Graph can be configured to display the data in the color of choice or simply left blank.

From the menu select **Graph**.. **Options**.. **Preferences**.



In the Real Time Graph Lost Readings list box select the option of your choice.

Plot At Last Reading will fill the gap where data has been missed with the last good reading received. To set the color of the trace for missed readings from the Menu select **Customize .. Colors**, highlight **Lost Readings** and select the color of choice.

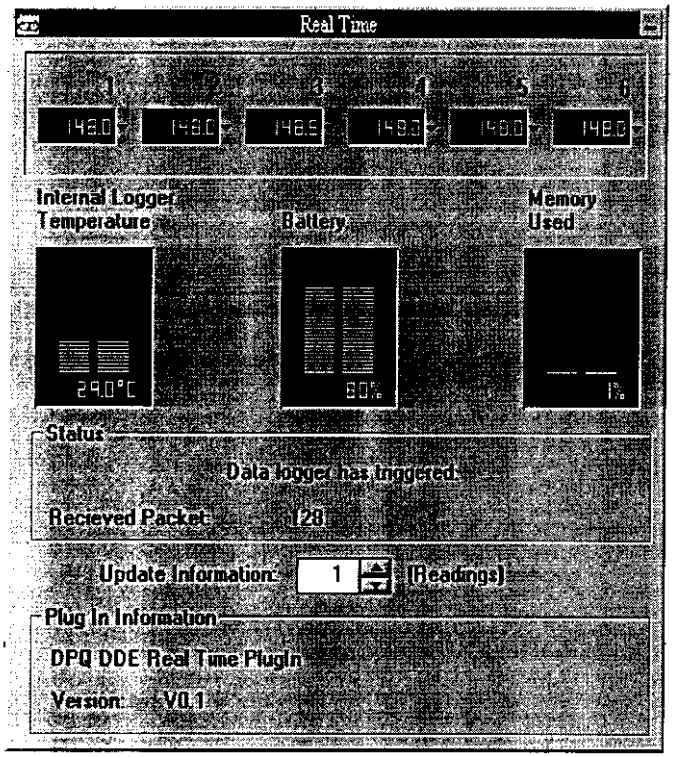
Leave Blank will simply leave a gap in the graph for the missed data.

The total number of missed readings for a run is shown on the Standard Report.

1.7.3 Real Time Tool

During a real time run information on the status of the data logger is available on the Real Time Tool. This shows the loggers battery status, internal temperature and memory status. It also shows the number of data packets received.

On the **Standard Toolbar**, click on the **Real Time Tool** button, or from the menu select **Window... Real Time Tool**. These options are only available during real time data collection.



1.7.4 Stopping and Saving the Real Time Run

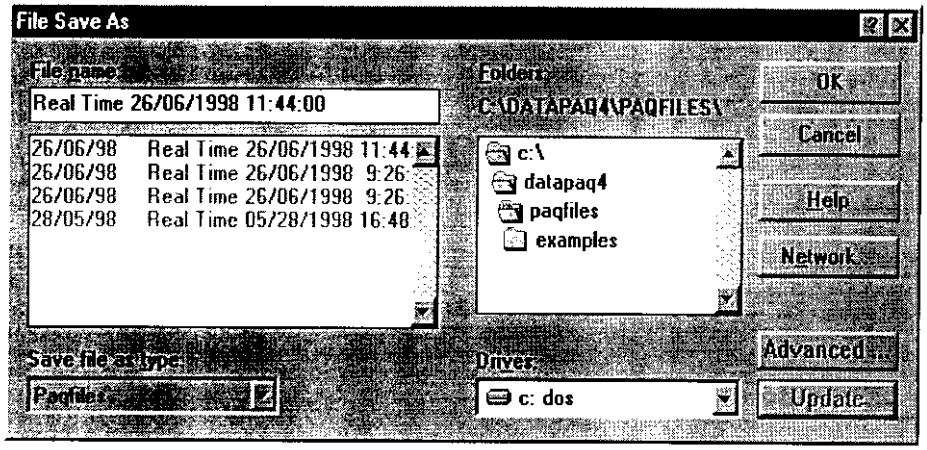
Once the run is complete real time data collection can be stopped in one of three ways;

1. By pressing the Stop button on the logger.

2. By plugging in the comms cable.

3. By selecting **Logger.. Stop Real Time** from the Menu

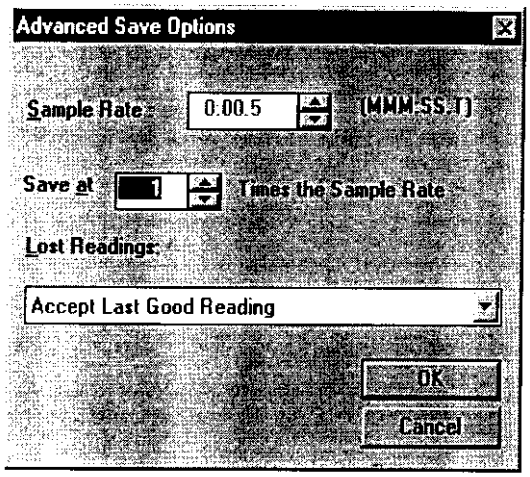
Whatever method used the software will display the File Save As window.



Save the file in the usual way.

1.7.5 Advanced Save Options

The Advanced Save options allow you to choose the sample interval at which the data is saved and how any missed readings are handled. These options are only available from the **Advanced..** button on the File Save as window at the end of a real time run.



Save at sets the intervals at which data is saved. To save every data point set this to 1.

Lost Readings allows a choice of how lost readings, if any, are saved. The choices are;

> **Save as Bad Data** will mark any lost data in the file as **N/A**. This data will not be used in calculations for the Analysis Views and will appear as blank on the graph.
>
> **Accept Last Good Reading** will fill in any gaps in the data with the last good reading received. This data will be used in calculations for the Analysis Views and will be displayed on the graph.

1.8. Repeat Profiling

Once a Real Time run is complete the data for the run is saved on the PC. However the data is also stored in the logger which can be downloaded for comparison with the real time data if necessary.

To perform another Real Time run without downloading or reseting the logger use the Listen Mode in the Tracker Software.

Note: *Exactly how the next run is started depends on how the previous run was stopped.*

1.2.1 Transmitter

The transmitter module is pending approval to national specifications as follows;

USA FCC Part 90: 1996 Clause 90.217

Specifications

Frequency	464.074 to 464.875 MHz
Effective radiated power	10 mW
Range	200 metres open space, typically 30 metres when in oven.
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USA FCC Part 15

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