T-TEC Data logger

USER'S MANUAL

Version 11A for Windows

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Acknowledgments: Thermochron is trade mark by Maxim Dallas. The I-Button-TMEX drivers and installation program for these have kindly been supplied by Maxim Dallas.
The installation program has kindly been supplied by JRSoftware.

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Preface:

Version 11 is the Windows version of the T-TEC program for data loggers and contains improvements over the former versions.
Version 11 supports data loggers types 501, type 6 and 7, with serial numbers starting with A, B, C, E, F, G, H, Y, P and V.
The software also supports the Thermochron data loggers Model DS1921 and the TempTec Reader for the Thermochrons.

We would like to thank our customers for their proposals for improvements to the program. These suggestions have been most helpful and are implemented as far as we could.
Any further suggestions to improvements to the program will be most welcome.

This manual contains instructions for installation and configuration of the program and some notes and examples for the use of the program. There is no detailed description of the functions in the printed manual as the program contains an extensive 'Help' file with all details. The manual is 'On Line'. Click on 'HELP' to access the information.

The help file also contains a small tutorial to ease the first understanding of the programs.-

Any new information, not available at the printing of this manual, is included in a text file Readme.txt.

Version 11 works with Win98/ME and Win NT, XP, Win2000 and VISTA. (Win98 series 1 and WinNT has no support for USB)
Please consult us for Win 3.11 and Win 95.

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Chapter 1: Installation

IMPORTANT: Copyright - limited use for software not licensed:
The software will work for 10 times only if not licensed. When you take out a license, we will supply a key which will unlock the software so it may be used continuously.

If you have bought your software, just fax back the registration form to receive your key by return email.

The key is a small file which should be copied to the same directory where the T-TECW program resides.

Upgrades: The software may be used to upgrade an older version of the T-TECW program, but you will need a key to make it work more than 10 times. Please email your serial number us and we will forward a key to you.

Version 11 is supplied on a CD with an installation program to make the installation easier. The CD also contains data sheets for some of our products and a copy of this manual in PDF format.

Installation & Configuration:

The software is best installed BEFORE connecting devices to the computer.

The T-TECW software supports:

T-TEC data loggers
TempTec 816 data logger
Thermochron data loggers

TempTec reader for Thermochrons.

The user can choose to install programs to support one or more of the devices.
We recommend to install all shown programs.

Installation is divided into three parts: Installation of software, installation of necessary drivers and configuring of the programs.

The installation program will work for WinNT/ Win98/XP/2000/NT/VISTA.
Please contact us if you want to install for Win3.11 or Win95.

Installing the T-TEC Software:

Please close all other programs first.

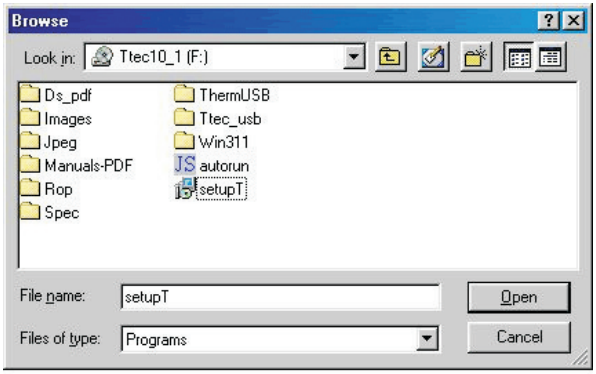
Do not connect cables to your computer yet.

Windows Vista: The CD will produce a window and ask for 'autorun'.
The CD has an overview of T-TEC products and installation instructions.

To install the program with the help of instructions here, just close the 'auto run' window.
Go to 'Start'
Click 'Computer' in the right field.
Select DVD/CD drive and double click on the program SetupT.exe.

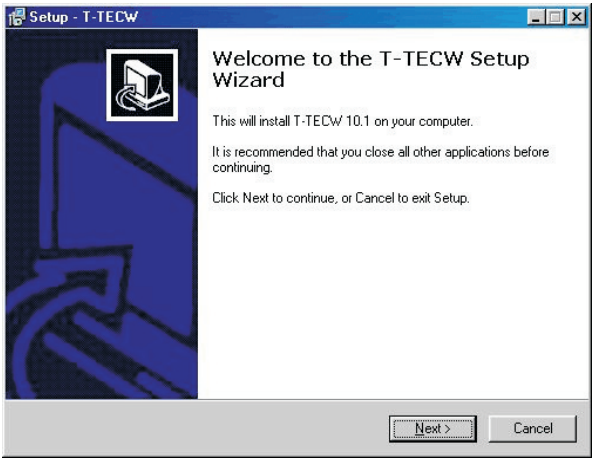
This program will install the software - please follow the instructions below for Win98.....Xp from 'Install Now'

For Windows NT/98/2000/XP:
Go to:
Start > Run > Browse.
Find your CD drive.
It should say:
T-TEC11_4
Choose: **setupT**



Install Now:

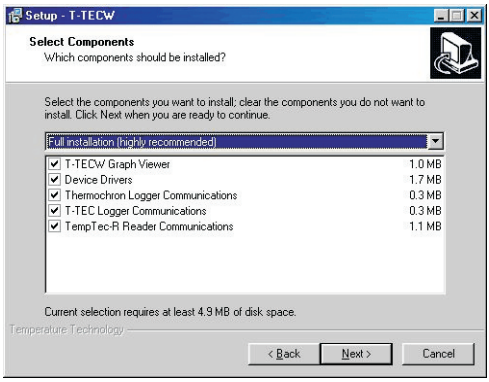
Installation starts with a Welcome screen.



Click Next.

Select Destination:
Choose Drive to install the program in:

The default is the C Drive.



Select components:
The T-TEC program has 5 components:
It is easiest to just install them all.

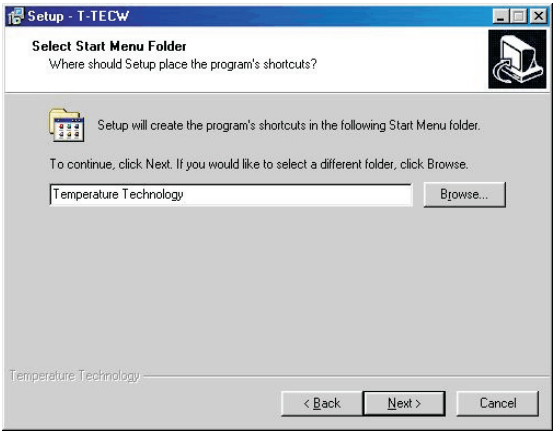
You will need
The T-TEC Graph viewer
The Device drivers

and **at least one** of the following communications programs:

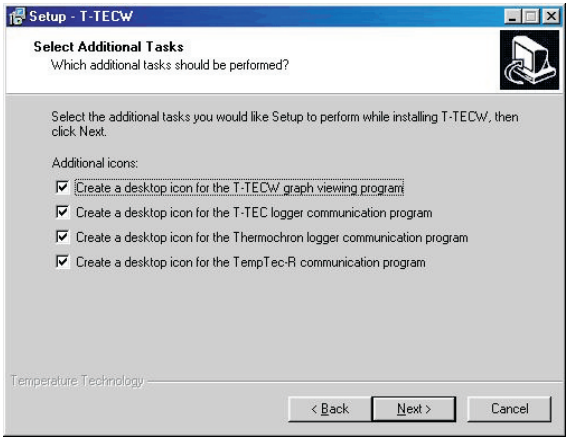
T-TEC Logger communications
Thermochron logger
communications

TempTec-R Reader communications

Start menu folder:
Click NEXT



Additional tasks:

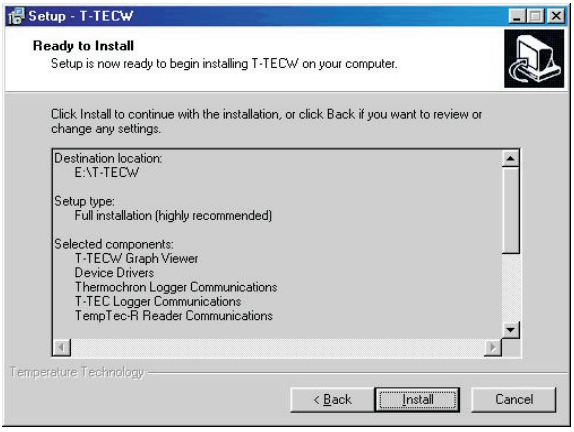


Select icons for your desk top. Again it is easy to select all.
You will need:
T-TECW Graph Viewer. From there you can access both Thermochon and T-TEC data logger communications programs.

If you have the **TempTec-R reader** you will need the icon for it as well.

Ready to install:
Click: INSTALL if you are happy with your choices or BACK if you want to change something.

Completing set-up:
Click: FINISH



.
Please connect the interface adaptor to the computer now and the device to the interface cable. If you install for more than one device, then connect one device at a time.

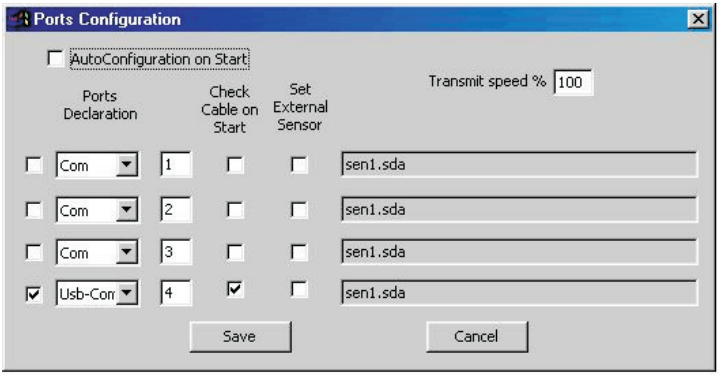
Installation of USB driver:
The drivers have been pre-installed for WinXp and Win2000 when the software was installed to make the process easier.
Connect the cable and the logger/reader to an USB port on the computer. The Windows system will detect the adaptor and either install the drivers automatically or start the 'Add New Hardware Wizard'.
If asked if you want to connect to Windows update, tick 'NO'.
Click 'Next' to continue.
The PC will ask you 'What do you want Windows to do?'
Please select 'Search for the best driver for your device'.
For WinXP/2000 the driver is now found automatically.
For Win98: 'Specify a location' and select the CD drive and the folder Ttec_USB for a T-TEC data logger or a TempTec-R reader or specify the folder ThermUSB for the Thermochron USB adaptor.

Click 'Next' and the driver will be installed.

Configuring the programs:
The program must be configured so the program can know which type logger is used and which port it is connected to on the computer.
Configuration is most easily done first time the program is used:

Configuration for a T-TEC data logger:
Connect a T-TEC data logger and open the T-TEC data logger communications program.
The program will now scan the ports on the computer and try to detect which adaptor is connected to which port.
The result will be shown in a window 'Port Configuration'. If one of the four small boxes to the left is ticked, then the program has found the adaptor and is configured.

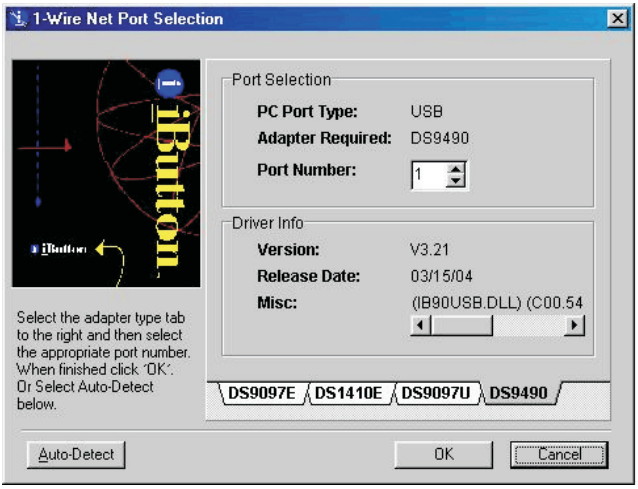
Then un-tick the small box at top: 'Auto configuration at start' to avoid having the program search each time it is opened.
Click 'Save'. The program is now ready to use.



If there are no ticks in any of the four boxes at the left, then the auto detect procedure could not find the interface adaptor. Please see Troubleshooting in the help file for the T-TEC program for possible solutions.

Configuration for Thermochron data loggers:

Open the Thermochron data logger communication program and connect a Thermochron Select 'Configure'.
A window with 'One Wire Net Port Selection' will come up. Click 'Autodetect' and 'OK' and then 'Yes' to save when the port has been found.

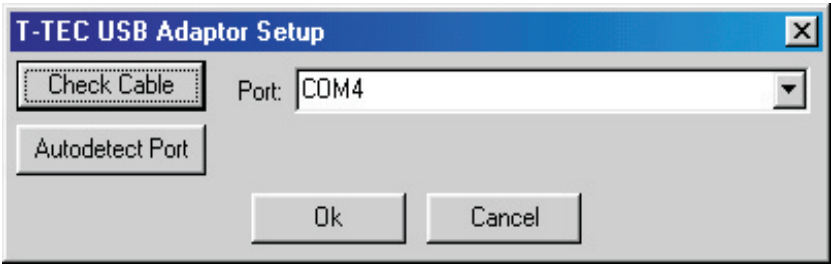


NOTE: The serial adaptor for the Thermochron may not work on all serial ports on a computer. Please try another serial port if it does not work.

The program will assign a default port for the 1-wire adapter. Other ports will not work unless the default port is changed (use Auto-detect).

Configuration for a TempTec-R Reader:

Open the TempTec_R communications program and connect a TempTecR reader.
Select 'Configure' and 'Configure Adaptor' and 'Autodetect Port'



The
n click 'Ok' to save.

In case of errors:
If needed, simply re-install the program. There is no need to un-install anything before re-installing.

Errors in Configurations: The configuration of the communications programs may be repeated later if needed:

To repeat the configuration process: Choose 'Auto-Detect.

To start the program: Double click the icon for the required program:

T-TECW Graph Viewer The graphic program for handling of data from the data loggers and the TempTec Reader.

Thermochron Logger is the communications program for Thermochron loggers.

T-TEC Logger is the communications program for the T-TEC logger.

Note: Both data logger communications programs can be accessed from the T-TECW program and this may be the most convenient way.

TempTecR communications program is the communication program for the TempTec Reader.

Chapter 2: Operating the data logger.

This section is the same as EXPRESS HELP in the on line manual - (Press F1 to see this) - it will show how to start the logger and read the logger without knowing anything about the facilities of the program. It is suggested, that a reading of the tutorial in the on-line manual may provide better knowledge.-

Communication with the data logger.
The T-TEC interface cable must be connected to the port which has been configured as described in chapter 1.

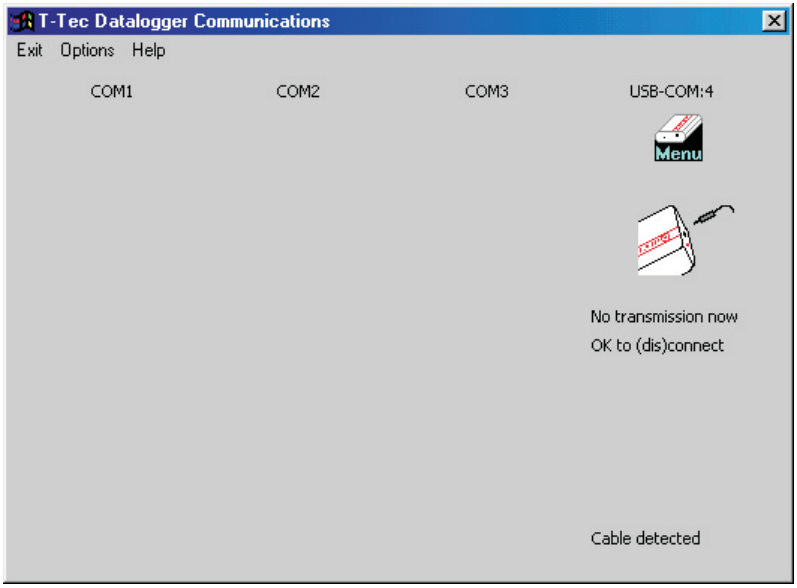
Now connect the data logger to the cable. This may be done at any time unless the red stop sign is displayed.

This sign indicates that active transmission between the computer and the data logger is taking place. It is very important to NOT connect or disconnect the data logger when this sign is shown on the screen. Transmission only takes a few seconds (longer in WIN NT)

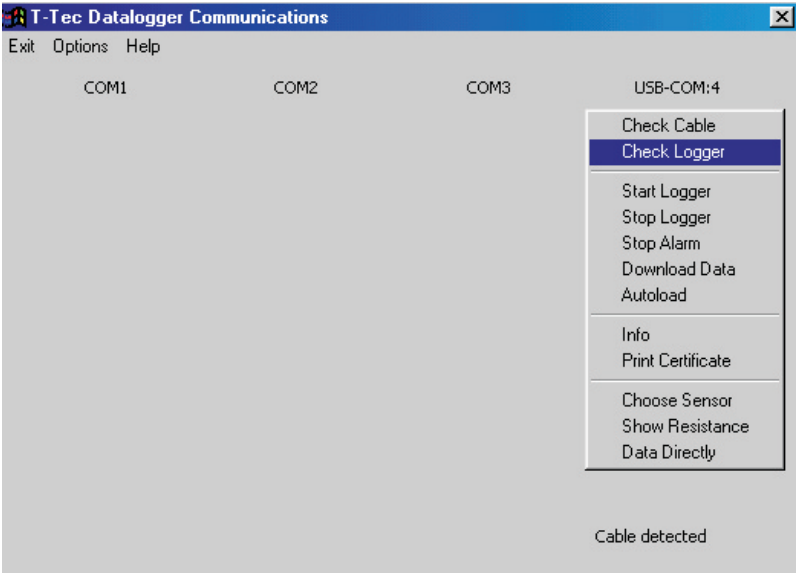
To read the T-TEC logger:
In the main window of the graphics program:
A) Select 'LOGGER' and 'To T-TEC logger '

B) Connect the logger to the cable when the communication window comes up.

The T-TEC Communications screen comes up:



D) Click on the MENU-icon to pull down the menu.



E)

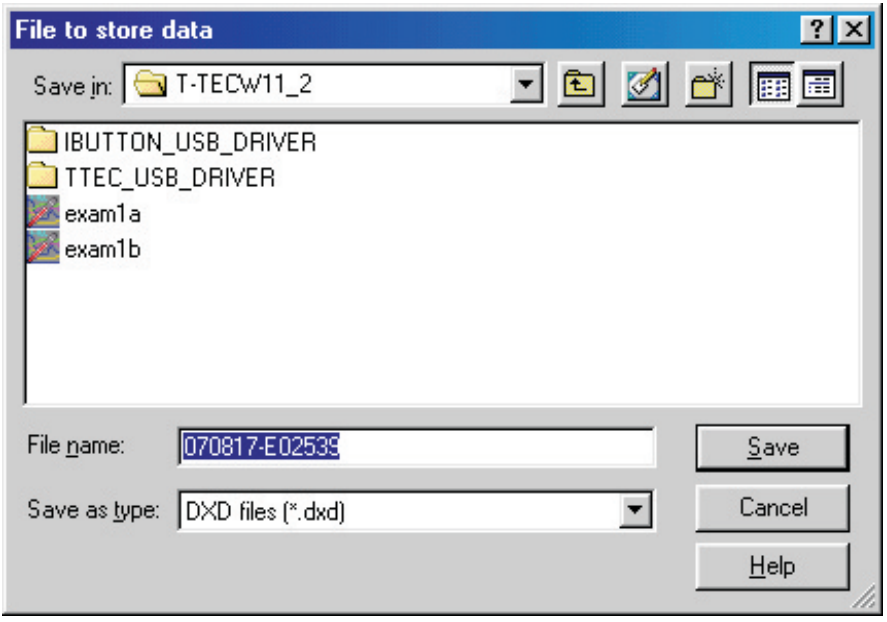
Click 'Check Logger'. The STOP SIGN will show for a short while. The identity information held in the data logger will be displayed as well as the actual temperature of the T-TEC logger.

F) Click menu again and click 'Autoload' to download the file of times and measurements held in the datalogger.

G) The data from the logger must be saved to a file first. A file window will appear. It will show a filename put together of the year, the month,

the date and the logger number. This name may be used or another name chosen with no blanks and no special characters. Click OK when ready.

H) The data from the logger will now be converted and show on the

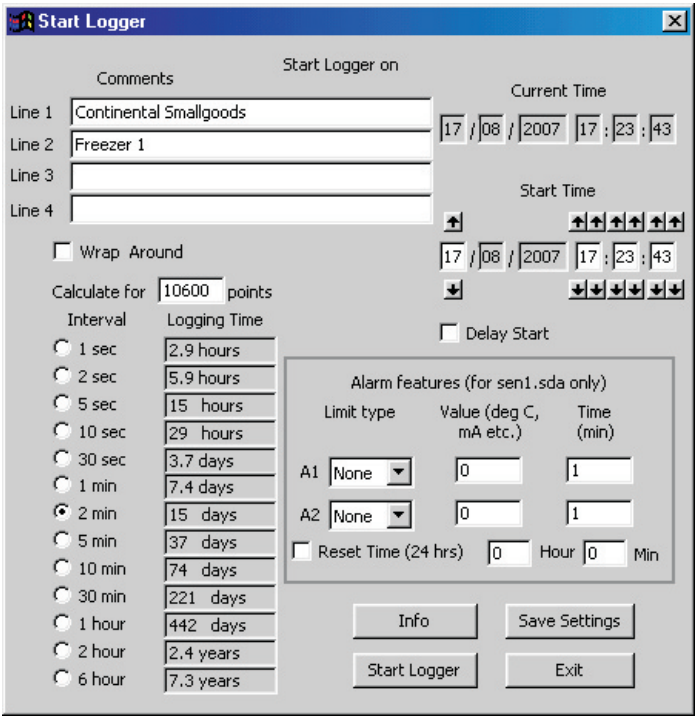


graph as a curve.

To start the logger:

Points A) to E) as above, then:

I) Click 'Menu' and 'Start Logger'. The 'Start Logger' window appears.



I. In this window set logging interval, start time, wrap around / stop when memory is full. Under comments you may type (optional) specific information for the new file the logger is going to log. (Tasks, names and places may be useful for identification later).

J) Current time:
The logger reads the internal clock of the computer at the time of start of logger and to get precise timing in real time, the clock in the computer should be adjusted with regular intervals - e.g., bi-monthly - depending on the accuracy of the clock.

K) Start time: The logger may be started with delayed start. Using the arrows, a later time for the start may be specified, up until 1 week's delay.

L) Alarms may be set as either minimum or maximum alarms.
Time: Grace period before alarm is triggered must be minimum 1 minute.

M) Click 'Start Logger' and 'Yes' to start the logger.

N) Wait until the stop sign disappears and exit this screen. The data logger is now logging as instructed. You can click 'Info' to check the new settings in the data logger.

O) 'Save Settings' if you have many data loggers to start up with almost identical settings. The start screen will then come up with the same settings each time.

P) If you would like hard copy of the set-up details, pull down the MENU again and click on 'PRINT CERTIFICATE'. The details may now be printed from Notepad.

Q) When the STOP SIGN disappears, disconnect the data logger from the cable. It can now be sent on its mission.

The Manual is on line. Click 'Help' in Top Bar.

The 'EXPRESS HELP' in the on-line manual will give you information about reading and starting the logger.

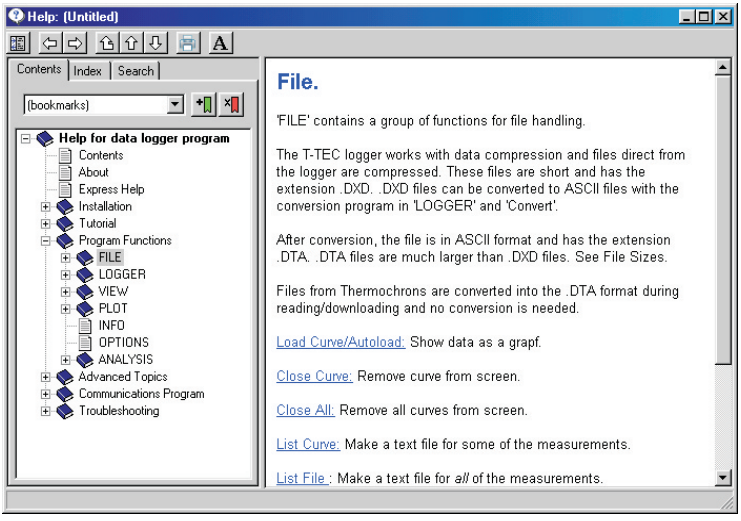
The 'TUTORIAL' in the on-line manual will take you through some of the many facilities this program offers.

Tutorial.

To access the Tutorial select 'HELP' from the top bar in the graphics screen, then 'Contents' and 'Tutorial'.

The help-text and the tutorial can stay on top of the T-TEC program so it is readable when working with the program. The tutorial will take about thirty minutes to an hour and is strongly recommended for new users.

The tutorial and any other topic in the 'Help/Manual' can be printed out by clicking the printer icon.



Chapter 3: *Program Facilities*

All information here is collected from the on-line manual. It covers some of the features we have found are important for the user and some of the features we are asked about when the program and logger are demonstrated.

How the system works:
The data logger contains a measuring circuit to measure the value from a sensor, a microprocessor to convert the measurements to numerical data and a memory to store the measurements in.

The data logger is set-up with the computer and the interval between measurements is chosen. The logger is then disconnected and will work as a stand alone unit, measuring with the set interval.

The logger can be set to collect data until the memory is full and then stop and keep all data or it may be set to use *Wrap Around* where it will go on collecting data, overwriting the oldest data.
The logger will then collect data on its own.
The logger can be re-connected to the computer and the collected measurements read from the logger to the computer where they may be displayed in different forms.

The interface cable contains electronics which make it possible for a standard PC to communicate with the logger and read the data stored in the data logger's memory.

Data Compression:
The T-Tec loggers use data compression for the data in the memory of the logger. The memory can then contain a greater number of measurements. The more constant the measurements are, the larger number of measurements the logger can keep. This is the reason we cannot give a fixed number of data a logger can contain. (Except the C-loggers which do not work with data compression and can store a fixed number, (3100 sets of measurements for older loggers and 10.600 sets for newer loggers) and F-loggers which can store a total of 21.000 measurements).

The Files:
When the computer reads the memory in the T-TEC logger, it creates a file with the extension .DXD. This is a complete copy of the data in the loggers memory and is in compressed format. To make it useful, it must be converted to a more readable format and the T-TEC program has facilities for this with the 'Convert' procedures in the LOGGER menu.
To make it easy, the 'Autoload' procedure will automatically convert new .DXD files and create a file with the same name as the .DXD file but with the extension .DTA.
Both .DXD files and .DTA files stay on the computers hard disk until they are removed by the user.
.DXD files are small, from 2.000 to 32.000 bytes. .DTA files are much larger and may be up to 700.000 bytes long.
Data from the Thermochron will be converted to a .DTA file directly and no .DXD files are created.

The program stores both file types from a T-TEC logger. It is easy for a user to make a backup copy of the .DXD files. A standard floppy disk can contain hundreds of .DXD files and the .DTA data files can always be re-created with the 'Convert' procedures. The .DTA files are used for

creating files suitable for export to spreadsheet programs.
For Thermochrons, the .DTA files must be saved.

Data logger with external sensor:
Different thermistor sensors will give different measuring ranges for the T-TEC data loggers. For example, a standard sensor (Type1) will measure from -40 to +85 degree Celsius and a T-TEC type 2 sensor from -100 to +20 DegC
If the datalogger has a fixed sensor, then the programs will detect this and automatically assume that a standard sensor type 1 has been used. If the logger uses an external thermistor sensor, then the sensor must be specified to the program.
See 'Choose Sensor' in the on-line manual.

.SDA files: (Sensor files)
The sensor is defined with values kept in a sensor file, e.g.,

sen1.sda for the standard temperature sensor (T1) range -40 +85°C
sen2.sda for the low temperature sensor (T2) -100 +20°C
sen6.sda for the high temperature sensor (T6) +20 +160°C

You can use your own thermistors if you so desire and create a sensor definition file yourself - see 'HELP' in the program under 'Advanced Topics - Thermistor sensors'.

Defective Sensors:
Logger for temperature:
A short circuited sensor will show a very high temperature and an open circuit sensor will show a very low temperature.

Alarms:
T-TEC Type 6 and 7 loggers (except loggers for humidity) contain an alarm function. Two alarm temperatures may be set when the logger is started, either as a maximum (Alarm if temperature exceeds a set limit) or as minimum (Alarm if the temperature falls below a set limit), and an individual delay time may be set for each alarm.

If an alarm is triggered, a T-TEC 6 data logger will indicate this with 'beeps': One beep if alarm1 has been triggered, two beeps if alarm2 has been triggered and three beeps if both alarms have been triggered. A T-TEC 7 data logger will show 'A1' if alarm1 has been triggered, 'A2' if alarm 2 has been triggered and 'A12' if both alarms have been triggered.

The beeping may be stopped by connecting the logger to the PC and choosing 'Stop Alarm' in the menu in the Communications Program.

An automatic reset may be activated when the logger is started. This will reset the alarm and the counters for delay(s) at a set time once a day. The function may be used to e.g. avoid an alarm situation during automatic defrost of freezers.-

Note: Alarm temperatures refer ONLY to sensor type 1. If another sensor is used, the settings will be incorrect, except for models marked L

Note 2: For T-TEC Data loggers type F with 2 channels, the alarm function works on sensor 1 only.

Relay output:
If you have a T-TEC Data logger with relay output, please refer to the instruction note in the box for the specific function.

A 3-wire cable for relay connection is provided. The relay connects the black and blue wires in reset and the black and brown wires in alarm.

Maximum load (resistive) for the relay: 1A 30V DC, 0.5A 125V AC.

Number of measurements for a logger.
The data sheets show the expected number for a specific logger type.

Data compression / Logging times
In 'Start Logger' there is a calculator. If the user types in the expected number of measurements (Depends on logger type) the calculator will show how long time the Data logger can log for at different intervals. Data loggers with data compression can contain more measurements if the measurements are much the same or only vary slowly.
For example, the temperature in a commercial freezer may vary from -23 to -20 deg.C, a variation of 3 degrees Celsius. Each cycle (top-to- top) may take around 1 hour. Compared to the logger measuring range of -40 to +70 deg.C, the variations are small, from top to bottom around 3%. Here we have registered around 28.000 to 30.000 measurements (logger type E) when setting the logger to 1 or 2 sec. intervals. The number of stored measurements will be smaller with longer intervals as the temperature will vary more between each measurement.

The following table may also be used:

Logging time at different intervals for different memory capacities.

Interval	3000 meas	12000 meas	20000 meas
1 sec	50 min	3.3 min	5.6 hours
2 sec	1.7 hour	6.7 hours	11 hours
5 sec	4.2 hours	17 hours	28 hours
10 sec	8.3 hours	33 hours	2.3 days
30 sec	25 hours	4.2 days	6.9 days
1 min	2.1 days	8.3 days	14 days
2 min	4.5 days	17 days	28 days
5 min	10 days	42 days	69 days
10 min	21 days	83 days	169 days
30 min	62 days	250 days	417 days
1 hour	125 days	500 days	2.3 years
2 hour	250 days	2.7 years	(4.6 years)
6 hour	2.1 Years	(8*.2 years)	

Notice: *: Battery lifetime may be shorter for some types.
A Thermochron can store 2000 measurements.

Stop of the logging:
The logger stops logging when:
The memory is full and the logger is set to stop at full memory,
The 'Stop Logger' function is selected in the communications program.
The re-set button inside the logger is pressed.

The logger does NOT stop because is connected to the computer and/or the memory in the logger is read. All communications happen in between the logger measurements. It may be set to log each second and can still be read without disturbing the logging.

It is not necessary to stop the logging when the logger is read or restarted.

Erasing of data in memory:
Data in the logger's memory are not erased or deleted. When the logger starts a new measuring cycle, the microprocessor in the logger resets all references to the existing data in the memory and the old data cannot be recovered. The new data then simply overwrite the old.
See *Change of Batteries* for precautions against loss of data when changing batteries.

More loggers can work together:
Some times one logger may tell what happened and another may tell why it happened.

Example Ex2-2 later shows results from two loggers working together. One logger is placed with the goods, another logger is placed to read the ambient temperature.

The first logger shows the temperature of the goods, the second shows why the temperature of the goods varied.

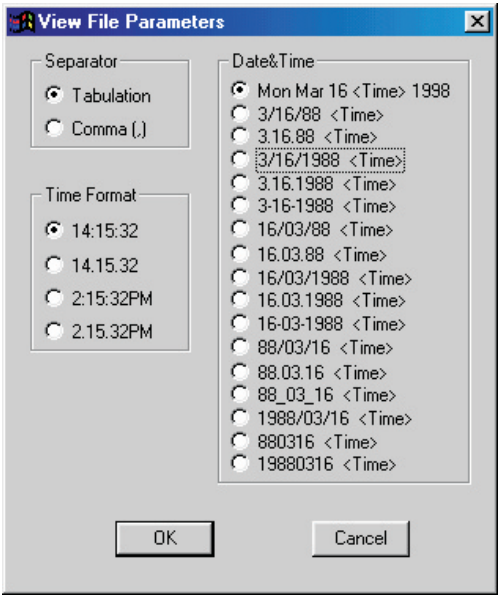
The T-TEC program can show up to eight graphs at the same time. When calendar time is selected as time scale, all loggers show what happened at the same time - six o'clock for one logger is also six o'clock for the other loggers. The loggers will the work together as a multichannel logger. There is no need to interconnect the loggers. Neither do the loggers need to be started at precisely the same time as long the measurements overlap in time. The computer synchronises all graphs to the computer's clock at the time of start of the loggers with a tolerance of +- 1 second.

Printing and export of files:

To get a list of measurements and times go to: 'FILE' - 'List *File*'
This creates a list which includes all the data from the file.
The data appear on the screen using "Notepad", "Write" or "Wordpad', depending on the operating system.

To limit the amount of data it is recommended to first zoom in on the important part of the file and then use: List curve.
'FILE' - List *Curve*' makes a list where only data seen on the screen are included.

The lists can be printed or saved to a file for later printing. The filename of a list has the same filename as the datafile with the extension .txt instead of .DTA. This file may be opened by spreadsheet programs. You will be given options of where to save the .txt file.
The format of the list can be chosen so that export to spreadsheet programs like Excel is as easy as possible.



Saving the graph for inclusion in reports or email:

For inclusion in reports or emails you may want to design the looks of the graph using 'zoom' 'add comments' 'add y-line etc.

To save the graph as it looks on the screen in a graphic format that may be inserted into word processor programs or sent as attachments to

emails, go to:

'FILE' - Export as .PNG
You will be given options of where to save the file.

Chapter 4: Batteries.

How long time the can the battery last?

This depends upon the type of logger, how often it measures and 'the circumstances'.

Expected battery life:

Replaceable by user:
T-TEC 501 manufactured before September 1998: 10 Months
T-TEC 501 manufactured after September 1998: More than 2 years.
T-TEC 6: 3.5 to 4 years
T-TEC 7: Approx 2 years.
TempTec 816: Battery should be changed once a year.

Batteries in Thermochrons are not replaceable.
Thermochron: 5-10 years, depending on the use and the temperatures:
In a freezer 2-3 years
In a refrigerator 5-6 years
In room temperatures 6-8 years.

Change of batteries:
The 'Check Logger' function in the communications program will display the actual battery voltage.

T-TEC 501 series uses two batteries, 3V Lithium Manganese batteries type CR2450.
Type 6 and 7 for temperature use one battery, 1/2 AA 3.7V Lithium Thionyl.

TempTec 816 uses one battery, AA 3.6V Lithium

Replacing batteries: If the batteries need replacement, it is recommended to change batteries before a longer measuring series.

A change of batteries in a logger containing data may result in loss of some of the newest data but the majority may be read after a change of batteries. An exception is earlier type loggers of type B where all data will be lost.
A logger set to 'Wrap around' will loose the correct start time when reset is pressed or batteries replaced and show a start time of 1st January 1970.

Access to the batteries:
For type 501: Remove the screw in the rear and the rear plate to get access to the battery. The narrow side of the coin type battery is negative and should turn towards the printed circuit.

For type 6 & 7: Remove the two screws in the sides and pull the two parts apart. When assembling the case: Take great care that the instrument is completely dry and that the O-ring is properly placed in the groove. Fasten the screws so the two parts just meet at the sides with the screws - Do not over tighten.

The 1/2AA type is marked + and -. Check with the markings on the battery holder to secure the battery is mounted the right way.
A battery inserted the wrong way round will be drained fast. It will not damage the instrument.

For TempTec 816: Battery cover is found at the side of the casing.
The + side of the battery must face the battery cover.

Logger reset:
When a new battery is inserted the logger responds with 3 beeps.
If you do not hear the beeps, it is necessary to press the switch marked reset inside the logger. The logger then resets, checks its batteries and makes three beeps or blinks if all is OK.
Some newer logger has 2 reset pins instead of the switch. A reset is done for these by removing the battery and then shortening the 2 pins. Reset - and three beeps - will then be executed.

Chapter 5: Examples.

The following examples show some measurements with the loggers and how the graphic program may be used to extract relevant information from the data.

Example 1 shows how to use the 'zoom' and the 'plot' function to set the graph as required.

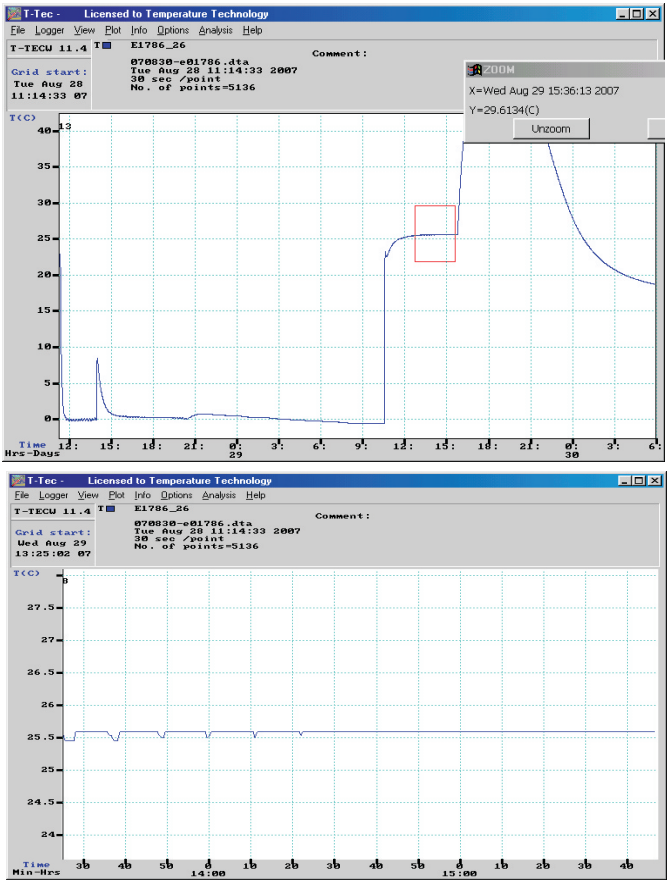
Example 2 is a simple measurement on a domestic freezer. It shows the use of two loggers, one with internal sensor and one with fixed external sensor. This example is based on the two files (Exam1a and Exam1b) supplied with the distribution disk.

Example 3 shows the result from a shipment of meat from Adelaide to Geneva in Switzerland. Two logger are used, one logger measures the temperature of the goods, the other ambient temperatures to try to see why the temperature in the goods changes.

Example 4 is based on measurements in our store room for a period of eight months and shows use of 'Smooth curve' or moving average.

Example 1: 'Zoom' & 'Plot'

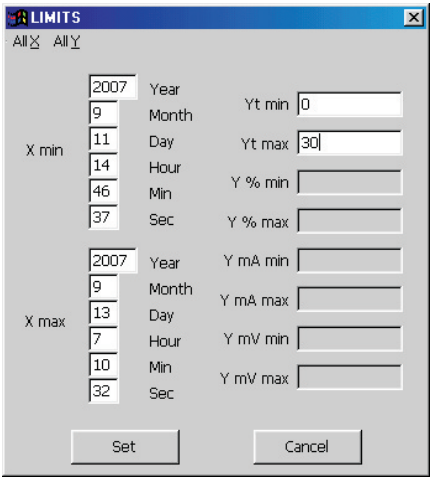
'VIEW - Zoom' can 'magnify' a part of the graph.
(Select 'Zoom'. Move the cursor to a point on the graph that should be the left bottom corner of the 'Zoomed' graph, press the left mouse button and hold it down. Drag the mouse until the box which appears contains the part to be 'magnified'. Then release the mouse button). The area of the graph inside the box is now magnified and it is easier to see the exact degrees and time.



PLOT:

This function is used for designing the graph for printing. The program auto-scales the graph to fit the curve/s that are currently showing.
For comparison between printed curves it may be preferable to have all the graphs using the same scales.

Press PLOT, then CLEAR and LIMITS.



In LIMITS you can set the scale (in the example minimum 0 and maximum 30°C) and the time you want on the graph. Click SET. Then you get back to the PLOT screen and you can plot: Scale X, Scale Y and then PLOT CURVE. The graph will appear as you have designed it.

Example 2: Measurements from a freezer:

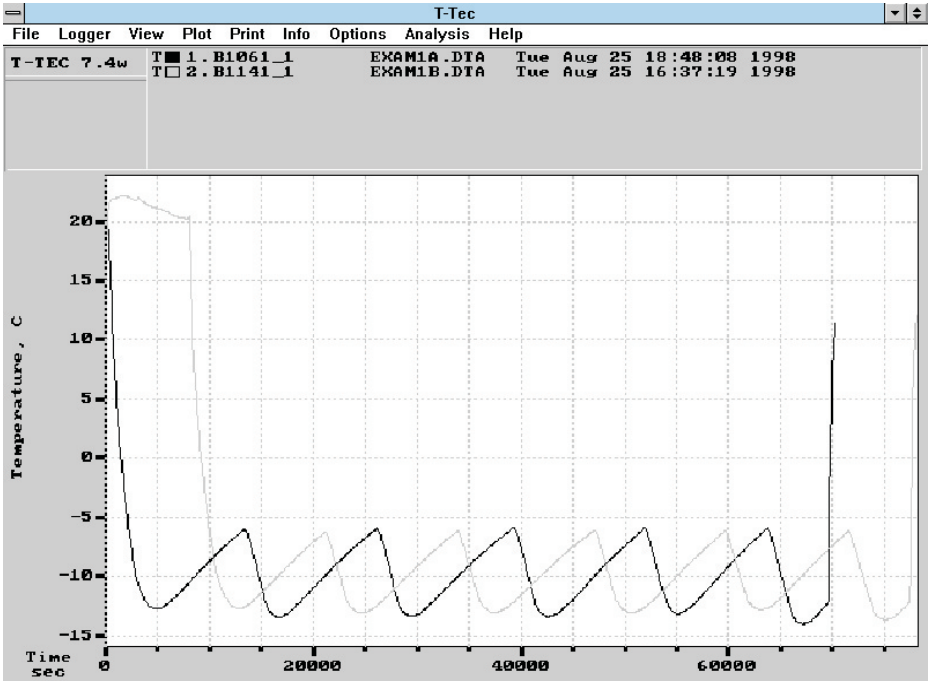


Fig Ex2-1

Two loggers used: B1061 has a fixed external sensor and B1141 an internal sensor. Logger B1141 is started approx 2 hours after logger B1061. Both loggers are set to measure once each minute.

After both loggers were started, they were placed side-by-side inside a domestic freezer and left there overnight.

When the loggers were read next day, the files were called Exam1A and Exam1B.

The two files are included in the distribution disk and may be used to try some of the features of the program.

The graph shows the raw data - the graph you will get if the files are loaded to the graph. - To get these curves on to your screen, click 'FILE - Load Curve ' for Exam1A.dta and 'FILE - Autoload first 8' to get the Exam1B - file to the screen. (Exam1A is converted on the distribution disk, Exam1B is not - see the on-line manual (Press F1) regarding file types).

Understanding the graph:
The graph shows the temperatures to the left and the time for measurements along the bottom. The time is in seconds from the start of the logger.
At the top of the graph there is a line with the words 'FILE-LOGGER ... etc..' which cover pull-down menus. A click on any of these words will give access to groups of functions.
Below this line is a field to the left divided in two parts: The top part shows the software version and the second is blank now.
To the right is another field which shows the file names and data logger identifications for the curves on the screen.
In case of one curve only, the field would show all details from the logger with time interval, number of points etc. With more than one curve on the screen, the information is reduced as shown here.
Full info about the curves can be found under 'INFO' in the top bar.
The small rectangles at the left shows T for temperature and H for humidity and the colour code for each curve.

The format with time scale in seconds (or minutes or hours) from the start of the logger is very useful if measurements taken at different times are to be compared - e.g., before and after a repair or summer compared to winter.

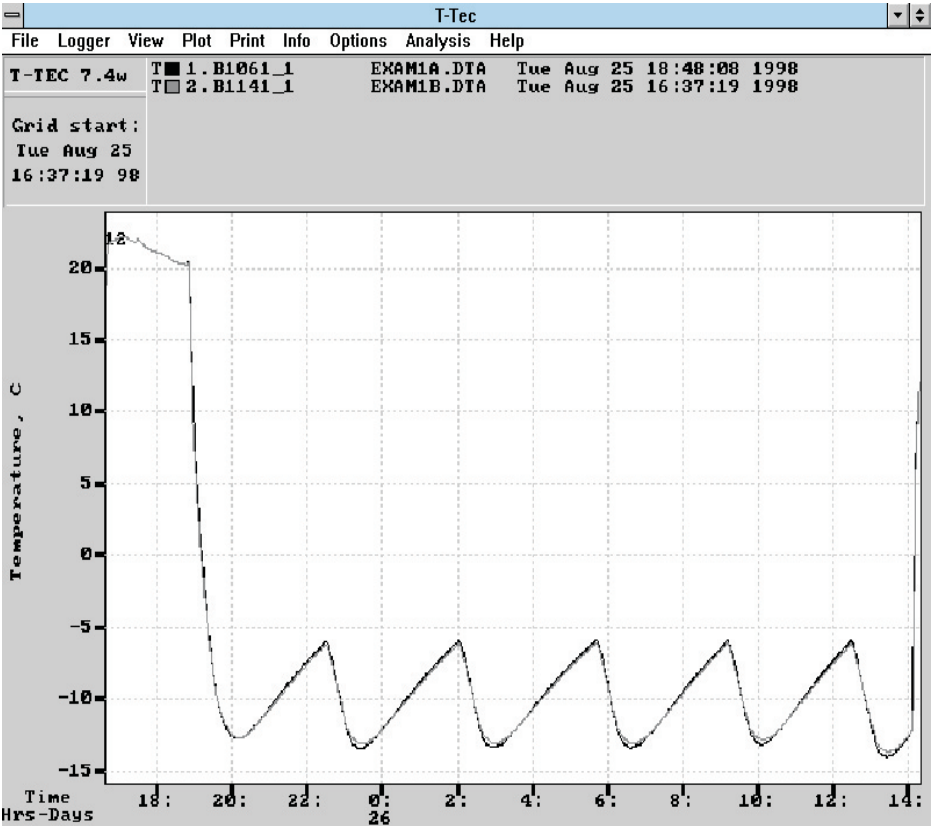


Fig Ex2-2

To get real time - month-day-hour etc - click on 'VIEW' in top bar and then 'Time Scales ' - 'Calendar'.
The graph will change to above picture.
The bottom of the top left field will now show the time for the start of the graph.
The numbers just under the graph show the time of the day in 24-hour

format. The line below shows day in the month as shown by the legend to the left.
The time intervals on the graph will be set so the graph can show all data from the logger. It could be months-days or minutes-seconds.

When the graph is changed to calendar time - real time - then six o'clock for one logger is also six o'clock for another logger. The loggers will therefore be synchronised in time and more loggers can work together as a multichannel logger.

As shown on Fig Ex2-2, it is not necessary that the loggers start at the same time. - One logger in this example was started several hours after the first. The software in the computer is able to synchronise the graphs as long as the measurements overlap in time.

Up to 8 curves may be shown together on the graph.

'ANALYSIS - Statistics' will drop a window with minimum, average and maximum values for the part of the curves that can be seen on the graph. Measurement values not shown on the graph are not included in the calculation.
Here, the average shows to be very close for the two loggers and the difference in minimum and maximum values shows the difference in time constants for the two loggers.

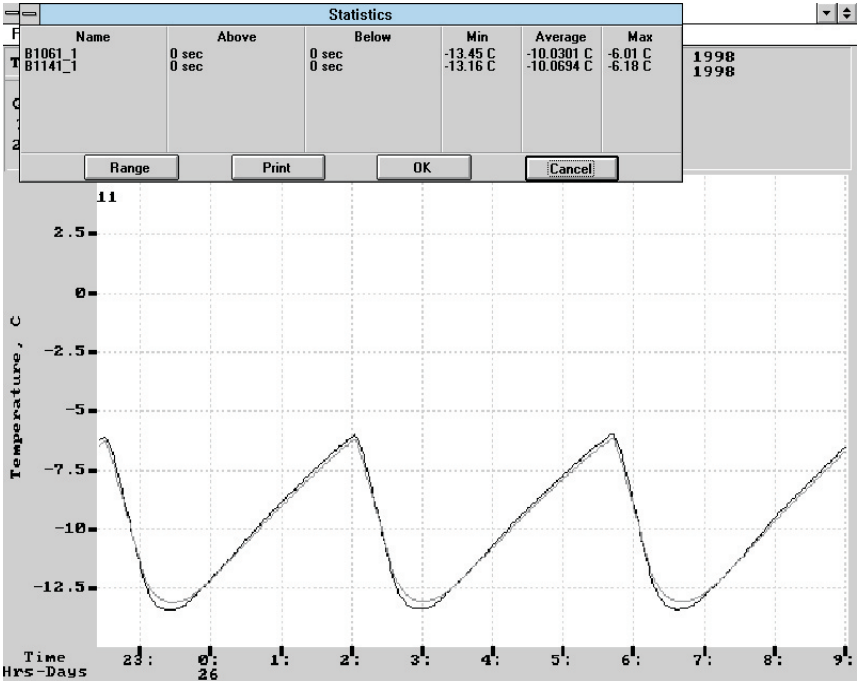
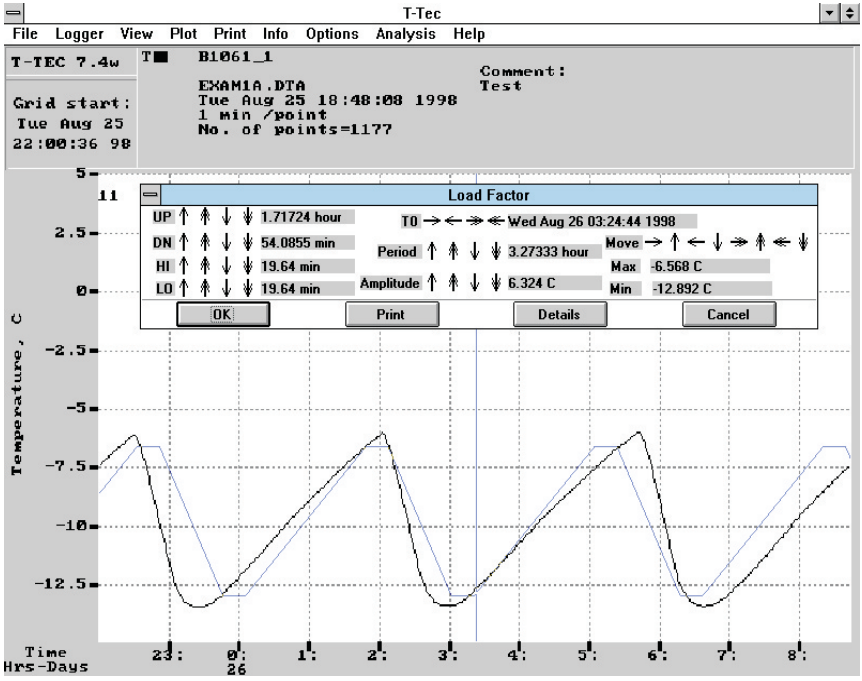


Fig Ex2-3

Load Factor



The curve Exam1B has been removed to get a simpler picture. ('FILE - Close Curve'), the curve has been 'zoomed' again and 'ANALYSIS - Load Factor' chosen.
The curve is now overlaid with another curve made of straight lines which averages the cycles. As described in the on-line help (Press F1 and use key word Load Factor), the overlaid curve can be manipulated to follow the original curve.

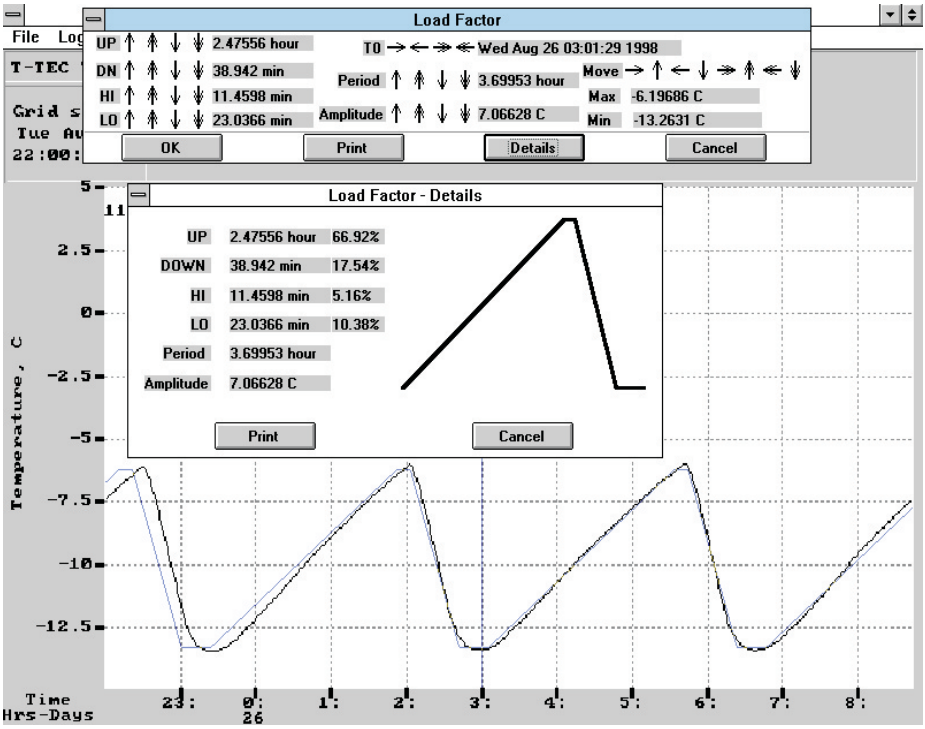
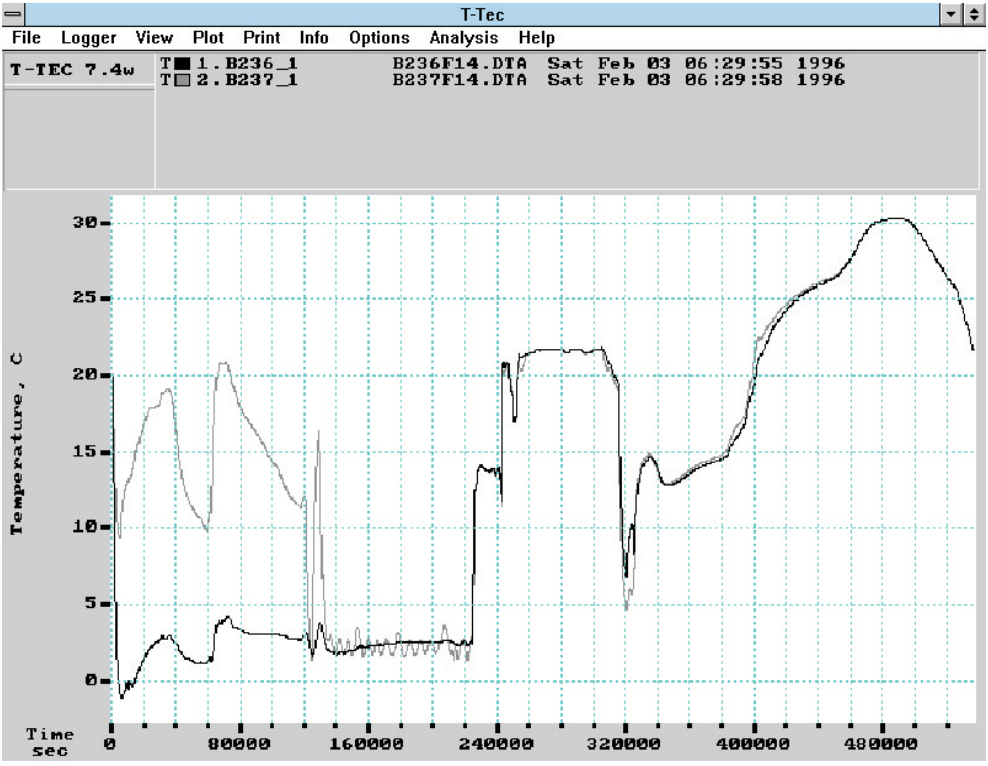


Fig Ex2-5

The overlaid curve is now modified to follow the cycle from 3 to 6.30 AM and 'Details' is used to get further information about the behaviour of the freezer.
The period time (From top to top) is 3.7 hours, the amplitude (difference between warmest and coldest point) is 7.1 deg.C. If the compressor starts when the temperature stops rising and stops when the temperature stops falling, then the compressor has been on for 22.7 % (17.54+5.16) and off for 77.3% of the time.

Example 3: A shipment of chilled meat.



<---------- Shipment ---------->|<--- Return of loggers by mail -------->

Fig Ex3-1

Meat packed into an insulated aircraft container. Two loggers used. One outside on a box inside insulation (B236). One outside insulation (B237). Raw data as read from logger after return in a jiffy bag. Time scale is seconds from the start of loggers.

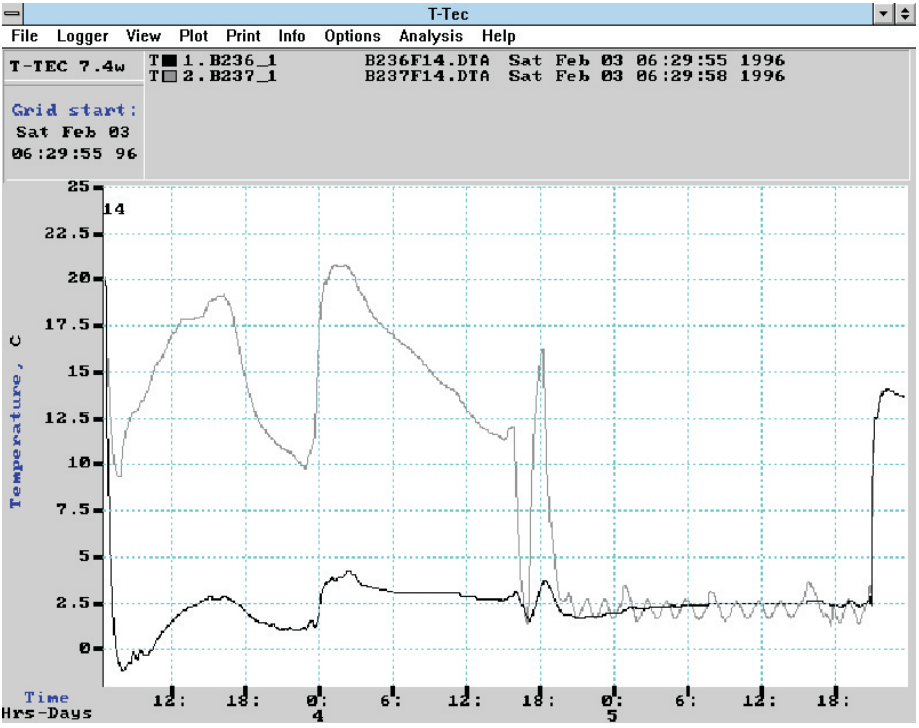


Fig. EX3-2

A) 'VIEW - Time Scales - Calendar' to change to real time with days & hours.
B) 'VIEW - Zoom' to cut off information from the return mail.

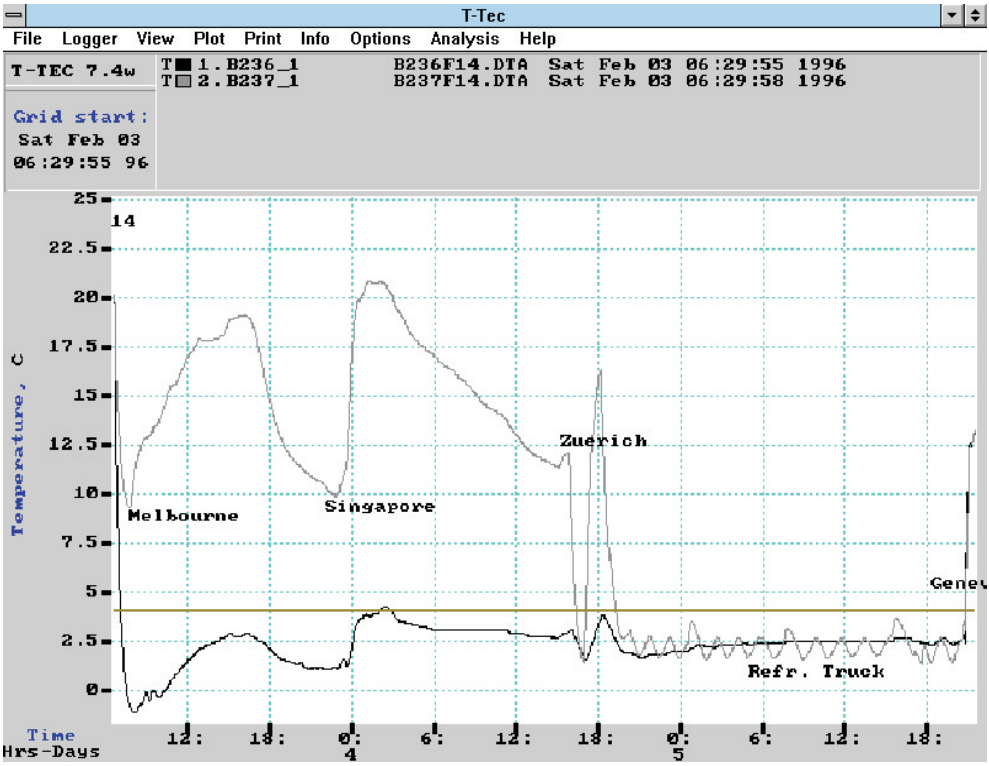


Fig. Ex3-3
C) 'View - Add Y line', 4 Deg.C
D) 'View -
Add Comments' for locations. (Matched with airlines.)
The shipment leaves Adelaide for Melbourne (Temperature falls during flight) and the cargo is left on the tarmac in Melbourne for approx. 10 hours. The next flight goes to Singapore where it is quickly loaded into a plane with destination Zurich. It is winter and cold in Zurich. The meat is loaded on a refrigerated truck in a warehouse and driven to Geneva.

Example 4. Store room temperatures.

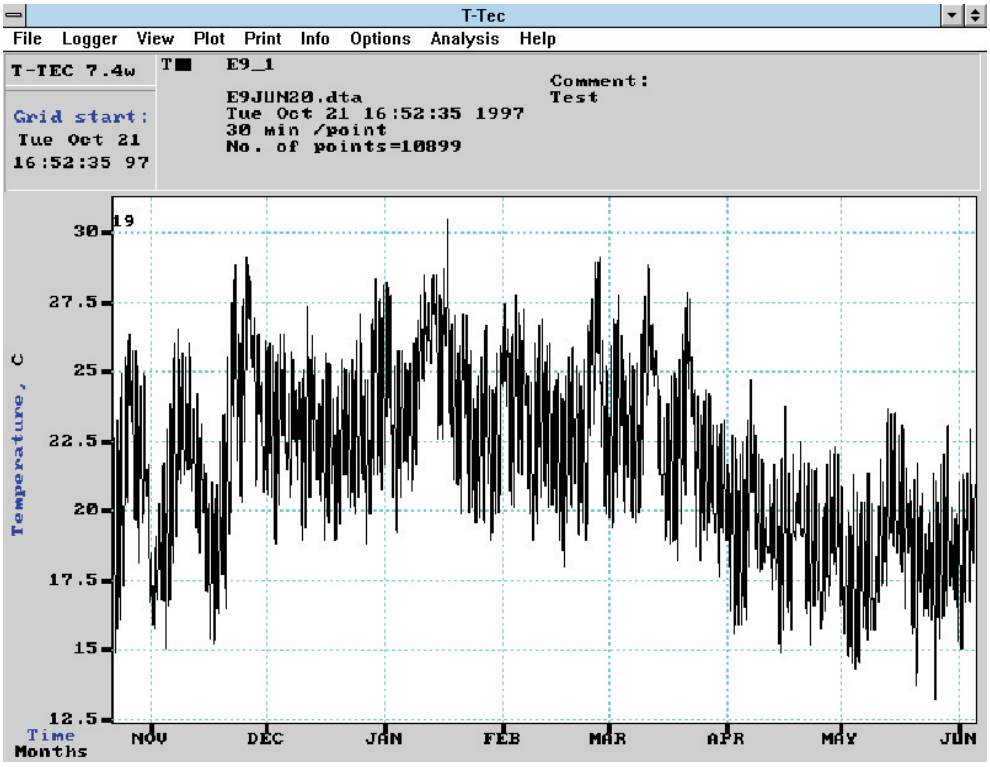


Fig. Ex4-1

Temperatures in store room over eight months. Time Scale set to 'Calendar' time, otherwise raw data.

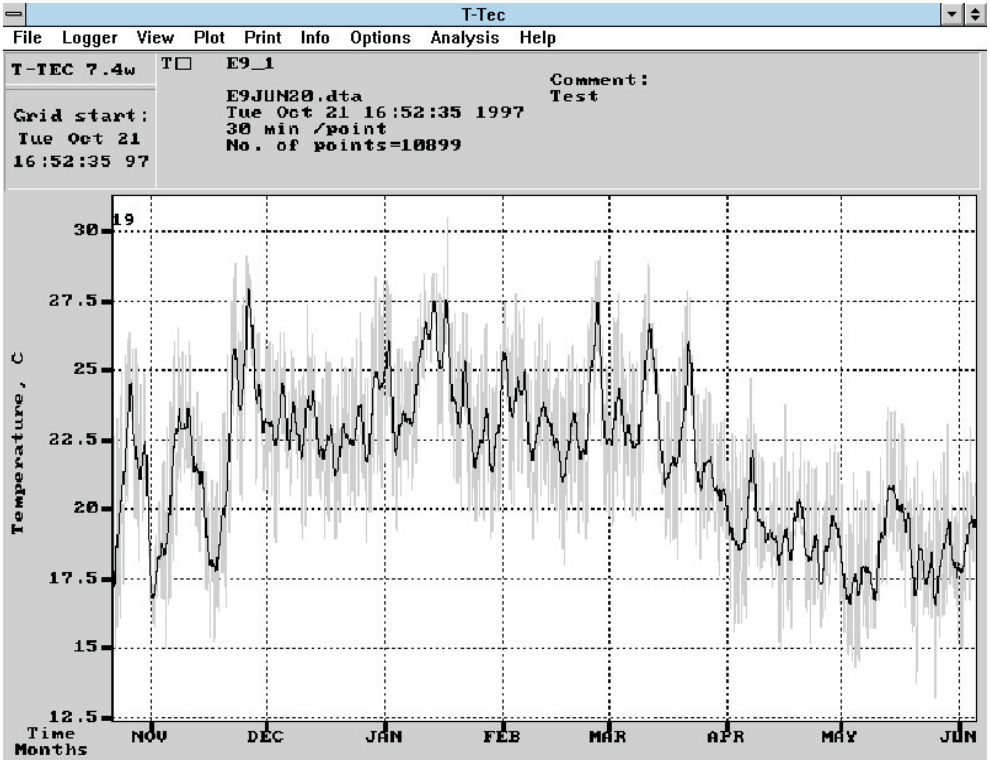


Fig. Ex4-2
A) 'OPTIONS - Graph Colors' used to change curve to light grey.
B) 'VIEW - Smooth' used to show moving average (or trend). Smooth factor set to 24, which with 30 minutes between measurements gives a 24-hour moving average.

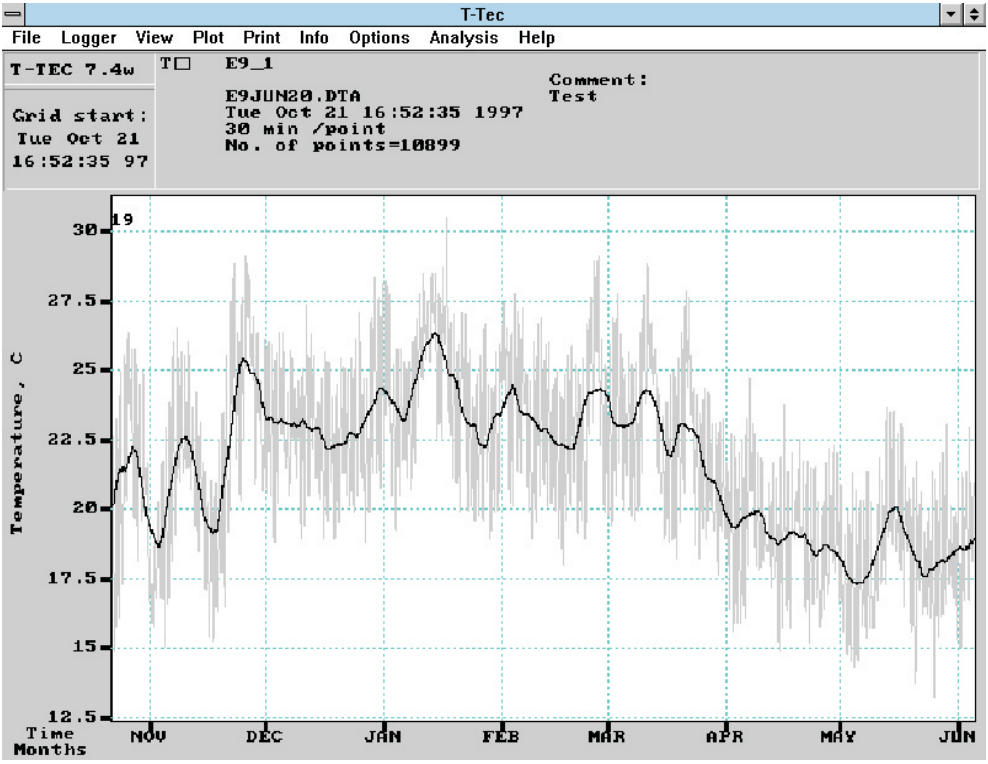


Fig Ex4-3.
As Fig Ex4-2 but 'Smooth factor' set to 168 to give a weekly moving average.

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