



TMS Terminal Emulator Interface Instructions (Text based) for the Thermal Management System (TMS)

Part Number: TMSB00000-01

Fan speed controller, 1 to 4 fans,
11-57V supply, highly configurable, alarm monitoring, enclosure.



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www.ebmpapst.co.uk/instructions



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DOCUMENT HISTORY

1	14 April 2015	Draft	Louis Abraka
Issue	Date	Comments	Name

The master of this document is stored at ebm-papst Chelmsford, Essex, UK:
T:\Design Projects\15148 - Controller GUI - epUK\OMI



1 Installation of Configuration Software on PC

1.1 Required Configuration Tools

Hardware:

For configuration, the TMS is designed to be connected to a PC using an ebm-papst supplied cable assembly ebm-papst part number 210-HAR11887, PC USB to TTL serial data adapter. The appropriate driver program must be installed on the PC, instructions below. The cable and the driver software have been tested with the TMS on MS XP, Vista & Windows 7 operating systems.

Software:

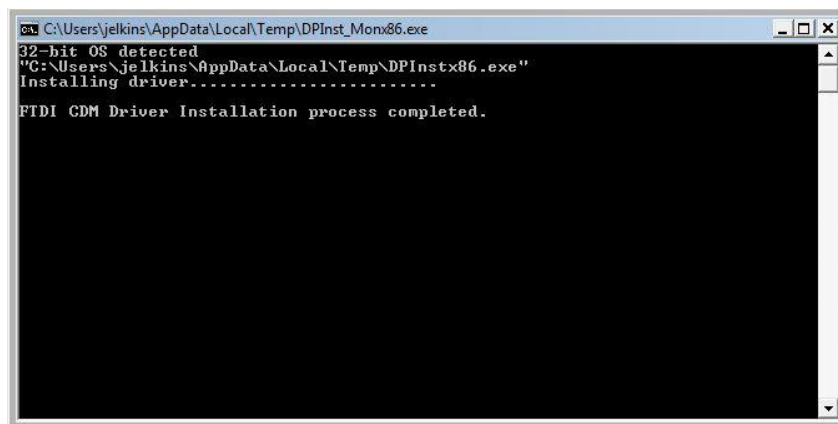
The data is displayed on and generated from a PC using Terminal Emulator software. The recommended software is TeraTerm, open source software, installation instructions below. This software has been tested with the TMS on MS XP, Vista & Windows 7 operating systems.

Terminal Emulator and USB Driver software Download:

The USB adapter driver and Terminal Emulator software may be downloaded from: <http://sites.google.com/site/serialdrivers/files> file name %serial.zip+.

1.2 Configuration Software Installation Instructions

- 1) Unzip the file. It contains CDM20802_Setup.exe and teraterm-4.66.exe
- 2) Double click on CDM20802_Setup.exe to install the drivers for the configuration cable. The pop-up window shown below should be displayed briefly (file path will vary):

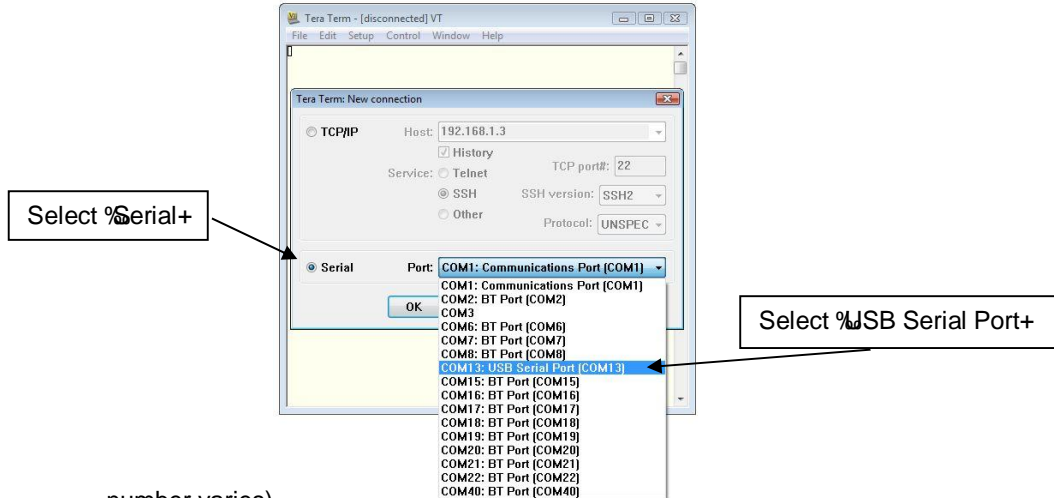


- 3) Double click on teraterm-4.66.exe to install the terminal emulator program. The pop-up window shown below should be displayed:





- Click **N**ext+, accept the license and all the defaults for TeraTerm but then click **C**ANCEL when prompted to install both LogMeTT and TTLEditor.
- 4) Plug the cable assembly ebm-papst part number 210-HAR11887 into a spare PC USB connector and connect the other end to a powered TMS control PCB **C**OM+ connector.
 - 5) Double click on the TeraTerm desktop icon to run it.
 - 6) In the TeraTerm new connection popup change the TCP/IP selection to Serial
 - 7) Click the Port drop down menu & select the port shown as USB Serial Port (Port



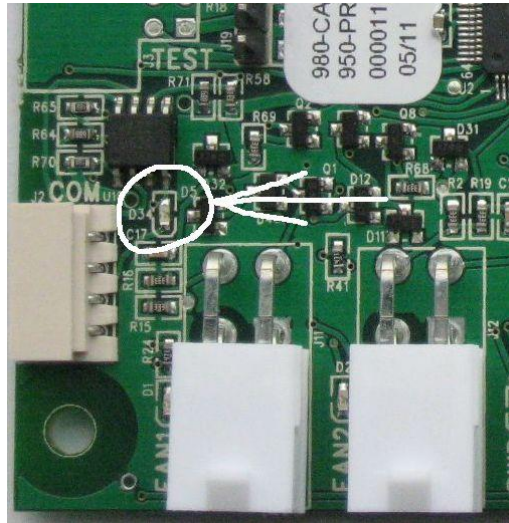
- number varies)
- 8) Leave the **S**erial+settings as default, i.e. 9600Baud, 8bit, no parity, 1 stop bit, no flow control. Do not enable Local Echo.
 - 9) Click **O**K.
 - 10) Data from the TMS should now be displayed on the TeraTerm window. To display the full configuration, press the [Enter] key on the PC keyboard. Change the font or window size to user's preferred setting if desired, using the **S**etting+drop-down menu. The font **C**ourier New+is recommended
 - 11) Select **S**etup, **S**ave Setup+from the drop down menu if desired to save the connection Port, Font, and Window Size setting. Note . if saved, then if another cable assembly ebm-papst part number 210-HAR11887 is connected it will not be recognised. Uninstall then reinstall the TeraTerm software to use another cable.
 - 12) Note . the TMS COM connector may be removed & reconnected and the TMS power cycled without affecting the Terminal program. If the USB connector is removed & reconnected the Terminal program must be restarted.

1.3 Configuration interface Fault Finding

- 1) If no data is being displayed check the serial configuration (Setup, Serial Port and Port Number) as shown above. The default configuration should work correctly.
- 2) As each key is pressed on the PC the **C**OM+LED D34 on the TMS should illuminate briefly. This will work even with no power supply to the TMS. This LED is located next to the configuration connector on the TMS PCB, it is just visible through the enclosure



Fan1 connector cut-out. Do not confuse this with the Fan1 status LED.



%COM+LED D34 location

- 3) Another check is to disconnect the TMS and link configuration lead connector pins 2&3 directly, then check characters typed on the PC keyboard are echoed back to the screen.
- 4) If the USB cable is changed for another USB cable then the Port Number assignment may need to be reset. The simplest way to do this is to uninstall then reinstall the Terminal Emulator software (TeraTerm). This will clear the user settings which include the port number. It is not necessary to reinstall the USB-Serial cable driver.
- 5) If the driver installation pop-up window is not displayed as shown then run the CDM20802_Setup.exe driver installation program again.



2 Configuration and Monitoring Interface

The TMS may be configured and monitored by connection to a PC, with the PC running a Terminal Emulator program, see section *Installation of Configuration Software on PC* above.

2.1 Welcome Screen, Header

Text similar to the following will be displayed at power-up:

```

TMS Controller
ebmpapst UK

TMS Thermal Management System, (c) ebm-papst UK Ltd 2012
Fan Speed Controller
Prog. 950-PRG11016 1.0.76, Jul  3 2012 16:39:38

Press [m] for Mode select Menu (ADVANCED)      Press [c] for Configuration File Menu
Press [f] for Fan Characteristics Menu          Press [L] for file Logging output toggle
Press [t] for Temperature/Control Profile Menu  Press [SPACE] to display this menu
Press [a] for Alarm & Relay Menu                Press [ENTER] to display all settings
Press [r] for RS485 modbus Menu

----- MEASURED VALUES -----
RPM1,PWM,   RPM2,PWM,   RPM3,PWM,   RPM4,PWM,   NTC1,  NCT2,INP1,INP2,ALARMS,Uptime (s)
 341, 25,    336, 25,    340, 25,    349, 25,    7.8,  9.8, HI , HI ,____ , 10s

```

To display the full configuration, press the [Enter] key on the PC keyboard
To display the configuration menu and measurement header, press [space].

2.2 Welcome Screen, Measured Values

```

----- MEASURED VALUES -----
RPM1,PWM,   RPM2,PWM,   RPM3,PWM,   RPM4,PWM,   NTC1,  NCT2,INP1,INP2,ALARMS,Uptime (s)
 341, 25,    336, 25,    340, 25,    349, 25,    7.8,  9.8, HI , HI ,____ , 10s

```

Displays the current values of Fan PWM (based on temperature profile configuration and measured temperature & alarm state) plus the measured RPM and Temperatures. Also displays the Switch Input state and any active Alarms, and seconds since power on. For Closed Loop modes the Target RPM will be displayed instead of the PWM Output. If 0-10V input selected (instead of Thermistor) then the voltage will be displayed.

2.3 Measured Value Data Logging

The measured values display is updated each second. To display each set of measured values on a new line, type %~~u~~t; to cancel type %~~u~~t+ again. The values may be saved to a log file. To do this, choose Log... from the TeraTerm File menu, type in a file name in the resulting dialogue box and select the location in which to save it. Ensure each set of data is being displayed on a new line as shown below.

As the data values are separated by a comma (CSV format) they are suitable for direct importing into a spreadsheet program such as MS Excel.

A text editor may be used to view the file. Some editors may reformat the file making it difficult to read, the notepad++ open source text editor is recommended.

```

----- MEASURED VALUES -----
RPM1,PWM,   RPM2,PWM,   RPM3,PWM,   RPM4,PWM,   NTC1,  NCT2,INP1,INP2,ALARMS,Uptime (s)
FAIL, 20,    FAIL, 20,    FAIL, 20,    FAIL, 20,    FAIL,  ____,low , HI ,1234 , 6s
FAIL, 20,    FAIL, 20,    FAIL, 20,    FAIL, 20,    FAIL,  ____,low , HI ,1234 , 6s
1233, 21,    1221, 21,    1234, 21,    1235, 21,    22.7, 25.0,low , HI ,____ , 7s
1286, 22,    1250, 22,    1279, 22,    1283, 22,    14.7, 25.6,low , HI ,____ , 8s
1317, 24,    1305, 24,    1342, 24,    1313, 24,    10.9, 26.0,low , HI ,____ , 9s

```



3 Configuration for user's application

Notes:

- 1) This controller is designed to be highly configurable. A user changing the configuration settings should be familiar with terms such as PWM, RPM, Proportional Band, Open Collector, etc, and the concepts associated with fan speed control.
- 2) The configuration may be updated by loading a Configuration File. This may be done by ebm-papst prior to TMS delivery (volume customers, contact ebm-papst). The instructions in this section are for use when creating a new configuration.
- 3) A configuration file may be loaded, modified, and then saved again.
- 4) The configuration should be set in the following sequence for each setting requiring to be changed:
 - a. Operating Mode (usually default, %Temperature sets PWM Output+)
 - b. Fan Characteristics (see fan data sheet)
 - c. Temperature/Control Profile (as customer requirement)
 - d. Alarms & Relays (as customer requirement)
 - e. Configuration File save (if required)
- 5) Within any sub-menu the parameters may generally be set in any sequence.
- 6) Each configuration change will be implemented as soon as it is entered, e.g. fan speed will change if required by temperature profile change.
- 7) Each configuration setting will be stored in non-volatile memory as it is entered.
- 8) The TMS program will attempt to disregard invalid settings, or limit the values to the permitted range.
- 9) If the controller is left displaying a configuration menu for an extended period with no key press on the PC, the controller will reset then return to the normal operating display.

3.1 Mode Select Menu

The Operating Mode of the controller may be set as follows, type %m+for Control Mode Configuration menu, display will be as shown:

```

----- OPERATING MODE -----
Operating Mode = "Temperature sets PWM Output" (Open Loop)

Press "1" for "Temperature sets PWM Output" (Open Loop)
Press "2" for "Temperature sets Fan RPM" (Closed Loop)
Press "3" for "0-10V input sets PWM Output" (Open Loop)
Press "4" for "0-10V input sets Fan RPM" (Closed Loop)

Press "p" to change Project Specific Mode (ADVANCED)

### CAUTION - CHANGING OPERATING MODE WILL OVERWRITE SETTINGS ###

Select new operating mode or Press SPACE to exit

```

Mode 1, "Temperature sets PWM Output" is an Open Loop control mode and the most commonly used operating mode. The fan is set to a proportion of its operating speed range e.g. 50%, rather than a specific RPM value. In this mode Fan Fail criterion is defined as measured fan RPM deviates too far from the predicted RPM, based on %Maximum Fan RPM+ configuration setting in %FAN CHARACTERISTICS+ menu. This mode may also be used to control a device with no Tachometer connection, see below.

Mode 2, "Temperature sets Fan RPM" is a Closed Loop control mode, i.e. the fan speed control will be continuously adjusted to bring the measured fan RPM to the set value. This mode is similar to the operating mode of the ebm-papst HMS Controller and may be preferred by users familiar with that controller. In this mode Fan Fail is defined as fan does not reach the RPM configured in the Temperature Profile.

Modes 3 and 4 map 0-10V inputs to Fan RPM or PWM output for other control applications.

Project Specific Mode - ONLY CHANGE THIS SETTING IF ADVISED BY ebm-papst, this is the access point for customer specific software features.



Changing operating mode will set many of the temperature / control and Alarm parameter settings to the default setting for the new mode.

3.2 Configuration of Fan Characteristics

Consult fan data sheet for required settings.

Type **F** for Fan Configuration menu, display will be as shown:

Fan Characteristics Configuration Menu

```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/  Control      Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%         Rate         Max Fan RPM
1     Y     2        Open_Collector  0           10     3000
2     Y     2        Open_Collector  0           10     3000
3     Y     2        Open_Collector  0           10     3000
4     Y     2        Open_Collector  0           10     3000
Dummy Fan Links IGNORED   Daily Fan Run DISABLED   PWM Frequency 2 kHz
Type "1" to "4" to select Fan or Space to exit without changing
Type "d" to change Dummy Fan Links allowed/ignored setting
Type "r" to change Fan Daily Run setting
Type "f" to change PWM Frequency setting (ADVANCED)
Type Space to exit without changing

```

Type **F1** for Fan 1 Configuration menu, display will be as shown:

```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/  Control      Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%         Rate         Max Fan RPM
1     Y     2        Open_Collector  0           10     3000
      1     2        3            4            5        6 <<< Menu Item Number

1:Change Used (Fan Present)
2:Change Pulses/Rev. (Tachometer Pulses per Fan Revolution)
3:Change Control Type (PWM level 0-10V or Open Collector)
4:Change Stationary PWM (PWM level to stop Fan rotating)
5:Change Ramp Rate (The rate at which the fan speed changes)
6:Change Fan Maximum RPM (As stated in fan Data Sheet. Note - this is NOT the set speed)
7:Copy this configuration to another fan
Press SPACE to exit

```

Type **F1U** to toggle the **Fan Used** setting, display will be as shown:
Setting a fan to **Not Used** will inhibit spurious alarm generation for unfitted fans.

```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/  Control      Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%         Rate         Max Fan RPM
1     N     2        Open_Collector  0           10     3000
      1     2        3            4            5        6 <<< Menu Item Number

```

Type **F1P** to change the **Pulses/Rev** setting, display will be as shown:
The pulses/rev must be set correctly in order for the TMS to be able measure the Fan RPM. Consult Fan data sheet.

Set the **Pulses/Rev** to zero if there is no open collector Tachometer output from the device being controlled or it is a Relay Alarm type fan (Open Loop control modes only).

```

Fan 1, Pulses (Tachometer Pulses per Fan Revolution) Current setting = 2
Select 0 if no Tachometer
Enter new value or SPACE to exit without changing
Enter a value between 0 and 9

```

Type e.g. **F1P6** to change the **Pulses/Rev** setting to 6 pulses/rev (as for some S-Force fan types), display will be as shown:



```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/  Control      Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%         Rate         Max Fan RPM
1     Y     6         Open_Collector 0           10      3000
      1     2         3           4           5       6 <<< Menu Item Number

```

Type **3**+ to toggle the **Control Type** setting, i.e. select PWM_0_10V for use with e.g. R1G175 type fan. Display will be as shown:

```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/  Control      Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%         Rate         Max Fan RPM
1     Y     2         PWM_0_10V    0           10      3000
      1     2         3           4           5       6 <<< Menu Item Number

```

IMPORTANT – Control Type setting must be correct for the fan being used. If incorrectly set to Open Collector with 0-10V Fan then the fan will not run. If incorrectly set to 0-10V with Open Collector fan then the fan input control voltage limit may be exceeded – fan damage risk.

Type **4**+ to change the **Stationary PWM** setting, display will be as shown:

```

Fan 1, Stationary PWM (Speed Control signal level for Fan Stop) Current setting = 0
Enter new value or SPACE to exit without changing

```

Type e.g. **100**+ to change the **Stationary PWM** setting, this will have the effect of inverting the PWM output speed control profile. Consult fan data sheet for correct setting. Display will be as shown:

```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/  Control      Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%         Rate         Max Fan RPM
1     Y     2         Open_Collector 100          10      3000
      1     2         3           4           5       6 <<< Menu Item Number

```

Type **5**+ to change the **Ramp Rate** setting, display will be as shown:

```

Fan 1, Ramp Rate (The rate at which the fan speed changes) Current setting = 10
Decrease the setting if the fan speed overshoots, increase for faster response
Enter new value between 1 and 100 or SPACE to exit without changing.

```

Type e.g. **20**+ as the new **Ramp Rate**, display will be as shown:

```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/  Control      Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%         Rate         Max Fan RPM
1     Y     2         Open_Collector 100          20      3000
      1     2         3           4           5       6 <<< Menu Item Number

```

For Open Loop modes only, Type **6**+ to change the **Fan Maximum RPM** (As stated in fan Data Sheet). Note: the fan run speed set by the TMS will be determined by the Temperature Profile and Alarm configurations. The display will be as shown:

```

Fan 1, Fan Maximum RPM as shown in Fan Data Sheet, Current setting = 3000
Used to check Fan working

```

```

Enter new Maximum RPM or Select 0 if no Tachometer or SPACE to exit without changing

```

Type e.g. **10000**+ to change the **Fan Maximum RPM**, display will be as shown:

```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/  Control      Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%         Rate         Max Fan RPM
1     Y     2         Open_Collector 100          20      10000
      1     2         3           4           5       6 <<< Menu Item Number

```



Type **%+** to copy this fan configuration to another fan, to avoid having to re-enter all parameters individually for each fan. Display will be as shown:

Enter number of fan to copy configuration to, or Space to exit without changing

Type e.g. **%2+** to copy this fan configuration to Fan 2, display will be as shown:

```

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/   Control   Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%      Rate        Max Fan RPM
1     Y      6         Open_Collector 100      20      10000
2     Y      6         Open_Collector 100      20      10000
3     Y      2         Open_Collector 0         10      3000
4     Y      2         Open_Collector 0         10      3000

----- FAN CHARACTERISTICS -----
Fan   Used   Pulses/   Control   Stationary   Ramp   Data Sheet
      Rev.   Type      PWM%      Rate        Max Fan RPM
1     Y      6         Open_Collector 100      20      10000
      1     2         3         4         5         6 <<< Menu Item Number

```

Press [SPACE] to exit the Fan Configuration menu, the following menu will be shown:

```

Dummy Fan Links IGNORED   Daily Fan Run DISABLED   PWM Frequency 2 kHz
Type "1" to "4" to select Fan or Space to exit without changing
Type "d" to change Dummy Fan Links allowed/ignored setting
Type "r" to change Fan Daily Run setting
Type "f" to change PWM Frequency setting (ADVANCED)
Type Space to exit without changing

```

Press [d] to enable **%Dummy fan links+**, the following will be shown:

```

Dummy Fan Links ALLOWED   Daily Fan Run DISABLED   PWM Frequency 2 kHz
Type "1" to "4" to select Fan or Space to exit without changing
Type "d" to change Dummy Fan Links allowed/ignored setting
Type "r" to change Fan Daily Run setting
Type "f" to change PWM Frequency setting (ADVANCED)
Type Space to exit without changing

```

Press [r] to enable **%Fan Daily Run+**, the following will be shown:

```

Dummy Fan Links ALLOWED   Daily Fan Run ENABLED   PWM Frequency 2 kHz
Type "1" to "4" to select Fan or Space to exit without changing
Type "d" to change Dummy Fan Links allowed/ignored setting
Type "r" to change Fan Daily Run setting
Type "f" to change PWM Frequency setting (ADVANCED)
Type Space to exit without changing

```

Press [f] to change the **%PWM frequency+**, the following will be shown:

```

PWM Frequency 2 kHz
Enter new value in the range 1 to 25
or SPACE to exit without changing

```

Type e.g. **%25+** to change the **%PWM frequency+** to 25kHz, display will be as shown:

```

Dummy Fan Links ALLOWED   Daily Fan Run ENABLED   PWM Frequency 25 kHz
Type "1" to "4" to select Fan or Space to exit without changing
Type "d" to change Dummy Fan Links allowed/ignored setting
Type "r" to change Fan Daily Run setting
Type "f" to change PWM Frequency setting (ADVANCED)
Type Space to exit without changing

```



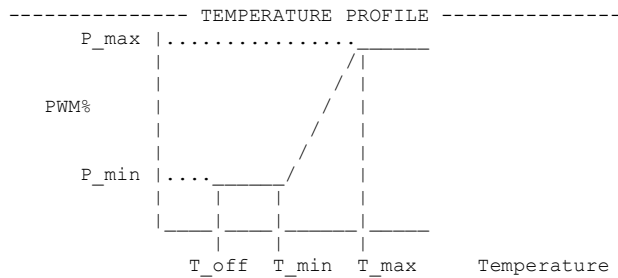
3.3 Configuration of Temperature Profile

Set the temperature control profile as required for the particular customer application.

Type **%+** for Temperature Profile Menu, display will be as shown for "Temperature sets Fan PWM" (Open Loop) Operating Mode.

For %Temperature sets RPM Output+(Closed Loop) mode, the RPM will be shown in place of percentage PWM.

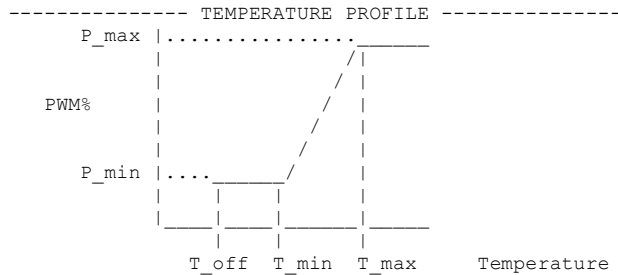
Temperature Profile Menu



Fan	T_off	T_on	T_min	P_min	T_max	P_max	NTC
1	5	6	25	30	50	90	1
2	5	6	25	30	50	90	1
3	5	6	25	30	50	90	1
4	5	6	25	30	50	90	1

Type "1" to "4" to select Fan or Space to exit without changing
Type "m" to enable Multi Point Profile or Space to exit without changing

Type **%+** for Fan 1 Temperature Profile menu, display will be as shown:



Fan	T_off	T_on	T_min	P_min	T_max	P_max	NTC
1	5	6	25	30	50	90	1
	1	2	3	4	5	6	7 8

<<< Menu Item Number

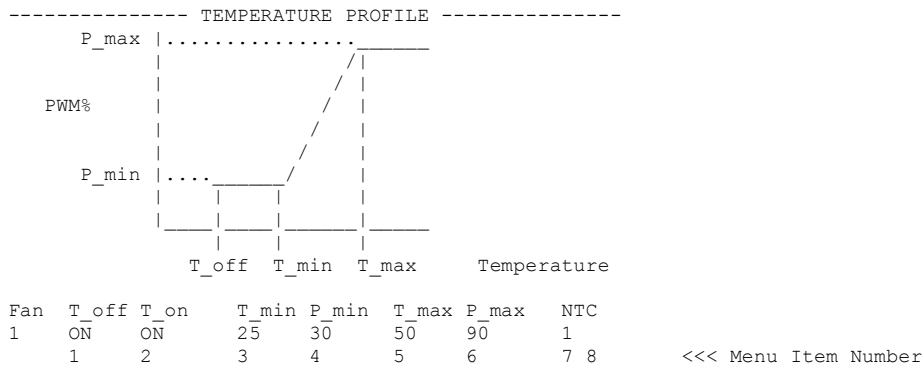
- 1:Change T_off (Low Temperature Cut-Off)
- 2:Change T_on (Low Temperature Fan Start)
- 3:Change T_min (Bottom of Proportional Control Band)
- 4:Change n_min (PWM at Bottom of Proportional Control Band)
- 5:Change T_max (Top of Proportional Control Band)
- 6:Change n_max (PWM at Top of Proportional Control Band)
- 7:Change NTC 1 (Thermistor 1 sets Fan Speed)
- 8:Change NTC 2 (Thermistor 2 sets Fan Speed)
- 9:Copy this configuration to another fan
Press SPACE to exit

Type **%+** for Low Temperature Fan Shut-Off menu, display will be as shown:

Fan 1, T_off (Low Temperature Fan Stop) Current setting = 5C
Enter a value between -20 and 99
or "on" for Always On or SPACE to exit without changing



Type **0n+** to disable low temperature fan shut-off, so the fan runs continuously regardless of how low the temperature drops. Display will be as shown:

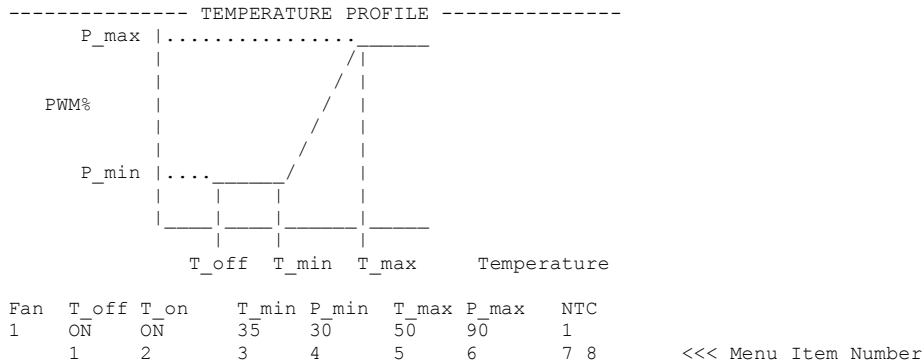


Type **2+** to change the Fan Start temperature.

Type **3+** to change the temperature at the Start of Proportional Control Band, display will be as shown:

Fan 1, Temperature Current setting = 25C
Enter new value or SPACE to exit without changing
Enter a value between -20 and 99

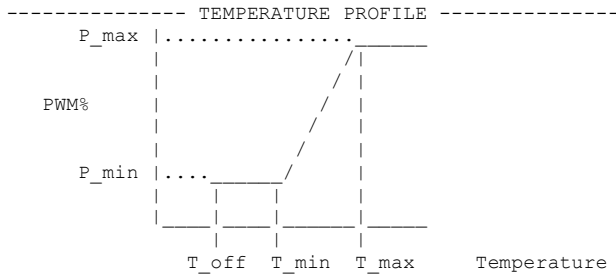
Type e.g. **35+** to set the temperature at the Bottom of Proportional Control Band to 35C, display will be as shown:



Type **4+** to change the PWM Output at the Bottom of Proportional Control Band and below, display will be as shown:

Fan 1, Fan_PWM Current setting = 30
Enter new value or SPACE to exit without changing
Enter a value between 0 and 100

Type e.g. **20+** to set the PWM output at the Bottom of Proportional Control Band to 20%, display will be as shown:



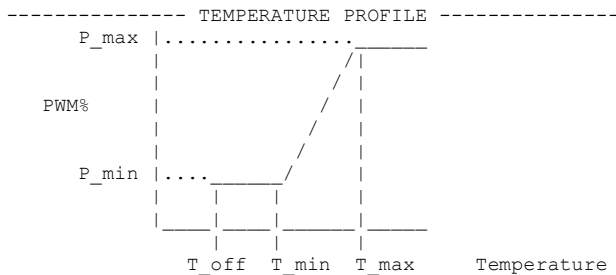
Fan	T_off	T_on	T_min	P_min	T_max	P_max	NTC
1	ON	ON	35	20	50	90	1
	1	2	3	4	5	6	7 8

<<< Menu Item Number

Type **%5+** to change the Temperature at the Top of Proportional Control Band, display will be as shown:

Fan 1, T_max (Top of Proportional Control Band) Current setting = 50C
 Enter new value or SPACE to exit without changing
 Enter a value between -20 and 99

Type e.g. **%45+** to change the Temperature at the Top of Proportional Control Band to 45C, display will be as shown:



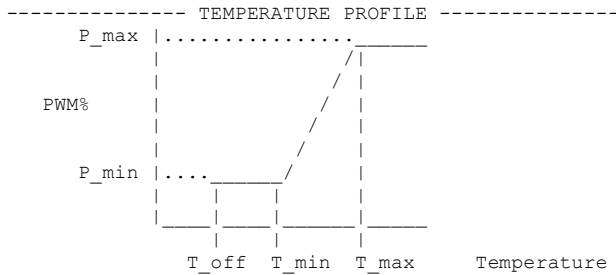
Fan	T_off	T_on	T_min	P_min	T_max	P_max	NTC
1	ON	ON	35	20	45	90	1
	1	2	3	4	5	6	7 8

<<< Menu Item Number

Type **%6+** to change the PWM Output at the Top of Proportional Control Band and above, display will be as shown:

Fan 1, Fan_PWM Current setting = 90
 Enter new value or SPACE to exit without changing
 Enter a value between 0 and 100

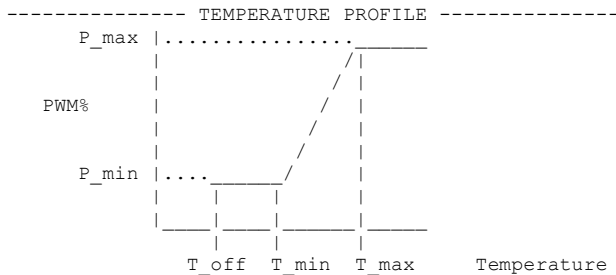
Type e.g. **%100+** to set the PWM Output at the Top of Proportional Control Band to 100%, display will be as shown:



Fan	T_off	T_on	T_min	P_min	T_max	P_max	NTC
1	ON	ON	35	20	45	100	1
	1	2	3	4	5	6	7 8

<<< Menu Item Number

Type **%+** to change the NTC Thermistor 2 used setting, if both thermistors selected then speed will be set by whichever of NTC Thermistor 1 or NTC Thermistor 2 is hottest. Display will be as shown:

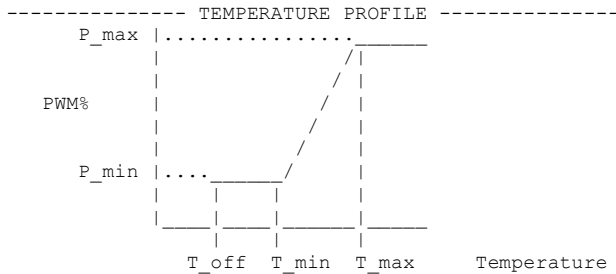


Fan	T_off	T_on	T_min	P_min	T_max	P_max	NTC
1	ON	ON	35	20	45	100	1^2
	1	2	3	4	5	6	7 8

<<< Menu Item Number

Type **%+** to change the NTC Thermistor 1 used setting.

Display will be as shown:



Fan	T_off	T_on	T_min	P_min	T_max	P_max	NTC
1	ON	ON	35	20	45	100	2
	1	2	3	4	5	6	7 8

<<< Menu Item Number

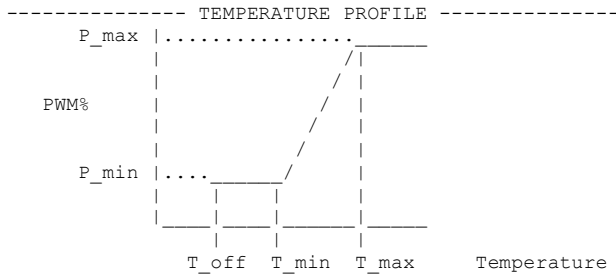
Type **%+** to copy this configuration to another fan, to avoid having to re-enter all parameters individually for each fan.

Display will be as shown:

Enter number of fan to copy configuration to, or Space to exit without changing

Type e.g. **%2+** to copy this configuration to fan 2.

Display will be as shown:

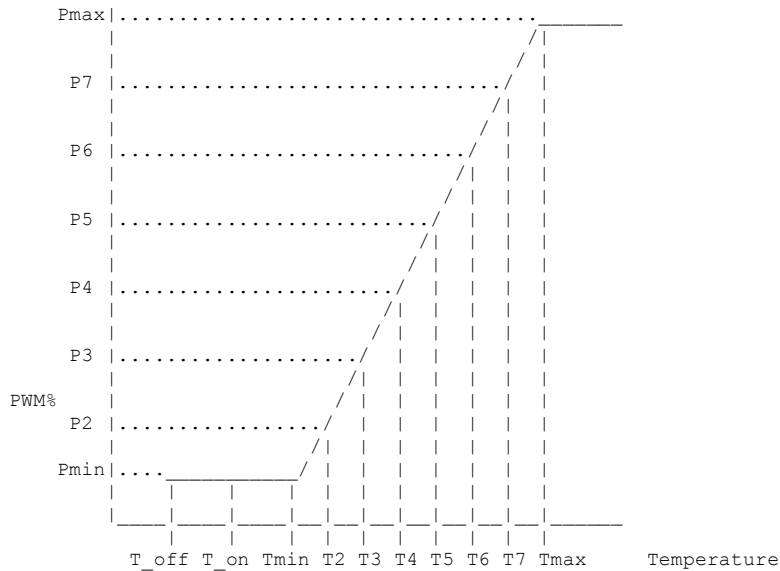


Fan	T_off	T_on	T_min	P_min	T_max	P_max	NTC
1	ON	ON	35	20	45	100	2
2	ON	ON	35	20	45	100	2
3	5	6	25	30	50	90	1
4	5	6	25	30	50	90	1

3.3.1 Multi-point Temperature Profile

From the Temperature Profile Menu, type "m" to enable Multi Point Profile, will enable configuration of interim points on the control profile as shown:

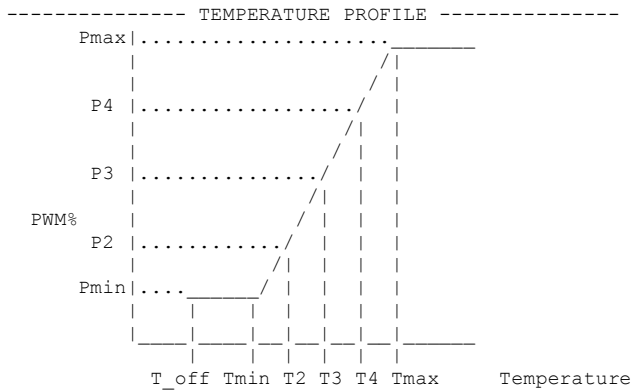
Temperature Profile Menu



Fan	T_off	T_on	T_min	P_min	T2	P2	T3	P3	T4	P4	T5	P5	T6	P6	T7	P7	T_max	P_max	NTC
1	10	15	20	20	32	30	34	30	36	30	38	30	40	30	42	30	43	80	1
2	ON	ON	15	20	32	30	34	30	36	30	38	30	40	30	42	30	43	100	1
3	----- Fan Not Used -----																		
4	----- Fan Not Used -----Type "1" to "4" to configure Temperature Profile or Space to exit without changing																		
	Type "m" to disable Multi Point Profile or Space to exit without changing																		

Type %m+ again to disable Multi Point Profile.

Set the extra control points as required using the multipoint configuration menu options a-f, see below:

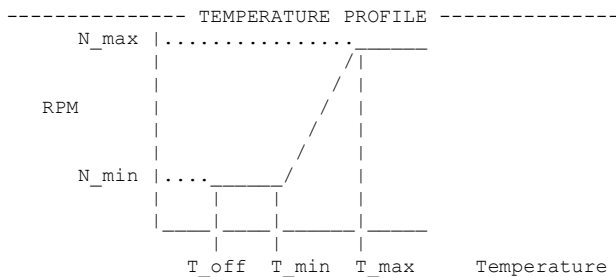


Fan	T_off	T_on	T_min	P_min	T2	P2	T3	P3	T4	P4	T_max	P_max	NTC
1	ON	ON	35	20	36	30	37	30	38	30	45	100	2
	1	2	3	4	a	b	c	d	e	f	5	6	7 8 <<<

- 1:Change T_off (Low Temperature Cut-Off)
 - 2:Change T_on (Low Temperature Fan Start)
 - 3:Change T_min (Bottom of Proportional Control Band)
 - 4:Change n_min (PWM at Bottom of Proportional Control Band)
 - a:Change T2 temperature
 - b:Change N2 (PWM at T2 temperature point)
 - c:Change T3 temperature
 - d:Change N3 (PWM at T3 temperature point)
 - e:Change T4 temperature
 - f:Change N4 (PWM at T4 temperature point)
 - 5:Change T_max (Top of Proportional Control Band)
 - 6:Change n_max (PWM at Top of Proportional Control Band)
 - 7:Change NTC 1 (Thermistor 1 sets Fan Speed)
 - 8:Change NTC 2 (Thermistor 2 sets Fan Speed)
 - 9:Copy this configuration to another fan
- Press SPACE to exit

3.3.2 Temperature Profile, Temperature sets RPM (closed loop) mode

Temperature Profile Menu



Fan	T_off	T_on	T_min	N_min	T_max	N_max	NTC
1	ON	ON	35	1000	45	3000	2
2	ON	ON	35	1000	45	3000	2
3	5	6	25	1000	50	3000	1
4	5	6	25	1000	50	3000	1

In this operating mode the Controller output sets the fan RPM (Closed Loop control). The fan speed control PWM output will be continuously adjusted to bring the measured fan RPM to the set value.

The setting shown for Fan1 would vary the speed from 1000 to 3000RPM over the temperature range 35C to 45C.



3.4 Alarm Configuration

Set the Alarm Configuration as required for the particular customer application.

Type **%+** for Alarm Menu, display will be as shown

Alarm & Relay Configuration Menu

```

----- ANY ALARM CONDITION -----
Alarm  Input Input  Fan  NTC  Lo_temp Hi_Temp Delta
        1      2      Bad  Bad   T1/T2   T1/T2   T1-T2
1      _____
2      _____
3      _____
4      _____

-- RELAY & ALARM ACTION ---
                FAN_PWM%
RELAY  /Fan1/Fan2/Fan3/Fan4/
OPEN   /_____/_____/_____/_____/
OPEN   /_____/_____/_____/_____/
OPEN   /_____/_____/_____/_____/
OPEN   /_____/_____/_____/_____/

```

Type "1" to "4" to select Alarm/Relay or Space to exit without changing
Type "p" to enable/disable Power Relay PCB or Space to exit without changing

Type **%+** for Alarm 1 Menu, display will be as shown

```

----- ANY ALARM CONDITION -----
Alarm  Input Input  Fan  NTC  Lo_temp Hi_Temp Delta
        1      2      Bad  Bad   T1/T2   T1/T2   T1-T2
1      _____
        1      2      3      4 5  6 7  8 9  a  b  c  d  e  f  g

```

ALARM CONDITIONS:

- 1:Change Input 1 (Switch Input 1 as an Alarm Condition)
- 2:Change Input 2 (Switch Input 2 as an Alarm Condition)
- 3:Change Fan Bad (Any Fan Fail as an Alarm Condition)
- 4:Change NTC 1 Bad (Thermistor 1 Fail as an Alarm Condition)
- 5:Change NTC 2 Bad (Thermistor 2 Fail as an Alarm Condition)
- 6:Change NTC 1 Low limit (temperature T1 below this limit as an Alarm Condition)
- 7:Change NTC 2 Low limit (temperature T2 below this limit as an Alarm Condition)
- 8:Change NTC 1 High limit (temperature T1 above this limit as an Alarm Condition)
- 9:Change NTC 2 High limit (temperature T2 above this limit as an Alarm Condition)
- h:Change T1 & T2 Hysteresis (difference between Alarm On and Alarm Off temperatures)
- a:Change Delta T1-T2 (Difference between Temperature 1 and Temperature 2 as an Alarm Condition)

ALARM ACTIONS:

- b:Change Alarm Relay action (select Contacts Open for Alarm or Contacts Closed for Alarm)
 - c:Change Fan 1 PWM% alarm action (Fan set to this PWM% if any specified alarm occurs)
 - d:Change Fan 2 PWM% alarm action (Fan set to this PWM% if any specified alarm occurs)
 - e:Change Fan 3 PWM% alarm action (Fan set to this PWM% if any specified alarm occurs)
 - f:Change Fan 4 PWM% alarm action (Fan set to this PWM% if any specified alarm occurs)
 - g:Change All Fans PWM% alarm action (Fans set to this PWM% if any specified alarm occurs)
- Press SPACE to exit

The default setting shown indicates that all of the alarms are set to **% ignored+**. With this setting the alarm will never be activated.

Note . Alarm 1 has highest priority, Alarm 2 next highest, etc.

Set the alarms as required for the application.

Notes:

- 1) The Switch inputs can be set to / ignored / Alarm when high / Alarm when low. The switch inputs are High when Open, and Low when Linked.
- 2) Fan Bad monitor. This is configured on a per-fan basis. Generally the alarm will be configured to monitor all used fans together, but if the fans were configured to operate in pairs, e.g. if fans 1 & 2 operate together and fans 3 & 4 operate together, then fan 1 fail could be used to set fan 2 to full speed but fan 3 or 4 fail could be configured to be ignored for that alarm.
- 3) NTC Thermistor fail alarm would typically be configured such that failure of the Thermistor used to vary the speed of a fan would set that fan to full speed.
- 4) NTC Thermistor over-temperature or under-temperature could typically be used to generate an external alarm by means of a Relay.
- 5) Delta T1-T2 (Difference between Temperature 1 and Temperature 2 as an Alarm Condition). An alarm will be raised if T2 plus this value exceeds T1. This may be able to be used as a **% blocked filter detect+**, dependant on the system configuration. Alternatively this may be used as an Intake Fan Shutoff Control, used for example when an equipment cabinet external temperature exceeds the internal temperature.



For maximum controller flexibility it is permitted to enter a negative value. This is equivalent to swapping the T1 and T2 inputs for the Delta T1-T2 alarm.

- 6) Alarm Relay action (select either Contacts Open for Alarm or Contacts Closed for Alarm) would normally be set to %Open+so that the contacts open in the case of alarm becoming active. The reason is that the contacts would also open in the event of a power failure thus generating an alarm, which is generally the desired action (fail safe).
- 7) Alarm Fan Speed setting would typically be used to increase the speed of the remaining fans in the event of a fan failure. **While an alarm is active the Alarm Fan Speed setting overrides the Temperature Profile Fan Speed setting.**

3.4.1 Alarm Configuration Example 1

Example Alarm Configuration,

Alarm & Relay Configuration Menu

----- ANY ALARM CONDITION -----								-- RELAY & ALARM ACTION --				
Alarm	Input 1	Input 2	Fan Bad	NTC Bad	Lo_temp T1/T2	Hi_Temp T1/T2	Delta T1-T2	RELAY	FAN_PWM%			
1	_____	_____	1234	1	___/___	55/___	___	OPEN	/100/	/100/	/100/	/100/
2	_____	_____	_____	---	___/___	50/___	___	OPEN	/___/	/___/	/___/	/___/
3	_____	_____	_____	---	___/___	___/___	___	OPEN	/___/	/___/	/___/	/___/
4	_____	_____	_____	---	___/___	___/___	___	OPEN	/___/	/___/	/___/	/___/

For this example the Alarm1 will behave as follows:

The alarm will become active if any of the following events take place:

- 1) Fan 1 fail
- 2) Fan 2 fail
- 3) Fan 3 fail
- 4) Fan 4 fail
- 5) NTC Thermistor 1 Fail
- 6) NTC Thermistor 1 measured temperature 55C or above

The Alarm Actions listed below will all occur if the alarm becomes active

- 1) Alarm relay 1 contacts Open
- 2) Fan 1 set to 100% PWM.
- 3) Fan 2 set to 100% PWM.
- 4) Fan 3 set to 100% PWM.
- 5) Fan 4 set to 100% PWM.

Alarm2 will be active (Relay 2 will Open) if the NTC Thermistor 2 temperature exceeds 50C. Alarm2 will not affect any fan speed.

3.4.2 Alarm Configuration Example 2

Example Alarm Configuration

----- ANY ALARM CONDITION -----								-- RELAY & ALARM ACTION --				
Alarm	Input 1	Input 2	Fan Bad	NTC Bad	Lo_temp T1/T2	Hi_Temp T1/T2	Delta T1-T2	RELAY	FAN_PWM%			
1	_____	_____	_____	---	___/___	___/___	___	OPEN	/___/	/___/	/___/	/___/
2	_____	_____	12	1 2	___/___	50/55	___	CLOSE	/95/	/90/	/85/	/80/
3	_____	_____	_____	---	___/___	___/___	___	OPEN	/___/	/___/	/___/	/___/
4	_____	_____	_____	---	___/___	___/___	___	OPEN	/___/	/___/	/___/	/___/

For this example the alarm will behave as follows:

Alarm 2 will become active if any of the following events take place:

- 1) Fan 1 Fail
- 2) Fan 2 Fail
- 3) (Note . Fan 3 ignored for this alarm)
- 4) (Note . Fan 4 ignored for this alarm)
- 5) NTC Thermistor 1 Fail
- 6) NTC Thermistor 2 Fail



- 7) NTC Thermistor 1 measured temperature 50C or above
- 8) NTC Thermistor 2 measured temperature 55C or above

The Alarm Actions listed below will all occur if the alarm becomes active

- 1) Alarm relay 2 contacts Close (Open for No Alarm)
- 2) Fan 1 set to 95% of maximum speed.
- 3) Fan 2 set to 90% of maximum speed.
- 4) Fan 3 set to 85% of maximum speed.
- 5) Fan 4 set to 80% of maximum speed.

3.4.3 Relay Daughterboard [PROVISIONAL]

From the Alarm menu, type "p" to enable/disable Power Relay daughterboard PCB.

If not present or not operating correctly the Expansion Alarm LED will illuminate.

Once enabled the relays can be configured to operate in the same way as relays 1-4 on the TMS main PCB, see instructions above.

Node . the Daughterboard Relays default setting is:

Alarm Inactive = relay de-energised, contacts open

Alarm Active = relay energised, contacts closed

----- ANY ALARM CONDITION -----								-- RELAY & ALARM ACTION ---					
Alarm	Input 1	Input 2	Fan Bad	NTC Bad	Lo_temp T1/T2	Hi_Temp T1/T2	Delta T1-T2	RELAY	FAN_PWM%				
1	_____	_____	_____	---	___/___	___/___	---	OPEN	/	/	/	/	/
2	_____	_____	_____	---	___/___	___/___	---	OPEN	/	/	/	/	/
3	_____	_____	_____	---	___/___	___/___	---	OPEN	/	/	/	/	/
4	_____	_____	_____	---	___/___	___/___	---	OPEN	/	/	/	/	/
POWER RELAYS on external Power Relay PCB													
5	_____	_____	_____	---	___/___	___/___	---	CLOSE	/	/	/	/	/
6	_____	_____	_____	---	___/___	___/___	---	CLOSE	/	/	/	/	/

The Expansion Board Alarm LED operates as follows:

- 1) If there is no Daughterboard enabled AND no Daughterboard fitted/responding then no Fault so Alarm LED OFF
- 2) If there is a Daughterboard enabled AND Daughterboard fitted/responding then no Fault so Alarm LED OFF
- 3) If there is Daughterboard enabled BUT no Daughterboard fitted/responding then Fault so Alarm LED ON
- 4) If there is no Daughterboard enabled BUT Daughterboard IS fitted/responding then Fault so Alarm LED ON
- 5) If an incorrect voltage Daughterboard is connected (e.g. 24V Daughterboard, 48V supply) then Fault so Alarm LED ON

For correct Power Relay daughterboard operation the green LED on the daughterboard will pulse in sync with the green power LED on the TMS.



3.5 Configuration File Menu (Load, Save, etc.)

Type **F6** for Configuration File Menu, display will be as shown

```

----- Configuration File Menu -----

CONFIGURATION FILE =  MODIFIED

Comment: Comment
Date:dd/mm/yyyy

CALCULATING Configuration Checksum ... PLEASE WAIT ... A562
"r" to Read configuration file from PC
"s" to Save configuration file to PC
"p" to set the configuration file Part Number
"i" to set the configuration file Issue Number
"c" to change the Comment
"d" to set the Date
"x" to restore configuration to Factory Default
"z" to Restart Program
Space to exit

```

Note that there is a few seconds delay while the TMS calculates the checksum. The value of the checksum is configuration dependant.

3.5.1 To read (load) an existing configuration file from the PC

To read (load) an existing configuration file from the PC to the TMS, proceed as follows:

On the TeraTerm drop down menu select **F5**, Send file **F6** +

Select the configuration file, it will be sent out on the serial interface to the TMS. Display will be as shown below (checksum for the file and CONFIGURATION FILE part / issue numbers are file dependant)

```

*** CONFIGURATION FILE RECEIVED ***

Checking file, please wait ...
Checksum Calc=A558 Embedded=A558 v.2, file Checksum correct.
Programming Configuration, please wait ... Programming completed.
Checking programming, please wait ...

*****
*** PROGRAMMING SUCCESSFUL ***
*** 950-PRG12418 Iss.1 ***
*****

Comment: Comment: File_name_and_short_description
Date:10May2012

press any key to continue

```

Notes

- 1) The part number, issue, comment and date are as set by the user.
- 2) The checksum value is configuration dependant.
- 3) The configuration file part number and checksum can be read at any time to ensure that the configuration is as intended.



Copy the displayed text from the Terminal Emulator window and paste it into a new Text Editor document. Copy all text from START to END inclusive.
MS Notebook is a suitable text editor. MS Word is not.
From the text editor menu, save the file in the desired location, assigning it a meaningful name e.g. the configuration file part number & issue.

The configuration file may then be reloaded at a future date, or loaded onto other TMS units.

3.5.3 Set Default Configuration

To set the configuration for all parameters to the factory default value, select option **%+** from the Configuration File Menu.

Caution . once the key is pressed the action will be implemented without any further check.

3.5.4 Restart TMS Program

To restart the TMS program, select option **%+** from the Configuration File Menu. This is equivalent to power cycling the TMS. This may be useful if the TMS is being configured or monitored remotely, e.g. by means of a Remote Desktop Control program on the PC running the Terminal program.

Caution . once the key is pressed the action will be implemented without any further check.