Total Energy Controls

TEC 1750 Programming & Installation Manual

Contents

Installation

General Notes

The installation of all TEC units should be carried out by a qualified electrical engineer familiar with heating systems and control wiring.

All control circuits of TEC units are ‘volt free’ and may be used to switch 240V AC or low voltage control systems.

Extreme care must be taken to ensure that all wiring is correct before applying power, as non-repairable damage to the PCB could result due to incorrect connections.

Mains Wiring

Unscrew the four screws of the TEC 1750 and remove the lid to gain access to the PCB and wiring connections.

A 240V AC 1Ph 50Hz supply may be taken from the existing time clock switched or permanent supply, or direct from the boiler mains input connections (where available), which ever is the most suitable. The 240V connection to the TEC 1750 is shown in Fig.1 below.

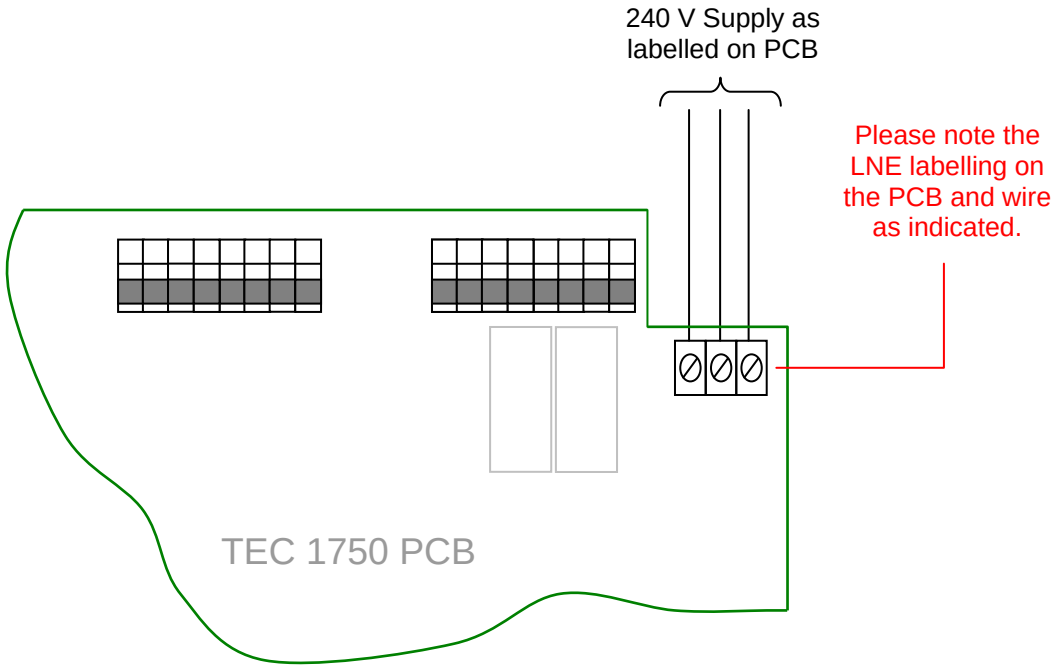


Fig. 1

Control Wiring

NOTE: If a wiring harness is provided in the rear of the enclosure please follow cables to TEC 1750 PCB to determine connections as described in the following sections.

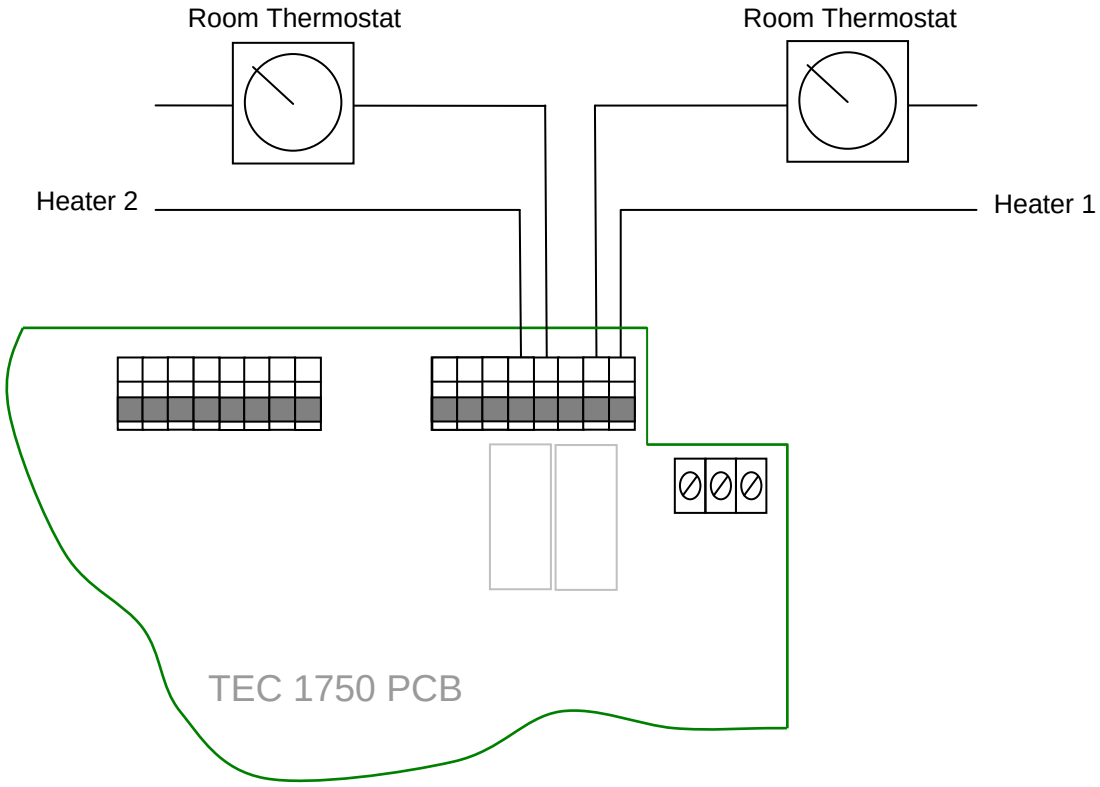


Fig. 2

Note: A 5-core heat resistant flex is ideal for connecting the TEC 1750 to the heater. The recommended connection method is via a flexible nylon conduit to house the cable.

Fitting and Wiring Temperature Sensors

The TEC 1750 has three temperature sensor inputs, these being **Duct, Internal** and **External** (optional). Connections are as shown in Fig.5.

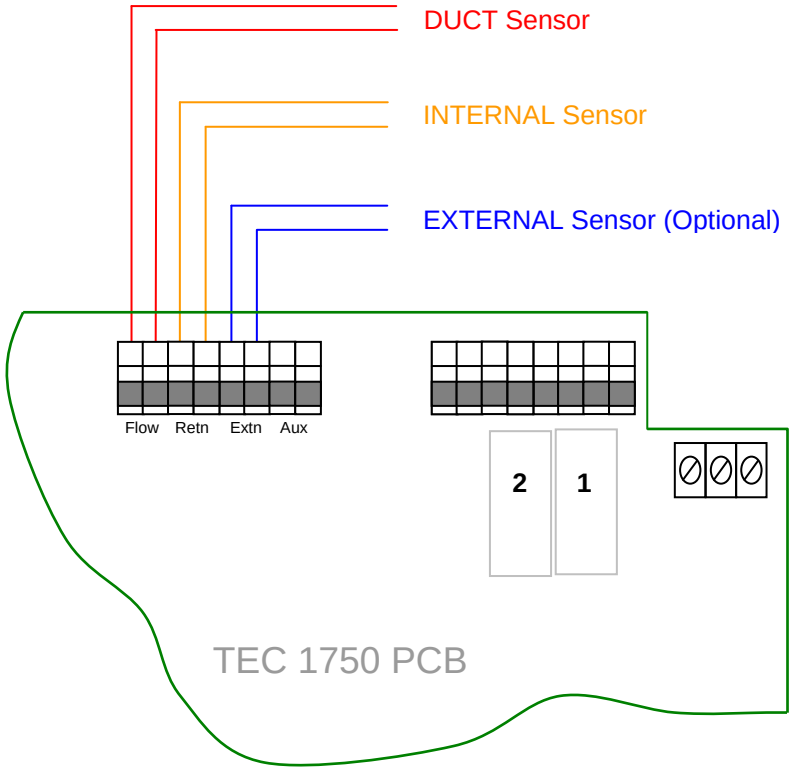


Fig. 5

Internal Temperature Sensor

The INTERNAL sensor can be fitted adjacent to the existing Room Thermostat if this is considered to be installed in a satisfactory location. Alternatively, the sensor may be located in the return path of the heater itself. In many instances, this may be the most convenient place to install. See Fig.6.

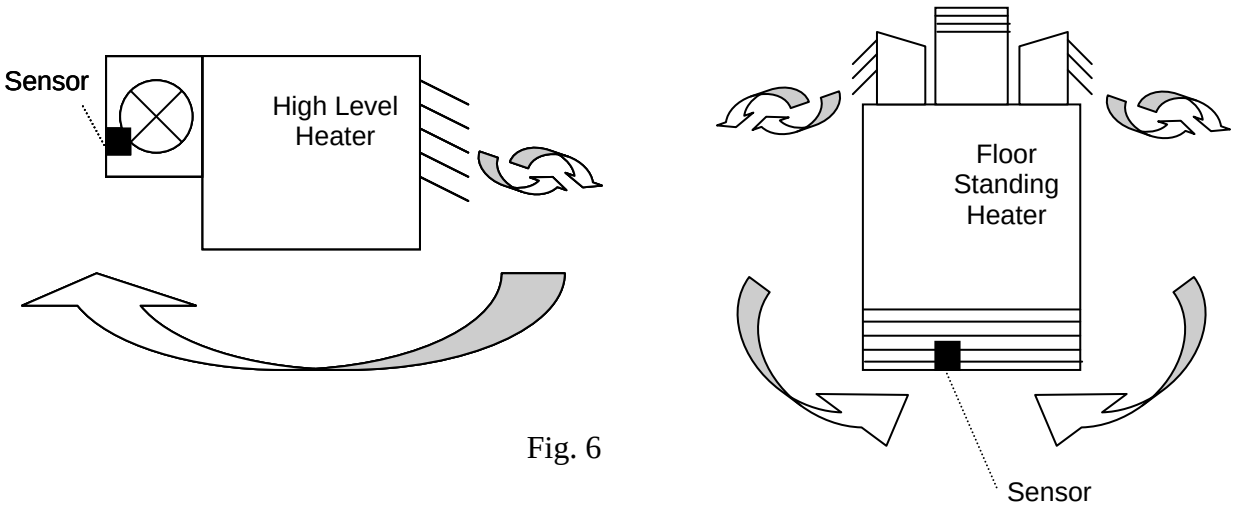


Fig. 6

Duct Temperature Sensor

In the case of a free standing warm air heater the DUCT sensor should be installed into one of the duct outlets, ensuring that the sensor picks up a positive flow of hot air that is not shielded by any of the air deflectors. On a fully ducted warm air heating system the sensor should be installed into the ducting, as close to the heater as possible.

Care must be taken that the sensor does not detect any excessive temperature rise created by the heater before the heater fan switches on.

External Sensor (Optional)

The **External Sensor** should preferably be positioned on a north facing exterior wall, and connected to the appropriate terminals of the TEC 1750. If it is not possible to mount the sensor on a north facing wall, then mount in a shaded position, under eaves, and away from boiler house vent grilles etc.

Commissioning - Introduction

The TEC 1750 Digital has 14 main programs, these being:

1.	Calendar	
2.	On/Off Times	(Two On/Off Periods per day)
3.	Frequency	(Once, Twice, 24 Hours)
4.	Select Days	(Every Day, Weekends, Week Days)
5.	Optimise On Time	(0 to 240 minutes)
6.	Optimise Off Time	(0 to 240 minutes)
7.	Set Day Temperature	(0ºC to 30 ºC)
8.	Set Night Temperature	(0ºC to 30ºC)
9.	Maximum Duct Temperature	(50ºC to 85ºC)
10.	Minimum Duct Temperature	(50ºC to 85ºC)
11.	Set On Time (Cycling Mode)	(1 to 15 minutes)
12.	Set Off Time (Cycling Mode)	(1 to 15 minutes)
13.	View External Temperature	
14.	Calibrate	

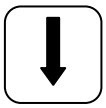
Keypad and Running Mode Overview

PROGRAM

Used to enter Programming Mode from normal running mode, and to access Change Mode for the selected program.

SELECT

Used to cycle through the program list when in Programming Mode and to change program settings when in Change Mode.



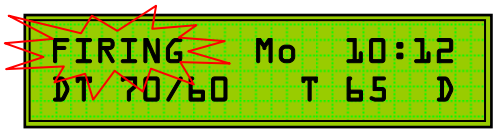
RETURN

Used to cycle through the program list when in Programming Mode and to change program settings when in Change Mode.

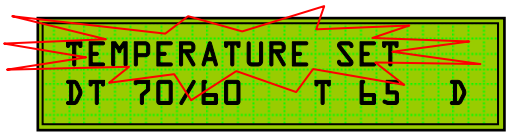
ENTER

Used to confirm a programming change and to exit from the Programming Mode.

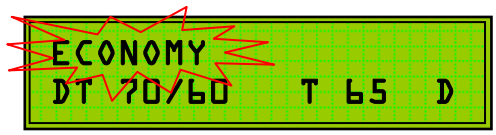
Firing mode indicates that the heater is firing.



Temp Set indicates that the **programmed day/ night temperature** has been achieved. The heater will not be firing at this point.



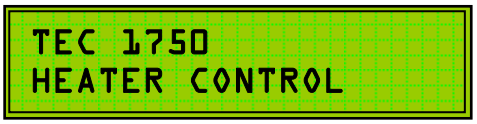
Economy indicates that the TEC 1750 is making economies. The heater will **not** be firing at this point.

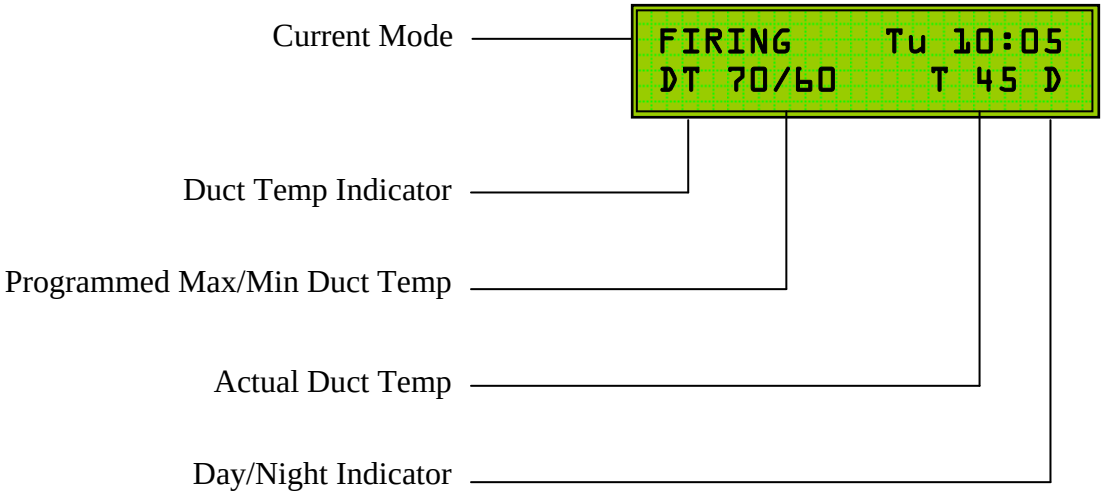


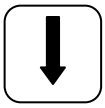
The Display

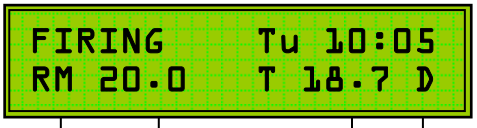
1. Switch on the power to the TEC 1750.

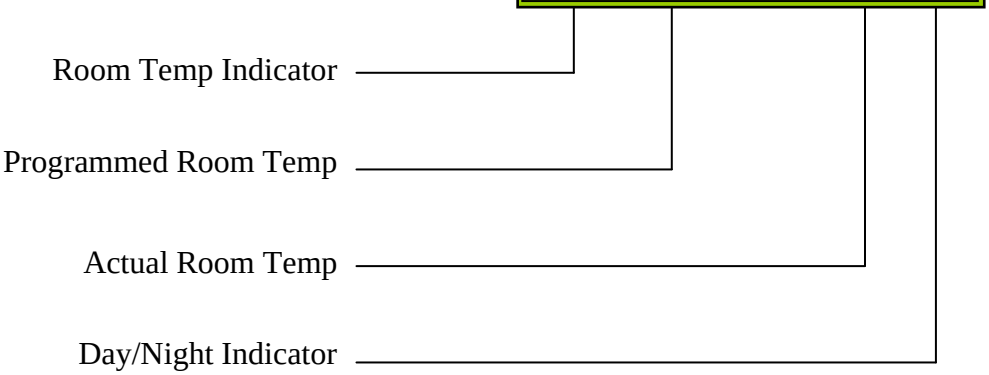
2. The display will show:





3. Pressing the  button will change the display to:





Setting the Optimisation

The maximum optimisation (preheat) for Winter conditions (external temperature < -1'C) may be determined by the historic settings of the existing time clock or if in doubt discuss with the owner/occupier/manager of the building to which the installation applies. In most warm air installations this will be 1-2 hours. If the external sensor is not used, add 15 minutes to the normal maximum preheat.

Set the optimisation time using program 5 as described later in this manual.

The TEC 1750 will automatically reduce the maximum preheat depending on the internal temperature at time clock switch on time. If the external sensor is fitted the ultimate preheat period will be derived from the combined input of both sensors. The preheat search period will occur each time the time clock is activated.

If a second off period is selected the on time must be compensated to allow for the optimisation search period that will occur.

I.E. First on period 07.00, maximum preheat of 1 hour to allow for an 08.00 occupation time. If the second on/off period is 13.00 to 15.00 then set the time clock to 13.00 OFF, 14.00 ON, therefore making the second on time 1 hour before that required.

This is to allow for the fact as the space temperature will be at normal levels, the TEC 1750 will delay the switch on time by 1 hour (in this example).

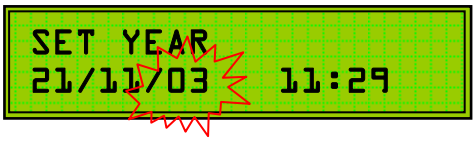
The use of a second on/off period is not always the most economical way to run a warm air heating system. To avoid the complications of the optimiser as described it may be better to persuade the user to use only one on/off period.

Setting the Programs

P1. Setting the Calendar (Factory Set)

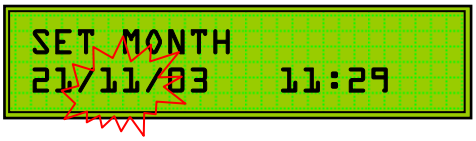
1. Press **P** PROGRAM to change display to:

2. Press **P** PROGRAM again to display:



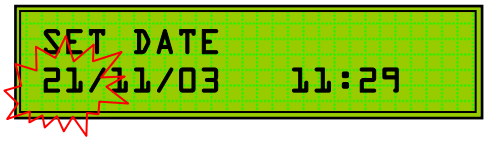
3. Press ↑ SELECT or ↓ RETURN to set the year.

4. Press **E** ENTER to change display to:



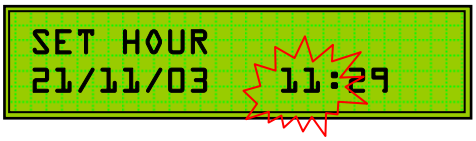
5. Press ↑ SELECT or ↓ RETURN to set the month.

6. Press **E** ENTER to change display to:



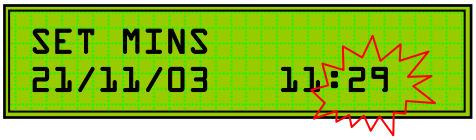
7. Press ↑ SELECT or ↓ RETURN to set the date.

8. Press **E** ENTER to change display to:



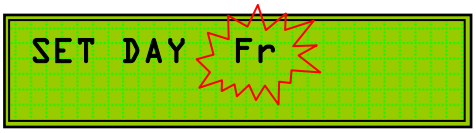
9. Press ↑ SELECT or ↓ RETURN to set the hour.

8. Press **E** ENTER to change display to:



9. Press ↑ SELECT or ↓ RETURN to set the minutes.

10. Press **E** ENTER to change display to:



11. Press ↑ SELECT or ↓ RETURN to set the day.

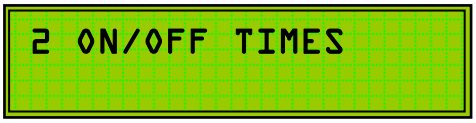
12. Press **E** ENTER to confirm the program change and return to main menu.

13. Press ↑ SELECT to advance to next program.

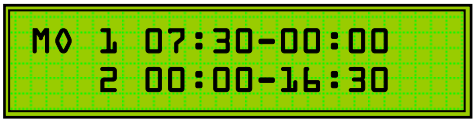
P2. Programming the Time Clock (On/Off Times)

If optimisation is not being used then set the ON time to provide the necessary pre-heat. If optimisation is selected then set the ON time to 15 minutes before the occupation time.

1. Press ↑ SELECT or ↓ RETURN to select program 2:



2. Press P PROGRAM again to display:



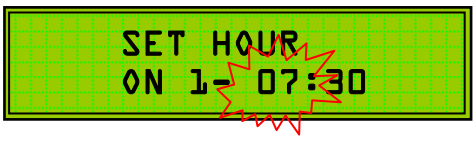
There are two (2) programmable On/Off times per day.

The second OFF time must ALWAYS be programmed, and set to a time after, but in the same 24 hour period as the first ON time.

3. To change On/Off Times select the required day with ↑ SELECT ↓ RETURN

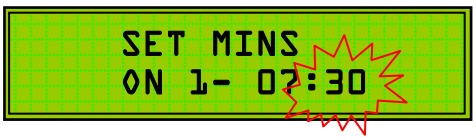
4. Press P PROGRAM to enter programming mode for the chosen day:

5. Press P PROGRAM to set first ON time:



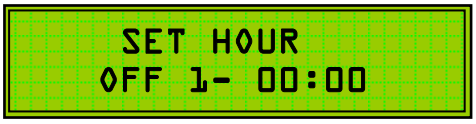
6. Press ↑ SELECT or ↓ RETURN to set the hour as required.

7. Press **E** (ENTER) to set first ON time minutes:



8. Press ↑ (SELECT) or ↓ (RETURN) to set the minutes as required.

9. Press **E** (ENTER) to set first OFF** time:



** If the FIRST OFF time is not required leave at 00:00.

Adjust HOUR and MINUTES in the same way as previously described.

10. Press **E** (ENTER) to set the second ON time and repeat as above.

11. Press **E** (ENTER) to set the second OFF time and repeat as above.

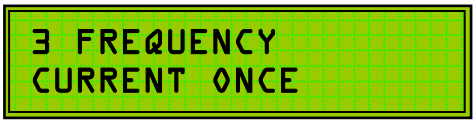
If different On/Off times are required for each day, then repeat the above instructions for each day's times.

To repeat a days On/Off times into the next day, select the next day as described above and press **P** (PROGRAM) followed by **E** (ENTER).

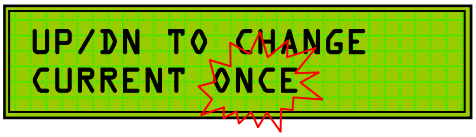
12. Press **E** (ENTER) to confirm program changes and return to main menu.

P3. Frequency (How the Time Clock operates)

1. Press ↑ SELECT or ↓ RETURN to select program 3:



2. Press **P** PROGRAM to display:



3. Press ↑ SELECT or ↓ RETURN to set as described below:

ONCE The time clock operates from the first ON time to the second OFF time.

TWICE The time clock operates on both ON and OFF times i.e. two On/Off periods per day.

24 HOUR The time clock operates 24 hours a day regardless of the On/Off settings.

4. Press **E** ENTER to confirm program changes and return to main menu.

P4. Select Days

1. Press ↑ SELECT or ↓ RETURN to select program 4:

2. Press P PROGRAM to display:

3. Press ↑ SELECT or ↓ RETURN to set as described below:

EVERY DAY The heating will operate everyday as set by the time clock On/Off times.

WEEK ENDS The heating will operate at week ends only as set by time clock On/Off time for Sat – Sun. If reduced heating is required at week ends then set the time clock for reduced hours during Saturday and Sunday, and then set program 4 to EVERY DAY.

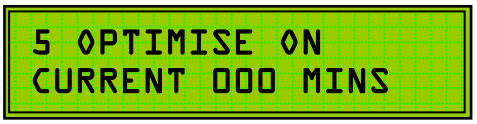
WEEK DAYS The heating will operate during week days only as set by the time clock On/Off times Mon – Fri. The heating will be OFF at weekends.

4. Press E ENTER to confirm program changes and return to main menu.

P5. Optimise On

Set to match existing Pre-Heat times.

1. Press ↑ SELECT or ↓ RETURN to select program 5:



When programming a **Variable Pre-Heat** period (Optimum On) the first switch on time (P2) should be set to the buildings occupation time less 15 minutes. If a **variable pre-heat** period is **not** required, then the first switch on time must allow for a sufficient warm-up period before occupation time.

When selected, the full programmed **variable pre-heat** period will occur at 0ºC external temperature. At temperatures above 0ºC the system will calculate the required **pre-heat** time.

Note: To assure adequate temperatures are achieved by occupation time the maximum **pre-heat** period must satisfy the building's thermal characteristics.

If Optimum On is not required then set to 000 mins.

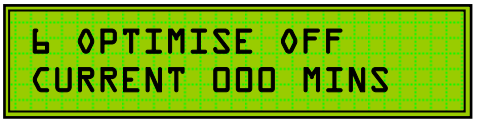
2. Press P PROGRAM to display:

3. Press ↑ SELECT or ↓ RETURN to set the required number of minutes.

4. Press E ENTER to confirm program changes and return to main menu.

P6. Optimise Off (for use with optional External Sensor)

1. Press ↑ SELECT or ↓ RETURN to select program 6:



Optimum Off periods will, when selected, switch off a boiler / heating system earlier than the programmed **off** time.

At 15ºC external temperature the full **optimum off** period will occur and the heaters will switch off early. At 0ºC external temperature there will be **no optimum off** and the boilers will switch off at the normal programmed time. At external temperatures between 0ºC and 15ºC the system will calculate the required **off** time.

If Optimum Off is not required (external sensor not fitted) then set to 000 mins.

2. Press P PROGRAM to display:

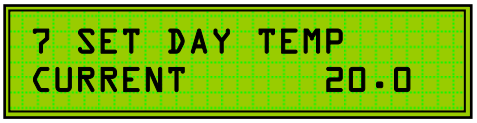
3. Press ↑ SELECT or ↓ RETURN to set the required number of minutes.

4. Press E ENTER to confirm program changes and return to main menu.

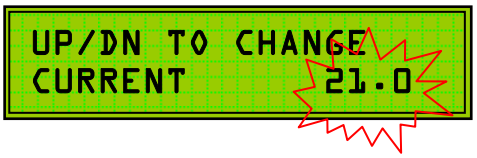
P7. Day Temperature

Set to the space temperature (room) required during the normal ON periods.

1. Press ↑ SELECT or ↓ RETURN to select program 7:



2. Press P PROGRAM to change display to:



3. Press ↑ SELECT or ↓ RETURN to change the temperature setting to that required (i.e. 21ºC).

4. Press E ENTER to confirm the program changes and return to main menu.

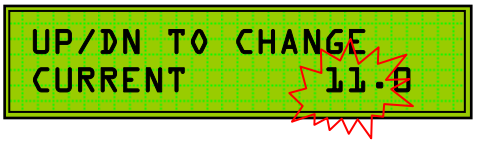
P8. Night Temperature

Set to the space temperature (room) required during the normal OFF periods.

If a night temperature is not required then set to 0ºC.

1. Press ↑ SELECT or ↓ RETURN to select program 8:

2. Press **P** PROGRAM to change display to:



3. Press ↑ SELECT or ↓ RETURN to change the temperature setting to that required.

4. Press **E** ENTER to confirm the program changes and return to main menu.

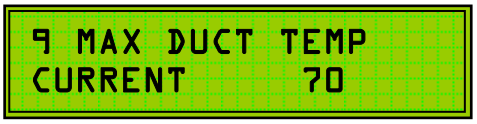
P9. Maximum Duct Temperature

Applicable when the Duct Sensor is fitted.

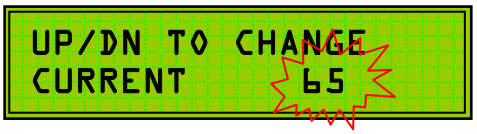
Allow the heater to run in BYPASS mode and note when the Duct Temperature stops rising, and the time taken to achieve this maximum temperature.

Set P9 to the temperature noted above.

1. Press ↑ SELECT or ↓ RETURN to select program 9:



2. Press P PROGRAM to change display to:



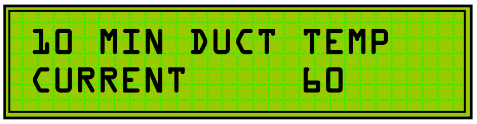
3. Press ↑ SELECT or ↓ RETURN to set the required temperature.

4. Press E ENTER to confirm program changes and return to main menu.

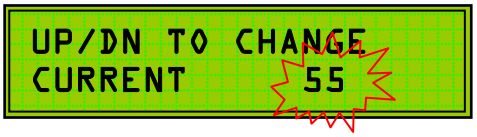
P10. Minimum Duct Temperature

Set the Minimum Duct Temperature 8-10 ºC below the level set in P9.
If this causes short cycling then set lower, i.e. 10-15 ºC.

1. Press ↑ SELECT or ↓ RETURN to select program 10:



2. Press P PROGRAM to change display to:



3. Press ↑ SELECT or ↓ RETURN to set the required temperature.

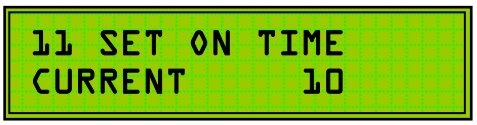
4. Press E ENTER to confirm program changes and return to main menu.

Note If fitting the duct sensor is impractical, i.e. high level heaters, then use the Cycling Mode programs (P11 and P12) to achieve heater cycling and enhance savings.

P11. On Time (Cycling Mode – no duct sensor fitted)

Set P11 to the time noted to reach Maximum Duct Temperature.

1. Press ↑ SELECT or ↓ RETURN to select program 11:



2. Press P PROGRAM to change display to:

3. Press ↑ SELECT or ↓ RETURN to set the required temperature.

4. Press E ENTER to confirm program changes and return to main menu.

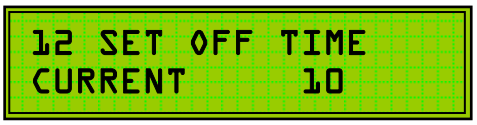
12. Off Time (Cycling Mode – no duct sensor fitted)

Set the Off Time to match the P11 On times as shown below:

10 mins ON - 3 mins OFF
8 mins ON - 3 mins OFF
7 mins ON - 2 mins OFF
6 mins ON - 2 mins OFF

These will normally be the most common figures encountered.

1. Press ↑ SELECT or ↓ RETURN to select program 12:

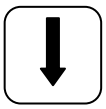


2. Press P PROGRAM to change display to:

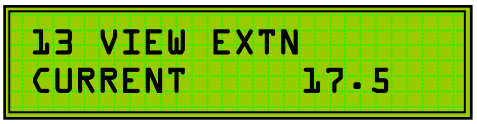
3. Press ↑ SELECT or ↓ RETURN to set the required temperature.

4. Press E ENTER to confirm program changes and return to main menu.

13. View External Temperature

1. Press  or  to select program 13:

SELECT RETURN



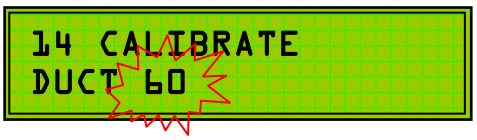
This menu option is NOT programmable, but allows you to see the current external temperature when the optional external temperature sensor is fitted.

P14 Calibration

Program 14allows individual calibration of the Duct, Room (Internal) and External (optional) temperature sensors. Each sensor reading can be adjusted by -10ºC/+20ºC.

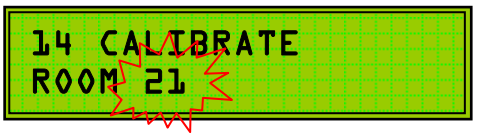
1. Press ↑ SELECT or ↓ RETURN to select program 14

2. Press P PROGRAM to change display to:



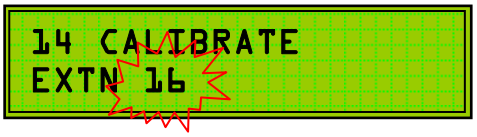
3. Press ↑ SELECT or ↓ RETURN to adjust the displayed temp (-10ºC/+20ºC).

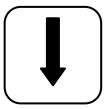
4. Press E ENTER to confirm program changes and display:



5. Press ↑ SELECT or ↓ RETURN to adjust the displayed temp (-10ºC/+20ºC).

6. Press E ENTER to confirm program changes and display:



7. Press  **SELECT** or  **RETURN** to adjust the displayed temp (-10ºC/+20ºC).

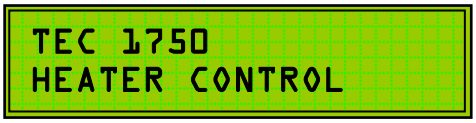
8. Press  **ENTER** to confirm program changes and return to main menu.

Exiting Programming Mode

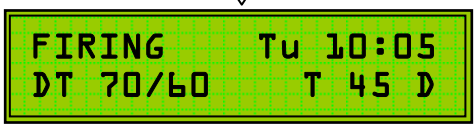
To exit from the programming mode, first ensure that the display indicates you are in the main menu.

At this point, press **E** (ENTER) to exit programming mode.

The display will change to:



And then, after a few seconds to:



The display may show slightly different information depending on the current mode of operation, i.e. firing, economising etc.

Note: When in programming mode the TEC 1750 will revert to normal running mode if the keypad is not operated for a period of 30 seconds (4 minutes if in program change mode).

To access programming mode from normal running mode:

Press **P** (PROGRAM) and then select required program with ↑ (SELECT) ↓ (RETURN).

Make any program changes as described previously.