



# T3001

## Heating System Controller



# Engineering Manual



# CONTENTS

<b>CONTENTS</b> .....	<b>3</b>
<b>INTRODUCTION</b> .....	<b>1</b>
<b>TECHNICAL DATA</b> .....	<b>1</b>
<b>GENERAL MENU STRUCTURE</b> .....	<b>2</b>
SCHEDULES.....	3
SETTINGS.....	3
STATUS.....	3
OPERATING MODES.....	4
SYSTEM CONFIGURATION.....	5
<b>FUNCTION DESCRIPTIONS</b> .....	<b>6</b>
OUTSIDE AIR COMPENSATION.....	6
BOILER CONTROL.....	7
MIXING VALVE CONTROL.....	8
DOMESTIC HOT WATER CONTROL.....	8
SELF-ADAPTIVE COMPENSATION.....	9
BY-PASS PUMP CONTROL.....	10
FROST PROTECTION.....	10
SPECIAL FUNCTIONS.....	11
AUTOMATIC SUMMER/WINTER CHANGEOVER.....	11
PUMP AND VALVE EXERCISE.....	11
HEATING PUMP CONTROL.....	12
SENSOR FAULTS.....	12
<b>START UP</b> .....	<b>13</b>
SYSTEM RESET.....	14
<b>PHONE LINE CONNECTION OPTIONS</b> .....	<b>15</b>
REMOTE DIAGNOSIS AND CONTROL BY MODEM.....	15
REMOTE START/STOP BY PHONE.....	15
<b>WIRING DIAGRAM</b> .....	<b>15</b>
<b>MECHANICAL INSTALLATION REQUIREMENTS</b> .....	<b>16</b>
POSITIONING OF SENSORS.....	16
<b>ELECTRICAL INSTALLATION REQUIREMENTS</b> .....	<b>17</b>
230 VAC POWER SUPPLY.....	17
BURNER WIRING.....	17
PUMP OUTPUTS.....	17
MIXING VALVE OUTPUTS.....	17
SENSOR WIRING.....	17



## INTRODUCTION

This engineering manual gives detailed information on various innovative control functions offered by the multifunction T3001 controller. In addition to this engineering manual, a commercial brochure, an owner's manual and wiring diagrams are available.

Furthermore, the free-of-charge *T3001 Asistant* software package can be used to prepare quotations and to support the engineering of systems. This Windows 95 software helps to prepare equipment lists, system drawings, wiring diagrams for different heating system configurations and temperature compensation curves for any setting.

## TECHNICAL DATA

<b>Supply Voltage</b> .....	230Vac + 10% - 20%
<b>Nominal Frequency</b> .....	50 Hz
<b>Power Consumption</b> .....	16 VA
<b>Memory Reserve</b> .....	Unlimited (non-volatile memory)
<b>Outputs</b> .....	6 Relays, 2A, 230 Vac
<b>Terminals</b> .....	Plug-in screw type (screwdriver included)
<b>Terminal Compartment</b> .....	For cables upto 1.5 mm <sup>2</sup> stranded
<b>Sensor Type</b> .....	Type Pt1000 PTC (1000 Ohm at 0 °C)
<b>Measurement Range</b> .....	-40...+120 °C
<b>Measurement Accuracy</b> .....	± 1 degree
<b>Ambient Temperature</b> .....	0...50 °C
<b>Humidity</b> .....	0%...90% Rh non-condensing
<b>Unit dimensions (w x h x d)</b> ..	144 x 96 x 140 mm
<b>Mounting</b> .....	Standard 35 mm rail or panel mounting
<b>Panel Cut-out</b> .....	138 x 92 mm
<b>Display</b> .....	2 lines, 16 characters, with backlighting
<b>Keypad</b> .....	Membrane type, 16 keys

### Factory Set Values

Please see "Function Descriptions" section, page 6

## GENERAL MENU STRUCTURE

The user-interface has the following menu structure. Detailed information and operation instructions are given in the owner's manual.

<u>Menu title</u>	<u>Description</u>
1.Schedules	Time Programming menu
1.ComfortPeriods	Heating circuit scheduling
2.DomesticHotWtr	DHW scheduling
3.Aux.Output	Time program for the auxillary output
2.Settings	
Comfort = 20°C	Desired room temperature for comfort periods (day)
Economy = 16°C	Desired room temperature for economy periods (night)
DHW = 50°C	Desired domestic hot water temperature
Sum/Win = 17°C	Summer/winter changeover temperature
3.Status	Actual values at the moment of reading
1.Temperatures	
Outdoor = 00.0	
Mixed Flow= 00.0	
Boiler = 00.0	
Return = 00.0	
DHW = 00.0	
Room = 00.0	
2.Outputs	
Valve = 84% +	“+” = opening, “-” = closing, “o” = stationary
Burner = 2	
Heating Pump= ON	0=Off, 1=First stage on, 2=Second stage on
DHW Output =OFF	
Bypass Pump =OFF	
Aux. Output =OFF	
3.Calc.Values	Calculated values
Season =Winter	Summer / Winter
MixedFlow=00.0°C	Calculated setpoint for mixed flow
Boiler =00.0°C	Calculated setpoint for boiler output
Burner1=00000hrs	Total operating hours for burner stage 1
Burner2=00000hrs	Total operating hours for burner stage 2
4.Special Func.	Current status of special functions (Yes = Active, No= inactive)
Soft Start =Yes	
PreHeating =Yes	
Pipe Frost = No	
Room Frost = No	
TempHotWater= No	
Disinfection= No	
Exercise = No	
Valve Sychr.= No	
4.OperatingMode	Selection of operating modes
5.Set Date/Time	
6.System	System configuration and settings

---

## SCHEDULES

T3001 has three independent schedules (time programs).

### Comfort Periods

This schedule allows the setting of comfort periods for the heating. During these hours, the T3001 will operate on a compensation curve to maintain comfort temperature inside the building.

Outside these hours, a reduced compensation curve which maintains economy temperature inside the building replaces above curve. If economy setpoint is set to 0 °C, the heating system will be switched off (heating pump and boiler will be switched off, mixing valve will be closed).

### Domestic Hot Water

The scheduling for the domestic hot water supply. Outside these programmed hours, domestic hot water will not be available.

### Auxillary Output

An unused output of the T3001 (e.g. second stage burner or mixing valve or DHW) can be utilized to provide an independent time channel to operate any other piece of equipment, e.g. security lighting.

These three schedules can very easily be programmed independently for any day of the week and for multiple switching times per day. In the example below, the programmed times are: Monday to Friday from 07:00 to 09:00 and from 17:30 to 22:00 and at the weekend from 08:30 to 23:45. Programs past midnight are also possible.

Day	Begin	End
1-5	07:00	09:00
1-5	17:30	22:00
6-7	08:30	23:45

A total of eight different lines can be defined for each schedule.

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## SETTINGS

The settings menu allows the user to change basic settings for daily operation. These settings are:

- Comfort Temperature
- Economy Temperature
- Domestic Hot Water Temperature
- Summer/Winter Changeover Temperature

---

## STATUS

The status menu is used to monitor the actual situation of the heating system at that moment. The submenus allow viewing of measured temperatures, output states, calculated values and special function states.

Unconnected inputs and outputs display as "---". A sensor fault displays "Fault"

---

## **OPERATING MODES**

“Full Automatic” is the normal operating mode of the controller where the boiler, mixing valve and pumps are operated as described in this manual. The owner can also select one of the below operating modes.

### **Comfort Always**

If this operating mode is selected, the heating circuit time program is disabled. The heating circuit will always operate with the comfort setting.

### **Economy Always**

In this case, the heating circuit time program is again disabled and the heating circuit will always operate with the economy setting.

### **DHW only**

The heating circuit is shut down (mixing valve closed and the heating pump switched off) but domestic hot water is available as programmed.

### **DHW Temporary**

This mode is used to provide domestic hot water outside of programmed hours. When this mode is selected, the DHW will be heated once to its setpoint. When the DHW setpoint is reached (or after a maximum of two hours), the system will revert to its previous operating mode automatically.

### **Holiday**

This mode is used to shut down the heating system for a period. When this mode is selected, T3001 will prompt the user to enter the date of the end of the holiday period. The system will shut down immediately, but will start automatically on the entered date.

### **Shut Down**

When this mode is selected, all pumps and the boiler will be switched off and mixing valve will be closed. Frost protection is still active and the pumps and the boiler can start automatically if necessary.

### **Manual**

All outputs are switched on and the valve is fully open. Control is only possible manually through the boiler thermostat.



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## SYSTEM CONFIGURATION

The system menu allows changes to the basic system configuration and many important parameters and settings. This menu is password protected, as the typical user is not expected to access these advanced functions.

The system menu has the following structure.

<u>Menu title</u>	<u>Description</u>
6.System	
1.Parameters	
1.Burner Control	
Hysteresis =04 K	
Max.Limit =90°C	
Min.Limit =30°C	
Min.Cycle=180sec	
Stage2Delay=6min	
DHW Diff. =15 K	
HeatingDiff=10 K	
2.Valve Control	
Max.Limit =90°C	
Prop.Band =12 K	
Integral =180sec	
RunTime = 80sec	
3.DHW Control	
Hysteresis = 5 K	
Priority =10 K	
Disinfect. =70°C	
4.Compensation	
DesignT =-12.0°C	
Max.Shift = 8 K	
5.Preheating	
Room Max=6hours	
Out Max=3hours	
RoomHeat=20K/min	
SoftStart= 15min	
6.Miscellaneous	
ByPassSet =55°C	
ByPassHyst.= 5 K	
Room Frost = 4°C	
Pipe Frost =10°C	
2.ChangePassword	
3.Offsets	
4.Sum/Win Time	Settings for automatic summer/winter time changeover
1.Summer Time	
2.Winter Time	
3.Enable/Disable	
5.System Reset	Use to enter the start-up menu
6.Test Outputs	Allows manual commanding of each output for test purposes

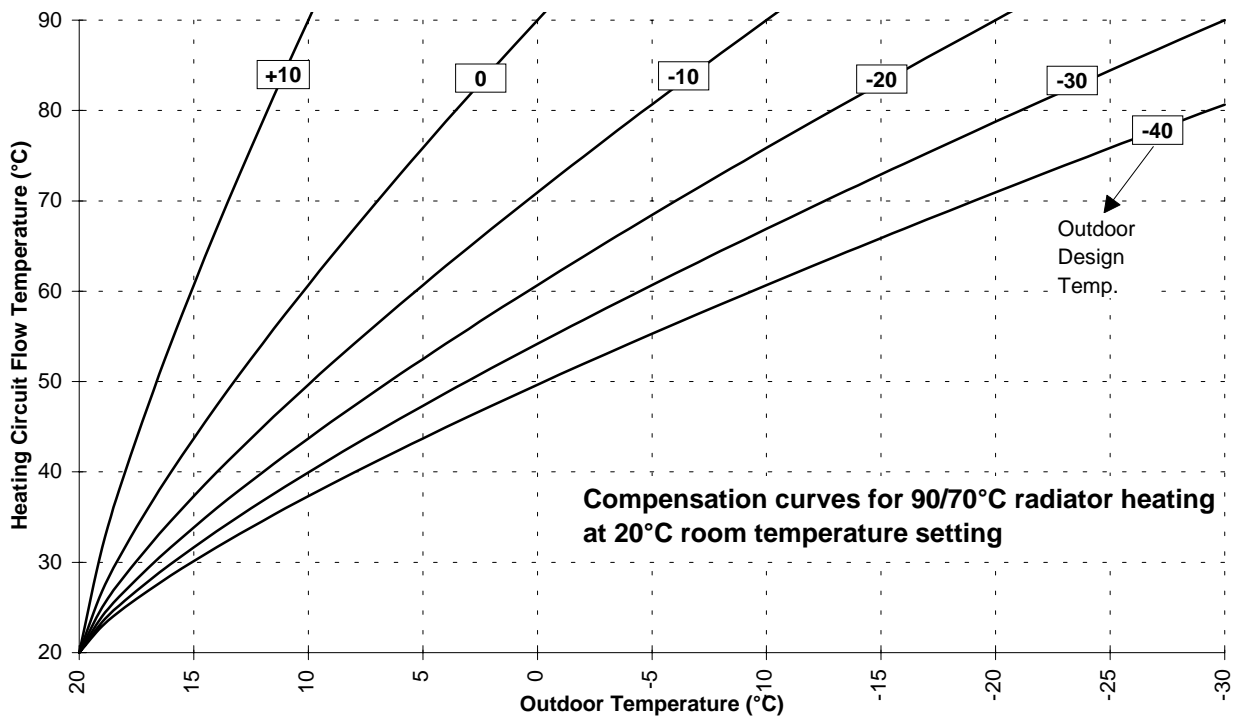
Detailed description of each parameter setting is given in the following function descriptions.

## FUNCTION DESCRIPTIONS

### OUTSIDE AIR COMPENSATION

T3001 controller maintains room temperature at setpoint by adjusting flow water temperature in accordance with changes in the outside air temperature .

Theoretical heating curve ratio to be used in different climactic areas to maintain the room temperature at 20 °C in a radiator circuit 90/70 °C heating system are shown on below graph.



The figures in the boxes on each curve represent the design temperatures which are the expected lowest outside air temperatures of the climactic area where the T3001 controller will be installed.

Please note that when outside air temperature falls to design temperature, the flow water temperature will be 90 °C for each curve.

T3001 selects the heating curve ratio to be used by considering three factors:

**Type of the Heating Circuits:** Under floor heating or radiator heating? The maximum flow water temperature will be 90 °C for radiator heating circuits and 55 °C for under floor heating circuits.

**Design Temperature:** The flow water temperature reaches its maximum value at this outside air temperature. It is set initially by considering the climactic conditions of the area where the controller will be used and by considering the capacity of the heating system. Normally this setting will not need to be changed.

**Desired Room Temperature:** Comfort and economy setpoints and the related time program are adjusted by the user.

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## **BOILER CONTROL**

A single-stage or dual-stage burner can be controlled to maintain the calculated boiler setpoint. The boiler setpoint is calculated based on the demand from the heating circuit and the domestic hot-water circuit (if applicable).

### **Systems with no mixing valve:**

If there is no mixing valve, the boiler is normally controlled to maintain the flow temperature setpoint, which is calculated based on the outside air temperature. The display will indicate the same value for both flow temperature setpoint and the boiler temperature setpoint (Main Menu > Status > Calc.Values).

When there is a demand for domestic hot water heating in combined DHW systems, the heating pump will be stopped.

### **Systems with mixing valve:**

In this case, the boiler temperature setpoint is equal to the calculated mixed flow setpoint plus a differential or the DHW setpoint plus a differential, whichever is greatest. Both differentials are adjustable (default values 10 and 15 K respectively).

### **Safety functions:**

The boiler will be switched off, if an adjustable maximum temperature is reached. This safety feature overrides all other functions.

During periods of heating demand, the boiler will be switched on if the water temperature falls below an adjustable low limit value.

The minimum on and off time for the burner can be adjusted to prevent the boiler from short cycling, to improve boiler efficiency, optimise life expectancy and reduce maintenance costs.

In dual-stage burners, the second stage will be switched on with an adjustable delay time after the first stage.

### **Parameters:**

Parameters for burner control should be set in accordance with the recommendations of the boiler manufacturer.

- Hysteresis:** The boiler will be switched off when the temperature reaches the calculated boiler setpoint. It will be switched on again when the temperature falls by this amount. Default value 4 K for single stage burners and 8 K for dual stage burners.
- Max. Limit:** The boiler temperature will not be allowed to exceed this value at any time. Default value 90°C.
- Min. Limit:** The boiler temperature will not be allowed to fall below this value during heating demand. Default value 30°C (60°C if by pass pump is installed).
- Min.Cycle:** Once a burner stage is switched on, it will not be switched off before this amount of time. Similarly, when a burner stage is switched off, TAS3001 will wait at least this much before restarting it. Default value 150 seconds.
- Stage2Delay:** After the first stage is switched on, the second stage will not be started until this amount of time expires. Only effective for systems with dual-stage burners. Default value 8 minutes.
- DHW Diff.:** Minimum differential to maintain between boiler temperature and DHW setpoint, when there is a demand for DHW. Only effective for systems with combined DHW. Default value 15 K.
- HeatingDiff:** Minimum differential to maintain between boiler temperature and calculated flow setpoint during heating periods. Only effective for systems with mixing valve. Default value 10 K.

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## **MIXING VALVE CONTROL**

During heating periods, a three-way or four-way mixing valve is controlled to maintain the calculated flow temperature. The valve is positioned through the 230 VAC floating control (three-position) outputs.

The flow temperature calculation is based on the outside air temperature, room setpoint (comfort or economy), and the compensation curve. The proportional plus integral (PI) control function provides accurate temperature control under all conditions. Proportional band and integral time parameters are adjustable.

The current mixing valve position (in percent) can be read on the display at any time (Main Menu > Status > Outputs). TAS3001 maintains this value by calculating the opening and closing times of the valve actuator and using the run-time parameter.

The valve is driven to the fully closed position every day at 01:00 to synchronize the calculated and actual valve position. This synchronization is repeated after power failure and when the valve run-time parameter is readjusted.

### Parameters:

- RunTime:** Time (in seconds) for the valve to travel from fully closed to fully open position. Default value 80 seconds.
- Max.Limit:** Maximum temperature allowed in the heating circuit. Default value 90°C for radiator systems, 55°C for underfloor heating systems.
- Prop.Band:** PI control parameter. Default value 10 K.
- IntegralTime:** PI control parameter. Default value 320 seconds.

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## **DOMESTIC HOT WATER CONTROL**

The DHW output will be switched on when the DHW temperature falls an adjustable differential below its setpoint. It will be switched on again when the temperature reaches the setpoint. The heating demand from the DHW circuit can effect the heating circuit as explained below.

### Seperate DHW:

If the heating source for DHW is independent of the heating boiler, the DHW control will not effect the boiler control functions in any way.

### Combined DHW:

If the boiler is providing hot water for both heating and DHW circuits, then different modes of operation are possible:

**Systems with no mixing valve:** In this case, DHW has priority over the heating. When a demand for DHW exists, the heating pump is switched off.

**Systems with mixing valve:** When a demand for DHW exists, if the boiler temperature is lower than the DHW setpoint plus the adjusted differential (**DHW Diff.**) explained above, the mixing valve will be closed giving the DHW priority.

If the boiler temperature is higher than this value (meaning extra heat is available), the mixing valve will be controlled with a reduced setpoint. If the boiler temperature is higher than this value plus an adjustable differential (**Priority**), the mixing valve will be controlled normally to maintain calculated flow temperature.

DHW priority can be cancelled by adjusting this differential to zero. In this case, the mixing valve will operate normally during all times (parallel operation).

## Disinfection

Every Monday morning at 01:00, the DHW will be heated to an adjustable high value for a period of two hours to kill germs and bacteria that might develop in the system. Disinfection function will not be initiated if there is a normal DHW demand at this time. Therefore, the DHW schedule should be set not to include this time.

This function can be disabled by setting the disinfection setpoint to 0 °C.

### Parameters:

- Hysteresis:** DHW control hysteresis. The DHW output will be switched on when the temperature falls below the DHW setpoint by this amount. Default value 5 K.
- Priority:** DHW Priority. The differential where the mixing valve maximum opening will be limited. Only effective in systems with combined DHW and mixing valve. Default value 10 K.
- Disinfect.:** Disinfection setpoint. To cancel the disinfection function, set this parameter to zero. Only effective in systems with DHW. Default value 70°C

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## **SELF-ADAPTIVE COMPENSATION**

The flow temperature setpoint is continually calculated based on the actual outside air temperature, the desired room temperature and the design temperature setting (Design Temperature = the lowest outside air temperature condition in which the heating system is able to maintain 20 °C room temperature).

However, the thermal characteristics of every building is different. The curves obtained from the theoretical design temperature may not provide the best results.

If a room temperature sensor is fitted, the TAS3001 will track the room temperature during the comfort period and evaluate its performance in maintaining the desired comfort setpoint. At the end of each comfort period, it will automatically make a small readjustment on the design temperature setting based on this evaluation. After one week from initial start-up, the setting that best matches the building's thermal characteristics should be reached.

The positioning of the room temperature sensor is very important. If this measurement is not representative of the indoor temperature, self-adaptive compensation will not provide satisfactory results.

If a room temperature is not fitted, it may be necessary to manually adjust the design temperature setting to obtain better results. The setting should be decreased if the building is overheated and vice versa.

### Parameters:

- Design Temp.:** The lowest outside air temperature condition in which the heating system is able to maintain 20 °C room temperature. Effective on all types of systems. This value will change automatically if a room temperature sensor is fitted and the self-adaptive compensation function is not disabled. Default value -3°C.
- Max.Shift:** The automatic shift of the design temperature will not exceed this limit. This limiting function will be reset each time the design temperature is manually adjusted. To disable the self-adaptive compensation, set this parameter to zero. Default value 10 K.
- Eval.Time:** If the performance evaluation time (which starts after the comfort room temperature is reached) is lower than this value, no automatic re-adjustment occurs. If, however, the comfort temperature is not reached during the comfort period, the design temperature is automatically re-adjusted. Default value 1 hour.

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## **BY-PASS PUMP CONTROL**

If a return water temperature sensor is not fitted, the by-pass pump will operate in parallel with the burner.

If a return water temperature sensor is fitted, when a demand for heating exists (either from the heating or the DHW circuit), the by-pass pump will be started if the return water temperature falls below an adjustable value. It will be stopped again when the return water temperature rises an adjustable amount.

Parameters:

**Ret.Setpoint:** Return temperature setpoint for by-pass pump control. If this parameter is set to zero, the bypass pump will operate in parallel with the burner. Default value 55°C.

**Hysteresis:** By-pass pump control hysteresis. When the by-pass pump is started, it will run until the return water temperature rises this amount above its setpoint. Default value 5 K.

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## **FROST PROTECTION**

Background protection is available at all times, even when the “shut-down” operating mode is selected. There are two types of protection, one based on room temperature, the other on the temperature of any pipe sensor.

### **ROOM PROTECTION**

If the room temperature falls below an adjustable value (typically 4°C), full heating is switched on until the room temperature rises by 1degree (fixed hysteresis). This function is only effective in systems where a room temperature sensor is fitted.

### **PIPING PROTECTION**

When any of the pipe sensors (boiler, return water, mixed flow or the domestic hot water) measure a temperature below an adjustable value (typically 10 °C), all pumps will be switched on and the boiler is controlled at its low limit setpoint until the temperature rises by 5 degrees (fixed hysteresis).

Parameters:

**Room Prot.:** Room frost protection setpoint. Default value 4°C.

**Pipe Prot:** Frost protection setpoint for the connected pipe sensors (boiler, return water, mixed flow and domestic hot water). Default value 10°C.

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## ***SPECIAL FUNCTIONS***

### **PRE-HEATING (Optimum Start)**

In order to boost the room temperature prior to occupancy, the heating will be switched to its maximum temperature before occupancy time. The calculation of this preheat period depends on whether a room temperature sensor is installed or not.

If a room temperature sensor is not installed, the preheat period is determined based on the current outdoor temperature, comfort setpoint and the design temperature setting. In this case the heating system operates at its maximum temperature until the comfort period.

If a room temperature sensor is installed, the preheat period is determined based on the current room temperature, comfort setting and past experience. During the preheat period, the room temperature is continuously monitored and changes are made automatically to improve future preheat time calculations. If the room temperature reaches the comfort setting before the occupancy time, the heating system will continue to normal operation at the comfort setting.

### **SOFT START**

To reduce pipework/system expansion noises at the beginning of the preheat/comfort period, the soft start function will restrict the mixed flow water temperature 50 °C for radiator circuits and to 30 °C for under floor heating circuits for an adjustable length of time. If the mixed flow temperature is already close to this value, the soft start function will not be initiated. If the soft start period is set to zero, the soft start function will be disabled.

#### **Parameters:**

- Room Max:** Maximum preheat time with room temperature sensor installed. If this parameter is set to zero, preheat time will be calculated based on the outdoor temperature. Default value 6 hours.
- Out Max:** Maximum preheat time with no room temperature sensor. If this parameter is set to zero as well, no preheating will occur before occupancy. Default value 2 hours for radiator systems, 4 hours for underfloor heating systems.
- RoomHeat:** A multiplier used to calculate the pre-heat period based on the room temperature. The T3001 automatically readjusts this value to find the optimum pre-heat time each day. Default value 30 min/K for radiator systems, 60 min/K for underfloor heating systems.
- SoftStart:** Soft start period in minutes. Setting this parameter to zero disables the soft start function. Default value 15 minutes.

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## ***AUTOMATIC SUMMER/WINTER CHANGEOVER***

When the average daily outside air temperature exceed the summer/winter changeover setpoint, the heating circuit is shut down (heating pump switched off and mixing valve closed).

In summer, the changeover temperature is increased by approx. 1 degree so that summer-to-winter changeover occurs at a higher outdoor temperature.

An attenuated outside air temperature is used in this comparison to prevent the heating system from frequent cycling due to irregular and unrepresentative temperature changes.

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## ***PUMP AND VALVE EXERCISE***

To prevent the mixing valve and the heating, DHW and by-pass pumps from sticking and jamming due to prolonged periods of inactivity, a brief valve and pump exercise program is activated weekly at 12:00 on Fridays. The valve and pump exercise function will be initiated only during the summer period.

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## **HEATING PUMP CONTROL**

Heating pump normally runs continuously during the heating period but will be switched off if any of the following conditions occur.

- during the summer season
- when the boiler temperature is close to the room setpoint
- when the room temperature is 2 K above setpoint
- When the DHW is switched on in a system with no mixing valve and combined DHW system.
- during the economy period, if the economy setpoint is set to 0 °C.
- "DHW only" or "Shut down" operating mode is selected manually.

The heating pump can be switched on, however, by the frost protection and exercise programs even when one of these conditions exists.

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## **SENSOR FAULTS**

If any connected sensor fails, an exclamation mark will be flashing on the main display screen. The failed sensor will display as "Fault". The control functions will react to sensor faults as follows:

### **Outdoor Sensor**

The boiler will be controlled at its minimum temperature and the mixing valve will be controlled at the maximum flow water temperature setting.

### **Boiler Sensor**

Normally both stages of the burner will be off: However, under frost conditions the first stage of the burner will cycle with a 20% on/off ratio.

### **Mixed Flow Sensor**

The valve will be fully open and all functions will continue as a system with no mixing valve.

### **DHW Sensor**

DHW output will be off, except under frost conditions.

### **Boiler Return Sensor**

The by-pass pump will operate in parallel with the burner.

### **Room Sensor**

All functions will operate as a system with no room temperature sensor.



## START UP

When power is first applied, the following questions/answers lines will appear on the display in sequence and the installer will be required to answer them by using the keypad.,

- A) Press ✓ key to accept the default setting. The next question will appear on the display.
- B) Press ↑ key to toggle between the options. Press ✓ key to accept the displayed answer and move to the next question.
- C) To change the “outdoor design temperature” and “valve runtime,” use the keypad to type in a new value.

<b>QUESTION</b> (with default answer shown)	<b>OPTION</b> (Press ↑ key to display option)	<b>Remarks</b>
Boiler control? Yes	No	Select “no” for heat-exchanger systems with no boiler
Burner type? Single Stage	Dual Stage	Displayed only if boiler control selected.
Heating circuit? Radiator	Underfloor	
Mixing valve installed? Yes	No	
Valve Runtime? 180 seconds	<i>Enter new value</i>	Displayed only if mixing valve is installed.
Domestic hotwater heating? Yes	No	
Domestic hotwater type? Combined	Seperate	Displayed only if DHW is present
Bypass pump installed? Yes	No	Displayed only if there is an unused output
Bypass pump = .....	-	Displayed only if bypass pump is installed to indicate which output the bypass pump should be connected to. Information only.
Return sensor installed? Yes	No	Displayed only if bypass pump is installed.

Room sensor  
installed? Yes

No

Outdoor design  
temperature? -03°C

*Enter new value*

Auxillary Output=  
.....

Displayed to indicate an unused output  
which can be used to connect an auxillary  
load.

After the completion of the start up process the T3001 controller selects the corresponding parameters and starts normal operation. The valve will be initially driven to the fully closed position for synchronization.

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### **System Reset**

The start-up procedure will not be repeated on subsequent power-ups. To repeat the start up procedure, select "system reset" under the password protected "system" menu.

You will be asked to confirm the reset with the following display.

Reset system?  
Cancel

Press ✓ to cancel.

To continue and reset the controller, first press ↑, then ✓.

## PHONE LINE CONNECTION OPTIONS

### **Remote Diagnosis and Control by Modem**

A distinguishing feature of the T3001 controller is the possibility of long distance service through telephone line-modem connection.

The only requirement for this option is to connect a phone line and a standard modem to the T3001 controller. Modem and cables can be purchased from Ontrol or from any other supplier.

If this option is purchased, in case of a complaint from an enduser, you can pre-check the controller through an IBM compatible computer before sending a technician. If the complaint is for the settings only you do not need to send a serviceman, any setting can be made through telephone line, including time programming, wherever the controller is (even if it is in another part of the world).

This service can be made by Ontrol or by any authorised service center having a telephone line, a computer and Windows software. The software will be supplied by Ontrol free of charge.

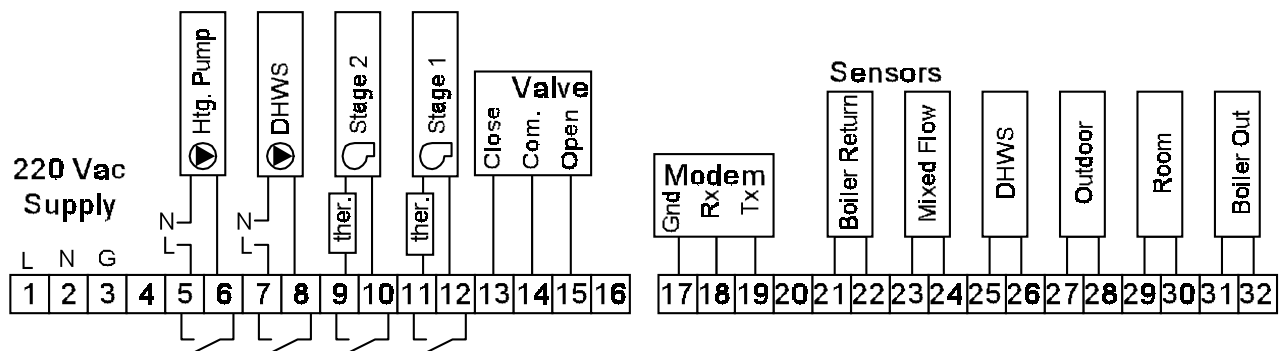
### **Remote Start/Stop by Phone**

The P101 interface allows the user to use an ordinary phone to remotely switch the T3001 between normal operation and "shut-down" modes.

To do this, the user dials the phone number and the P101 will answer the phone after the assigned number of rings. The user then punches in his/her security code, receives a confirmation tone and presses a key to start or stop the heating system.

The P101 also allows the user to change the security code and the number of rings before answering.

## WIRING DIAGRAM



The by-pass pump and auxillary load connect to an unused output.

## MECHANICAL INSTALLATION REQUIREMENTS

The application (installation, wiring and start up) must be done properly to have any controller to control efficiently. Simple mistakes cause dissatisfaction of the enduser and unnecessary service hours.

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### POSITIONING OF SENSORS

The accurate measurements of the temperatures is most important for the proper functioning of the T3001 controller. General principals of the positioning of the sensors are described below. One of the most important points to be considered carefully by the installer is to locate the sensor to the place to provide the most accurate measurement.

- Outside air sensor** The outside air temperature sensor should be exposed to the same conditions of temperature, wind and sun as the rooms being controlled. Normally, a north facing wall provides the coldest location and is not affected by direct sunlight. Many buildings do not have a perfect geographic orientation and in these cases choose a north to north-westerly aspect. Only if all the rooms in the zone to be controlled are facing in one direction should the outside air temperature sensor be mounted on this particular wall. Do not mount the outside air temperature sensor near windows, doors, exhaust air vents, on external boiler flues, or anywhere that might cause the sensor to give an incorrect measurement. For small buildings (up to 3 storeys) mount the sensor about 2/3 wall height and, for taller buildings, between the 2<sup>nd</sup> and 3<sup>rd</sup> floors.
- Clamp-on sensors** It is important to ensure that good heat transfer takes place through the pipe onto the sensitive area. The pipe or cylinder must be cleaned to reveal bright metal. When fitting, cut the clamp-on strip to the approximate length beforehand and tighten the sensor firmly in place using the lock. To further improve heat transfer it is strongly recommended that a heat-conductive compound is used and that the sensor is fully insulated.
- Immersion sensors** The favoured position is on a pipe bend. Insert the full length of the pocket as the sensor, which is on the tip of the stem, needs to be surrounded by the water temperature to be measured.
- Mixed flow temp.sensor** The mixed flow temperature sensor must be positioned at least 10 pipe diameters after the heating pump. If the heating pump is in the return pipe, position the temperature sensor at least 1.5m after the mixing valve, but before the radiators. Failure to observe these distances could cause the control system to cycle rapidly.
- Boiler temp. Sensor** It must be installed as near as possible to the boiler outlet to minimise the difference between the temperature read on the boiler temperature indicator and measured by the sensor. The temperature measured by the sensor will allways be a little lower then the temperature read on the boiler temperature indicator.
- DHW sensor** If the sensor is installed on the outlet pipe of the water heater, the measurement will be misleading when hot water usage is limited. Therefore the sensor should be installed on a place in the water heater tank.
- Room sensor** The room temperature sensor should be mounted approximately 1.5m above floor level in a good air circulation and well away from any external or internal heat sources, e.g. direct sunlight, radiators, office equipment, etc. Do not mount the room sensor in a room with thermostatic radiator valves fitted to the radiators. If thermostatic radiator valves are already fitted, lock them at their maximum setting.

## ELECTRICAL INSTALLATION REQUIREMENTS

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### ***230 VAC Power Supply***

The T3001 controller should be supplied through a separate and independent circuit breaker (6A). This is important for the protection and usage of the controller. In case of a failure, power can be disconnected through this fuse and the heating system can be controlled by the boiler thermostat manually, until service can be provided.

Furthermore separate wiring of all devices in the heating system (burner, pumps) will provide easy and quick service.

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### ***Burner Wiring***

The boiler high limit thermostat must always be used and it is recommended that the boiler control thermostat, supplied as an integral part of the boiler, is retained and adjusted to its maximum setting for use as a second high limit thermostat.

The burner outputs of T3001 controller are normally open contacts and must be serially wired to boiler thermostats.

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### ***Pump Outputs***

As a general principle the pumps should not be connected directly to the outputs of the T3001 controller. Additional relays external to the controller are recommended.

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### ***Mixing Valve Outputs***

The T3001 controller drives a 230 V, 50 Hz floating actuator. If the actuator is designed to operate other than 230V supply, two relays with 230 V coil must be installed between the actuator and the controller.

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### ***Sensor Wiring***

The maximum wiring length between any sensor and the T3001 is 50 meters.

The configuration menu allows the installer to enter a calibration value for each sensor to offset measurement faults due to cable resistances.

In some heating systems, incidences of electrical noise interference occur during the switching on and off heavy electrical loads. The rule for wiring any sensor is if in doubt, use screened cables. The screen must be continuous from the sensor to the T3001 controller and only earthed at the controller end. Not to cause the screen earthed at the sensors end care must be shown that the cables do not touch pipes.