

## ENDEAVOUR

PREVIOUSLY VERSION KNOWN AS HTC-DIGITAL-LCD

### PROGRAMMABLE TEMPERATURE CONTROLLER c/w YEARLY PROGRAMMABLE TIME SWITCH

COMPATIBLE WITH A WIDE RANGE OF SENSORS



ROOM

O/A WALL

DUCT

PIPE



CONNECT UPTO 32 TO HMI

#### Features

- Measure & Control Temperature & CO2 levels with analog & digital I/O
- Temperature Input Thermistor or 0-10vDC, Remote S/P 10K or 0-10vDC
- Five 8 Amp (2.5) Relays .4 Freely Configurable + 2 x 0-10vDC Analog O/P'S
- Automatic Night Purge for building cool down when O/A conditions suitable
- LED Indication of Relay Outputs
- Economy Cycle use for both free Cooling or Heating when Suitable Preset
- for most Common Usage but easily Editable with intuitive Menu Mounts in
- most M.C.B din rail enclosures
- Event Driven Time Switch allowing switching **Past** Midnight.
- Optional connect CO2 & O/A sensors to override Economy cycle Dampers.
- Programmable Start by Internal 365 day T/Switch **& or** Push Button triggered Run Timer **& or** Manual On/Off Switch.
- **Modbus** for Remote **HMI** or **BMS** Override Control & Monitoring.
- External inputs for : Auto / Off / On, AHR override & A/C fault indication.

The **ENDEAVOUR** temperature Controller is a fully programmable microprocessor based Temperature Controller with optional use of an internal 365 day Time Switch & / or Run Timer facility all in the one model. The Controller is intended for applications where On/Off control of Heating and Cooling stages and / or control of modulating actuators is required. The controller is suitable for mounting in a mechanical services switchboard or the A/C units control cubicle, and connected to remote measuring sensors by a 2 or 3 wire screened cable. Four of the five relays are programmable for their mode of operation (as heat or cool stages or as both) with individual switching characteristics. The 5th relay is dedicated as a System Run (fan/time switch) relay. Two Analog 0-10vDC output signals can also be programmed individually for start, range and mode of operation. Outside Air Temperature and Room (or R/A duct) CO2 sensors can also be optionally connected to override motorized modulating economy cycle damper operation. Use of fresh air intake (Economy Cycle Damper operation) due to high CO2 levels can be limited on high & low extremes of outside air temperatures (adjustable) so as not to inhibit normal temperature control.

## EXTERNAL OVERRIDES & OPTIONAL CONNECTIONS

Upto 32 of ENDEAVOUR controllers can be connected via 2 wire shielded RS485 MODBUS to the Hevac **HMI-EZS** colour touch screen master control panel (can be wall or panel mounted) for centralised control and monitoring, or upto 42 panels to 3rd party BMS system using MODBUS.



Remote System **AUTO/OFF & AHR** operation can be easily added by simply connecting a N/O switch or & push button in parallel with the main temperature sensor (X1 & M) wires out in the field either as an optional room sensor type or separate switches mounted where convenient. Momentarily shorting X1 & M results in triggering a run timer function (typically as an after hours run function) or constant shorting of X1 & M results in a system **OFF** function. These functions are also alternatively available using the controllers D1 & M terminals for **AUTO/OFF & AHR** operation & connecting D2 & M is a forced manual Time switch override Manual **ON** input.

**Outside air** temperature and room (or R/A) **CO2** sensors can also be optionally connected to override the output signal of Y1 when used to control a modulating Economy cycle damper set if connected.

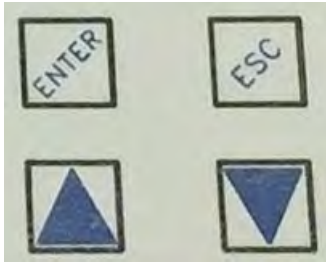
With an optional **O/A sensor** connected, the Economy cycle damper operation for temperature control can be interlocked for free heating, cooling or both, when the outside air temperature conditions are favorable. The fresh air sensor is compared to the room (or return air) temperature sensor, and if outside air temperature is measured to be more suitable than using recycled air for free temperature control, the motorized damper output signal will modulate per room temperature demand.

The use of outside air for temperature control can also be inhibited if the outside air temperature falls below an adjustable minimum temperature (factory set at 16C).

With an optional **CO2 sensor** connected, the economy cycle dampers will be also be proportionally driven to the fresh air mode to reduce high CO2 levels. The maximum damper output signal for CO2 control can be restricted in extreme O/A temperatures so as not to lose temperature control, all settings are user adjustable.

A **Remote Set Point** device (either passive or active) can be connected to the controller. **If** a passive adjuster is connected (default setting), the controller will automatically detect and hand over set point adjustment authority to the remote device (then ignoring the controllers UP & DOWN buttons for set point adjustment). The passive remote set point potentiometer can be built into a room temperature sensor (SRT-DSP) or as a separate stand alone device giving remote setpoint control (SPA-D). The range of the passive remote setpoint is fixed at 18 to 25 degrees over 0 to 10K, if an active remote setpoint is used the 0-10vDC is 0-5c adjustable for 0v & the top end range adjustable upto 100c.

The controllers face plate has four push buttons to edit controller settings.



“ENTER” ACTS AS THE SAVE OR MENU OPEN BUTTON

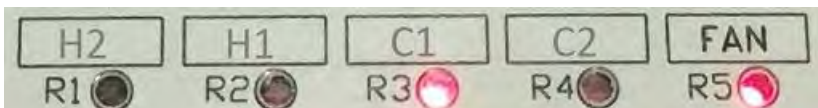
“ESC” ACTS AS THE EXIT OR JUMP BACK TO PREVIOUS MENU BUTTON

The controller has a large L.C.D (16x2) screen and 5 red L.E.D's to give user input / output status. The LCD screen will automatically cycle through relevant screens, displaying applicable information as programmed into the control settings of the controller, ie Temperature, Setpoint, System “On By”, Time & Date, Analogue Output Values, Outside Air Temperature & CO2 ppm levels (if these optional sensors are programmed to be enabled).

The relay assignments are user programmable and as such the relay “use identifier” text box above each LED is not factory marked and is for optional labeling by the commissioning technician. The factory default settings for these relays, from left to right is : COMP3, COMP2, COMP1, R/V HEAT, FAN. But could for example be assigned and marked as per below. The analogue outputs Y1 & Y2 if used, are shown as a LCD display.



The LCD screens will automatically cycle through each relevant display.





## MENU DESCRIPTION

The user menu is easily accessible by pushing the “**ENTER**” button on the controller’s fascia. The menu item to be checked or edited can then be viewed by pushing the “**UP**” or “**DOWN**” button to cycle around the menu tree.

***The menu order and brief description is as follows:***

<u>MENU NAME</u>	<u>FUNCTION</u>
<b>Set * START BY * METHOD :</b>	<i>SET <u>SYSTEM ON/OFF OPERATION</u> BY EITHER THE INTERNAL <u>TIMESWITCH</u>, INTERNAL RUN TIMER (Triggered by remote push button) OR REMOTE MANUAL ON OFF SYSTEM SWITCH (by shorting out either sensor X1 &amp; M or D1 &amp; M terminals).</i>
<b>Set RUN / AHR TIMER PERIOD :</b>	<i>SET <u>RUN TIMER DURATION</u> FOR USE AS AN AFTER HOURS RUN TIMER OR AS A SYSTEM RUN (FOR) TIMER (with or without time switch usage).</i>
<b>PROGRAM TIME SWITCH :</b>	<i>PROGRAM SYSTEM <u>START AND FINISH TIME</u> FOR EACH DAY OF THE WEEK.</i>
<b>LOAD HOLIDAYS :</b>	<i>PROGRAM INDIVIDULE OR GROUP <u>HOLIDAY SYSTEM OFF DATES</u>.</i>
<b>ENABLE NIGHT PURGE :</b>	<i>ENABLE <u>NIGHT PURGE TIMECLOCK PERIOD AND TEMPERATURE SETTINGS</u>.</i>
<b>RELAY PROGRAMMING :</b>	<i>SET <u>MODE &amp; SETTINGS</u> FOR THE 4 PROGRAMMABLE <u>RELAYS</u> (R1-4).</i>
<b>Y1 &amp; Y2 ANALOG PROGRAMMING :</b>	<i>SET <u>MODE &amp; SETTINGS</u> FOR THE 2 PROGRAMMABLE <u>ANALOG</u> (Y1 &amp;Y2) O/P's</i>
<b>(X1) SENSOR CONFIGURATION :</b>	<i>SET ROOM SENSOR AS <u>ACTIVE, PASSIVE, CAL OFFSET &amp; RANGE ADJUSTMENT</u>.</i>
<b>(X2) REMOTE S/P CONFIGURATION :</b>	<i>SET TYPE OF OPTIONALLY CONNECTED <u>REMOTE SETPOINT</u> AS PASSIVE 0-10K (FIXED RANGE OF 10-25C) OR 0-10VDC (MAX RANGE ADJUSTABLE)</i>
<b>(X3) O/AIR TEMP. CONFIGURATION :</b>	<i>ENABLE &amp; ADJUST SETTINGS FOR <u>O/A TEMPERATURE SENSOR AFFECTS</u></i>
<b>(X4) CO2 SENSOR CONFIGURATION :</b>	<i>ENABLE &amp; ADJUST SETTINGS FOR A ROOM or (R/A DUCT) <u>CO2 SENSOR TO OPEN THE ECONOMY CYCLE DAMPERS WHEN MEASURED CO2 IS HIGH</u>.</i>
<b>SET CLOCK :</b>	<i>TO SET THE CONTROLLERS , <u>TIME, DATE</u> AND ENABLE DAY LIGHT SAVING.</i>
<b>MODBUS SETUP :</b>	<i>TO ENABLE, SET <u>MODBUS ADDRESS</u> &amp; CONNECTION SPEED.</i>
<b>RESTORE FACTORY DEFAULTS :</b>	<i>CLEARs MEMORY AND RESTORES THE CONTROLLER TO <u>FACTORY DEFAULTS</u></i>
<b>PRESS ENTER TO EXIST MENU :</b>	<i>TO <u>EXIT</u> THE PROGRAM <u>MENU</u> AND RETURN TO NORMAL OPERATION.</i>

## Technical Data

General Specifications	Operating Voltage	12 to 24 Volts AC or DC
	Power Consumption	
	At 24vDC Volts	200mA
	At 24vAC Volts	5 VA
	Switching Capacity of Relays	
	Voltage	AC 0....250 Volts
	Current	8.0 (2.5) Amps
	Set point Setting Range	1....50 oC in 0.1 oC Increments
	Relay Switch ON Points (Dead band)	0.1....19.9 oC
	Relay Hysteresis (Switching Differential)	0.1....9.9 oC
	Relay to Energise Time Delay	0.1....42 Minutes
	Y1/Y2 Output Voltage Range	0....10VDC
	Y1/Y2 Start Point (Dead band)	0.....19.9 oC
	Y1/Y2 Range (Proportional Band)	0.5....25 oC
Y1/Y2 Integral action (P+I triggers >10% P output)	Off....60 minutes	

### ANALOG INPUTS

- X1 : Main Measurement Temperature Sensor Input configurable (with jumper) as either Active (0-10vdc ~0 to 100c (adjustable) or Passive (4.2k@22c).
- X2 : Remote Set point configurable (with jumper) as either passive using 10K Potentiometer = fixed 18-25c Range **or** 0-10vdc (top end range configurable).
- X3 : Outside temperature sensor configurable (with jumper) as either Active (0-10v~0-100c) or Passive (4.2k@22c) (factory default).
- X4 : Room or R/A Duct CO2 Sensor input to override economy cycle operation

### Output Indication

Relay On/Off Status	5 x Red LED
LCD Display	2 x 16 character LCD
Display Resolution	0.1 Increments

### Communication

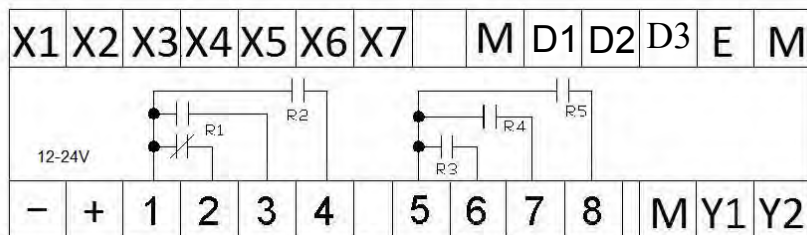
Terminal's X5,X6 & X7 configurable as RS485 MODBUS Outputs

Environmental Conditions	Operation	
	Ambient Temperature	0...45oC
	Humidity	< 85 % RH (Non Condensing)
	Storage and Transport	
	Ambient Temperature	-5...65oC
	Humidity	< 90 % RH (Non Condensing)
Product Standards	COMPLIES TO ALL RELEVANT AUSTRALIAN STANDARDS including 6mm segregation between high & low voltage connections	
Weight	Including Packaging	600 grams
Housing	Colour	Grey
	Material	ABS POLYCARB
	UV Stabilised	YES
	Fire Retardant	YES
	Size	L105mm x W105mm x D60mm
	Mounting Method	35mm Din Rail Mountable

### Terminal Designations

X1	Main Temperature Sensor Input (Passive or Active)	M	Common sensor & signal ground
X2	Remote S/P input (Passive or Active) (Optional connection)	D1	Manual System OFF <b>&amp;/or</b> AHR trigger input
X3	O/A sensor input (Passive or Active) (Optional connection)	D2	Manual System ON Override (T/Sw. override)
X4	CO2 Room or R/A Duct sensor (Optional connection)	D3	External FAULT I/P (for indication)
X5	MODBUS RS485 - A Terminal	E & M	future Expansion module O/P
X6	MODBUS RS485 - B Terminal		
X7	MODBUS SHIELD (GND)		

### **ACTUAL** TERMINAL LAYOUT



-	12-24 Volt Supply Neutral (internally connected to terminals M)	5	Relay 3,4 & 5 Common
+	12-24 Volt AC or DC Supply Active	6	Relay 3 Normally Open
	1 Relay 1 & 2 Common	7	Relay 4 Normally Open
	2 Relay 1 Normally Closed	8	Relay 5 Normally Open (FAN)
	3 Relay 1 Normally Open	M	Signal ground
	4 Relay 2 Normally Open	Y1	Analog Modulating Output 0-10 vDC
		Y2	Analog Modulating Output 0-10 vDC

Abbreviations & Definitions

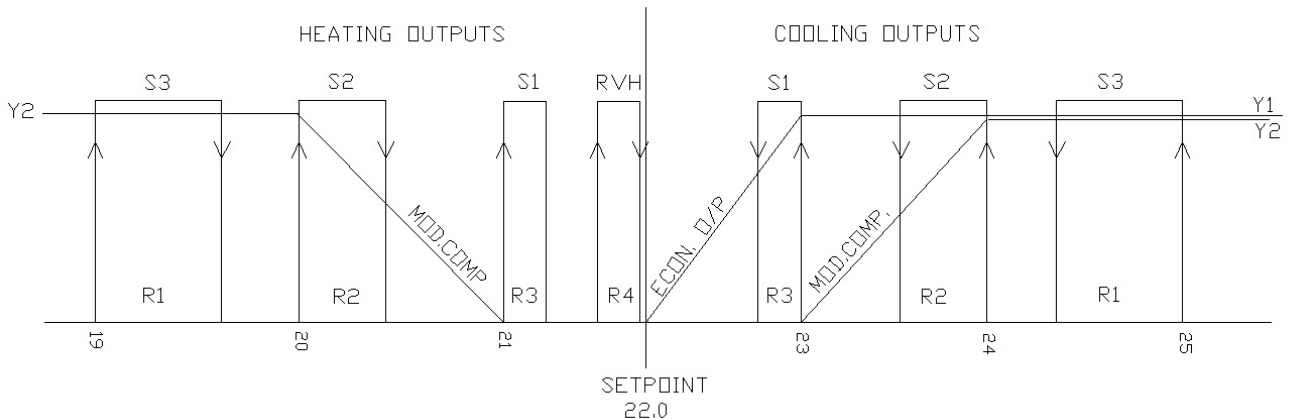
DB	Dead Band in Degrees Celsius
SD	Switching Differential in Degrees Celsius
PB	Proportional band in Degrees Celsius
TD	Time Delay in minutes & seconds
I	Integral Time in minutes & seconds
MODE	H = <u>HEAT</u> ONLY MODE
	C = <u>COOL</u> ONLY MODE
	B = <u>BOTH</u> HEAT & COOL MODE

**Pre Loaded Program**

**FACTORY DEFAULT SETTINGS**

Relays preset for 3 Stage Reverse Cycle A/C Unit control + T/Switch  
 Y1 Set as Economy Cycle o/p (Cool only) (P only mode)  
 Y2 Set as Modulating Compressor output (P only mode)  
 X1 Main temperature input set for passive (Hevac 4k -D type sensor)  
 X2 remote S/P input set for passive (0-10k pot.) automatically takes control if connected.  
 X3 O/A sensor input Disabled (enable if on O/A sensor connected) jumper set for passive  
 X4 CO2 sensor Input Disabled (enable if CO2 sensor to be connected)  
 Start / Stop Mode via Time Switch Operation Mon-Fri 8:00-17:30  
 After hours / Run Timer set for 2 hours  
 Modbus connections X5,6 & 7 Disabled both in hardware jumper settings & user software.

RELAY	MODE	DB	SD	PB	I	TD	USE
R1	B	3.0	1.0			3.0	HEAT & COOL STAGE 3 (COMP.3)
R2	B	2.0	0.7			2.0	HEAT & COOL STAGE 2 (COMP.2)
R3	B	1.0	0.3			1.0	HEAT & COOL STAGE 1 (COMP.1)
R4	H	0.5	0.4			0.1	REVERSING VALVE HEAT MODE
R5							TIME SWITCH / FAN FIXED SYSTEM ON RELAY
Y1	C	0.1		1.0	OFF		ECONOMY CYCLE DAMPER O/P
Y2	B	1.0		1.0	OFF		MODULATING COMPRESSOR O/P



## Typical Wiring Connections

### AVAILABLE SENSORS

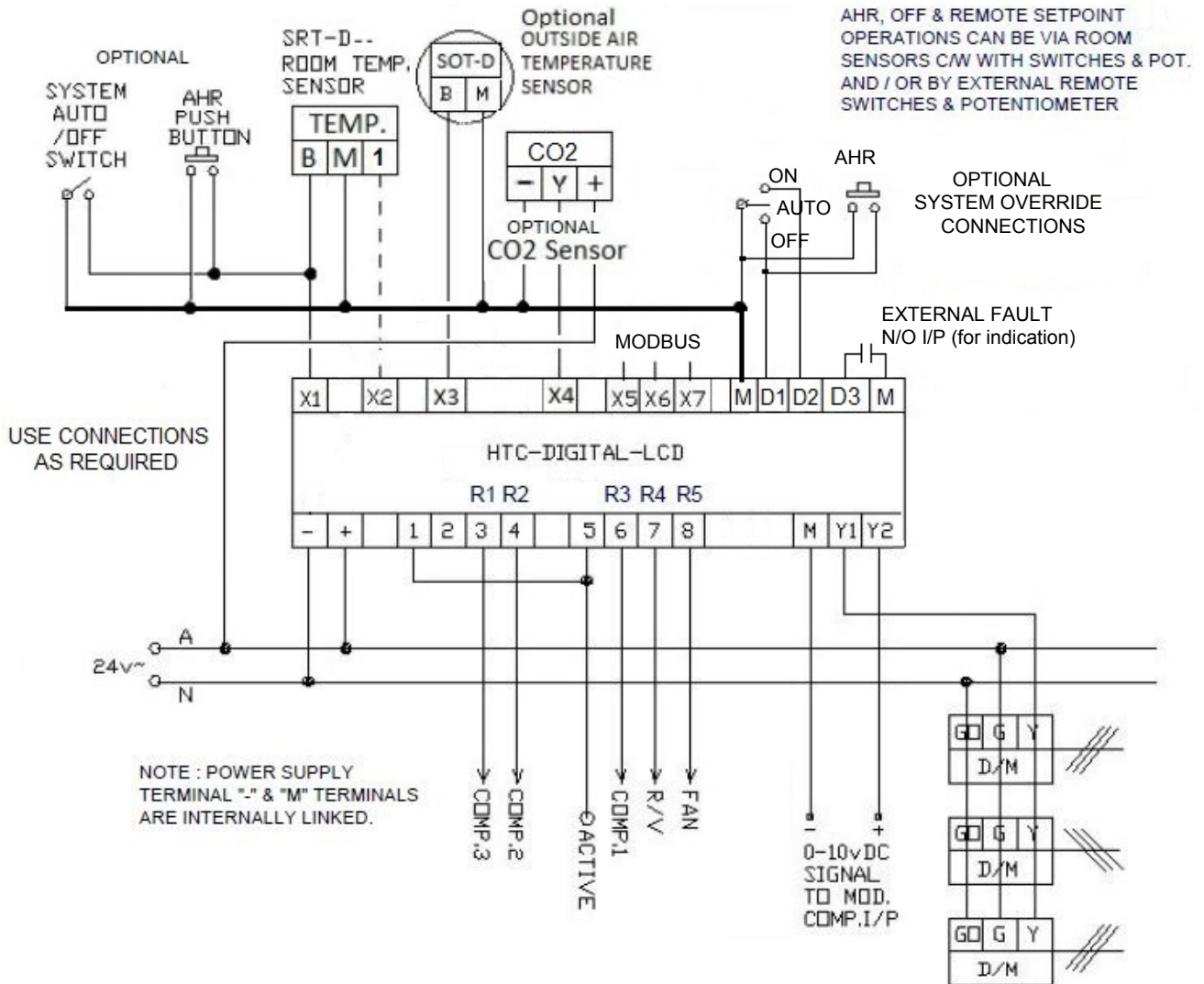
SRT-D	ROOM TEMPERATURE SENSOR	2 WIRE
SRT-DSW	" + ON/OFF SWITCH	2 WIRE
SRT-DSP	" C/W SETPOINT POT.	3 WIRE
SRT-DSPSW	" C/W S/P + ON/OFF SW.	3 WIRE
SDT-D	DUCT TEMPERATURE SENSOR	2 WIRE
SOT-D	OUTSIDE AIR SENSOR (PASSIVE)	2 WIRE
OSAO	OUTSIDE AIR SENSOR (ACTIVE)	3 WIRE
CDT-2N40	ROOM CO2 SENSOR	3 WIRE
CDT-2N44	ROOM TEMP. & CO2 SENSOR	4 WIRE

### OPERATIONAL NOTES:

If a **remote setpoint** device is connected (X2) then local setpoint control (via Controllers UP & DOWN buttons) is disabled.

**System Off & AHR** switch functions can be triggered by connections to either X1 or D1.

**Manual Off** (X1 or D1) takes priority over manual On (D2).



### Wiring Considerations

Supply Voltage

The Controller requires either a 12-24Volt AC or DC Supply. This diagram assumes a 24 Volt AC connection. Note terminals "M" & "-" are **internally** connected so as to allow a common ground reference.

Cabling Requirements

Its is recommended to connect remote input devices using twisted pair screened cable. Screened cable shield should be grounded to a good Earth at the controller end only.