

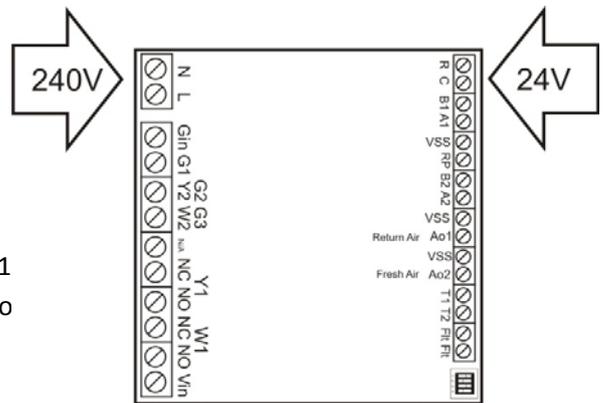
Smart Temp Australia P/L
EC-02 Multifunction Module Instruction Manual
 Ver 1.0

Preface

The EC-02 module is a dedicated companion module for exclusive use with the Smart Temp SMT-770 thermostat (firmware version 2.16 or higher). The EC-02 hardware consists of the following main components

- Modbus Port “A” – To connect the EC-02 to a Building Management System.
- Modbus Port “B” – To connect the EC-02 to the SMT-770 thermostat.
- 2 x 0-10V outputs – For economy damper or modulating valve control.
- 5 relays rated at line voltage 10A max.

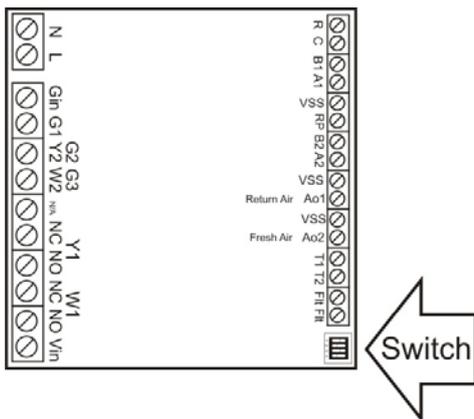
These main components can be used in a number of different ways depending on the demands of the HVAC project, for example the EC-02 can be used as remote relays (where line voltage must be switched), for outside economy cooling logic or to control 0-10V modulating valves for heating or cooling control.



Powering the EC-02

The EC-02 can be powered with either 24VAC or 240VAC (Fig 1 both at the same time. This power will also provide power to the SMT-770 thermostat and the 0-10V outputs (10mA max).

The 24V terminal input is for voltage in ONLY, do not attempt to power remote devices from this port.



Switch settings.

The EC-02 is fitted with 4 dip switches that control the mode of operation and functions. (Fig 2) The DIP switch is clearly marked with numbers 1 to 4 at position is ON.

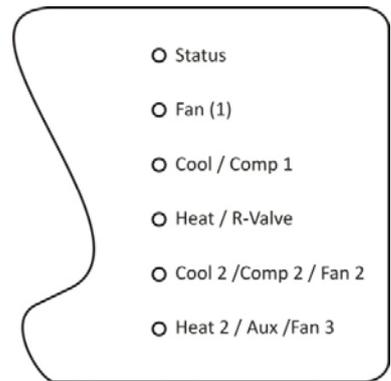
	On	Off
Sw1	Economy Cooling Mode	Valve Mode
Sw 2	Relay Test Mode	Normal Mode
Sw 3		Leave in this position
Sw 4	EOL in circuit	EOL not in circuit

SW1 sets the operational mode for the EC-02’s two 0-10V outputs.

SW2 runs the relay test sequence which forces the 5 EC-02 relays through an endless test loop. It can be used to test the outputs of the fitted relays are working correctly. It is **STRONGLY** recommended that any HVAC systems connected to the EC-02 is isolated.

Sw3 Not used – please leave OFF

Sw4 switches a 10KΩ end of line resistor into the Modbus circuit



Status LEDS

The EC-02 has 6 status LEDS. (Fig 3) 5 lower LEDS indicate the status of the 5 relays (On or Off) while the 6th (uppermost) LED provides an overall status indication giving valuable feedback of the EC-02 operation.

Off	No power or EC 02 Faulty.
On Steady	EC-02 Faulty – Microprocessor failure.
Regular flash (Heartbeat)	System is OK.
Fast Flash	Outside Air Economy function in use
2 flash then pause	Internal EC-02 fault (E ² prom failure).
3 flash then pause	Loss of communication between EC-02 and SMT-770.
4 flash then pause	Outside air temperature sensor missing / faulty.

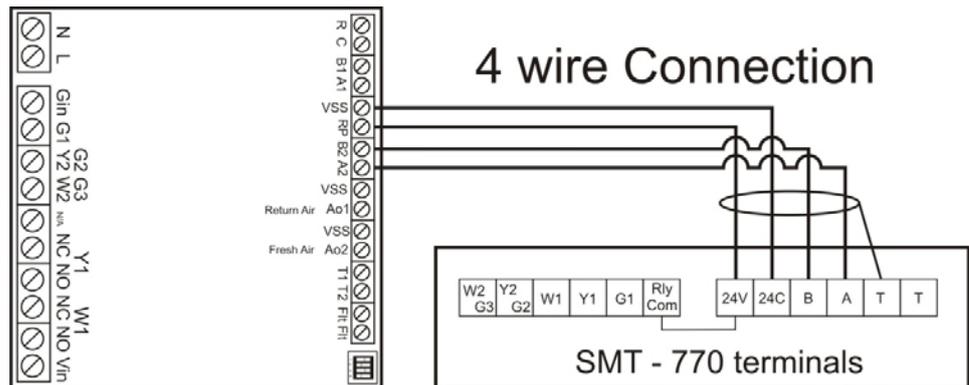
It is normal during the first time the EC-02 and SMT-770 are wired together for the EC-02 to report loss of communication (3 flash then pause) for up to 3 or 4 minutes. The EC-02 may take some time to locate the network address of the connected SMT-770 and then read configuration data. Please be patient.

Connecting the EC-02 to the SMT-770

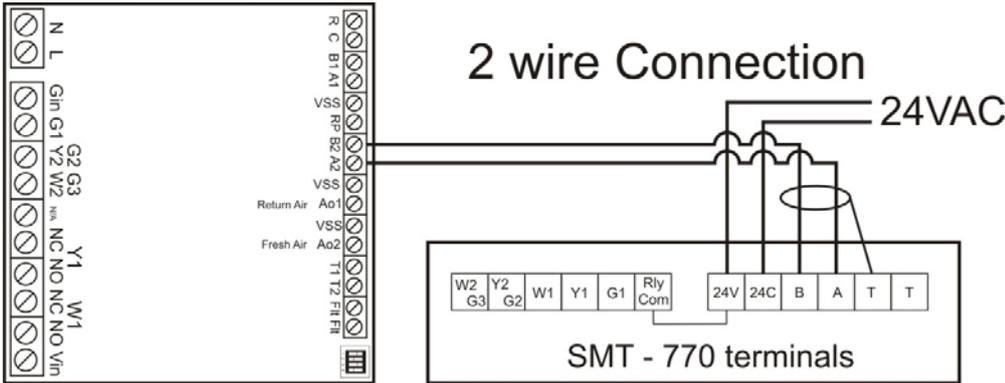
Please Note: Only 1 SMT-770 can be connected to each EC-02.

The EOL switch in the SMT-770 should be left OFF (refer to the SMT-770 manual)

The EC-02 can be connected to the SMT-770 via 4 screened wires (fig 4) or if the SMT-770 can be powered locally via 2 screened wires (Fig 5). Examples of both configurations are provided. The maximum



distance between the SMT-770 and EC-02 using “normal “ screened cable is 100 meters, however distances up to 400m are possible by using premium 0.3mm STP communications cable. **Do NOT use Cat 5 cable.**



Even though the EC-02 and SMT-770 communicate with each other via Modbus, there is no need to set baud rates or device I.D. on either the EC-02 or SMT-770. Upon connection the EC-02 will scan all baud rates and network

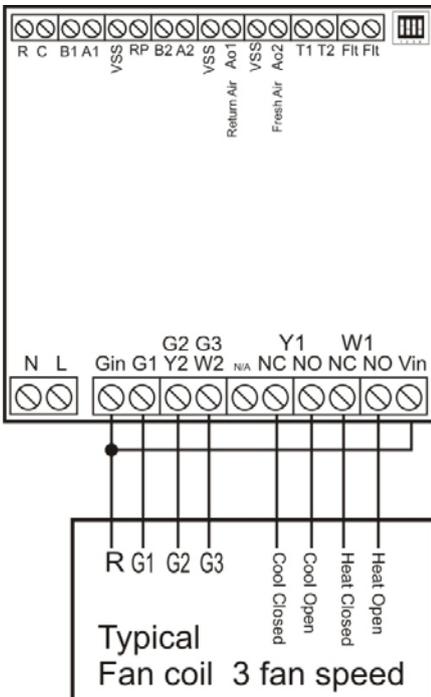
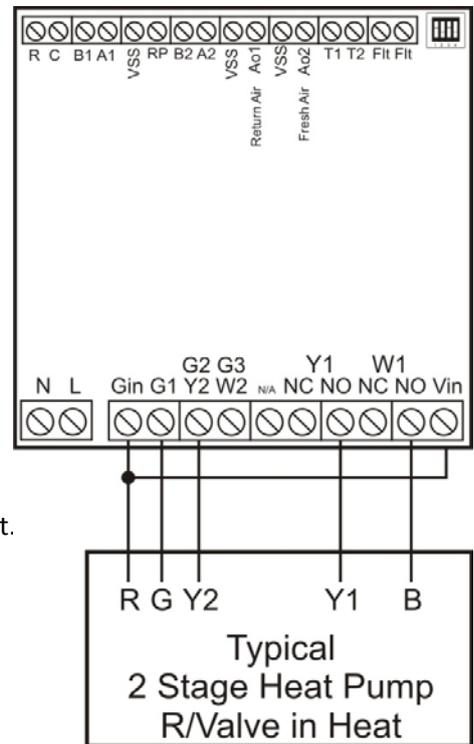
addresses on Modbus port "B" in an attempt to locate the SMT-770. Once discovered the EC-02 and SMT-770 will "pair" and in effect become a single Modbus device to any controlling Modbus master.

During pairing, the status LED on the EC-02 may flash 3 times then pause as it tries to locate the SMT-770. Once communication is established a regular "heartbeat" blink will be established confirming solid communications.

Upon first connection it may take up to 5 minutes to establish connection, please be patient.

Once "paired" the EC-02 will read all SMT-770 configuration settings for equipment type, fan speeds, compressor delays, fan purge

periods and all other relevant SMT-770 settings. It will then use these settings to control any HVAC system connected to it. This reduces setup errors considerably.

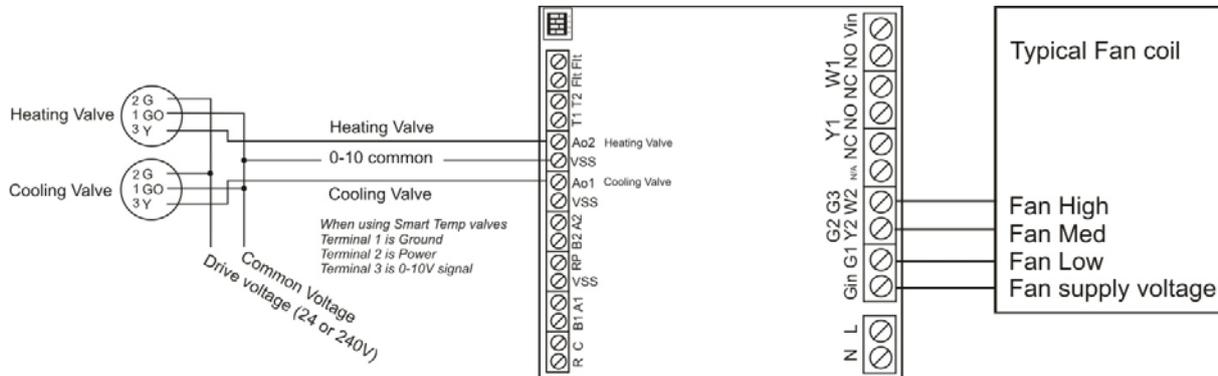


Equipment Connections.

The EC-02 duplicates all functions of the SMT-770 connected to it. The manual supplied with the SMT-770 provides multiple wiring examples. The EC-02 copies the functions of the relays in the SMT-770 - this makes wiring a simple process. For example, the "G" terminal function as described in the SMT-770 manual is the same function as the "G" terminal in the EC-02. W1=W1, Y1=Y1 etc.

Modulating valve control.

The EC-02 outputs can be set to provide an analogue control signal that is proportional to the difference between the room and set temperature to drive valves (for example) to regulate the flow of water through a fan coil. The greater the difference between the room set temperature and the actual room temperature, the higher the voltage at the corresponding 0-10V output.



You can set the span of the 0-10V output by adjusting the “Span” value on the SMT-770. Consult the SMT-770 Installer Manual for making this adjustment.

Span 1 = 10 Volts when the room temperature is 0.5c or higher from set temperature.

Span 2 = 10 Volts when the room temperature is 1.0c or higher from set temperature.

Span 3 = 10 Volts when the room temperature is 1.5c or higher from set temperature.

Modbus wiring.

The EC-02 / SMT-770 when properly paired will be seen by a Modbus master as a single device on the node. Any command sent by the Modbus master will be read by the EC-02 and then passed onto the SMT-770 if relevant. Consequently there is NO Modbus objects list for the EC-02. All Modbus points in the EC-02 are for exclusive use by the SMT-770 thermostat only.

The network address, baud rate and other parameters are set in the SMT-770 thermostat. The SMT. See the SMT-770 installer instructions for setting these values. The EC-02 will then read these values during the pairing process and adopt them as its own.

Use the SMT-770 thermostat Modbus objects list for any EC-02 / SMT-770 pair on the node.

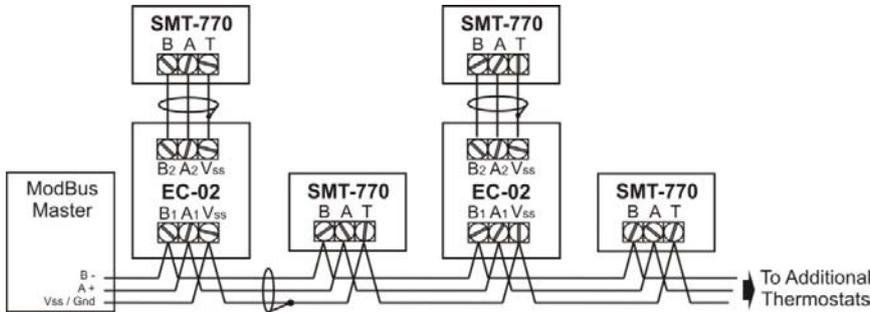
The EC-02 is fitted with 2 Modbus ports.

Port “A” – Modbus Slave Port. Used to connect the EC-02 to the BMS Modbus master device.

Port “B” – Modbus Master Port. Used to send & read commands from the SMT-770 thermostat.

A wiring example of a typical Modbus node is provided. This example shows a mixture of standalone SMT-770 thermostats and SMT-770 thermostats paired with EC-02 multifunction boards. If any other devices sit on the same node normal Modbus communication wiring practices should be observed.

Whenever possible always use the best STP communication cable available. Always try and separate communications cable from line voltage cable. Never run communications cable close to Variable Speed Drive (VSD) equipment.

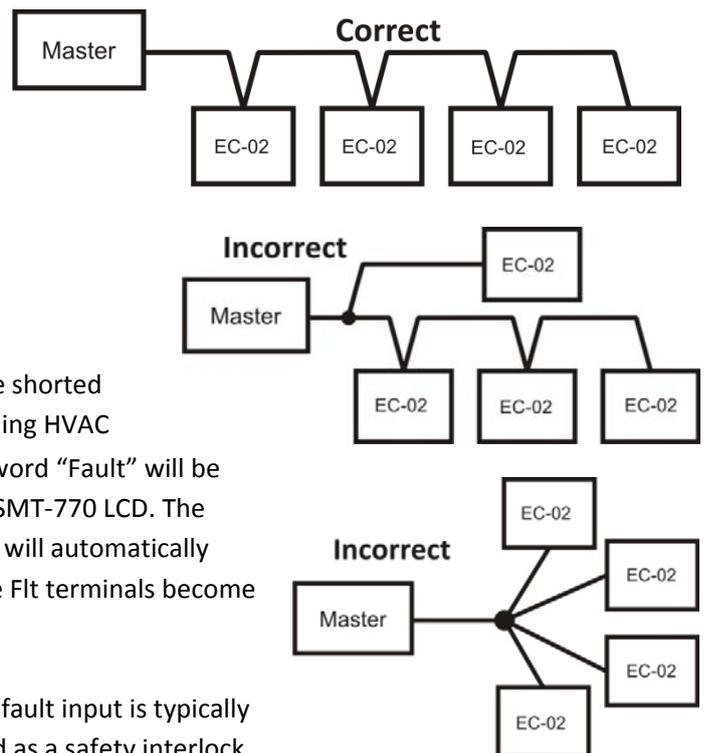


Follow the instructions provided by the Modbus master device you are using for specific wiring detail relating to that device.

Figure 10

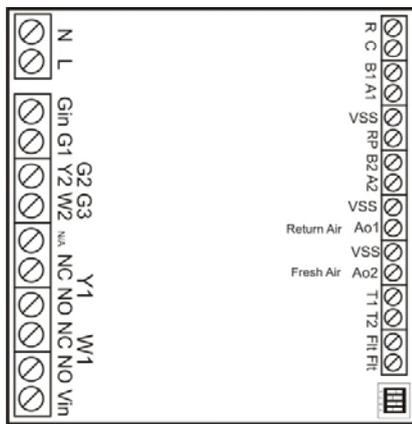
You may need to set the end of line switches on the LAST device in the node if communications is not working or proves to be intermittent. To place the End Of Line (EOL) resistor into circuit on the EC-02 set sw 4 to on. The EOL in the SMT-770 thermostat is never used when the SMT-770 is paired with an EC-02. Leave this switch in the SMT-770 off.

Some examples of Modbus wiring are provided and for clarity these examples do not show the SMT-770 that should be connected to each EC-02. Modbus requires end to end wiring. Never branch a "T" leg (fig 12) or wire in a star configuration (Fig 14).



Fault Input.

The EC-02 has a fault input. If the two Flt terminals are shorted together the EC-02 will de-energise all relays (suspending HVAC



and the word "Fault" will be in the SMT-770 LCD. The condition will automatically open the Flt terminals become a circuit.

The fault input is typically used as a safety interlock to shutdown a HVAC system for loss of phase or low water is detected in a water sourced heat pump.

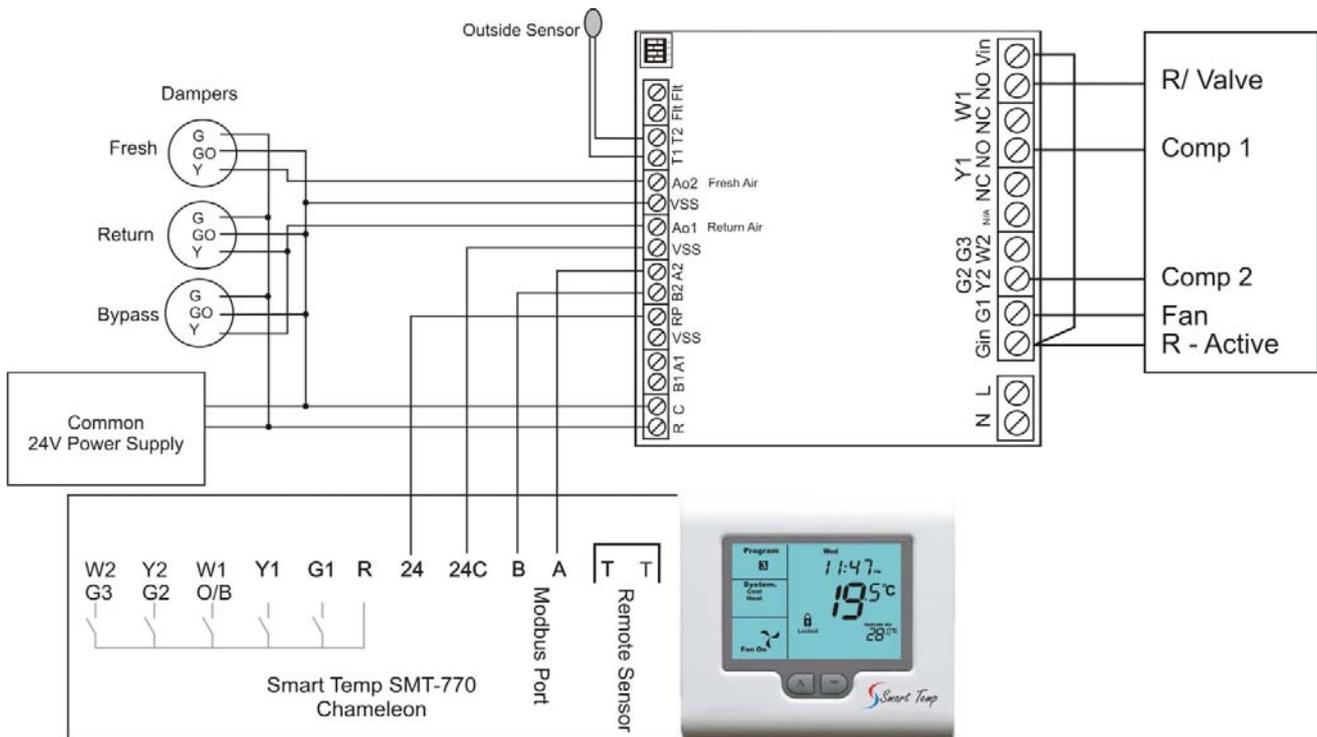
Typical wiring diagram

A “as installed” wiring diagram is shown below putting all the major components onto a single diagram.

Power connections for the dampers are shown as 24V, however if necessary other damper voltages can also be used.

This diagram shows a 2 stage Heat pump, single fan speed, reversing valve energise in heating with outside air economy function installed.

Figure 15



Specifications

Power supply	240VAC or 24VAC 50/60Hz
Relay Contact rating	10A max @240V
Size	110 x 110 x 65
Communications (both ports)	Modbus RTU (4.8 /9.6 / 18.2 Kps)
Indicators	6 LEDS - status and 5 relay indicators
Pairing with thermostat	Automatic using sentinel points in thermostat
Outside air sensor	10Ktype II NTC
Fault input	Dry contact closure initiates fault shutdown
Warranty	3 year RTB