

SMARTCOOL™



# ECO<sup>3</sup>™ User Manual

Software Version 23

## Product Overview

The ECO<sup>3™</sup> is a product designed to improve the energy efficiency of air conditioning, refrigeration or heat pump systems. The unit can be easily retro fitted, and is installed so that it intercepts the compressor demand signals from the existing primary controller. The ECO<sup>3™</sup> can then determine when and for how long each compressor will run, and optimise the operating cycle.

***At any time, the ECO<sup>3™</sup> can be put into manual bypass and the system returns to operating exactly as it was prior to the installation.***

This is an important distinction for system repairs and/or troubleshooting.

Two versions of the ECO<sup>3™</sup> are available depending on the application. The single channel ECO<sup>3™</sup> is designed for single compressor installations with only one stage of control. The dual channel ECO<sup>3™</sup> is designed for installations with two compressors (or a single compressor with two stages) that are cooling a common controlled space.

Both products are suitably IP rated, this means they are totally protected against dust and the limited ingress of water. The product can be safely installed out doors, however it is recommended that where possible the unit is sheltered and away from direct exposure to the sun. Please note that a suitably rated (24Vac) power supply is required to power the ECO<sup>3™</sup>, this must be enclosed and suitably protected if affixed out doors.

The ECO<sup>3™</sup> is connected in series with the air conditioning, refrigeration or heat pump system control circuit to directly control the compressor operation. The units have either one (Single Channel Controller) or two (Dual Channel Controller) electrically separate, independent channels with normally open and normally closed switching.

## Display

At power up, unless the unit is in manual bypass, the version of the software is displayed briefly and then the display will show "ON" indicating the unit is on. By pressing the ENTER key on the front of the unit, the display will rotate through the number of hours from the various modes (i.e. Run, Save, Bypass, Override).



There are 4 displayed digits, but values up to 65000 are displayed. For values up to 9,999 the format is d.ddd and for values above 9,999 the format is dd.dd. Hence, 5432 is displayed as 5.432 and 15,432 is displayed as 15.43.

During manual bypass, the display will show the remaining bypass hours counting down until bypass is manually removed or the time runs out.

## LEDs

When the display is off, the LEDs indicate the current system state.

● Yellow - Run

● Red - Manual Bypass

● Green - Save

● Red (Flashing) - Automatic Override

● Green (Flashing) - Locked Channel

## The 'Enter' Switch

Any action caused by the switch occurs when the switch is released. There are 4 functions performed by the ENTER switch:

### 1. Cycle Hours Display:

If switch is operated during normal operation it is used to step through the hour log:

Display	CH 1 LED	CH 2 LED*
CH 1 Run Hours	Run	-
CH2 Run Hours*	-	Run
Combined Run Hours*	Run	Run
CH1 Save Hours	Save	-
CH2 Save Hours*	-	Save
Combined Save Hours*	Save	Save
CH1 Bypass Hours	Bypass	-
CH2 Bypass Hours*	-	Bypass
Combined Bypass Hours*	Bypass	Bypass
CH1 Override Hours	Override	-
CH2 Override Hours*	-	Override
Combined Override Hours*	Override	Override

\*Dual unit only

### 2. Enter and exit manual bypass:

During manual bypass, the signal from the primary controller is passed through the ECO<sup>3</sup>™ as if it was not even there. No savings will occur during the bypass period.

A long operation of the ENTER switch (5 sec) causes the bypass mode to be initiated, or the bypass timeout to be changed. If not currently

in Bypass Mode, the first long switch operation causes the ECO<sup>3</sup>™ to enter Bypass mode, and sets the bypass time to 2 hours. Subsequent long switch operations cause the bypass time to cycle through 24 hours and 168 hours (1 week). The next long switch operation resets the bypass time to 0, cancelling bypass mode. Should power fail while the unit is in bypass, the bypass hour count down will resume from the same point once power is restored.

Manual bypass state can be exited at any time using the Enter switch. Simply operate the switch, remembering each operation takes 5 seconds, until the bypass timeout period steps back to 0. For example, suppose the bypass time had been set to 24 hours, but you decided to cancel it after 12 hours. Press the Enter switch for about 5 seconds, and 168 will be displayed. Release the switch and press it again for about 5 seconds, and 0 will be displayed and the Bypass LED will go out.

### 3. Clearing Hour Logs:

By powering off the ECO<sup>3</sup>™ it is possible to reset all accumulated hours to zero. Holding down the Enter key when the unit is repowered will clear the memory. The unit will enter **false save**.

### 4. False Save:

False save can be used to test connections and operation after installation.

If the 'ENTER' switch is operated as the unit is powered, this will enable false save mode on both channels. A subsequent (5sec) press of the switch will release channel 2 (Dual Only), a further (5sec) press will release channel 1. If the unit is left in false save it will time out after the default save period, with a subsequent 2 minute delay between each channel on Dual units.

## Dip Switch Settings

Application specific unit settings for each ECO3 can be set using the 2 DIP switches located on the base of the unit.

	Dip 1	Dip 2	
ECO <sup>3</sup> ™	ON		Disable the Automatic Override function
Dual		ON	Set Fixed Channel Priority
ECO <sup>3</sup> ™	ON		Disable the Automatic Override function
Single		ON	Enable Advanced Profile

## Automatic Override

The ECO3™ is designed to be automatically overridden should satisfaction of the thermostat not occur for 6 full cycles. Should this occur, the unit will remain in override until the thermostat is satisfied and will be indicated by flashing override LED. By setting SW1 to ON, the automatic override feature is disabled.

**NOTE:** The auto override feature should only be disabled in situations where temperature control is not critical. By disabling the override feature, temperature may be affected in the controlled space during times when the ECO<sup>3</sup>™ would normally be in override.

## Save Priority (Dual Only)

When both channels have demand at the start of a subsequent saving period, a save channel selection decision is required. In the default Auto priority, the channel with the most run hours will save. If the run hours are equal, channel 1 will save. If Fixed priority is set, channel 2 will save. The selection between Fixed and Auto priority is done using DIP switch 2.

## Advanced Profile (Single Only)

The Advanced Profile is intended for systems with non-demand related interruptions that may have a impact on a conditioned space, such as defrost cycles. It will also offer a faster response to high load situation where temperature regulation is more critical. Advanced profile is selected by setting DIP switch 2 to the ON position. Advanced profile will revert to base savings after 15 minutes of no demand (instead of 1 hour).

## Terminology

**Run** – The primary controller calls for the compressor(s) and Smartcool's technology allows the compressor(s) to run.

**Save** – The primary controller calls for the compressor(s) and Smartcool's technology does not allow the compressor(s) to run.

**Override** – Smartcool's technology automatically removes itself from the system and allows primary controller to control the system until the control parameters are met.

**Bypass** – Smartcool's technology is manually removed from the system and has no effect on the system.

**Lock (Dual Only)** – An undemanded channel is locked out and disabled from running to prevent possible load shift.

## **General Warranty Policy**

Smartcool Systems Inc. (hereinafter referred to as SMARTCOOL) warrants that the Product shall conform to and perform in accordance with published technical specifications and the accompanying written materials, and shall be free of defects in materials and workmanship, for the period of time herein indicated, such warranty period commencing upon receipt of the Product.

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## Warning

When the ECO<sup>3™</sup> is being used to switch main voltages, these voltages are present on exposed metal on the PCB. Ensure that incoming voltages are switched off before the enclosure is opened.

The control signal switched in the ECO<sup>3™</sup> is not fuse protected. This was done because the production unit is sealed and a fuse cannot be replaced.

## Statutory Notices

### Safety

Smartcool Systems declares that this product conforms with the requirements of the European Communities Directive of 2006/95/EC on the harmonization of the laws of Member States for electrical equipment designed for use within certain voltage limits.

### Electromagnetic Compatibility

Smartcool Systems declares that this product conforms with the protection requirements of the Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

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## Certification

This device complies with the following health, safety and environmental requirements of the European Union and the United States, and is RoHS compliant:

Low Voltage Safety Directive – 73/23/EEC (EU)

Electromagnetic Compatibility Directive – 93/68/EEC (EU)

T08216\_F to FCC Part 15 (USA)



Additional certification standards held by this product:



## Support

**Contact your local installer for additional support.** If local support is not available, the Smartcool team is available to help you with any problems you may have with an installation of Smartcool products.

[support@smartcool.net](mailto:support@smartcool.net)

[www.smartcool.net](http://www.smartcool.net)