



Controls User Manual

EM™ Make Up Air Unit with electronic controller

ECOLOGIX HEATING TECHNOLOGIES INC.

45 Cowansview Rd.
Cambridge, Ontario
N1R 7L2

Phone: 855-658-4330
Fax: 855-658-9384
info@ecologix.ca
www.ecologix.ca

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This document describes proper setup and use of the electronic controller for the Ecologix EM™ Make Up Air units. Although the system will function when left at factory default settings, it is recommended that the installer read through this short manual in order to ensure the system has been setup to match the required heating and cooling loads and air-conditioning equipment installed (if applicable), and to take advantage of the various features available.

Controller Basics

The controller automatically adjusts blower motor speeds and engages relays for control of the system components. Through its LCD display and keypad, important system parameters may be configured and operating conditions may be monitored.

When the controller keypad has not been pressed for a few minutes, the backlight will turn off and the display may go blank. Simply hit any one of the buttons to wake the controller up. By default, the controller will display a short message describing the operating status of the system. *Table 1* provides a list of the different possible status messages and their meaning. There are also a number of small icons that may appear around the edges of the display according to the current operating status. *Table 2* below gives an explanation of the different icons.

Table 1 - Status Messages

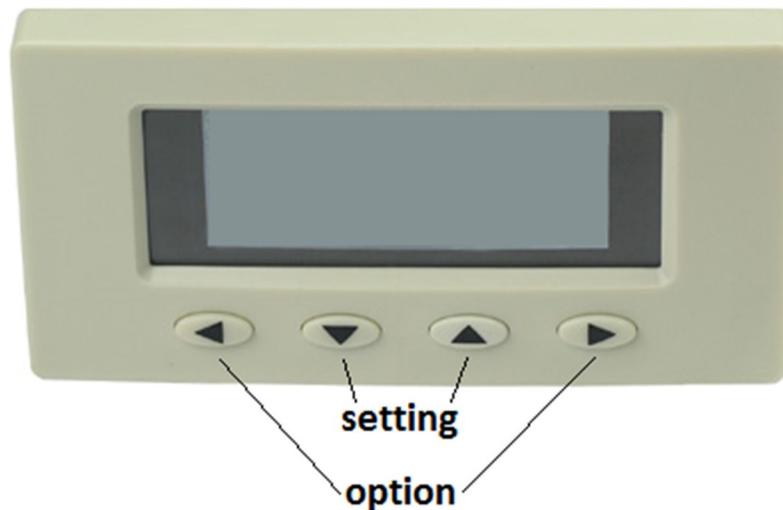
Message	Meaning
READY	System is not currently receiving a call
HEATING	There is currently a call for heating
COOLING	There is currently a call for cooling
SNS_ERR	The air temperature sensor is out of range (failed or unplugged).
FROZEN	Supply air is too cold, freeze protection has been activated. Compressor calls will be suspended until temperature rises and time delays are satisfied

Table 2 - Display Icons

Icon	Meaning
Flame	system is in heating mode
Snowflake	system is in cooling mode
4-blade fan	blower is running for freeze alarm
8-blade fan	blower is running for heating or cooling

Controller Keypad

By using the *option* and *setting* keys, different parameters and their current settings may be displayed and modified. Use the *option* keys to scroll through the available parameters, and use the *setting* keys to modify the parameter's current setting (if available). By default, the control will remain in 'user' mode, in which a limited selection of parameters may be accessed. By entering 'admin' mode, additional parameters may be made available. Please exercise caution while in 'admin' mode, as these settings are meant to be accessed by the experienced user or installing contractor. A description of each of the modes is found below.



USER MODE

This is the basic display and operating mode, in which only a limited selection of parameters may be accessed and modified. Refer to *Table 3* for a description of each item displayed.

ADMIN MODE

This is the advanced display and configuration mode. It is intended only for the properly trained contractor. To enter 'admin' mode, press any button to illuminate the display backlight, then press and hold the two *option* buttons at the same time ('user' will be displayed at first, hold until 'admin' is displayed). You can now scroll through the display items by using the two *option* buttons, and adjust certain values using the two *setting* buttons. To return the control to 'user' mode, simply wait a few minutes or press and hold both *option* buttons.

Use *Table 4* as a quick reference on the items available in this mode. Detailed descriptions on important parameters are found below.

Initial Controls Setup

When first powering up the EM Make Up Air unit during commissioning, enter 'admin' mode on the controller and adjust the following settings to match the installed equipment and heating and cooling loads.

FAN_MAX – This parameter is used to limit the maximum allowable fan speed of the system. Refer to the spec sheet to see the rated maximum air flow for the specific model number. Default is set to 100%.

Zone or Stage heating/cooling loads

With the EM Make Up Air unit, the amount of heating and cooling airflow supplied is adjustable for two stages or 'zones'. Many systems will only require one stage, but the option is available for having multiple fan speeds for various loads. This may be desired on systems which have a large difference in actual heating & cooling loads and/or multiple exhaust stages. Modify the applicable variables below to adjust these airflows.

Z1H_SPD, Z2H_SPD – Heating loads for each stage, as a percentage of the air handler's maximum airflow (**FAN_MAX**). Default for each is 50%. The total for both stages may exceed 100%.

If there is a heating call on Zone 1 and Zone 2 simultaneously, the air flow will be the summation of **Z1H_SPD** and **Z2H_SPD** up to the maximum **FAN_MAX** setting. This strategy is also true for cooling.

Z1C_SPD, Z2C_SPD– Cooling loads for each stage, as a percentage of the air handler's maximum airflow (**FAN_MAX**). Default for each is 50%. The total for both stages may exceed 100%.

If using the EM Make Up Air unit in conjunction with an AC condenser, be sure to set the cooling fan speed(s) (**Z1C_SPD** and/or **Z2C_SPD**) to a sufficient air flow based on the air conditioner capacity. Too low of air flow will cause the freeze protection to shut the compressor off in order to prevent the cooling coil from freezing.

Circulator Pump Control

T_SETP – The supply air set point temperature in heating mode. The controller will cycle the circulation pump on and off in order to target this specified temperature while the fan continues to run. Default is set to 20°C.

PUMP_DB – This setting is the dead-band used to determine when to turn the pump on or off based on the actual supply air temperature versus the set point temperature. The dead band is used to help prevent the pump from cycling too rapidly. The default setting is 2°C.

PUMP_DLY – The pump delay parameter is the minimum allowable time before the pump is allowed to switch from OFF to ON or vice versa. This is also used to prevent the pump from cycling rapidly. The default setting is 2 minutes.

Cycle Timer (Pump Exerciser)

The EM Make Up Air controller includes an optional cycle timer or pump exerciser feature which may need to be enabled depending on the hot water source and local regulations. When enabled, the cycle timer will run the heating circulating pump for 90 seconds every 24 hours.

CPT_EN – Circulation pump timer or cycle timer mode. Cycle timer is disabled by default.

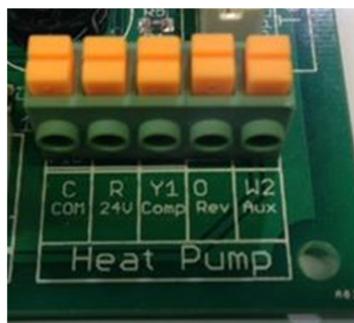
Boiler Control

The EM air handler board provides a TT connection for bringing a boiler on and off during heating mode. The TT connection closes as soon as the pump is brought on and has a built-in OFF delay (**TT_DLY**) that keeps the boiler running after the pump shuts off. The default is set to 5 minutes. This is to ensure that the boiler is up to temperature if/when the pump comes back on and to prevent unnecessary cycling.

If this delay is not required, **TT_DLY** may be set to zero or you can use the TT connection at the pump relay on the unused side. (See Wiring Diagram & Control Connections)

Optional Air-Conditioning

If an air conditioner is connected to the EM Make Up Air unit, the controller will run the fan based on the strategy discussed above as well as provide 24 VAC outputs to turn the compressor on and off (see figure below). If a 2-stage condenser is installed, the 'O' output on the board has been repurposed as a Y2 signal.



When a cooling call is present, second stage will be activated if the calculated airflow demand exceeds the parameter **Y2_ON** (default setting is 70%). This is determined based

on the current zone call(s) and their respective cooling load settings **Z1C_SPD** and **Z2C_SPD**.

If using a 2-stage air conditioner, be sure to take advantage of the multiple fan speeds and to set **Y2_ON** to an appropriate value to ensure that the compressor is only running on second stage when desired.

Freeze Protection

In order to prevent the heat exchanger coil from freezing during cooling, the EM controller has a built-in freeze protection feature. If the measured intermediate air temperature drops below the freeze protection temperature **FRZP_SP**, the air-conditioner is shut down, **FROZEN** is displayed on the controller display, and the fan runs at **FRZ_SPD** in order to circulate air over the coil. To prevent short-cycling of the compressor, this feature includes a built-in deadband.

FRZP_ON – Freeze Protection On determines if freeze protection is used. The default is set to 'ON' and it is highly recommended to leave it this way.

FRZP_SP – The freeze protection setpoint temperature. Default value is 6°C. Lowering this value will decrease sensitivity of the freeze protection feature.

FRZP_SPD – The freeze protection speed is the airflow that the fan will run at during freeze protection. Default value is 40%.

Troubleshooting

Blower motor never fully stops, even with no demand signal

Ensure the thermostats have been wired according to the Zone Comfort Installation Instructions.

Too much airflow to a single zone or stage, causing noise

This can occur due to undersized ductwork or improper setup of the air handler zone heating/cooling loads. The problem may be fixed by reducing the amount of airflow. See above section on zone heating/ cooling loads for details on adjusting the airflow used for each zone/stage.

Alarm message “SNR_ERR”

The EM air handler comes with the intermediate and supply air sensors (**T_IA** & **T_SA**) factory installed. If **SNR_ERR** is displayed, the intermediate or supply air sensor has either

failed or is unplugged. Check to ensure sensors are plugged in at the board AND the sensor. If problem still exists, contact the Ecologix Technical Support team.

Return air temperature (T_RA) reads -40 °C

The EM air handler does not come with this sensor factory installed as it is not required from a controls standpoint. It can be field added if desired for monitoring purposes. Contact Ecologix for more information.

Freeze protection errors (alarm message “FROZEN”)

This usually occurs when there is inadequate airflow for a given air-conditioner.

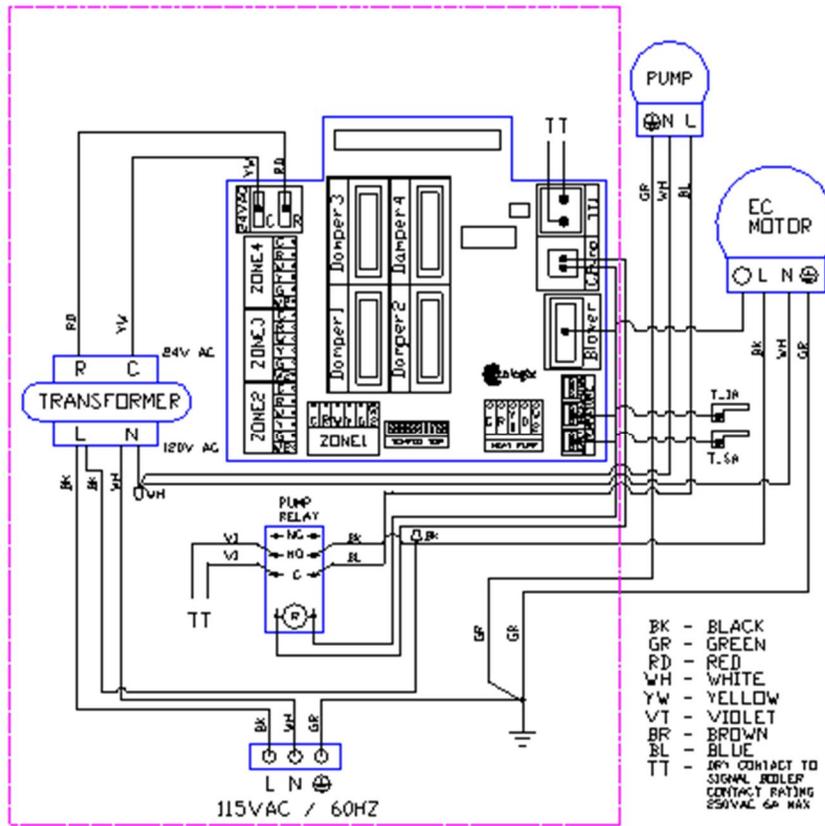
- Ensure that the air filter is not plugged
- Ensure intermediate air temperature sensor is located after cooling coil and in the supply air stream, not touching heat source, plumbing, etc.
- Decrease sensitivity of the freeze protection feature (see Freeze Protection above)

The intermediate air sensor may be unplugged or have failed.

- Ensure that the sensor is plugged in at both the board and the sensor.
- Check the controller for the temperature reading on T_IA
- Check for broken or cut wires.

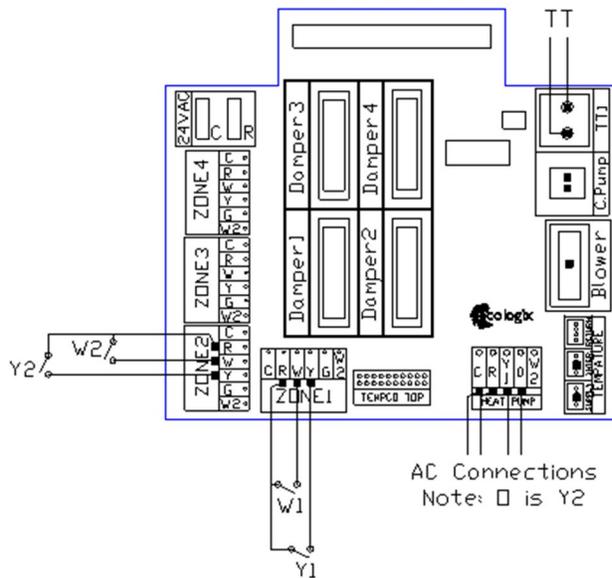
The freeze protection may be turned off to allow cooling operation.

Wiring Diagram & Control Connections



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MUA AIR HANDLER WITH, TEMCO, AND EC MOTOR



Control Parameters

Table 3 - User Mode Parameters

Line 1	Line 2	Set.	Description	Notes
Status	####	D	Displays current status message	
MUA	##.## REV	D	Revision number of program	
T_IA	#### C	D	Intermediate air temperature	Factory installed
T_SA	#### C	D	Supply air temperature	Factory installed

* Note: “D” in the set column indicates this parameter is for display only, and cannot be modified using the controller.

Table 4 – Admin Mode Parameters

Line 1	Line 2	Set.	Description	Notes
Status	####	D	Displays current status message	
MUA	##.## REV	D	Revision number of program	
ModBus	####	D	Displays the device address of the controller	
T_SETP	#### C		Supply air set point temperature in heating mode.	Default is 20°C
FRZP_ON	####		Enables freeze protection	Default is ON
FRZP_SP	#### C		Temperature setpoint for freeze protection alarm	Default is 6
FRZ_SPD	#### %		Airflow during freeze protection, as a percentage of max speed	Default setting is 40
Z1C_SPD	#### %		Zone 1 cooling load, as % of max speed (for ‘fixed’ cooling mode)	Default setting is 50
Z1H_SPD	#### %		Zone 1 heating load, as % of max speed	Default setting is 50
Z2C_SPD	#### %		Zone 2 cooling load, as % of max speed (for ‘fixed’ cooling mode)	Default setting is 50
Z2H_SPD	#### %		Zone 2 heating load, as % of max speed	Default setting is 50
T_IA	#### C	D	Intermediate air temperature	Factory installed
T_RA	#### C	D	Return air temperature	Not included
T_SA	#### C	D	Supply air temperature	Factory installed
CPT_EN	####		Enables cycle timer feature.	Default is OFF
PUMP_DLY	#### min		Pump delay to dictate minimum amount of time before pump can turn ON/OFF	Default setting is 2 min
PUMP_DB	#### C		Pump deadband to determine when to turn pump ON/OFF around set point temp.	Default is 2°C
TT_DLY	#### min		OFF delay to keep the boiler on when the circulation pump shuts off during heating	Default setting is 5 min
FAN_MAX	#### %		Maximum allowable fan speed as a percentage of the rated maximum.	Default setting is 100
Y2_ON	#### %		Determines when 2 nd stage AC is turned on. Based on cooling load setpoints	Default setting is 70

* Note: “D” in the set column indicates this parameter is for display only, and cannot be modified using the controller.