

**EngA**<sup>®</sup>

**ENGINEERED AIR**<sup>®</sup>

**C-TRAC3**  
**COMMUNICATION MANUAL**  
**FOR**  
**Modbus**<sup>®</sup>

UNIT MODEL NO. \_\_\_\_\_  
UNIT SERIAL NO. \_\_\_\_\_  
SERVICED BY: \_\_\_\_\_  
TEL. NO: \_\_\_\_\_

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Retain instructions with unit and maintain in a legible condition.  
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[www.engineeredair.com](http://www.engineeredair.com)

If any errors or omissions are noted please contact the Calgary Engineered Air Service Department at (403) 287-4775, or fax: (403) 287-4799 or (403) 243-5059 or use email address [service@engineeredair.com](mailto:service@engineeredair.com).

To ensure warranty is honored, only a qualified HVAC service person should be employed for service and troubleshooting. If further information is required please contact the nearest Engineered Air office.

**Under no conditions (except for temporary copying) should the unit function be removed from the unit.** There are two copies provided with the unit. One is in an envelope for copying, then return it to the unit or store in a safe place. The other is attached to the control panel door and should never be removed. If a copy of the function for a particular unit is needed, record the unit serial number, C-TRAC3 model number (ex model C-TRAC3.2) and record the C-TRAC3's program number from under the model number (top right corner). Then contact the nearest Engineered Air factory for a copy.

<b>INTRODUCTION</b> .....	<b>5</b>
<b>COMMUNICATION</b> .....	<b>5</b>
<b>WIRING</b> .....	<b>5</b>
<b>PDA</b> .....	<b>5</b>
<b>SUMMARY OF POINTS</b> .....	<b>6</b>
<b>GENERAL</b> .....	<b>7</b>
UNIT ADDRESS .....	7
PROGRAM NUMBER .....	7
WRITE TO FLASH .....	7
<b>DIGITAL INPUTS</b> .....	<b>8</b>
DIGITAL INPUT TERMINAL 'A' .....	10
DIGITAL INPUT TERMINAL 'E' .....	10
DIGITAL INPUT TERMINAL 'HS' .....	10
DIGITAL INPUT TERMINAL 'FS' .....	10
DIGITAL INPUT TERMINAL 'K' .....	10
<b>TEMPERATURE SENSORS</b> .....	<b>11</b>
AMBIENT TEMPERATURE SENSOR .....	11
PRIMARY TEMPERATURE SENSOR .....	11
SECONDARY TEMPERATURE SENSOR (OPTIONAL) .....	11
<b>TEMPERATURE SET POINTS</b> .....	<b>12</b>
PRIMARY BASE SETPOINT .....	12
SECONDARY BASE SETPOINT (OPTIONAL) .....	12
EFFECTIVE PRIMARY SETPOINT .....	13
EFFECTIVE SECONDARY SETPOINT .....	13
<b>UNIT ON/OFF, AND ALARMS</b> .....	<b>14</b>
UNIT ON / OFF STATUS .....	14
LOCKOUT ALARMS .....	14
HEAT ALARMS .....	14
HEAT SAFETY .....	15
DIGITAL INPUT EXTERNAL ALARMS (OPTIONAL) .....	15
HEAT WHEEL OPERATING SIGNAL (OPTIONAL) .....	15
<b>BLOWER OPERATION</b> .....	<b>16</b>
BLOWER OPERATING STATUS .....	16
VFD SPEED FEEDBACK (OPTIONAL) .....	16
<b>CONTROL MODE</b> .....	<b>17</b>
PRIMARY APPLICATION MODE .....	17
SECONDARY APPLICATION MODE .....	17
<b>COOLING</b> .....	<b>18</b>
COOLING STATUS .....	18
COOLING STATUS 2 .....	18
COOLING STAGES % ON .....	18

---

COOLING MODULATED OUTPUT (OPTIONAL) .....	18
<b>ECONOMIZER .....</b>	<b>19</b>
ECONOMIZER MINIMUM POSITION SETPOINT .....	19
ECONOMIZER / INLET DAMPER STATUS .....	19
ECONOMIZER OUTPUT % (OPERATOR) .....	19
<b>HEATING.....</b>	<b>20</b>
HEATING MODULATED OUTPUT .....	20
HEATING STATUS .....	20
<b>SERIAL COMMUNICATION AND EMS COMMANDABLE REGISTERS .....</b>	<b>8</b>
OVERRIDE FLAGS.....	8
EMS PRIMARY SETPOINT ACCESS.....	8
EMS SECONDARY SETPOINT ACCESS.....	8
EMS ECONOMIZER MINIMUM POSITION ACCESS.....	9
EMS UNIT ON / OFF ACCESS .....	9
EMS DEHUMIDIFICATION CALL ACCESS.....	9
EMS DISABLE OPERATING METHODS ACCESS .....	9
EMS REMOTE LOCKOUT SAFE RESET .....	9
<b>UNOCCUPIED OPERATION .....</b>	<b>22</b>
<b>MORNING WARM-UP OPERATION.....</b>	<b>22</b>
<b>NOTES .....</b>	<b>23</b>

## **C-TRAC3 Modbus® Manual**

### **INTRODUCTION**

The C-TRAC3 is a configurable logic controller designed to be the primary controller of Engineered Air heating, cooling and ventilation equipment. This manual should be used in conjunction with the C-TRAC3 operation manual. The C-TRAC3 is designed to control the cooling, heating, and mixing economizer. The C-TRAC3 HVAC controller can be configured to control one or two independent control process at the same time. In this manual, the primary setpoint and sensor refer to the final leaving temperature. Multizone equipment use the primary sensor and setpoint as the hot deck. The secondary sensor and setpoint are typically used for pre-cool control of dehumidifiers or the cold deck control of multizone equipment.

All temperature register readings are based on degrees Fahrenheit. Conversion to degrees Celsius can be accomplished at the front end software.

### **COMMUNICATION**

The C-TRAC3 has provisions for an optional communication board. This board includes an RS485 port with the Modbus® RTU protocol. The controller supports Modbus® RTU functions 3, 4 and 6. Multiple (max. 7) register read and single register write. The Baud rate can be adjusted from 4800 to 19.2k. This manual describes the Modbus® registers and the information contained in each register. In this manual register points that can be written to are said to be EMS (Energy Management System) commandable.

### **WIRING**

The RS-485 communication cable to the C-TRAC3 is 24awg shielded twisted pair (STP) with a shunt capacitance of 16pF per foot and 100 ohm characteristic impedance. Category 5 cable can be used as defined by the EIA/TIA/ANSI 568 specification.

### **PDA**

The C-TRAC3 also has an RS232 port that is designed for local service, monitoring and commissioning purposes. Engineered air has developed software packages (SMC) to be used with this port. In this manual the term PDA refers to this port and the SMC software. NOTE! Due to communication conflicts, when both ports are active at the same time some data packages may be lost through the RS485 port.

**SUMMARY OF POINTS**

DESCRIPTION	In / Out	REG. #	FUNCTION CODE	TYPE	R/W
Unit Address	O	40015	3	Integer	R
Program Number	O	40001	3	Integer	R
Write to Flash	O	40240	3/6	0/1	R/W
EMS Primary Setpoint Access	I	40047	3/6	Integer °F	R/W
EMS Secondary Setpoint Access	I	40048	3/6	Integer °F	R/W
EMS Economizer Minimum Position Access	I	40046	3/6	Integer %	R/W
EMS Unit On/Off Access	I	40044	3/6	0/1	R/W
EMS Dehumidification Call Access	I	40045	3/6	0/1	R/W
EMS Disable Operating Methods Access	I	40078	3/6	Bit Map	R/W
EMS Remote Safe Reset	I	40164	3/6	0/1	R/W
Digital Input Terminal 'A'	I	30138	4	0/1	R
Digital Input Terminal 'E'	I	30137	4	0/1	R
Digital Input Terminal 'HS'	I	30236	4	0/1	R
Digital Input Terminal 'FS'	I	30136	4	0/1	R
Digital Input Terminal 'K'	I	30139	4	0/1	R
Ambient Temperature Sensor	I	30709	4	Int/10=°F	R
Primary Temperature Sensor	I	30715	4	Int/10=°F	R
Secondary Temperature Sensor	I	30710	4	Int/10=°F	R
Primary Base Setpoint	I	30716	4	Int/10=°F	R
Secondary Base Setpoint	I	30717	4	Int/10=°F	R
Effective Primary Setpoint	O	40713	3	Int/10=°F	R
Effective Secondary Setpoint	O	40714	3	Int/10=°F	R
Unit On/Off Status	O	40144	3	0/1/2	R
Lockout Alarms	O	40155	3	Bit Map	R
Heat Alarms	O	40147	3	Bit Map	R
Heat Safety	O	40148	3	Bit Map	R
Digital Input External Alarms	I	30154	4	Bit Map	R
Heat Wheel Operating Signal	I	30153	4	Bit Map	R
Blower Operating Status	O	40152	3	Integer %	R
VFD Speed Feedback	I	30238	4	Integer %	R
Primary Application Mode	O	40145	3	0/1/2/3	R
Secondary Application Mode	O	40146	3	0/1/2/3	R
Cooling Status	O	40158	3	Bit Map	R
Cooling Status 2	O	40150	3	Bit Map	R
Cooling Stages % On	O	40162	3	Integer %	R
Cooling Modulated Output	O	40241	3	Integer %	R
Economizer Minimum Position Setpoint	I	30718	4	Integer %	R
Economizer / Inlet Damper Status	O	40159	3	Bit Map	R
Economizer Output	O	40242	3	Integer %	R
Heating Modulating Output	O	40243	3	Integer %	R
Heating Status	O	40157	3	Bit Map	R
Override Flags	O	40052	3	Bit Map	R

## GENERAL

### Unit address

- Description: This is the controller's Modbus® address
- Read only. Can be changed using a lap top or suitable PDA with the Engineered Air SMC setup software installed.
- Modbus® register: 40015
- Return value: Integer

### Program Number

- Description: This program number defines the basic unit operating function. The return value is a 2 digit number, with the first number indicating the basic unit operating style (0=make up air, 1=mix box, 2=dehumidification make up air, 3=dehumidification mix box, 4=multizone). The second digit indicates the style of temperature control and reset.
- Read only
- Modbus® register: 40001
- Return value: integer

### Write to Flash

- Description: The C-TRAC3 uses *flash* memory. This is used both for the program as well as set up variables. Flash memory is a very stable long term memory storage device. During power-up, the operating and configuration variables stored in flash memory are brought into RAM memory where the program can read and write at will. All the register values in this manual are actually stored in RAM. Changes to some of the C-TRAC3 variables, such as set point (See SERIAL COMMUNICATION AND COMMANDABLE REGISTERS), will be lost if the C-TRAC3 power is removed. To permanently save the change in values the changes must be saved to flash. To use the Write to Flash variable store the value 1. When the C-TRAC3 operating system sees the value 1, it will save all the register variables to Flash and then automatically clear the Write to Flash register.
- R/W
- Modbus® register: 40240
- Return: integer 1 = a write has been requested. 0 = write done

**Caution:** As Flash memory has a limited number of write cycles, use this feature only when necessary.



## SERIAL COMMUNICATION AND EMS COMMANDABLE REGISTERS

### Override Flags

- Description: This register indicates what variables are allowed to be serially commanded. The Modbus® cannot write to this location. These locations must be set using the Engineered Air SMC commissioning software "service access". This tool is normally run from a hand held PDA or laptop and has the highest authority level.
- Read only
- Modbus® register: 40052
- Return value: Bit mapped integer
  - B0 bit set = The PDA has manually disabled all the set point resets. The operating setpoint is the base setpoint.
  - B1 bit set = The main base set point has been manually commanded by the PDA.
  - B2 bit set = The secondary base set point has been manually commanded by the PDA.
  - B3 bit set = The economizer minimum position has been manually commanded by the PDA.
  - B4 bit set = Connected to the RS485 remote panel. This point is not used on an EMS system.
  - B5 bit set = The main operating discharge set point, secondary discharge set point and the economizer minimum position is being controlled from the central building computer or the RS485 remote panel.
  - B6 bit set = The unit on/off function is being controlled from the central building computer.
  - B7 bit set = The dehumidification function is being controlled from the central building computer.

### EMS Primary Setpoint Access

- Description: This is a window in which the central computer can change the primary discharge air temperature setpoint. This ability must first be enabled using the Engineered Air commissioning software on the local RS232 port. The input range must be between 0 to 255 °F with a 1° resolution. See register 40052.
- Read / Write
- Modbus® register: 40047
- Return value: unsigned integer
- Units: °F

### EMS Secondary Setpoint Access

- Description: This is a window in which the central computer can change the secondary discharge air temperature setpoint (usually cold deck or dehumidification/dew point temperature) . This ability must first be enabled using the Engineered Air commissioning software on the local RS232 port. The input range must be between 0 to 255°F with a 1° resolution. See register 40052.
- R/W
- Modbus® register: 40048
- Return value: unsigned integer
- Units: °F



### EMS Economizer Minimum Position Access

- Description: This is a window in which the central computer can change the economizer minimum outside air setpoint. The input range must be between 0 to 100%. A PDA or Laptop must enable this register. See register 40052.
- R/W
- Modbus® register: 40046
- Return value: unsigned integer
- Units: %

### EMS Unit On / Off Access

- Description: This is a window in which the central computer can command the unit on or off. A PDA or Laptop must enable this register. See register 40052.
- R/W
- Modbus® register: 40044
- Return value: integer 0 = off, 1 = on

### EMS Dehumidification Call Access

- Description: This is a window in which the central computer can enable the dehumidification function, assuming the equipment has this ability. See the unit function and wiring diagram. If the register is enabled, it will override the normal dehumidification command function. The input range must be either '0' or '1'. A PDA or Laptop must enable this register. See register 40052.
- R/W
- Modbus® register: 40045
- Return value: integer 0 = no dehumidification and 1 = start dehumidification

### EMS Disable Operating Methods Access

- Description: This is a window in which the central computer can selectively disable methods of controlling the discharge temperature. The heating, economizer and mechanical cooling can be commanded into either the automatic or disabled state.
- R/W
- Modbus® register: 40078
- Return value: bit mapped integer
  - B0 bit set = disable economizer
  - B1 bit set = disable mechanical cooling
  - B2 bit set = disable heating
  - B3-7 bits unused

### EMS Remote Lockout Safe Reset

Description: This register will prompt the C-TRAC3 to reset and restart to the last saved flash values in memory. Any working data not saved to flash will be lost. Writing any value to this register will cause the C-TRAC3 to restart.

- R/W
- Modbus® register: 40164
- **Return value: 0 = Do not Reset and 1 = Reset**

## DIGITAL INPUTS

The following digital inputs are generally used for service and troubleshooting.

### Digital Input Terminal 'A'

- Description: Status of 24Vac input to disable cooling mode. Usually wired from external cooling safeties or controls. Refer to the wiring diagram to determine.
- Read only
- Modbus® register: 30138
- Return value: enabled =1, disabled =0

### Digital Input Terminal 'E'

- Description: Status of 24Vac input to disable economizer or mix box operation. Usually wired from external safeties or controls. Refer to the wiring diagram to determine.
- Read only
- Modbus® register: 30137
- Return value: enabled =0, disabled =1

### Digital Input Terminal 'HS'

- Description: Status of 24Vac input to disable the heating. Usually wired from external safeties or controls. Refer to the wiring diagram to determine.
- Read only
- Modbus® register: 30236
- Return value: enabled =1, disabled =0

### Digital Input Terminal 'FS'

- Description: Status of 24Vac input to enable occupied operation. Usually wired from external safeties or controls. Refer to the wiring diagram to determine.
- Read only
- Modbus® register: 30136
- Return value: enabled =1, disabled =0

### Digital Input Terminal 'K'

- Description: Status of 24Vac input to enable unoccupied operation or a call for dehumidification. Usually wired from external safeties or controls. Refer to the wiring diagram to determine.
- Read only
- Modbus® register: 30139
- Return value: enabled =1, disabled =0

## TEMPERATURE SENSORS

### Ambient Temperature Sensor

- Description: Outdoor ambient sensor generally located in the outside air inlet.
- Read only
- Modbus® register: 30709
- Return value: The floating point variable inside the C-TRAC3 has been multiplied by 10 then converted into a Signed Integer which is sent out on the Modbus® port. To reconstruct a single precision number, divide the returned integer value by 10.
- Sensor range: -46 to 160 °F

### Primary Temperature Sensor

- Description: Primary leaving air discharge air sensor.
- Read only
- Modbus® register: 30715
- Return value: The floating point variable inside the C-TRAC3 has been multiplied by 10 then converted into a Signed Integer which is sent out on the Modbus® port. To reconstruct a single precision number, divide the returned integer value by 10.
- Sensor range: -46 to 205 °F

### Secondary Temperature Sensor (optional)

- Description: Multiple use sensor input. If used, confirm its operation with the wiring diagram and unit function. This sensor connects to C-TRAC3 terminal X.
  - Not used
  - Used as a secondary discharge temperature sensor.
  - Room temperature sensor.
  - Return air temperature sensor.
  - Cold deck temperature sensor. (Multi-zone function)
  - Dehumidification temperature sensor.
- Read only
- Modbus® register: 30710
- Return value: The floating point variable inside the C-TRAC3 has been multiplied by 10 then converted into a Signed Integer which is sent out on the Modbus® port. To reconstruct a single precision number, divide the returned integer value by 10.
- Sensor range: -46 to 205 °F

## TEMPERATURE SET POINTS

### Primary Base Setpoint

- Description: This is the primary discharge air setpoint. If the C-TRAC3 is configured to allow set point reset of the primary setpoint, any set point offset will be added to or subtracted from this base set point to determine the effective operating set point (below). The base set point can originate from several sources. Consult the wiring diagram and function.
  - Set point knob built onto the face of the C-TRAC3.
  - Remote mounted pot.
  - 0 to 10 volt input. Temperature range is determined by preprogrammed minimum and maximum temperature values.
  - Override value entered by the RS-232 commissioning tool (PDA or PC).
  - Serial command (value written to "EMS primary set point access" variable).
- Read only
- Modbus<sup>®</sup> register: 30716
- Return value: The floating point variable inside the C-TRAC3 has been multiplied by 10 then converted into a Signed Integer which is sent out on the Modbus<sup>®</sup> port. To reconstruct a single precision number, divide the returned integer value by 10.
- Set point range: Upper and lower set point limits have been preprogrammed into the C-TRAC3. Depending on the application, different limits may have been programmed for heating and economizer/mechanical cooling functions. Consult the unit function.

### Secondary Base Setpoint (optional)

- Description: If used, the C-TRAC3 will also require a base set point for the secondary sensor. If the C-TRAC3 is configured to allow set point reset of the secondary setpoint, any set point offset will be added to or subtracted from this base set point to determine the effective operating set point (below). The secondary set point can be used for a variety of functions, including room or return set point, cold-deck set point and dehumidification temperature set point. (See secondary temperature sensor). The secondary base set point can originate from several sources. Consult the wiring diagram and or the unit control function to determine how this particular unit is set up.
  - Set point knob built into the C-TRAC3.
  - Remote mounted pot.
  - 0 to 10 volt input. Temperature range is determined by preprogrammed minimum and maximum temperature values.
  - Override value entered by the RS-232 commissioning tool (PDA or PC).
  - Serial command (value to be written to "EMS secondary set point access" variable).
- Read only
- Modbus<sup>®</sup> register: 30717
- Return value: The floating point variable inside the C-TRAC3 has been multiplied by 10 then converted into a Signed Integer which is sent out on the Modbus<sup>®</sup> port. To reconstruct a single precision number, divide the returned integer value by 10.
- Set point range: Upper and lower set point limits have been preprogrammed into the C-TRAC3. Depending on the application, different limits may have been programmed for heating and economizer/mechanical cooling functions. Consult the unit function.

**Effective Primary Setpoint**

- Description: This is the actual controlling discharge air temperature set point after all the set point offsets and resets have been applied to the initial base set point.
- Read only
- Modbus® register: 30713
- Return value: The floating point variable inside the C-TRAC3 has been multiplied by 10 then converted into a Signed Integer which is sent out on the Modbus® port. To reconstruct a single precision number, divide the returned integer value by 10.
- Set point range: Upper and lower set point limits have been preprogrammed into the C-TRAC3. Depending on the application, different limits may have been programmed for heating and economizer/mechanical cooling functions. Consult the unit function.

**Effective Secondary Setpoint**

- Description: This is the actual controlling temperature set point for the secondary loop after all the set point offsets have been applied to the initial base set point.
- Read only
- Modbus® register: 30714
- Return value: The floating point variable inside the C-TRAC3 has been multiplied by 10 then converted into a Signed Integer which is sent out on the Modbus® port. To reconstruct a single precision number, divide the returned integer value by 10.
- Set point range: Upper and lower set point limits have been preprogrammed into the C-TRAC3. Depending on the application, different limits may have been programmed for heating and economizer/mechanical cooling functions. Consult the unit function.

## UNIT ON/OFF, AND ALARMS

### Unit On / Off Status

- Description: This variable indicates the unit on/off function. The returned value indicates if the unit is in unoccupied (0), occupied (1) or off (2)
- Read only
- Modbus® register: 40144
- Return value: integer

### Lockout Alarms

- Description: These are conditions which have caused the C-TRAC3 to shut down the equipment and lockout.
- Read only
- Modbus® register: 40155
- Return value: Bit mapped integer
  - B0 bit set = Unit locked out on heat failure. See Heat Alarms (optional).
  - B1 bit set = Sensor failure. See bits 5,6,7
  - B2 bit set = Low limit lockout (optional).
  - B3 bit set = Air flow problem (VFD feedback or low air flow, optional).
  - B4 bit set = Unused
  - B5 bit set = The main discharge air sensor is open. (Terminal Q)
  - B6 bit set = The secondary temperature sensor is open. (Terminal X, optional).
  - B7 bit set = The Ambient sensor is open. (Terminal AMB)

### Heat Alarms

- Description: These bit maps indicate the type of heater failure (optional).
- Modbus® register: 40147
- Return value: Bit mapped integer
  - B0 bit set = DJ or DG heater pre-purge problem.
  - B1 bit set = DJ or DG heater flame fail.
  - B2 bit set = Unused
  - B3 bit set = Unused
  - B4 bit set = Unused
  - B5 bit set = Unused
  - B6 bit set = Unused
  - B7 bit set = LMK (electric heat) or HE burner fail.

### Heat Safety

- Description: These bit maps indicate specific heat failure causes.
- Read only
- Modbus® register: 40148
- Return value: Bit mapped integer
  - B0 bit set = DJ/DG Burner wiring problem.
  - B1 bit set = DJ/DG Flame relay problem.
  - B2 bit set = Unused
  - B3 bit set = Unused
  - B4 bit set = Unused
  - B5 bit set = Unused
  - B6 bit set = Unused
  - B7 bit set = Unused

### Digital Input External Alarms (optional)

- Description: The C-TRAC3 may use remaining analog inputs for a variety of external alarm situations. Refer to the wiring diagram to determine which, if any, are used. 2 minute delay and air flow (if supplied).
- Read only
- Modbus® register: 30154
- Return value: Bit mapped integer
  - B0 bit set = Clogged Filter.
  - B1 bit set = Mechanical cooling safeties open.
  - B2 bit set = Air flow too low.
  - B3 bit set = Unused
  - B4 bit set = Unused
  - B5 bit set = Unused
  - B6 bit set = Unused
  - B7 bit set = Unused

### Heat Wheel Operating Signal (optional)

- Description: If the unit is equipped with an enthalpy recovery wheel. 2 minute delay and air flow (if supplied). This is also for special defined external on/off status.
- Read only
- Modbus® register: 30153
- Return value: Bit mapped integer
  - B0 bit set = Wheel is turning.
  - B1 bit set = External on/off contact made

## **BLOWER OPERATION**

### **Blower Operating Status**

- Description: Describes the present operation of the supply blower digital output.
- Read only
- Modbus® register: 40152
- Return value: Bit mapped integer
  - B0 bit set = Blower is off.
  - B1 bit set = Blower is delaying on in occupied mode.
  - B2 bit set = Blower is delaying off in occupied mode.
  - B3 bit set = Blower is on in occupied mode.
  - B4 bit set = Blower is off.
  - B5 bit set = Blower is on in unoccupied mode.
  - B6 bit set = Blower is off in unoccupied mode.
  - B7 bit set = unused.

### **VFD Speed Feedback (optional)**

- Description: Indicates the variable frequency drive feedback signal corresponding to the 0-10Vdc signal feeding C-TRAC3 terminals MP, + or the expansion board AI. See wiring diagram to determine which terminal is being used.
- Read only
- Modbus® register: 30238
- Return value: integer.
- Range: 0 to 100%



**CONTROL MODE****Primary Application Mode**

- Description: This variable indicates the current operating mode (heating, cooling or economizer) for the primary control process.
- Read only
- Modbus® register: 40145
- Return value: Integer: 0 = none, 1 = heat, 2 = economizer, 3 = mechanical cooling

**Secondary Application Mode**

- Description: This variable indicates the current operating mode (heating, cooling or economizer) for the secondary control process.
- Read only
- Modbus® register: 40146
- Return value: Integer: 0 = none, 1 = heat, 2 = economizer, 3 = mechanical cooling

## COOLING

### Cooling Status

- Description: This register describes some of the mechanical cooling operating status
- Read only
- Modbus® register: 40158
- Return value: Bit mapped integer
  - B0 bit set = Mechanical cooling is on
  - B1 bit set = Physically the mechanical cooling is allowed to run.
  - B2 bit set = Mechanical cooling is not required.
  - B3 bit set = External cooling lockout is active. Terminal A is open.
  - B4 bit set = Compressor cycle on is blocked by low ambient temperature.
  - B5 bit set = A compressor is delaying on.
  - B6 bit set = A compressor is delaying off.
  - B7 bit set = The unit is not equipped with mechanical cooling.

### Cooling Status 2

- Description: Additional cooling status register.
- Read only
- Modbus® register: 40150
- Return value: Bit mapped integer
  - B0 bit set = The number of stages allowed to run is limited due to low air volume.
  - B1 bit set = Unused
  - B2 bit set = Unused
  - B3 bit set = Unused
  - B4 bit set = Unused
  - B5 bit set = Unused
  - B6 bit set = Unused
  - B7 bit set = Unused

### Cooling Stages % On

- Description: Indicates the percentage of mechanical cooling that is running. To know the exact number of compressors running, you must decode the information based on this percentage and the total number of cooling stages.
- Read only
- Modbus® register: 40162
- Return value: integer.
- Range: 0 to 100%

### Cooling Modulated Output (optional)

- Description: Optional modulated output voltage control for mechanical cooling or chilled water. See the function and or wiring diagram for the output range.
- Read only
- Modbus® register: 40241
- Return value: integer
- Range: 0-100%

## ECONOMIZER

### Economizer Minimum Position Setpoint

- Description: Indicates the required minimum position volume setpoint. The minimum position can be set by the face mounted C-TRAC3 pot, remote pot, PDA/laptop or serially commanded.
- Read only
- Modbus® register: 30718
- Return value: The floating point variable inside the C-TRAC3 has been multiplied by 10 then converted into a Signed Integer which is sent out on the Modbus® port. To reconstruct a single precision number, divide the returned integer value by 10.
- Range: 0-100%

### Economizer / Inlet Damper Status

- Description: Describes the current economizer operating status
- Read only
- Modbus® register: 40159
- Return value: Bit mapped integer
  - B0 bit set = Economizer is operating (Std air conditioning programs)
  - B1 bit set = Fresh air inlet damper is open. (Make up air programs)
  - B2 bit set = Economizer is not required.
  - B3 bit set = The economizer is locked out by an external safety which is wired to Terminal E. Typically this is an enthalpy sensor contact.
  - B4 bit set = The economizer is at minimum position due to high ambient temperature.
  - B5 bit set = The unit does not have an economizer section.
  - B6 bit set = The economizer minimum position is being overridden due to a low discharge air temperature. This is being done to avoid a low limit lockout. The maximum amount of minimum position override is limited to 50% of the minimum position setting
  - B7 bit set = Unused

### Economizer Output % (Operator)

- Description: Indicates the economizer output position in percentage. This number may not exactly match the economizer minimum position setpoint. The C-TRAC3 will modify the output to the damper actuator for a number of reasons. The airflow across a set of dampers does not increase linearly as the dampers open. For example, if the dampers are open 50%, the actual airflow is not 50%, but more like 70%. The C-TRAC3 has a preprogrammed 'damper linearization curve' to account for this to give a more accurate reflection of airflow volume. The low limit function will also reduce the minimum position if the discharge air temperature approaches the low limit setpoint (if used). Additionally, ambient compensation may be implemented to account for the thermal expansion of the cold outside air as it passes over the heat exchanger.
- Read only
- Modbus® register: 40242
- Return value: integer
- Range: 0 to 100%

## HEATING

### Heating Modulated Output

- Description: Displays the voltage output to the heating device.
- Read only
- Modbus® register: 40243
- Return value: integer
- Range: 0-100%.

### Heating Status

- Description: This variable gives the current heating status.
- Read only
- Modbus® register: 40157
- Return value: Bit mapped integer
  - B0 bit set = The heat is operating.
  - B1 bit set = The heating section is physically ok to cycle on.
  - B2 bit set = Heating is not required.
  - B3 bit set = The heating is locked out due to high ambient.
  - B4 bit set = An external device is preventing the heat from cycling on. Terminal HS is open.
  - B5 bit set = This unit is equipped with both reheat and primary heat. The primary heat is on.
  - B6 bit set = This unit does not have a heat section.
  - B7 bit set = Heat failure.



**UNOCCUPIED OPERATION**

The C-TRAC3 controller may have a preprogrammed unoccupied mode, with the EMS used for monitoring or triggering the event. Refer to the C-TRAC3 IOM manual and unit function for more information.

Unoccupied, or night, mode can also be accomplished through the BACnet head-end program. This would typically include provisions for night heat only, however night cooling can be allowed in a similar fashion:

- Disable the economizer to minimum position (40078).
- Set the minimum position to 0% (40046).
- Set the discharge air temperature to (40047).
- Enable the unit (40044).

**MORNING WARM-UP OPERATION**

Similar to unoccupied mode, morning warm up must also be accomplished through the Modbus® head-end program for a preset amount of time.

- Disable the economizer to minimum position (40078).
- Set the minimum position to 0% (40046).
- Set the discharge air temperature to (40047).
- Enable the unit (40044).

**NOTES**