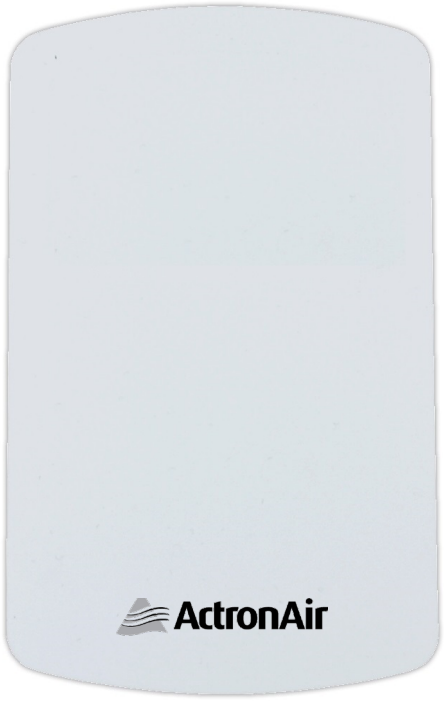
CO_2 Sensor

Installation and Commissioning Guide



Sensor Model Number	Family	Model Number	Connector Type
CCO2-S*	Tri-Capacity	PKY470/500/520/620/700/820/960T CAY470/500/520/620/700T EVY470/500/520/620/700T	8 Pin
	Hercules	PKV1400T/2000T	
CCO2-MOD	Variable Capacity Commercial	PKV720T/850T/960T CRV/EVA720T/850T/960T	4 Pin

* Compatible with CG10K Module

IMPORTANT NOTE:
Please read this manual carefully before installing or operating your air conditioning unit.

ActronAir

Table of Contents

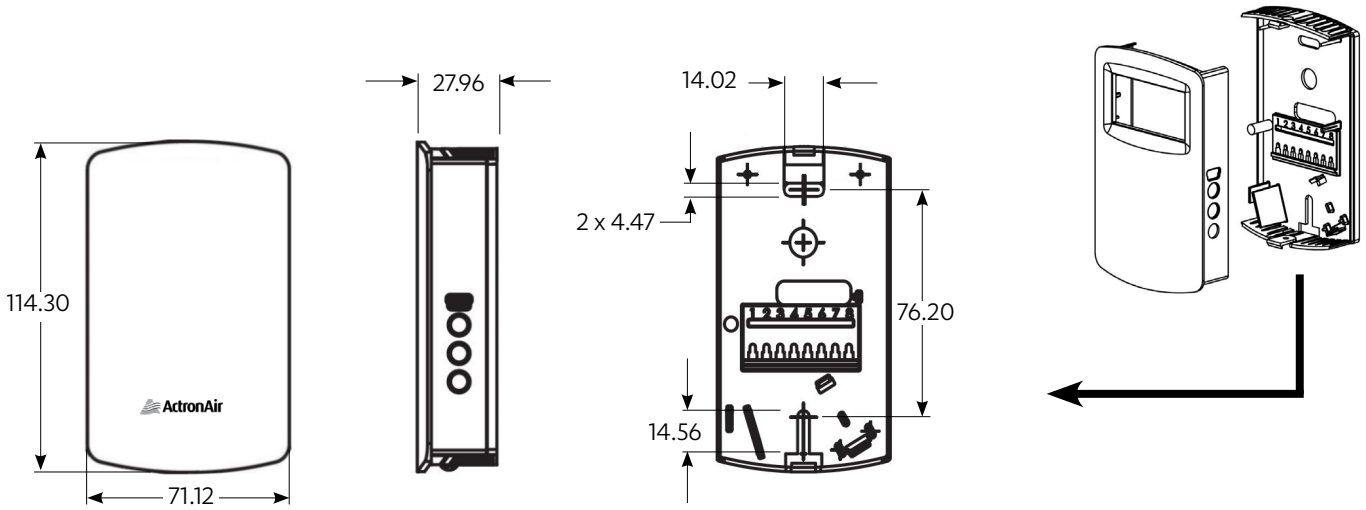
01. Introduction

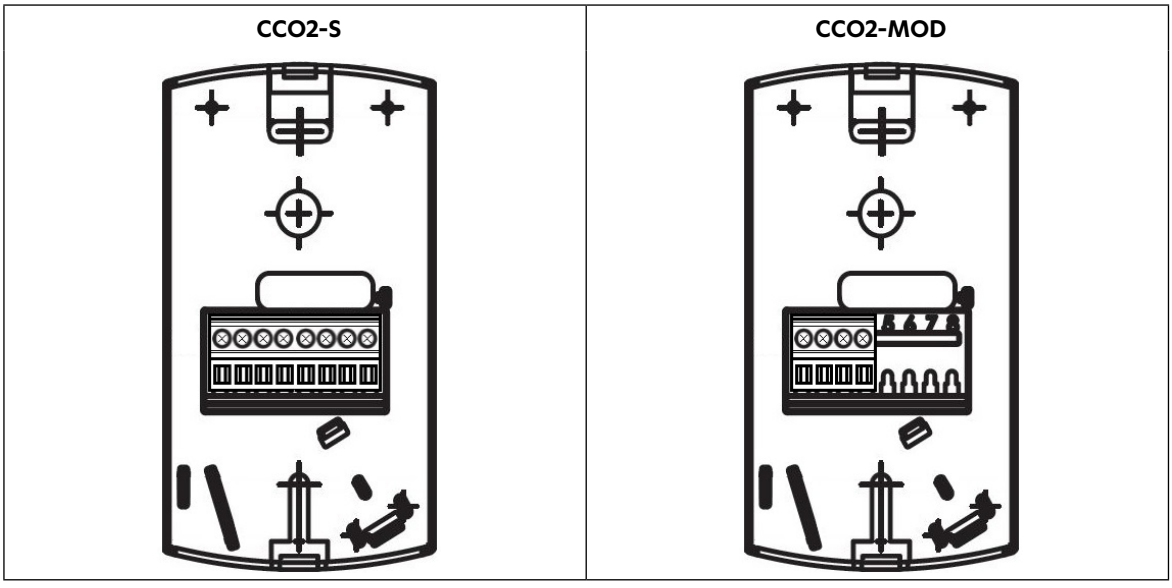
CONGRATULATIONS on your purchase of an ActronAir CO_2 sensor. This sensor has been designed and engineered to give you control of the amount of fresh air to be introduced into your compatible ActronAir airconditioning units with outside air dampers, for the purpose of Demand Control Ventilation (DCV). DCV allows for the modulation of the outdoor airflow in response to the occupancy of the conditioned space. When the actual occupancy is below the maximum occupancy assumed for system design, the occupancy-based outdoor air rate may be reduced accordingly. This reduction of outside airflow which requires conditioning, will result in an increase in efficiency of operation and associated lower running costs. CO_2 based DCV should not be applied in zones with indoor sources of CO_2 other than occupants.

The procedures outlined in this guide are provided to correctly and safely install the ActronAir CO_2 sensor to an appropriate ActronAir ducted air conditioning system. Failure to follow these procedures may result in personal injury, damage to the air conditioner, damage to the CO_2 sensor or incorrect operation of the air conditioning system. Such failure could render your warranty null and void.

02. Installation

02.01. Dimensions





02.02. Cable Specifications and Mounting Location

The recommended cable to use is 0.50mm^2 shielded data cable.

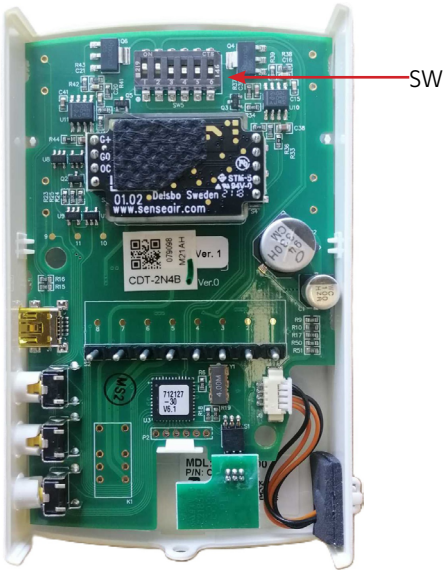
The steps on how to mount CO_2 sensor are described below:

1. Remove screw located at the bottom of the tab.
2. Press the tabs located on top and bottom of the rear plate and lift the cover.
3. Select and mount the rear plate in an appropriate location - the CO_2 sensor is to be mounted 1.0 to 1.8 meters above the floor, away from lights, diffusers, doorways and external influences . This will ensure accurate CO_2 concentration levels measured based on occupancy level in conditioned space.
4. Pull the wires through the rear plate base hole and make necessary connections. Ensure cable entry gaps are sealed.
5. Secure the cover back to the rear plate.

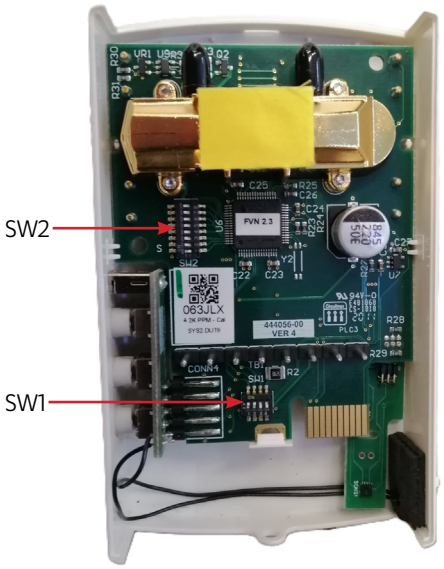
02.03. DIP Switch Settings

To gain access to the DIP switch, remove the cover the CO_2 sensor and locate the switches.

CCO2-S (Tri-Capacity and Hercules)



CCO2-MOD (VCC720-960)



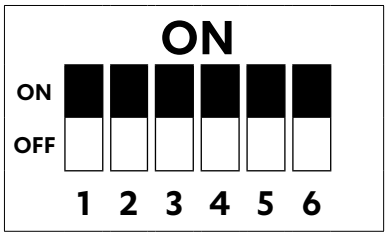
Please follow the DIP switch configuration in the figure below to ensure proper functionality of the CO_2 sensor.

02.03.01. Tri-Capacity and Hercules

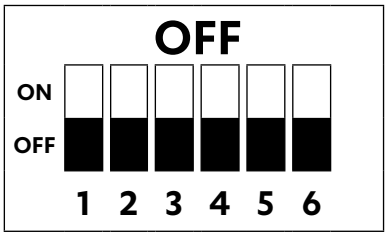
Switch Settings

Each switch may be set to ON or OFF based on the required output, example as below:

All six switches are ON



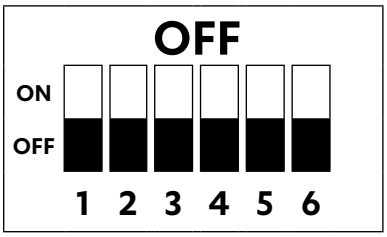
All six switches are OFF



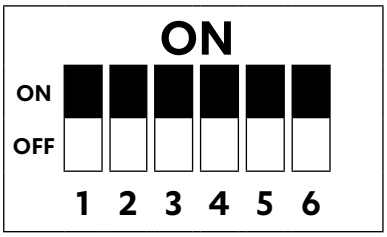
Switch Positions

There are six switches to configure the output of the CCO2 sensor. Switch position designations are as follows:

DIP Switch Position 1: CO_2 Output Selection
ON: Output set to voltage
OFF: Output set to current



DIP Switch Position 2: Not used
Must always be set to OFF



DIP Switch Positions 3 and 4: Current or Voltage Output Range Selection
Depending on the Switch setting of Position 1, Switch Position 3 and 4 may be set to configure the Output Range. The table below shows the Output Range indicated in the first column.

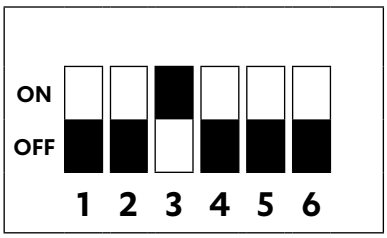
	DIP Switch Setting			Actron Product Application
Output Range	**Position 1**	**Position 3**	**Position 4**	
2-10V	ON	ON	OFF	---
0-10V	ON	OFF	OFF	*CG10K
0-5V	ON	OFF	ON	---
1-5V	ON	ON	ON	---
4-20mA	OFF	ON	OFF	**Hercules/Tri-Capacity
0-20mA	OFF	OFF	OFF	---
0-10mA	OFF	OFF	ON	---
2-10mA	OFF	ON	ON	---

* See 02.04.04 for illustration of DIP switch setting required when connected to CG10K

** See 02.04.03 for illustration of DIP switch setting required when connected to Tri-Capacity or Hercules unit

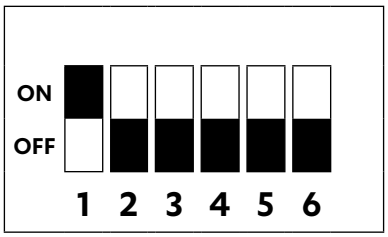
4-20mA output DIP Switch Setting

These settings will output readings within the range of 4-20mA based on CO_2 concentration levels.
Example application for this setting are Tri-Capacity (for PKY/CAY fitted with CM100 controller) and large Hercules (PKV) units.



0-10VDC output DIP Switch Setting

These settings will output readings within the range of 0-10VDC based on CO_2 concentration levels.
Example application for this setting is when connected to CG10K or PKY/CAY (Tri-Capacity fitted with uPC Controller only).



NOTE

Voltage divider terminal blocks are required for 0-10VDC operation with uPC Controller.
Refer to Wiring Diagram 02.04.04. for installation instructions.

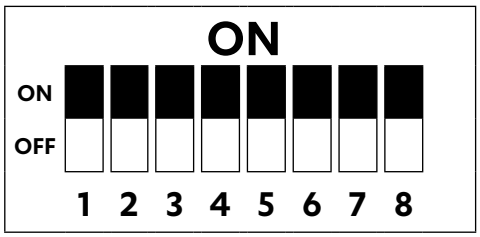
02.03.02. Variable Capacity Commercial (720-960)

Switch Settings

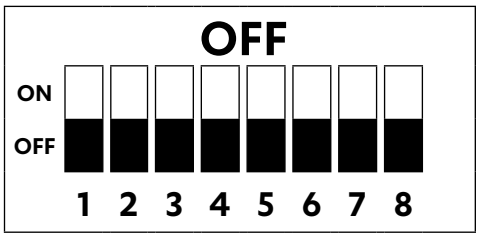
There are two different DIP switches on the CCO2-MOD, SW2 (8 DIP switch) which is for configuring the RS-485 address value and SW1 (4 DIP switch) which configures other hardware and software options.

SW2 is used to configure the RS-485 address of the device. The factory setting address is 127 and which is also the address required to communicate with the ActronAir board. To set the MAC address to 127, all DIP switch positions must be set to ON, except for position 1.

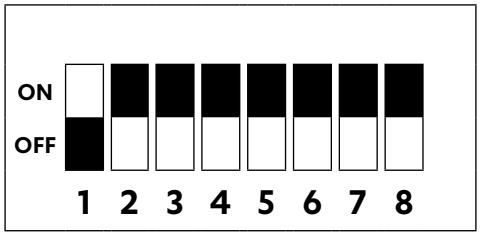
All eight switches are ON



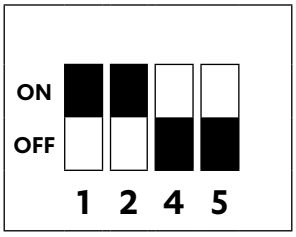
All eight switches are OFF



If the address needs to be changed, the assignment is determined by adding the values for each of the switches that are on. In this example 64+32+16+8+4+2+1 = 127



SW1 will come default with DIP switch positions 1 and 2 on and only 1 and 2 is required for communication to the ActronAir Board.



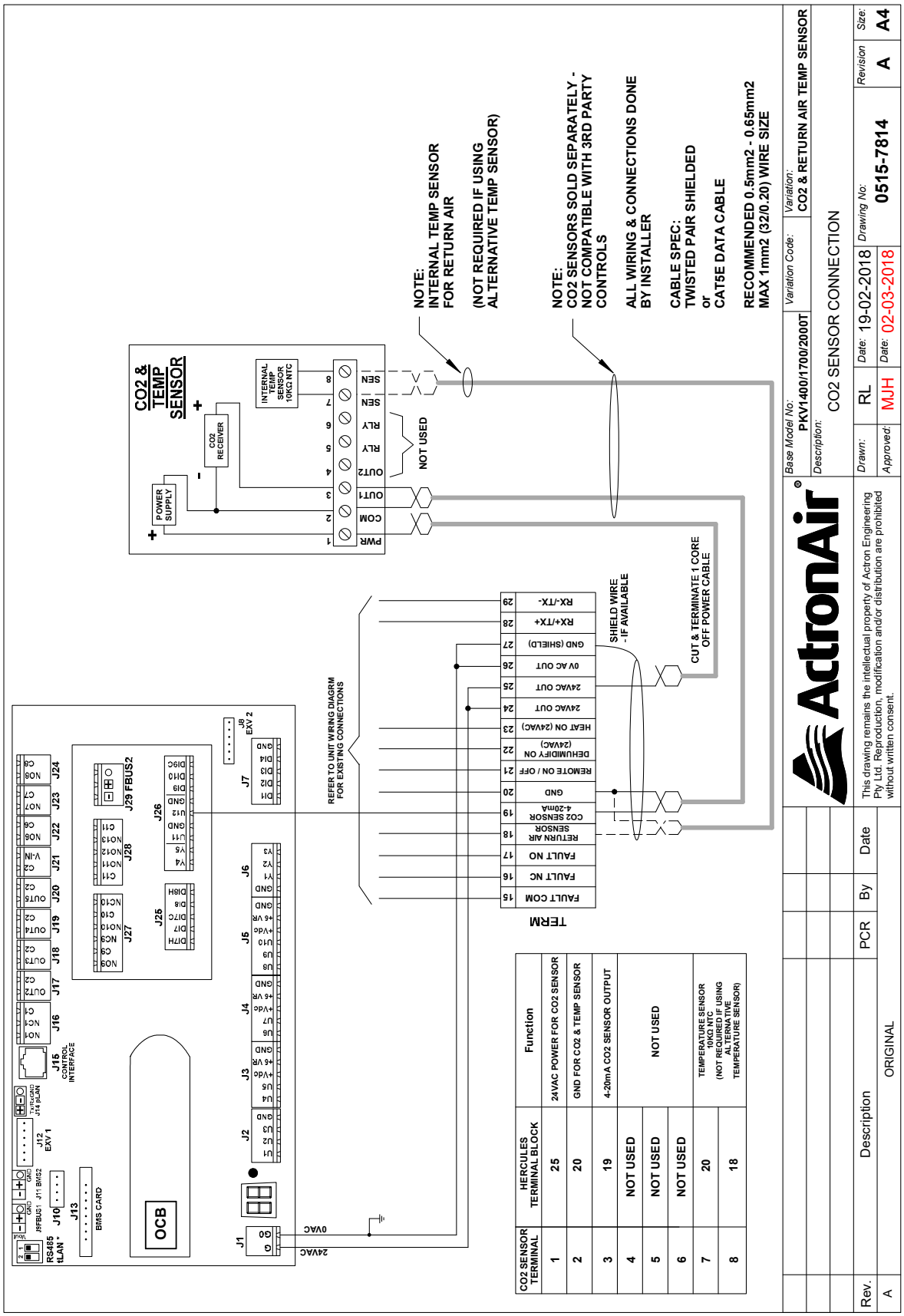
Auto Serial Configuration (AUT)

This value enables or disables the automatic baud rate detection. If the device fails to communicate on the MS/TP bus or the serial configuration is not 8 data bits, no parity and 1 stop bit, then this value should be set to "OFF", and the serial configured manually.

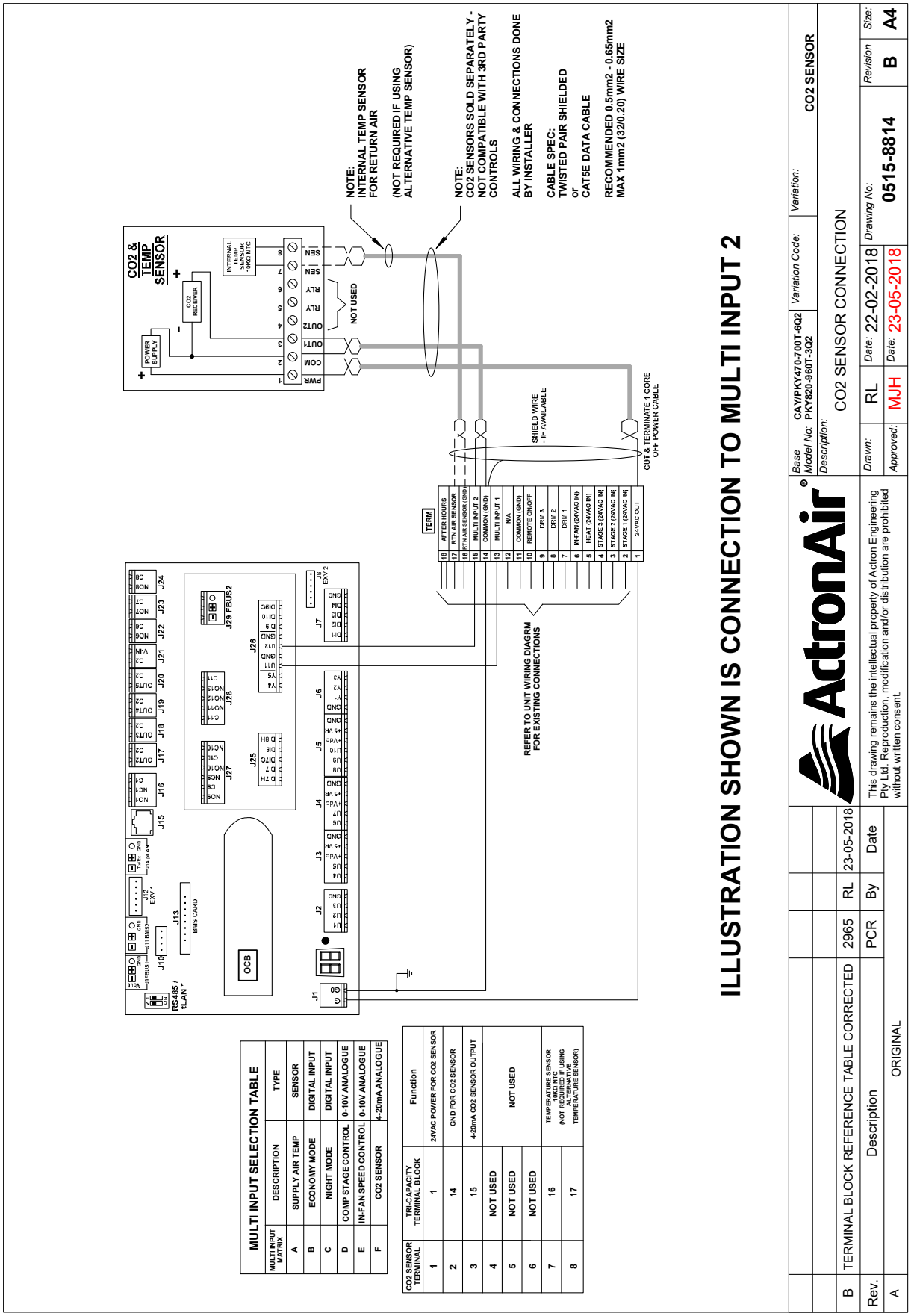
Setting Value	Description
ON / OFF	Auto baud enabled, assumes 8 data bits, no parity and 1 stop bit Auto baud disabled, serial baud rate, parity, and stop bits must be set manually

02.04. Wiring Diagram

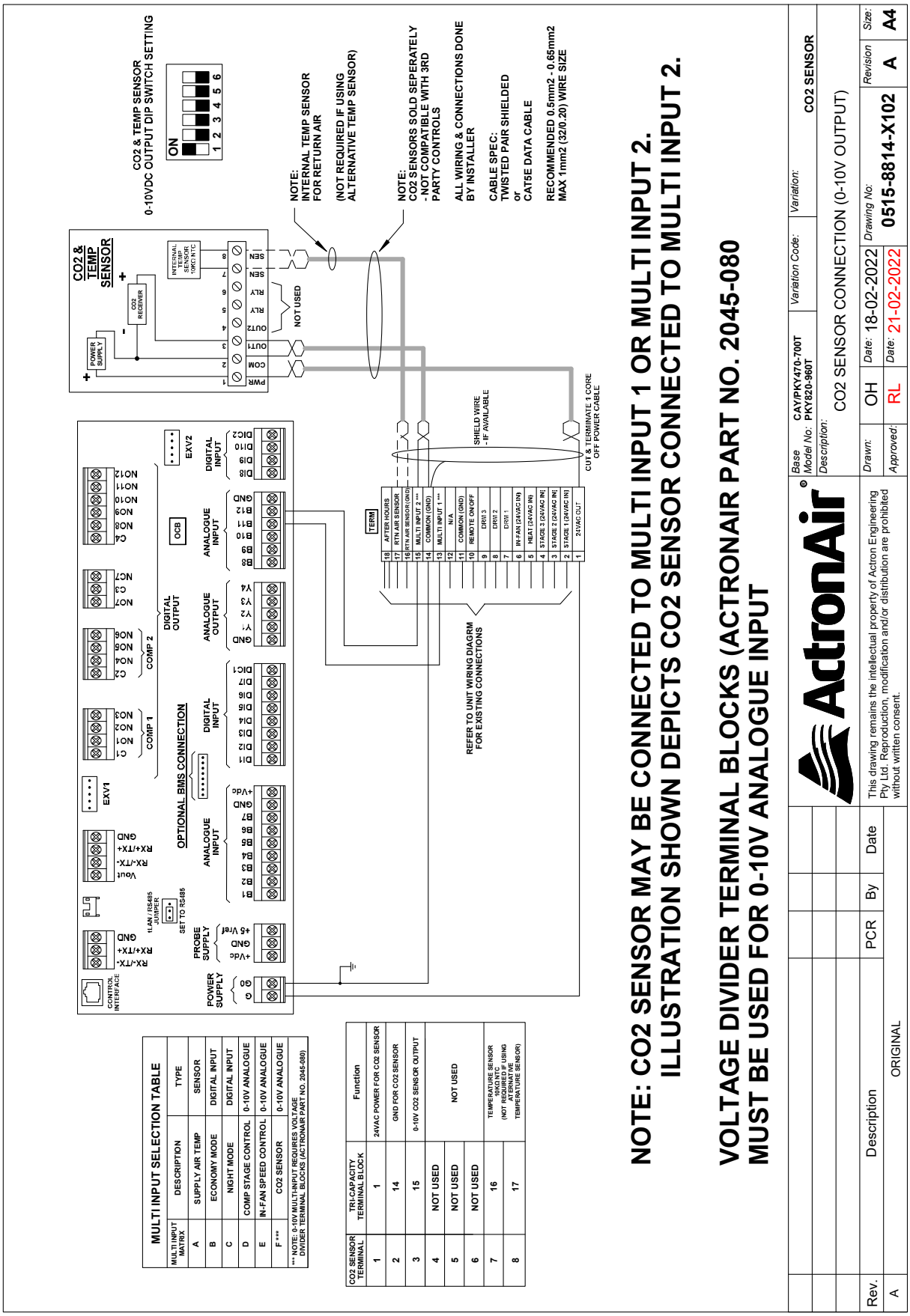
02.04.01. Hercules Models



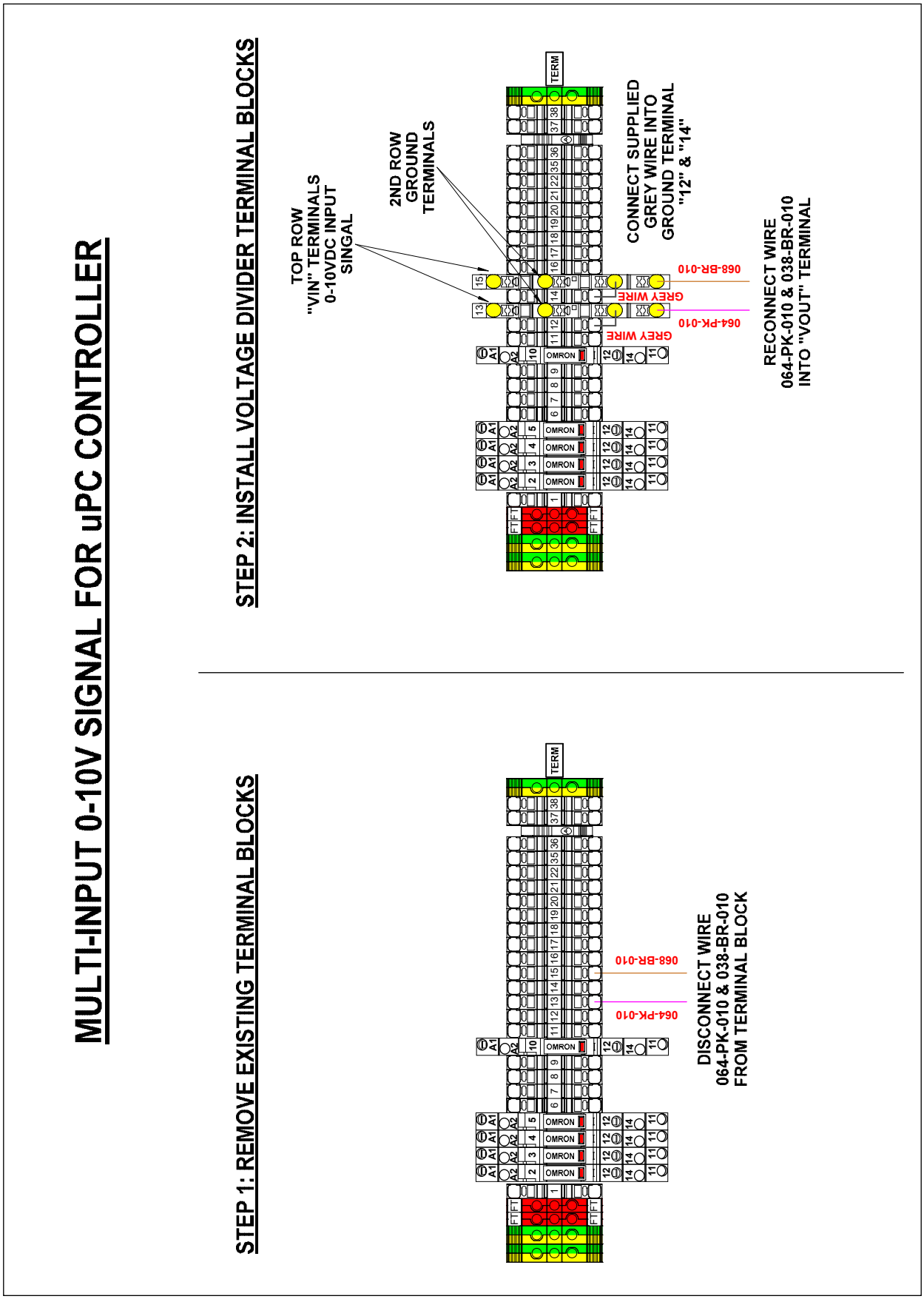
02.04.02. Tri-Capacity Models - CM100



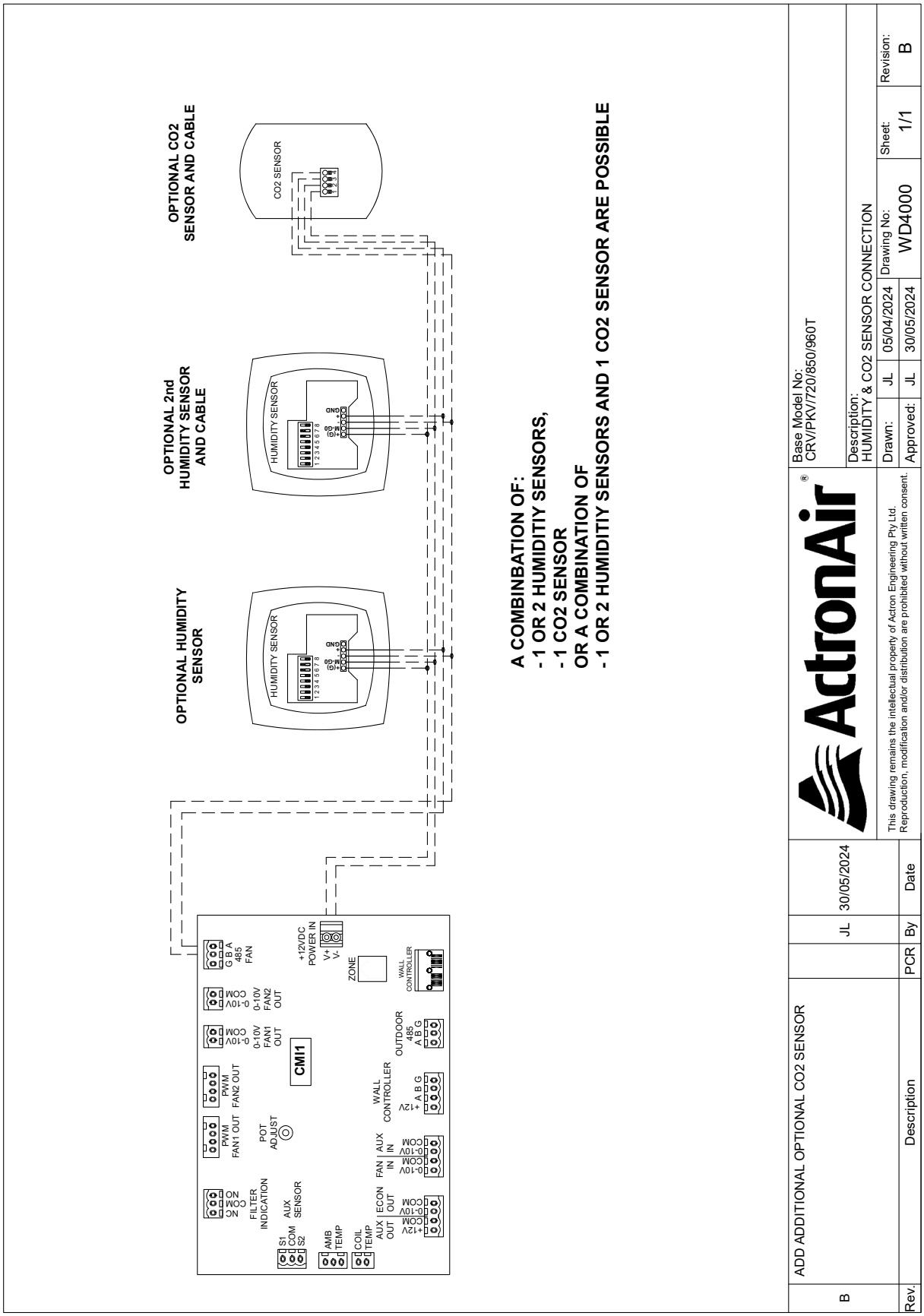
02.04.03. Tri-Capacity Models - uPC



02.04.04. Tri-Cap 0-10VDC Voltage Divider Terminal Block - uPC



02.04.05. VCC (72-96kW) Models

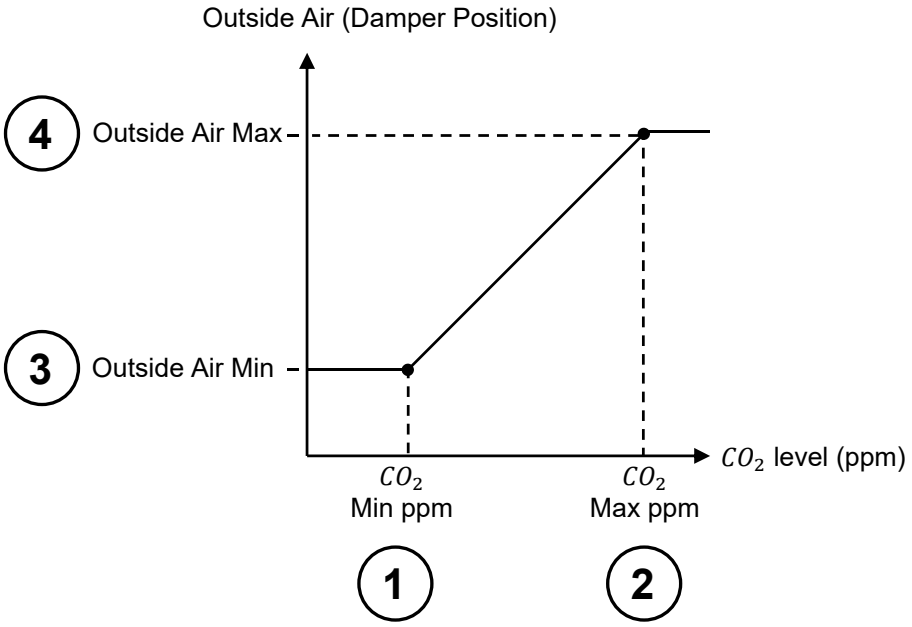


03. Controller Setup

The optional CO_2 sensor function will be operational when the CO_2 sensor is enabled and configured.
For third party control, please contact third party supplier as controller configuration will be a different process.

03.01. CO_2 Sensor Setup

The CO_2 levels and corresponding damper positions is to be adjusted in accordance to the applications requirements. Steps provided in succeeding instructions are aimed to configure the setting as below. **Consult the relevant standards as required for your application.**



03.01.01. Tri-Capacity and Hercules

The unit control mode is to be set to **INTERNAL SENSOR**. This can be set through the Service Menu or via seven segment. The input type is **4-20mA** (for CM100 controller) or **0-5V** (for uPC controller) and the sensor is connected to the following ports as described below:

- Hercules - universal input **U12**
- Tri-Capacity - **Multi Input 1** or **2** (Note: Wiring Diagram and CO_2 Sensor Setup shown for Multi Input 2)

NOTES

The CO_2 sensor is compatible with the following software:
- For Hercules with (CM100): 2021-136-1030 and onwards
- For Tri Capacity with (CM100): 2021-136-2008 and onwards
- For Tri Capacity with (uPC): 2021-136-3000 and onwards

The following steps will be necessary to install and commission the CO_2 sensor.

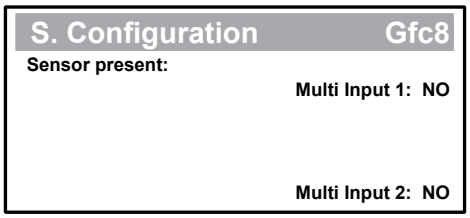
NOTES

Steps 1 - 2 are only applicable for Tri-Capacity (PKY/CAY) units only.
Steps 3 and onwards, will be relevant to both Hercules and Tri-Capacity units.

1. Select Service page **Gfc8** to assign the CO_2 sensor to **Multi input 2**.

NOTE

For this Tri-Capacity example, CO_2 sensor will be assigned to **Multi Input 2**.

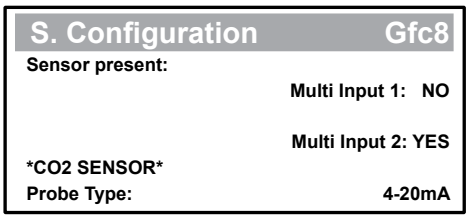


NOTE

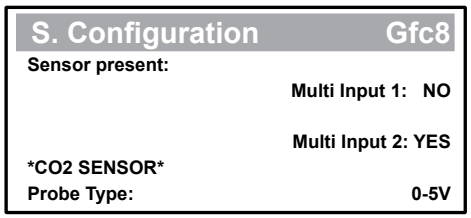
Do not change your existing configuration for **Multi Input 1**.

2. Alter the option of **Multi Input 2** to **YES**. Ensure **CO_2 SENSOR** input is selected with a probe type of **4-20mA (for PKY/CAY fitted with CM100 controller)** or **0-5V (for PKY/CAY fitted with uPC controller)** as displayed in screenshot below.

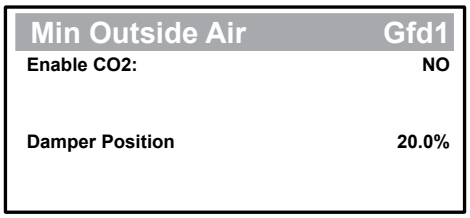
For PKY/CAY fitted with CM100 controller



For PKY/CAY fitted with uPC controller



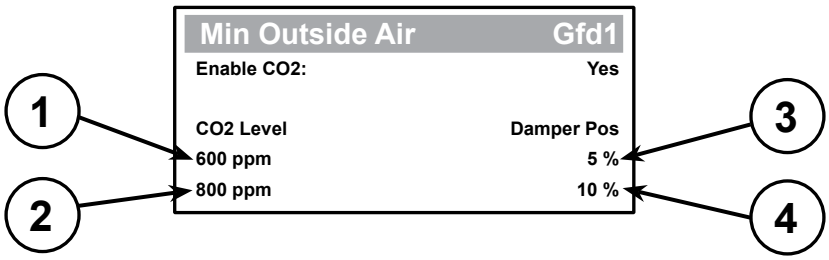
3. Navigate to Economy Setting page **Gfd1** from Service Menu.



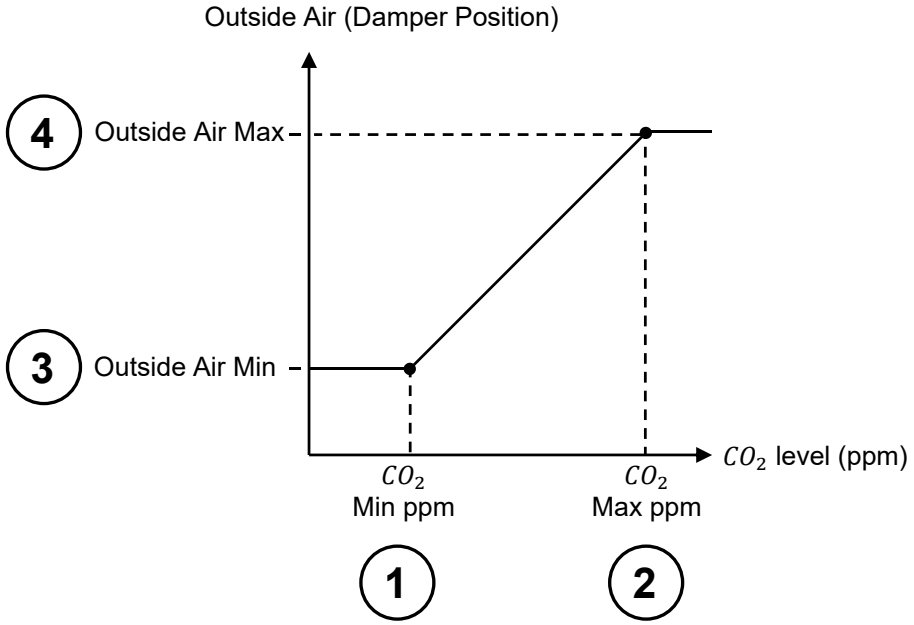
4. Press Enter to select **Enable CO_2** and change setting to **Yes** to enable the CO_2 sensor.

NOTE

The number entities are represented in the damper position picture in step 5.



5. Adjust CO_2 levels and corresponding damper positions to suit your applications requirements. Consult the relevant standards as required for your application.



03.01.02. Variable Capacity Commercial (720-960)

Connector to be used is RJ485.
The CO_2 sensor may be enabled by the following options:

Outdoor Board	Bluetooth Commissioning Tool	NEO Wall Controller

NOTE

For detailed instructions on enabling the CO_2 sensor using NEO, go to the Setting Economy Cycle Section in the Installation and Commissioning Guide of the Unit.

NOTE

The CO_2 sensor is compatible with the following software with CMI board:

Outdoor Board

By using the Outdoor board Seven Segment buttons, a linear scale can be created for the outside air damper.

To enable the CO_2 sensor go to the following menu.

diS (Display)	**Display system's status and settings**	
SEr (Service)	**Service use only**	
SEt (Settings)	**cnFg**	Family/Capacity/Circuit/Controller
	CtrS	Control Source
	iduS	IDU Fan and Airflow setting
	run	Run (Indoor Fan and Compressor) Indicator
	odFS	OD Fan Setting
	qS	Quiet Mode
	ECn	Group Control
	ECoE	**oAdC =** Outside air damper enable
		oAdo = Outside air damper On Off
		ECEo = Economiser control enable
		EHCE = Humidity control enable
		EHCo = Humidity control mode
		EHCS = Humidity sensor source
		CCE = CO_2 control enable

03.02. Minimum Outside Air Setup (Demand Controlled Ventilation)

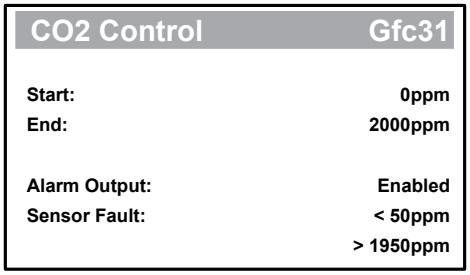
03.02.01. Tri-Capacity and Hercules

Select service page **Gfc31** to check the CO_2 sensor operating range, enable/disable sensor fault alarm and the corresponding alarm levels, as shown below. In the event that the sensor is not operating or is out of range, the outside air will operate at the outside air minimum setting as shown on screen **Gfd1**.

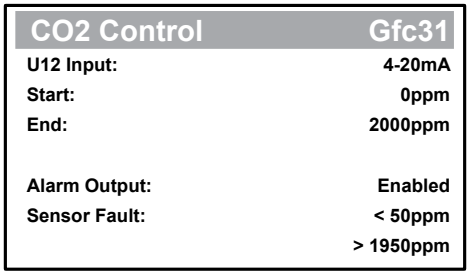
NOTE

The screenshot displayed below from the Hercules CP10 displays **U12 Input** and is set to 4-20mA.
For Tri-Capacity CP10 display, this is omitted as the CO_2 sensor input is setup in **Gfc8**.

For Tri-Capacity



For Hercules



03.02.02. Variable Capacity Commercial (720-960)

NOTE

The table shown below is from the Variable Commercial Capacity Installation and Commissioning Guide where the CO_2 setting is enabled.

To set the minimum, maximum damper positions and the CO_2 scale go to the following menus.

diS (Display)	Display system's status and settings	
SEr (Service)	Service use only	
SEt (Settings)	ECoE	**oAdC** = Outside air damper enable
		oAdo = Outside air damper On Off
		ECEo = Economiser control enable
		EHCE = Humidity control enable
		EHCo = Humidity control mode
		EHCS = Humidity sensor source
		CCE = CO_2 control enable
	ECoS	**Etd** = Economiser temperature difference
		EoLt = Economiser outside min temp
		EoHt = Economiser outside max temp
		EoLd = Economiser outside min damper
		EoHd = Economiser outside max damper
		EoHH = Economiser outside max humidity
		EoHn = Economiser outside max moisture
		EodP = Economiser outside max dew point
		EoHE = Economiser outside max enthalpy
		EEd = Economiser enthalpy delta
		ELPL = Economiser CO_2 p1
		EHPL = Economiser CO_2 p2
		ELdP = Economiser CO_2 damper p1
		EHdP = Economiser CO_2 damper p2

03.03. CO_2 Status

03.03.01. Tri-Capacity and Hercules

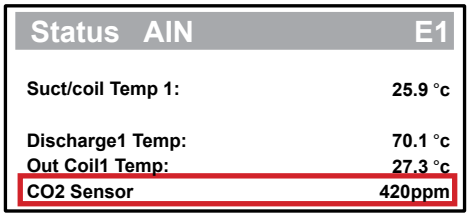
To view the current status / levels of concentration of the CO_2 in the condition space, please flow the steps below:

NOTES

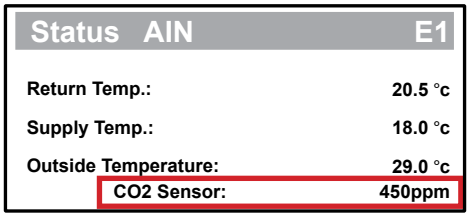
The screenshots portrayed below are taken from the Hercules CP10. The same steps maybe followed on the Tri-Capacity's CP05 to determine the CO_2 concentration levels, however, contents on E1 page may vary.

Go to Status Screen Page E1 and locate the last field named **CO_2 Sensor** on page E1, this will display the CO_2 concentration levels in the conditioned space.

For Tri-Capacity



For Hercules



03.03.02. Variable Capacity Commercial (720-960)

The CO_2 maybe set up via the outdoor board, please refer to section 03.02.02 for the parameters required.

04. Specifications

Model	CCO2-S	CCO2-MOD
CO_2 Sensor	Single beam, dual wavelength NDIR	
Humidity Type	Capacitive Polymer	
Humidity Range / Limits	0 to 100% RH / 10 to 95% RH (non-condensing)	
Temperature State	Solid state band gap	
Temperature Range /Limits	0 to 50°C	
PPM Range	0 to 2000	
Accuracy	±40 ppm ±3% of reading	
Relative Humidity	±2% (10 to 90% RH)	
Temperature	±1°C @25°C	
Temperature Dependence	±8 ppm/°C at 1100 ppm	
Non-Linearity	16 ppm	
Pressure Dependence	0.13% of reading per mm Hg	
Response Time	2 min for 99% step change	
Power Requirements	16 to 35 VDC or 19 to 28 VAC	10 to 42 VDC or 10 to 30 VAC
Power Consumption	Average: 2 W Peak: 3.75 W	Average: 0.5 W Peak: 1.2 W
Communication Protocol	N/A	2-Wire RS-485, Modbus RTU
Output	4 to 20 mA (max. 500 Ω)	Modbus
Weight	125 g	
CM100 Software		
Hercules	2021-136-1030 onwards	N/A
Tri-Capacity	2021-136-2008 onwards	N/A
VCC70-100	N/A	CMI 4.18
Connecting Cable		
Maximum Cable Length	50 metres	100m
Recommended Cable	VCC - 0.50mm^2 - 0.65mm^2 twisted pair cable	

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Certified System
Quality
ISO 9001

ARC
Refrigerant Trading Authorisation
No.: AU06394

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