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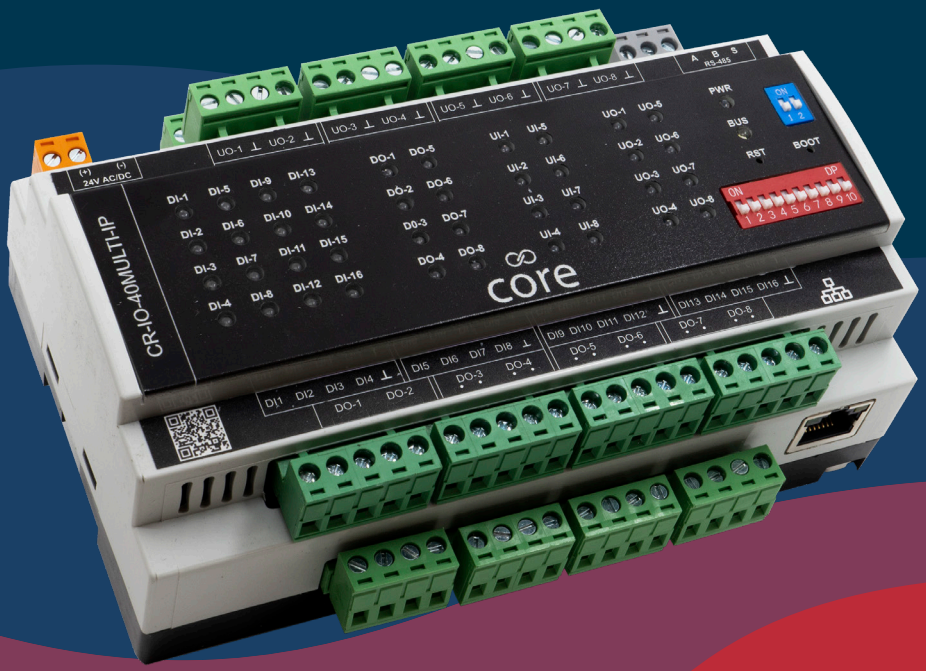
Core IO - CR-IO-40MULTI

User Manual

40 Point Mudbus I/O Module I6 DI, 8 DO, 8 UI, 8 UO/DI



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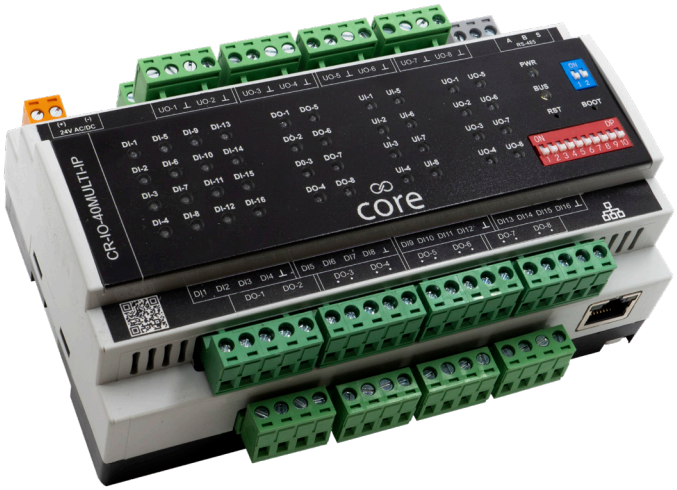


In many installations, having cost-effective, robust, and simple hardware becomes a key factor in winning a project. The Core range provides the perfect solution to meet these criteria. Innon have collaborated with Atimus, a company with a wealth of experience in the field, and are proud to present Core IO!

The 40 MULTI is a 40 point I/O device providing a perfect balance of analogue and digital inputs and outputs. The device supports a variety of sensor types, allows the use of pulse counters and integrates a watchdog to safely position its outputs in case of a network failure.

BEMS communication is based on the robust and well-proven Modbus RTU over RS485 or Modbus TCP (IP model only).

The configuration of the device can be achieved through the network using either the web interface (IP version only) or Modbus configuration registers or by using an Android device and connecting over Bluetooth using the dedicated app.

This Core IO model

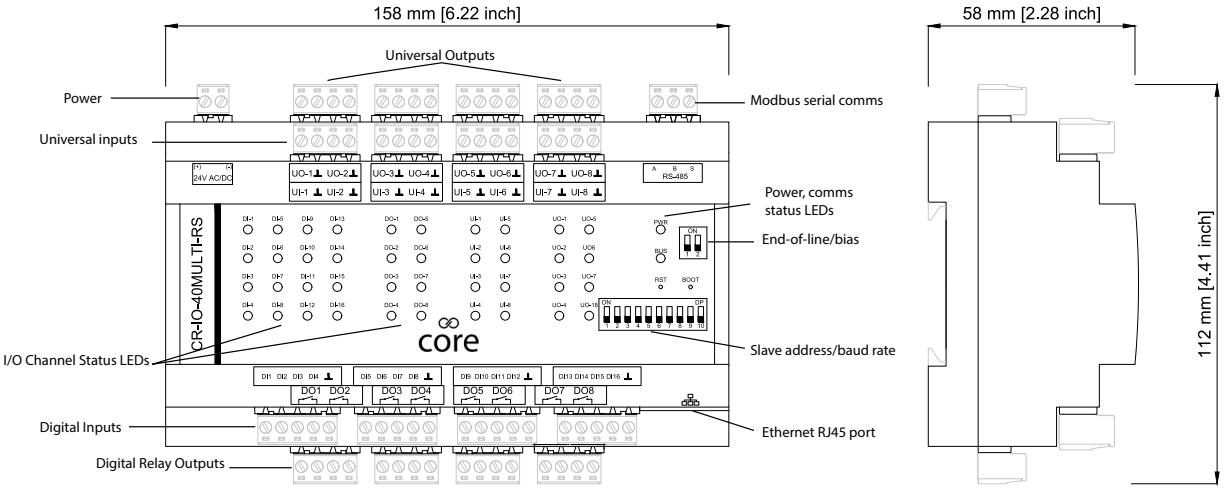
The CR-IO-40MULTI-RS and the CR-IO-40MULTI-IP modules come with 8 universal inputs, 8 universal outputs, 16 digital inputs and 8 relay outputs.

The CR-IO-40MULTI-RS only comes with the RS485 port, while the CR-IO-40MULTI-IP comes with both RS485 and IP ports.

Both models come with Bluetooth on-board, so configuration can be achieved using an Android device and the dedicated app. The IP CR-IO-40MULTI-IP model also integrates a web server configuration interface, accessible via a PC web browser.

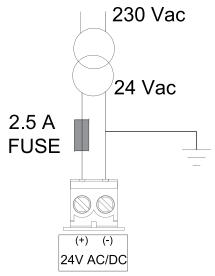
HARDWARE

Overview

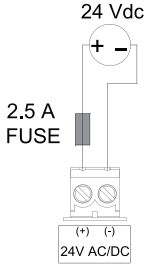


Wiring Power Supply

AC (24Vac)

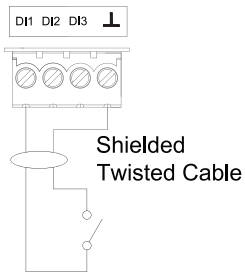


DC (24Vdc)



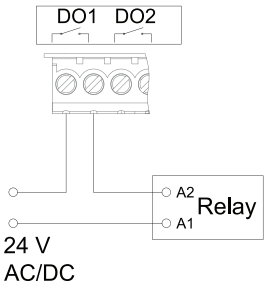
Wiring Digital Inputs (DI)

Digital Input



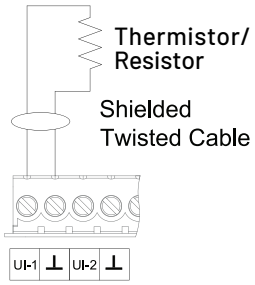
Wiring Digital Outputs (DO)

Relay out

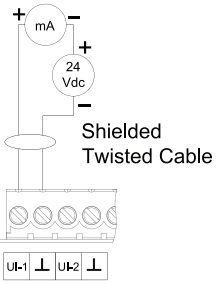


Wiring Universal Inputs (UI)

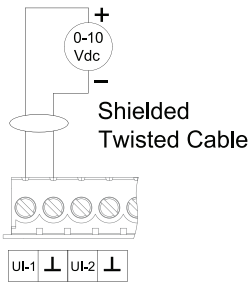
Passive Sensor/Resistor Input



0/4-20mA

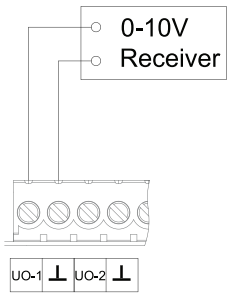


0/2-10v

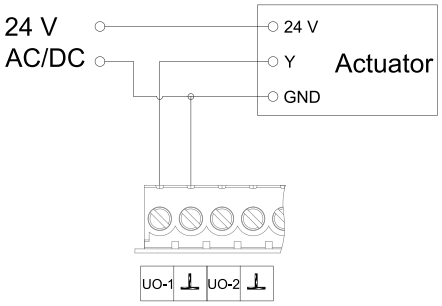


Wiring Universal Outputs (UO) - Including Use as Digital Input

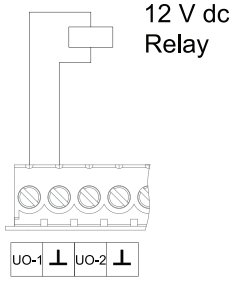
0-10V Output



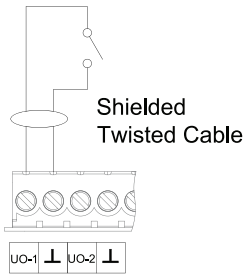
0-10V actuator output example



12V DC Relay



Digital Input



Wiring the RS485 network

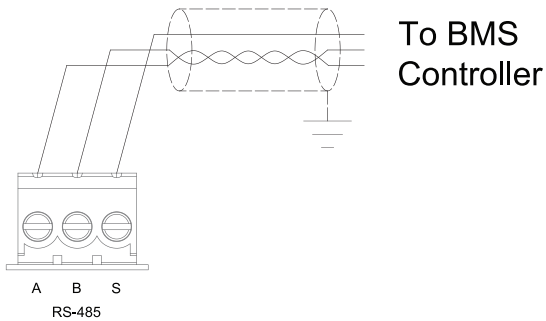
Some useful links to our knowledge base website:

How to wire an RS485 network
https://know.innon.com/howtowire-non-optoisolated

How to terminate and bias an RS485 network
https://know.innon.com/bias-termination-rs485-network

Please note - both IP and RS versions can use the RS485 port to respond to serial Modbus master comms from the BEMS, but neither version can use the RS485 port to act as a Modbus master or gateway.

RS485 to BEMS Master



Front LED Panel

The LEDs in the front panel can be used to get direct feedback on the status of the I/Os of Core IO and more general information.

Below are some tables that will help decode each LED behaviour –

DI 1 to 16		
Digital Input Mode	**Conditions**	**LED Status**
Direct	Open circuit	LED OFF
	Short circuit	LED ON
Reverse	Open circuit	LED ON
	Short circuit	LED OFF
Pulse input	Receiving a pulse	LED blinks ON for every pulse

DO 1 to 8		
Digital Output Mode	**Conditions**	**LED Status**
Direct	Output active	LED ON
	Output not active	LED OFF
Reverse	Output active	LED OFF
	Output not active	LED ON

UI 1 to 8		
Digital Input Mode	**Conditions**	**LED Status**
0-10V 2-10V 0-20mA 4-20mA	Always	Blinks ON x3 times in 50ms intervals, then pauses for 800ms
PT1000 NI1000 DIN NI1000 LG NTC1K8 NTC2K2 NTC3K3 NTC10K3A1 NTC10K4A1 NTC10K CAREL NTC20K6A1 RESISTOR VALUE	Open Circuit Short Circuit Sensor reading	LED ON then OFF blinking LED ON LED OFF

UO 1 to 8		
Input/Output Mode	**Conditions**	**LED Status**
0-10V Output 2-10V Output	Min value out Value in between Max value out	LED OFF LED blinking 2s ON, 2s OFF LED ON
Digital Input Direct	Open circuit Short circuit	LED OFF LED ON
Digital Input Reverse	Open circuit Short circuit	LED ON LED OFF
Pulse input	Receiving a pulse	LED blinks ON for every pulse
Digital Output Direct	Output active Output not active	LED ON LED OFF
Digital Output Reverse	Output active Output not active	LED OFF LED ON

BUS and PWR		
LED	**Conditions**	**LED Status**
PWR	Core IO not powered Core IO correctly powered	LED OFF LED ON
BUS	Data being received Data being transmitted Bus polarity problem	LED blinks RED LED blinks BLUE LED ON RED

CONFIGURE I/O

Digital Inputs

Digital Inputs can have a clean/volt free contact connected to Core IO to read its open/closed status.

Each digital input can be configured to be either:

- Digital Input direct
- Digital Input reverse
- Pulse input

While the “direct” and “reverse” mode would basically return status “False (0)” or “True (1)” when the contact is either open or closed, the third mode “pulse input” is used to return a counter value increasing by 1 unit every time the digital input closes.

A dedicated chapter on the pulse input topic is available later in this manual.

The pulse input can count effectively up to a frequency of 100Hz, with 50% duty cycle.

Digital Outputs (Relay)

The Digital Outputs are driven by relays.

Each Digital Output can be configured to be either:

- Digital Output direct
- Digital Output reverse (effectively reversing the logic of the output status)

For every Digital Output it is possible to configure the desired status when the “Watchdog” function is triggered (BEMS offline for over a timeout delay).

Universal Inputs

Universal Inputs are used to connect analogue signal inputs to Core IO.

A variety of sensors and signals can be connected to a Universal Input. In terms of active signals, both voltage (0-10V, 2-10V) and current (0-20mA, 4-20mA) are supported directly. As for passive sensors, a long list of different thermistor types is available, on top of the direct resistance reading (in case you prefer to run the conversion to temperature in the BEMS strategy for dedicated types of sensors)

Here is a list of the supported input types for each individual Universal Input:

- Analogue Input 0-10V
- Analogue Input 2-10V
- Analogue Input 0-20 mA
- Analogue Input 4-20 mA
- PT1000
- NI1000 DIN
- NI1000 LG
- NTC1K8
- NTC2K2
- NTC3K3
- NTC10K3A1
- NTC10K4A1
- NTC10KCAREL
- NTC20K6A1
- Resistor Value

Universal Outputs (Digital Inputs)

Universal Outputs are primarily used as analogue outputs (0-10V, 2-10V). They can also be configured in “digital output” mode, which is just sending “0V” at a low state, “10V” at high state with 20mA max current.

Despite the name “outputs”, the Universal Outputs can be configured as digital inputs as well to extend the number of digital inputs available. They can also be configured as inputs for pulse counting like standard digital inputs can with the same 100Hz/50% duty cycle property.

As per Digital Outputs, Universal Outputs can also be configured with a default output position in case the Watchdog function triggers (BEMS offline for over a timeout delay).

Here is a list of the available options that can be selected to be used for Universal Outputs:

- Analogue Output 0-10V
- Analogue Output 2-10V
- Digital Output direct
- Digital Output reverse
- Digital Input direct
- Digital Input reverse
- Pulse input

Pulse Counting

Digital Inputs and Universal Outputs can be configured specifically to work as pulse counting inputs.

The counting maximum readable frequency is 100Hz, with a duty cycle of 50% and the maximum “contact closed” readable resistance is 50ohm.

When an input is configured to count pulses, a number of Modbus Registers are available with information and commands specifically for the pulse counting function.

The pulse input will, in fact count 2 totalizers as follows –

• The first one is continuous; it will increase by one unit for every pulse received and will keep counting until a reset command is sent over Modbus

• The other totalizer is timed. Basically, it will also increase by one unit for every pulse received but will count only for a specified (adjustable) time (in minutes). When the time expires, this second counter will start counting again from "0" immediately, repeating the cycle, but will hold the last resulting value for a minute in the register (counting the next cycle in the background)

Each pulse counting input has the following Modbus registers associated with it –

• **counter (totalizer):** this is the main totalizer. It will go back to "0" only if a reset command is sent, or if Core IO is power cycled – you can also write to this value to restore a previous count if replacing a module or to reset to 0

• **counter (timer):** this is the second totalizer, the timed one. It will go back to "0" every time the timer reaches the maximum set value (with a delay of 1 minute), or if Core IO is power cycled. If the counter reset is activated, the counts within the timed cycle will be ignored and the counter timer reset to 0. The reset will not reset this count to 0 after it has finished a timed cycle and is displaying the result for 1 minute

• **counter timer:** this data point returns the current time of the counter in minutes. It will of course, go back to "0" when it reaches the maximum set value

• **counter timer set:** using this data point you can configure the duration of the timer for the second totalizer (max set value) in minutes. This value is stored within the Core IO memory

• **counter reset:** using this data point, you can reset the totalizer counter to value "0" and the timed counter will discard counts up to that point in the timed cycle and reset its timer to 0. Core IO will self-reset this data point to value "0" once the command has been executed

CONFIGURING THE DEVICE

Fixed Settings

The RS485 Modbus Slave communication have some settings that are fixed as follows –

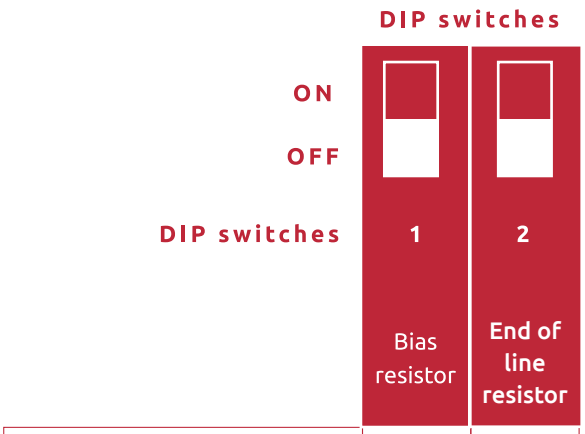
- 8-bit data length
- 1 stop bit
- Parity NONE

DIP Switch Setting

The DIP switches are used to configure the other RS485 settings and the Modbus slave address thus–

- RS485 End-Of-Line (EOL) resistor
- RS485 Bias resistors
- Modbus Slave Address
- RS485 Baud-Rate

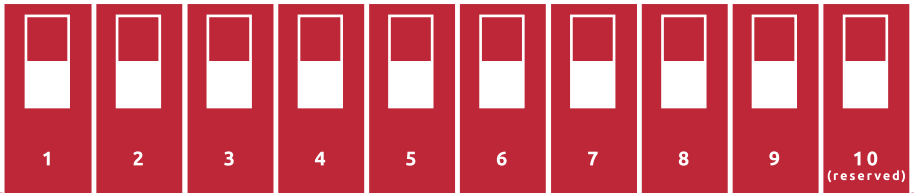
The bank of two EOL (End-Of-Line) blue DIP switches are configured as follows –



No bias, no termination	OFF	OFF
Bias active, no termination	ON	OFF
No bias, termination active	OFF	ON
Bias active, termination active	ON	ON

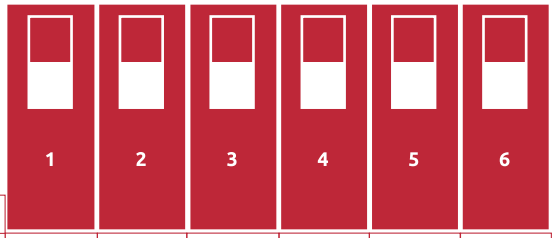
Please check our dedicated knowledge base article available at the website http://know.innon.com where we explain in detail the use of the termination and bias resistors on RS485 networks.

The Modbus ID and baud rate DIP switches are configured as follows –



Slave address										Baud rate
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	4800 Kbps
2	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	9600 Kbps
3	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	19200 Kbps
4	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	OFF	38400 Kbps
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	57600 Kbps
6	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	ON	76800 Kbps
7	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	115200 Kbps
8	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	ON	230400 Kbps
9	ON	OFF	OFF	ON	OFF	OFF				
10	OFF	ON	OFF	ON	OFF	OFF				
11	ON	ON	OFF	ON	OFF	OFF				
12	OFF	OFF	ON	ON	OFF	OFF				
13	ON	OFF	ON	ON	OFF	OFF				
14	OFF	ON	ON	ON	OFF	OFF				
15	ON	ON	ON	ON	OFF	OFF				
16	OFF	OFF	OFF	OFF	ON	OFF				
17	ON	OFF	OFF	OFF	ON	OFF				
18	OFF	ON	OFF	OFF	ON	OFF				
19	ON	ON	OFF	OFF	ON	OFF				
20	OFF	OFF	ON	OFF	ON	OFF				
21	ON	OFF	ON	OFF	ON	OFF				
22	OFF	ON	ON	OFF	ON	OFF				
23	ON	ON	ON	OFF	ON	OFF				
24	OFF	OFF	OFF	ON	ON	OFF				
25	ON	OFF	OFF	ON	ON	OFF				
26	OFF	ON	OFF	ON	ON	OFF				
27	ON	ON	OFF	ON	ON	OFF				
28	OFF	OFF	ON	ON	ON	OFF				

Slave address DIP switch settings, continued.



Slave address						
29	ON	OFF	ON	ON	ON	OFF
30	OFF	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON	OFF
32	OFF	OFF	OFF	OFF	OFF	ON
33	ON	OFF	OFF	OFF	OFF	ON
34	OFF	ON	OFF	OFF	OFF	ON
35	ON	ON	OFF	OFF	OFF	ON
36	OFF	OFF	ON	OFF	OFF	ON
37	ON	OFF	ON	OFF	OFF	ON
38	OFF	ON	ON	OFF	OFF	ON
39	ON	ON	ON	OFF	OFF	ON
40	OFF	OFF	OFF	ON	OFF	ON
41	ON	OFF	OFF	ON	OFF	ON
42	OFF	ON	OFF	ON	OFF	ON
43	ON	ON	OFF	ON	OFF	ON
44	OFF	OFF	ON	ON	OFF	ON
45	ON	OFF	ON	ON	OFF	ON
46	OFF	ON	ON	ON	OFF	ON
47	ON	ON	ON	ON	OFF	ON
48	OFF	OFF	OFF	OFF	ON	ON
49	ON	OFF	OFF	OFF	ON	ON
50	OFF	ON	OFF	OFF	ON	ON
51	ON	ON	OFF	OFF	ON	ON
52	OFF	OFF	ON	OFF	ON	ON
53	ON	OFF	ON	OFF	ON	ON
54	OFF	ON	ON	OFF	ON	ON
55	ON	ON	ON	OFF	ON	ON
56	OFF	OFF	OFF	ON	ON	ON
57	ON	OFF	OFF	ON	ON	ON
58	OFF	ON	OFF	ON	ON	ON
59	ON	ON	OFF	ON	ON	ON
60	OFF	OFF	OFF	ON	ON	ON
61	ON	OFF	ON	ON	ON	ON
62	OFF	ON	ON	ON	ON	ON
63	ON	ON	ON	ON	ON	ON

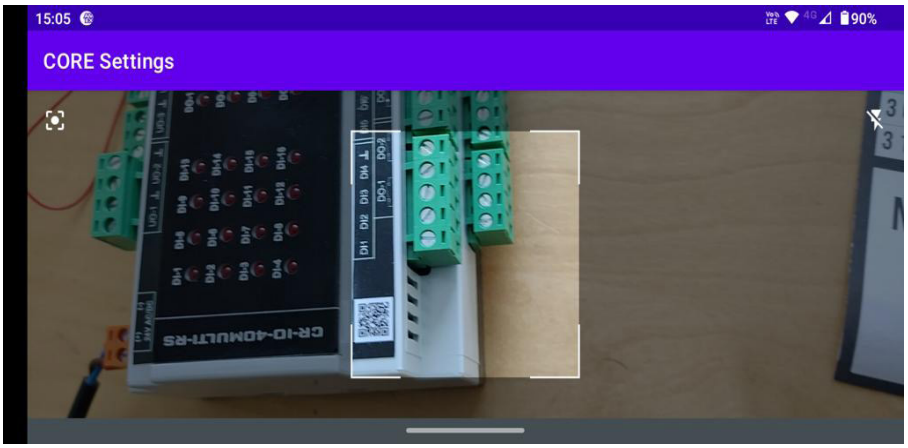
Bluetooth and Android App

Core IO has built-in Bluetooth which allows the Core Settings app running on an Android device to configure the IP settings and I/O.

Please download the app from Google Play – search for “core settings”
Download and install the app, then check/make the following settings changes –

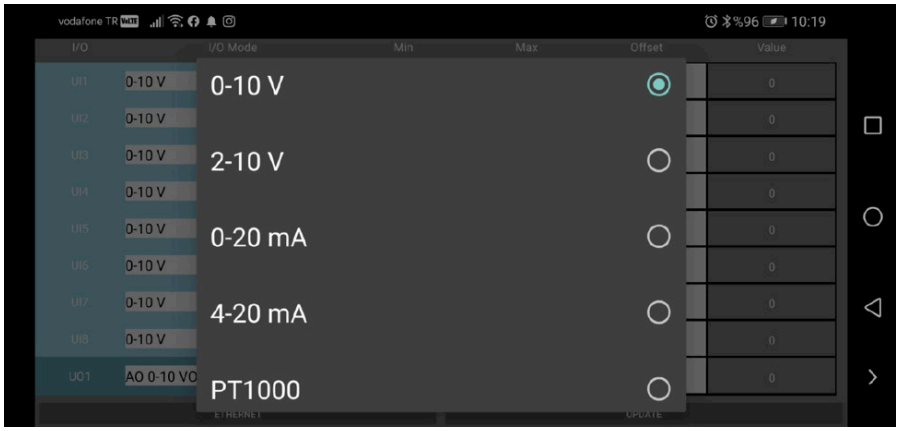
- Open your phone settings (drag down from top, press “cog” icon)
- Click on “Apps”
- Select “Core Settings” app
- Press “Permissions”
- Press “Camera” – set to “Allow only while using the app”
- Go back then press “Nearby devices” – set to “Allow”

When you run the app, the camera will switch on, and you will need to use it to read the QR code on the module you wish to set up, i.e. –



The Android device will ask you to allow the Bluetooth devices to pair on the first connection, watch out for the notifications on your device and accept them.

Once connected, you will land on the I/O setup screen, where you can set up the I/O and read input and output current values –



Use the drop-down arrows in the “I/O Mode” column to select the type of input or output type by clicking on the respective radio button –

Input data into the white boxes under Min, Max, and Offset as required. Please note – the Min and Max parameters do not apply to all input/output types. E.g. thermistor inputs are not affected by Min or Max settings, whereas 0/2-10v and 0/4-20mA use them to scale the input voltage/current being measured to provide a meaningful reading in the Modbus register.

Once you make a change or number of changes, the “UPDATE” button on the bottom right will go from greyed-out to white; press this to commit your changes.

Click on the “ETHERNET” button (bottom left) to setup the required IP settings. Set and commit data as per the I/O method above.

Click on “MODE” button (bottom left) to get back to the I/O settings.

Ethernet Port and Web Server Configuration (IP version only)

For the IP models of Core IO, a standard RJ45 socket is available to be used for:

- Modbus TCP (slave) communication
- Web server access to configure the device

The IP models still provide access on the RS485 port for Modbus RTU (slave) communication on these models, so the user can decide which one to use to connect the BEMS to Core IO.

The default settings of the IP port are:

IP address:	192.168.1.175
Subnet:	255.255.255.0
Gateway address:	192.168.1.1
Modbus TCP port:	502 (fixed)
Http port (web server):	80 (fixed)
Web server user:	atimus (fixed)
Web server password:	HD1881 (fixed)

IP address, subnet and gateway address can be changed from the Bluetooth Android app or from the webserver interface.

The web server interface looks and works in much the same way as the Core Settings app described in the previous section.

Watchdog

Watchdog is an internal function of Core IO used to check if a master is online to control the I/O, and if it is not, it can position the outputs to a pre-configured (default) pattern. This could be useful to keep a critical plant running in the event of a Modbus comms or main BEMS controller failure.

A “BEMS timeout” point is available to set the watchdog delay (decimal register address 999). If the BEMS does not send any command to Core IO within the “BEMS timeout” set time, Core IO will determine the BEMS as being offline and will position all the available outputs to their “default” positions. The “default” configuration is available as an individual Modbus configurable point for each output.

The “BEMS timeout” is expressed in “seconds /100”. This means that the writing value “3000” will correspond to a timeout of “30 seconds”.

The watchdog function can be disabled by setting “BEMS timeout” to 0.

Note for Niagara users: make sure at least one of the network points is constantly subscribing (used within the strategy, history or alarm extension associated or visualized on a page) so that Niagara sends a command to Core IO and the watchdog feature doesn’t kick in when not needed.

BEMS POINT LISTS

Modbus Register Types

Unless otherwise stated in the tables, all I/O point values/statuses and settings are held as Holding Register Modbus data type and use a single register (16 bit) to represent either an Integer (Int, range 0 - 65535) or Signed Integer (Sint, range -32768 – 32767) type of data. Please refer to the "Range" column to determine which is used (if column shows negative Min setting or refers to another setting that is negative, use Signed Integer)

Pulse count registers are 32-bit long, unsigned registers, i.e. two consecutive 16-bit registers combined, and their byte order is sent in little endian, i.e. –

- Niagara/Sedona Modbus driver – 1032
- Teltonika RTU xxx – 3412 – also use 2 x "Register count/values" to obtain all 32 bits

For some Modbus master devices, the decimal and hex register addresses in the table will need to be incremented by 1 to read the correct register (e.g. Teltonika RTU xxx)

Bit-field data type uses individual bits from the 16 bits available on the Modbus register to provide multiple Boolean information or command by reading or writing a single register.

Please note – digital output points can be controlled by integer registers AND bit-field registers concurrently and are not linked to each other directly by reading or writing in any way – these will act on the output in an OR logical way, i.e. if either register is set to 1 or True, the output will see this as a positive command signal. Therefore, if changing from one control type to another and the new register requires exclusive control, the old register must first be set to 0 or False.

Input and Output Scaling

The holding registers associated with inputs and outputs can be scaled as follows –

- Thermistors and Resistor types – precision is fixed to 1 decimal place, divide by 10 to get actual temperature reading, i.e. –
  - Modbus register value = 234, therefore temperature = 234/10 = 23.4°C
- Input 0/2-10V and 0/4-20mA types – user defined, set Min and Max to precision required e.g.
  - 0-20mA detector with range of 0 to 100°C –
    - Set Min to 0, Max to 1000, divide register value by 10 to get 1 decimal point precision actual temperature reading
    - Set Min to 0, Max to 10000 divide register value by 100 to get 2 decimal point precision actual temperature reading
- Output 0/2-10V – user defined, set Min and Max to precision required e.g.
  - 0 to 10V output to valve –
    - Set Min to 0, Max to 100 – precision is 0.1V, e.g. register value set to 55 = output of 5.5V
    - Set Min to 0, Max to 1000 – precision is 0.01V, e.g. register value set to 345 = output of 3.45V

Modbus Register Tables

General Points						
Decimal	**Hex**	**Name**	**Details**	**Stored**	**Type**	**Range**
999	3E7	BEMS timeout	Delay for the watchdog to engage when the module is offline, setting all outputs to "default" position. Value expressed in seconds /100, default value 3000 = 30 seconds (0 = disable watchdog function)	YES	R/W	0...30000
3002	BBA	Firmware version - units	Most significant number for firmware version e.g. 2.xx	YES	R	0-9
999	BBB	Firmware version - tenths	2nd Most significant number for firmware version e.g. x.0x	YES	R	0-9
3002	BBC	Firmware version - hundredths	3rd Most significant number for firmware version e.g. x.x4	YES	R	0-9

Digital Output Points						
Decimal	Hex	Name	Details	Stored	Type	Range
51	33	DO 1 mode	Digital Output mode select: 0 = Digital Output direct 1 = Digital Output reverse	YES	R/W	0...1
52	34	DO 2 mode				
53	35	DO 3 mode				
54	36	DO 4 mode				
55	37	DO 5 mode				
56	38	DO 6 mode				
57	39	DO 7 mode				
58	3A	DO 8 mode				
1	1	DO 1	Control Digital Output status: 0 = disengaged 1 = engaged	NO	R/W	0...1
2	2	DO 2				
3	3	DO 3				
4	4	DO 4				
5	5	DO 5				
6	6	DO 6				
7	7	DO 7				
8	8	DO 8				
11	B	DO 1-8	Control Digital Output status by bit (bit 0 = DO 1)	NO	R/W	0...1
91	5B	DO 1 default	Watchdog fall back value in case of connection lost. Digital Output status: 0 = disengaged 1 = engaged	YES	R/W	0...1
92	5C	DO 2 default				
93	5D	DO 3 default				
94	5E	DO 4 default				
95	5F	DO 5 default				
96	60	DO 6 default				
97	61	DO 7 default				
98	62	DO 8 default				

Universal Output Points						
Decimal	Hex	Name	Details	Stored	Type	Range
501	1F5	UO 1 mode	Universal Output mode select: 0 = Analog Output 0-10V 1 = Analog Output 2-10V 2 = Digital Input direct 3 = Digital Input reverse 4 = Pulse input 5 = Digital Output direct 6 = Digital Output reverse	YES	R/W	0...6
502	1F6	UO 2 mode				
503	1F7	UO 3 mode				
504	1F8	UO 4 mode				
505	1F9	UO 5 mode				
506	1FA	UO 6 mode				
507	1FB	UO 7 mode				
508	1FC	UO 8 mode				
101	65	UO 1	Control Universal Output status (digital output mode): 0 = disengaged 1 = engaged Control Universal Output status (analogue output mode): value between "Min" register and "Max" register Read Universal Output status (read only, digital input mode): 0 = inactive 1 = active	NO	R/W	Min register... Max register
102	66	UO 2				
103	67	UO 3				
104	68	UO 4				
105	69	UO 5				
106	6A	UO 6				
107	6B	UO 7				
108	6C	UO 8				
111	6F	UO 1-8	Control Universal Output status by bit (only digital output mode, bit 0 = UO 1)	NO	R/W	0...1
901	385	UO 1 default	Watchdog fall back value in case of connection lost. Universal Output status (digital output mode): 0 = disengaged 1 = engaged Universal Output status (analogue output mode): value between "Min" register and "Max" register	YES	R/W	Min register... Max register
902	386	UO 2 default				
903	387	UO 3 default				
904	388	UO 4 default				
905	389	UO 5 default				
906	38A	UO 6 default				
907	38B	UO 7 default				
908	38C	UO 8 default				
201	C9	UO 1 min	Minimum value for Universal Outputs configured as Analog Outputs	YES	R/W	-10000... 10000
202	CA	UO 2 min				
203	CB	UO 3 min				
204	CC	UO 4 min				
205	CD	UO 5 min				
206	CE	UO 6 min				
207	CF	UO 7 min				
208	D0	UO 8 min				

301	12D	UO 1 max	Maximum value for Universal Outputs configured as Analog Outputs	YES	R/W	-10000... 10000
302	12E	UO 2 max				
303	12F	UO 3 max				
304	130	UO 4 max				
305	131	UO 5 max				
306	132	UO 6 max				
307	133	UO 7 max				
308	134	UO 8 max				
401	191	UO 1 offset	Offset value for Universal Outputs configured as Analog Outputs	YES	R/W	-10000... 10000
402	192	UO 2 offset				
403	193	UO 3 offset				
404	194	UO 4 offset				
405	195	UO 5 offset				
406	196	UO 6 offset				
407	197	UO 7 offset				
408	198	UO 8 offset				
121	79	UO 1 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967 295
123	7B	UO 1 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967 295
125	7D	UO 1 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
126	7E	UO 1 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
127	7F	UO 1 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
221	DD	UO 2 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967 295
223	DF	UO 2 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967 295
225	E1	UO 2 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
226	E2	UO 2 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
227	E3	UO 2 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
321	141	UO 3 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967 295
323	143	UO 3 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967 295
325	145	UO 3 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
326	146	UO 3 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
327	147	UO 3 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1

421	1A5	UO 4 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
423	1A7	UO 4 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
425	1A9	UO 4 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
426	1AA	UO 4 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
427	1AB	UO 4 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
521	209	UO 5 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
523	20B	UO 5 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
525	20D	UO 5 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
526	20E	UO 5 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
527	20F	UO 5 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
621	26D	UO 6 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
623	26F	UO 6 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
625	271	UO 6 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
626	272	UO 6 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
627	273	UO 6 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
721	2D1	UO 7 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
723	2D3	UO 7 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
725	2D5	UO 7 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
726	2D6	UO 7 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
727	2D7	UO 7 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
821	335	UO 8 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
823	337	UO 8 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
825	339	UO 8 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
826	33A	UO 8 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
827	33B	UO 8 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1

Digital Input Points						
Decimal	Hex	Name	Details	Stored	Type	Range
5001	1389	DI 1 mode	Digital Input mode select: 0 = Digital Input direct 1 = Digital Input reverse 2 = Pulse input	YES	R/W	0...2
5002	138A	DI 2 mode				
5003	138B	DI 3 mode				
5004	138C	DI 4 mode				
5005	138D	DI 5 mode				
5006	138E	DI 6 mode				
5007	138F	DI 7 mode				
5008	1390	DI 8 mode				
5009	1391	DI 9 mode				
5010	1392	DI 10 mode				
5011	1393	DI 11 mode				
5012	1394	DI 12 mode				
5013	1395	DI 13 mode				
5014	1396	DI 14 mode				
5015	1397	DI 15 mode				
5016	1398	DI 16 mode				
1001	3E9	DI 1	Read Digital Input status (digital input mode): 0 = inactive 1 = active	NO	R	0...1
1002	3EA	DI 2				
1003	3EB	DI 3				
1004	3EC	DI 4				
1005	3ED	DI 5				
1006	3EE	DI 6				
1007	3EF	DI 7				
1008	3F0	DI 8				
1009	3F1	DI 9				
1010	3F2	DI 10				
1011	3F3	DI 11				
1012	3F4	DI 12				
1013	3F5	DI 13				
1014	3F6	DI 14				
1015	3F7	DI 15				
1016	3F8	DI 16				
1111	457	DI 1-16	Read digital input status by bit (only digital input mode, bit 0 = DI 1)	NO	R	0...1
1121	461	DI 1 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295

1123	463	DI 1 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1125	465	DI 1 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1126	466	DI 1 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1127	467	DI 1 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
1221	4C5	DI 2 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
1223	4C7	DI 2 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1225	4C9	DI 2 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1226	4CA	DI 2 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1227	4CB	DI 2 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
1321	529	DI 3 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
1323	52B	DI 3 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1325	52D	DI 3 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1326	52E	DI 3 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1327	52F	DI 3 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
1421	58D	DI 4 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
1423	58F	DI 4 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1425	591	DI 4 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1426	592	DI 4 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1427	593	DI 4 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
1521	5F1	DI 5 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
1523	5F3	DI 5 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1525	5F5	DI 5 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1526	5F6	DI 5 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1527	5F7	DI 5 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
1621	655	DI 6 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
1623	657	DI 6 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1625	659	DI 6 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1626	65A	DI 6 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1627	65B	DI 6 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
1721	6B9	DI 7 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295

1723	6BB	DI 7 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1725	6BD	DI 7 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1726	6BE	DI 7 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1727	6BF	DI 7 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
1821	655	DI 8 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
1823	657	DI 8 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1825	659	DI 8 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1826	65A	DI 8 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1827	65B	DI 8 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
1921	781	DI 9 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
1923	783	DI 9 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
1925	785	DI 9 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
1926	786	DI 9 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
1927	787	DI 9 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
2021	7E5	DI 10 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
2023	7E7	DI 10 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
2025	7E9	DI 10 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
2026	7EA	DI 10 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
2027	7EB	DI 10 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
2121	849	DI 11 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
2123	84B	DI 11 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
2125	84D	DI 11 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
2126	84E	DI 11 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
2127	84F	DI 11 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
2221	8AD	DI 12 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
2223	8AF	DI 12 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
2225	8B1	DI 12 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
2226	8B2	DI 12 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
2227	8B3	DI 12 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1

2321	911	DI 13 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
2323	913	DI 13 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
2325	915	DI 13 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
2326	916	DI 13 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
2327	917	DI 13 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
2421	975	DI 14 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
2423	977	DI 14 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
2425	979	DI 14 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
2426	97A	DI 14 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
2427	97B	DI 14 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
2521	9D9	DI 15 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
2523	9DB	DI 15 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
2525	9DD	DI 15 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
2526	9DE	DI 15 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
2527	9DF	DI 15 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1
2621	A3D	DI 16 counter (totalizer)	32 bit long, total counter value (totalizer) (pulse input mode)	NO	R/W	0...4294967295
2623	A3F	DI 16 counter (timer)	32 bit long, counter value for the running timer (pulse input mode)	NO	R	0...4294967295
2625	A41	DI 16 counter timer	Running timer in minutes. Will reset once "counter timer set" reached and start again	NO	R	0...14400
2626	A42	DI 16 counter timer set	Timer duration configuration in minutes	YES	R/W	0...14400
2627	A43	DI 16 counter reset	Reset command to all counted values (goes back to "0" automatically)	NO	R/W	0...1

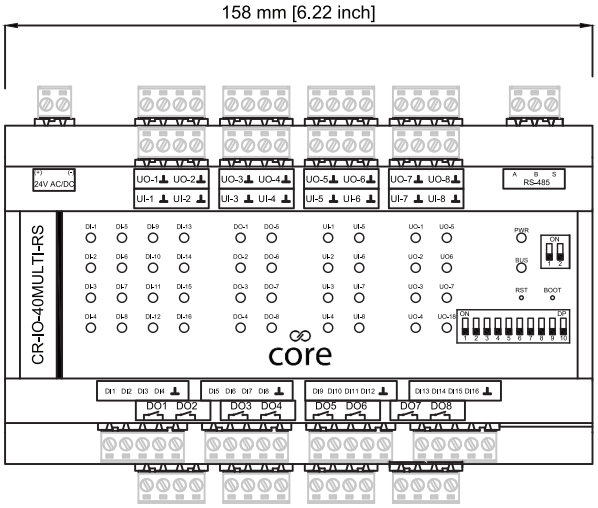
Universal Input Points						
Decimal	**Hex**	**Name**	**Details**	**Store**	**Type**	**Range**
50001	C351	UI 1 mode	Universal Input mode select: 0 = Analog Input 0-10V 1 = Analog Input 2-10V 2 = Analog Input 0-20 mA 3 = Analog Input 4-20 mA 4 = PT1000 5 = NI1000 DIN 6 = NI1000 LG 7 = NTC1K8 8 = NTC2K2 9 = NTC3K3 10 = NTC10K3A1 11 = NTC10K4A1 12 = NTC10KCAREL 13 = NTC20K6A1 14 = Resistor Value	YES	R/W	0...14
50002	C352	UI 2 mode				
50003	C353	UI 3 mode				
50004	C354	UI 4 mode				
50005	C355	UI 5 mode				
50006	C356	UI 6 mode				
50007	C357	UI 7 mode				
50008	C358	UI 8 mode				
10001	2711	UI1	Read Universal Input value	NO	R	0/2-10v and 0/4-20mA types -Min register… Max register Thermistor type – bottom of scaling range….top of scaling range (non-configurable)
10002	2712	UI2				
10003	2713	UI3				
10004	2714	UI4				
10005	2715	UI5				
10006	2716	UI6				
10007	2717	UI7				
10008	2718	UI8				
20001	4E21	UI 1 min	Minimum value for Universal Inputs	YES	R/W	-10000… 10000
20002	4E22	UI 2 min				
20003	4E23	UI 3 min				
20004	4E24	UI 4 min				
20005	4E25	UI 5 min				
20006	4E26	UI 6 min				
20007	4E27	UI 7 min				
20008	4E28	UI 8 min				

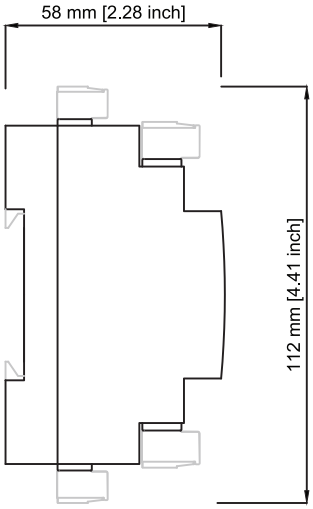
30001	7531	UI 1 max	Maximum value for Universal Inputs	YES	R/W	-10000… 10000
30002	7532	UI 2 max				
30003	7533	UI 3 max				
30004	7534	UI 4 max				
30005	7535	UI 5 max				
30006	7536	UI 6 max				
30007	7537	UI 7 max				
30008	7538	UI 8 max				
40001	9C41	UI 1 offset	Offset value for Universal Inputs	YES	R/W	-10000… 10000
40002	9C42	UI 2 offset				
40003	9C43	UI 3 offset				
40004	9C44	UI 4 offset				
40005	9C45	UI 5 offset				
40006	9C46	UI 6 offset				
40007	9C47	UI 7 offset				
40008	9C48	UI 8 offset				

TECHNICAL DATA

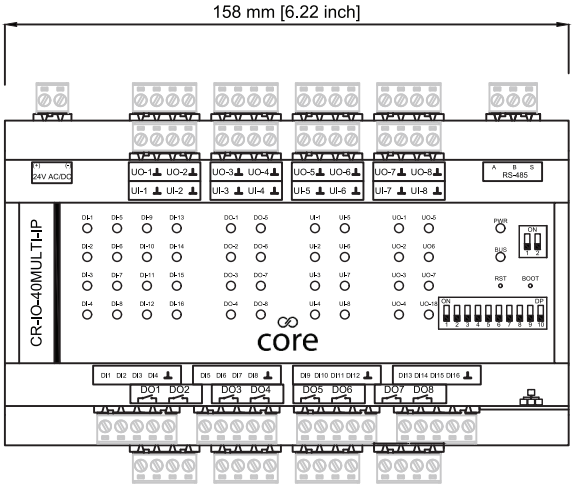
Drawings

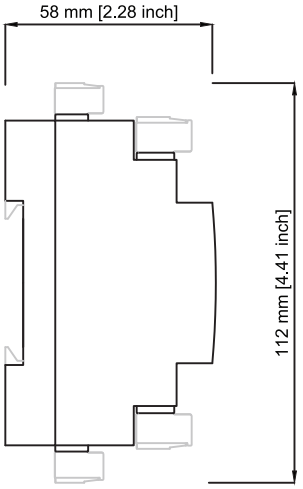
Part number: CR-IO-40MULTI-RS





Part number: CR-IO-40MULTI-IP





Specifications

Power supply	24 Vac +10%/-15% 50 Hz, 24 Vdc +10%/-15%
	Current draw – 80mA min, 200mA max
Digital Inputs	16 x Digital Inputs (volt free)
	DI direct, DI reverse, PULSE (up to 100 Hz, 50% duty cycle, max 50 ohm contact)
Universal Inputs	8x selectable inputs Precision reading ±0.5 degrees (PT1000), ±0.1 degrees (NTC), ±0.1 % full scale (active sensor) 21 bits conversion
	Passive Inputs: PT1000, NTC10K3A1, NTC10K4A1, NTC1K8, NTC10K CAREL, NTC20K6A1, NTC2.2K, NTC3.3K, NI1000
	Active Inputs: 0-10V, 2-10V, 0-20mA, 4-20mA
Digital Outputs	8 x NO/C relays 230 Vac/30 Vdc, 5 A max, 100.000 cycles
	DO direct, DO reverse
Universal Outputs	8 x universal outputs, precision output ±0.1% of full scale, 12 bits conversion
	Analog Outputs: 0-10V, 2-10V, maximum current 20 mA
	Digital Inputs (volt free): DI direct, DI reverse, PULSE (up to 100 Hz)
	Digital Outputs (0-10Vdc out, max 20mA): DO direct, DO reverse
Interface to BEMS	RS485, opto-isolated, max 63 devices supported on the network
	Ethernet/IP (IP version)
Protocol to BEMS	Modbus RTU, baud rate 9600 – 230400, 8 bit, no parity, 1 stop bit
	Modbus TCP (IP version)
Ingress Protection Rating	IP20, EN 61326-1
Temperature and humidity	Operating: 0°C to +50°C (32°F to 122°F), max 95% RH (without condensation)
	Storage: -25°C to +75°C (-13°F to 167°F), max 95% RH (without condensation)
Connectors	Plug-in Terminals 1 x 2.5 mm2
Mounting	Panel mounted (2x on-board sliding screw holders on the back) / DIN rail mounting

Guidelines for Disposal

• The appliance (or the product) must be disposed of separately in accordance with the local waste disposal legislation in force.

• Do not dispose of the product as municipal waste; it must be disposed of through specialist waste disposal centres.

• Improper use or incorrect disposal of the product may negatively affect human health and the environment.

• In the event of illegal electrical and electronic waste disposal, the penalties are specified by local waste disposal legislation.