

4.7 EXPANSION CARDS

4.7.0. INSERTING EXPANSION CARDS



Before doing any maintenance or repair work or handling any of the system connections, disconnect the device from all power sources: power supplies and input signals alike. Working on the system while it is powered up is dangerous, and it can cause irreversible damage to the system.

To insert an expansion card in the **CVMk2**, follow the procedure described here. Keep in mind that the images demonstrate how an expansion card is inserted in slot (position) 1. Position/slot 2 is immediately below slot 1, and position/slot 3 is furthest away from the terminal strips.



Shut off the power supply to the system.
Unscrew and remove the protective cover.



Insert the card by sliding it between the two lateral guides.

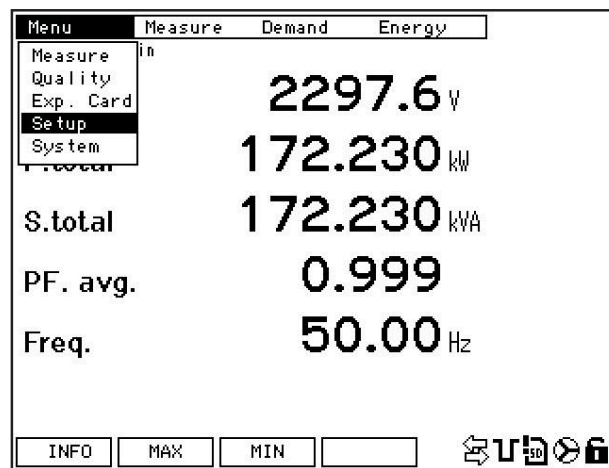


Carefully press to assure that the expansion card is properly connected in the **CVMk2**.



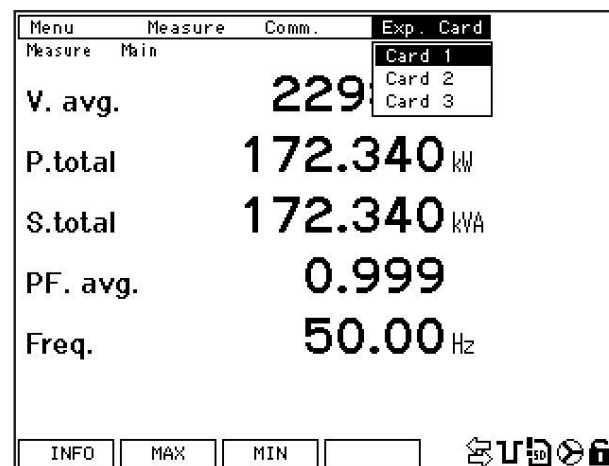
Now, screw on the top provided with the card.

To access the configuration menu for the different expansion cards, select *CARDS* in the *CONFIG*



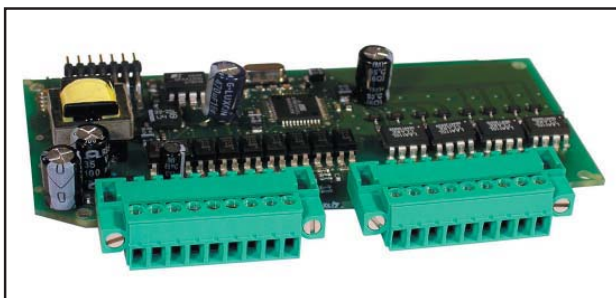
In the configuration menu, select the position of the card to be configured.

If there is no card inserted in the position selected, the *NO CARD* message will be displayed on the screen.



Before to powering up the machine, make sure that all the cables are properly connected. A wrong connection can cause serious injuries to the personnel that is working on the system.

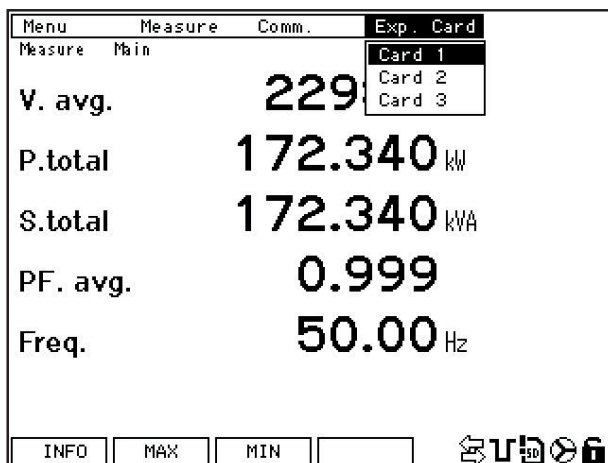
4.7.1 - 8 DIGITAL INPUTS AND 8 DIGITAL OUTPUTS



Read Section 4.7.0., Inserting Expansion Cards.

To access the configuration of the card with 8 digital inputs and 8 digital outputs, enter the configuration menu (*MENU* ---> *CONFIG.*) and in the *CARDS* menu, select the position where the card is inserted.

To modify the card configuration parameters, press the *EDIT* button (F4).



The parameters configured on the alarms screen have different meanings depending on the electric variable chosen on the configuration line, *VAR. CODE*. (See Chapter 8.3, Modbus Memory Map, to see the codes for all variables.)

Two types of electric variables are distinguished to configure an alarm.

- One type of variable is a real time value that is measured or calculated by the analyzer. (type a).
- Another type of variable is assigned an output for pulses (kW·h). One example of this type of variable can be active energy consumed with code 129 (type b).

type a: Real time electric variable code.

type b: Energy variable code (kW·h).

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 1			
Alarm 01			
Var. code			001
Maximum			0002300
Minimum			0001000
Delay ON			0001
Delay OFF			0001
IN	NEXT	EQ	EDIT

4.7.1.1. Alarm configuration

When cards configuration is accessed, the following menu will appear:

Alarm 1: *ALARMA 01*

VAR. CODE: The code entered in this variable may be:

type a: Real time electric variable to which an alarm is assigned.

type b: Energy variable (Example: 129 Active Energy) to which an output of pulses and a weight for each pulse is assigned.

MAXIMUM:

If a type a variable was selected, the maximum value of the real time electric variable should be configured. This should be considered as a maximum value alarm.

If the type b variable was selected, the size of the pulse, that the alarm will have should be provided in kW·h.

Example: If *000.010* is entered, the alarm will activate every 10W·h; i.e., it will generate a pulse every 10W·h.

MINIMUM:

If a type a variable is selected, the minimum value of the real time electric variable should be configured. This should be considered as a minimum value alarm.

If a type b variable is selected, it is not necessary to configure this parameter.

DELAY. ON:

If a type a variable is selected, it corresponds to the minimum time in seconds that the condition must complete, to activate the alarm.

If a type b variable is selected, this value corresponds to the ON time parameter. This is the number of 10 ms steps that the alarm will be activated to generate the pulse.

Example: If the *000010* value is programmed, the alarm will activate for 100ms.

DELAY. OFF:

If a type a variable is selected, it corresponds to the minimum time in seconds that the condition must complete, to deactivate the alarm.

If a type b variable is selected, this value corresponds to the OFF time parameter. This is the number of 10 ms steps that the alarm will be deactivated to generate the pulse.

To access the configuration for alarm 2 and subsequent alarms, press the *NEXT* button (F2). The configuration screens for all the alarms, up to a maximum of 16 alarms, can be accessed in this way.

From the alarm 16 screen, the equation editor screen is accessed to activate the expansion card's physical outputs by pressing the F2 (*NEXT*) button once again. This card permits configuring outputs 01 to 08.

It is possible to access the inputs configuration screen (section 4.7.1.3., Configuration of Status Digital Inputs) from any alarm screen by pressing *IN* (F1). It is also possible to access the output equations configuration screen (section 4.7.1.2., Configuration of Static Digital Outputs) by pressing *EQ* (F3).

4.7.1.1.a Alarm configuration assigned to digital outputs

To configure the expansion card inputs, enter the corresponding input code. The code that corresponds to each input depends on the input number to be selected and the position in which the card is inserted (see attached table).

CARD POSITION	VARIABLE	SYMBOL	CODE	MODBUS ADDRESS
CARD 1	Input 1 meter	IN_1001	400	0C80-0C81
	Input 2 meter	IN_1002	401	0C82-0C83
	Input 3 meter	IN_1003	402	0C84-0C85
	Input 4 meter	IN_1004	403	0C86-0C87
	Input 5 meter	IN_1005	404	0C88-0C89
	Input 6 meter	IN_1006	405	0C8A-0C8B
	Input 7 meter	IN_1007	406	0C8C-0C8D
	Input 8 meter	IN_1008	407	0C8E-0C8F
CARD 2	Input 1 meter	IN_2001	408	0C90-0C91
	Input 2 meter	IN_2002	409	0C92-0C93
	Input 3 meter	IN_2003	410	0C94-0C95
	Input 4 meter	IN_2004	411	0C96-0C97
	Input 5 meter	IN_2005	412	0C98-0C99
	Input 6 meter	IN_2006	413	0C9A-0C9B
	Input 7 meter	IN_2007	414	0C9C-0C9D
	Input 8 meter	IN_2008	415	0C9E-0C9F

CARD 3	Input 1 meter	IN_3001	416	0CA0-0CA1
	Input 2 meter	IN_3002	417	0CA2-0CA3
	Input 3 meter	IN_3003	418	0CA4-0CA5
	Input 4 meter	IN_3004	419	0CA6-0CA7
	Input 5 meter	IN_3005	420	0CA8-0CA9
	Input 6 meter	IN_3006	421	0CAA-0CAB
	Input 7 meter	IN_3007	422	0CAC-0CAD
	Input 8 meter	IN_3008	423	0CAE-0CAF

4.7.1.1.b Alarm assigned to Input status

When a variable code corresponding to the status of an expansion card input is selected, an alarm can be activated in one of two possible ways: direct or inverse logic.

To configure the alarms using direct logic, with respect to the input, [i.e., the alarm activates (value = 1) when the input activates (value = 1)], the parameters should be configured as follows:

$MAX = 1$ and $MIN = -1$.

To configure the alarms using inverse logic, with respect to the input, [i.e., the alarm activates (value = 0) when the input deactivates (value = 1)], the parameters should be configured as follows:

$MAX = 0$ and $MIN = 0$.

4.7.1.2. Configuration of digital outputs

On this screen, equations are configured for the alarms that are applied to activate the system outputs. Equations can be configured using AND (*) and/or OR (+) functions between one or more of the 16 previously configured alarms (see Section 4.7.1.1., Alarms Configuration), in order to activate each one of the card's 8 digital outputs.

To modify the card equations' configuration parameters, press the *EDIT* button (F4). Select the output to be configured and press *SET* to begin editing.

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 1			
OUT 01		00*00*00*00*00*00*00*00	
OUT 02		00*00*00*00*00*00*00*00	
OUT 03		00*00*00*00*00*00*00*00	
OUT 04		00*00*00*00*00*00*00*00	
OUT 05		00*00*00*00*00*00*00*00	
OUT 06		00*00*00*00*00*00*00*00	
OUT 07		00*00*00*00*00*00*00*00	
OUT 08		00*00*00*00*00*00*00*00	
		ESC	OK

Edit the two digits in the equation that correspond to the appropriate alarm. Between the two digits corresponding to the alarm, an "*" or "+" sign can be entered. These correspond to the AND or OR functions, respectively, and will be applied between the alarms configured.

Press (F3) to return to the *ALARM 01* screen (Section 4.7.1.1).

Press (F1) to return to the *INPUTS* screen (Section 4.7.1.3).



WARNING: The value 00 in an outputs activation equation means that nothing at all should be done. Thus, it should only be entered at the end of the equation. If the value 00 is entered at the beginning of the equation, the **CVMk2** will not make the calculation or activate the corresponding output.

4.7.1.3. Digital inputs configurations

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 1			
Input 01			
Weight			0010
Dec. Pos.			0
<div> <div>OUT</div> <div>NEXT</div> <div></div> <div>EDIT</div> </div> <div> </div>			

The card inputs are also configured in two different ways depending on whether the user desires to configure the input as an incremental counter or a two-state logic input (ON/OFF).

SIZE = 0000

Accordingly, the input is configured as a two-state input, ON/OFF. When the input is configured as ON/OFF, it is not necessary to configure the next menu option, *DEC. POS.*

SIZE ≠ 0000

When an input size other than zero is configured, this is configured as an incremental pulse counter, which can have a maximum counter value of 10M. The value to enter is the multiplier for each input pulse.

DEC. POS.: Indicate the decimal positions that the corresponding input counter should have.

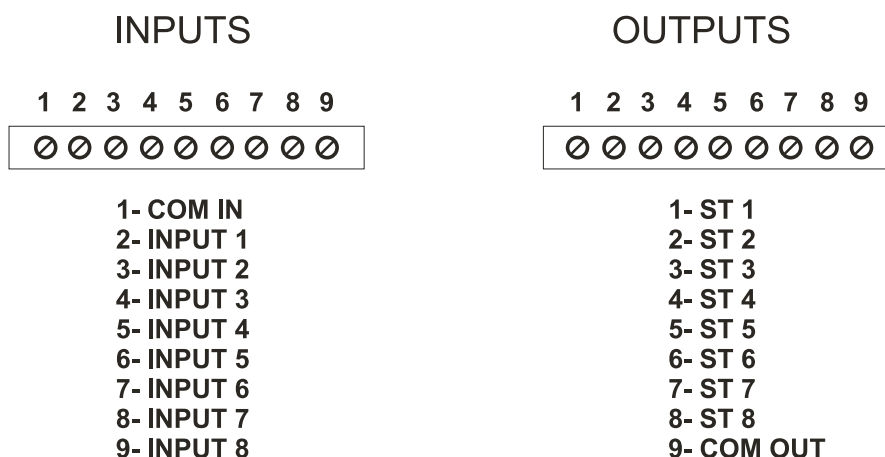
The options available in the lower menu include:

NEXT(F2). This increases the input number from 1 to a maximum of 08 to access its configuration. From the 08 input configuration screen, pressing F2 (*NEXT*) again will take the user back to the 01 input configuration screen.

OUT (F1): Press this button to access the alarms configuration screen, Section 4.7.1.1.

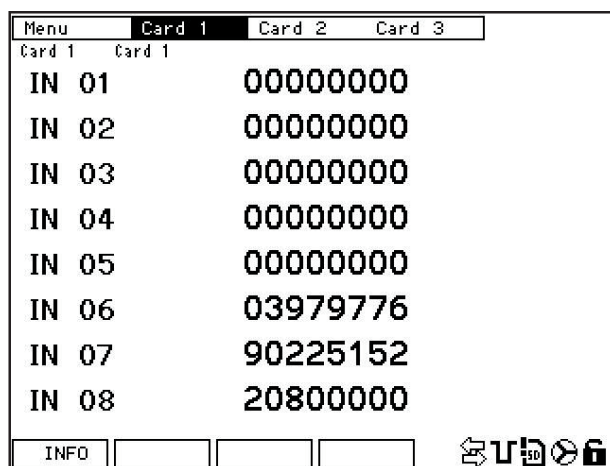
To save the parameters modified on any screen, press *OK* (F4) before exiting. To exit edit mode without saving the changes, press *ESC* (F3).

The connection of the card inputs and outputs is shown in the following figure:



4.7.1.4. Expansion card parameters

To see the parameters of the expansion card, you have to intro in menu, select cards, and go to the card to see the parameters.



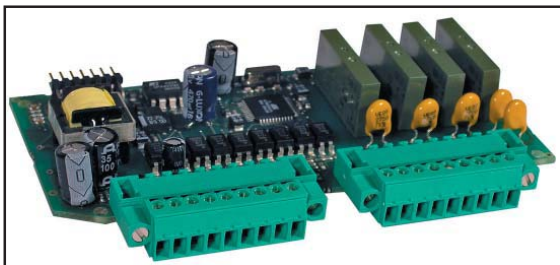
The picture shows the status of the inputs of the cards or the number of impulses that has conuted each one.

Is possible to edit names to each input to recognice them if whe are centralizing impulses of differents devices.

4.7.1.5. Characteristics

CHARACTERISTIC	VALUE	UNIT
LOGICAL INPUTS		
Type of input	Non voltage / NPN	
Type of coupling	Optically isolated input	
Maximum peak voltage	24	V d.c
Minimum times	t_{on} 40	ms
	t_{off} 40	ms
STATUS OUTPUT		
Rated voltage	< 48	V d.c
Rated current	100	mA
Maximum power	0.8	W
Maximum R_{ON}	35	Ω
CONNECTIONS		
Rigid conductor cross section	0,05..1 (AWG 30...18)	mm ²
Terminal torque	0,3	Nm

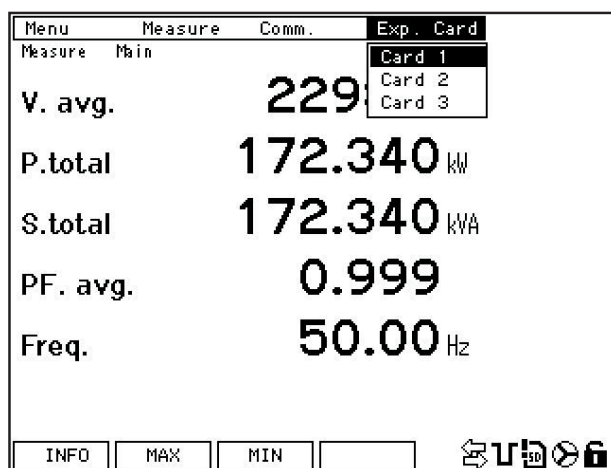
4.7.2 - 8 DIGITAL INPUTS AND 4 RELAY OUTPUTS



Read Section 4.7.0., Inserting Expansion Cards.

To access the configuration of the card with 8 digital inputs and 4 relay outputs, enter the configuration menu (*MENU* ---> *CONFIG.*) and in the CARDS menu, select the position where the card is inserted.

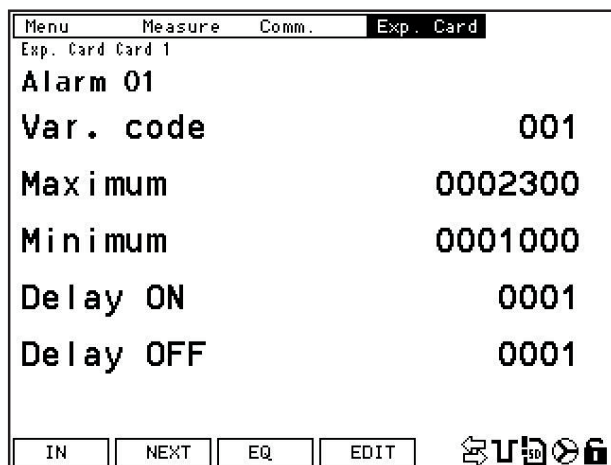
To modify the card configuration parameters, press the *EDIT* button (F4).



The parameters configured on the alarms screen have different meanings depending on the electric variable chosen on the configuration line, *VAR. CODE*, (See Chapter 8.3, Modbus Memory Map, to see the codes for all variables.)

Two types of electric variables are distinguished to configure an alarm.

- One type of variable is a real time value that is measured or calculated by the analyzer. (type a).
- Another type of variable is assigned an output for pulses (kW·h). One example of this type of variable can be active energy consumed with code 129 (type b).



4.7.2.1. Alarm configuration

When cards configuration is accessed, the following menu will appear:

Alarm 1: *ALARMA 01*

VAR. CODE: The code entered in this variable may be:

type a: Real time electric variable to which an alarm is assigned.

type b: Energy variable (Example: 129 Active Energy) to which a pulse output and a size for each pulse is assigned.

MAXIMUM:

If a type a variable was selected, the maximum value of the real time electric variable should be configured. This should be considered as a maximum value alarm.

If the type b variable was selected, the size of the pulse, that the alarm will have should be provided in kW·h.

Example: If *000.010* is entered, the alarm will activate every 10W·h; i.e., it will generate a pulse every 10W·h.

MINIMUM:

If a type a variable was selected, the minimum value of the real time electric variable should be configured. This should be considered as a minimum value alarm.

If a type b variable is selected, it is not necessary to configure this parameter.

DELAY. ON:

If a type a variable is selected, it corresponds to the minimum time in seconds that the condition must complete, to activate the alarm.

If a type b variable is selected, this value corresponds to the ON time parameter. This is the number of 10 ms steps that the alarm will be activated to generate the pulse.

Example: If the *000010* value is programmed, the alarm will be activated for 100ms.

DELAY. OFF:

If a type a variable is selected, it corresponds to the minimum time in seconds that the condition must complete, to deactivate the alarm.

If a type b variable is selected, this value corresponds to the OFF time parameter. This is the number of 10 ms steps that the alarm will be deactivated to generate the pulse.

To access the configuration for alarm 2 and subsequent alarms, press the *NEXT* button. (F2). The configuration screens for all the alarms, up to a maximum of 16 alarms, can be accessed in this way.

From the alarm 16 configuration screen, the equation editor screen is accessed to activate the expansion card's physical outputs by pressing again the F2 (*NEXT*) button. This card permits configuring outputs 01 to 04.

It is possible to access the inputs configuration screen (section 4.7.2.3., Configuration of Status Digital Inputs) from any alarm screen by pressing *INI* (F1). It is also possible to access the output equations configuration screen (section 4.7.2.2., Configuration of Relay Outputs) by pressing *EQ* (F3).

4.7.2.1.a Alarm configuration on digital inputs

To configure the expansion card outputs, enter the corresponding input code. The code that corresponds to each input depends on the input number to be selected and the position in which the card is inserted (see attached table).

CARD POSITION	VARIABLE	SYMBOL	CODE	MODUS ADDRESS
CARD 1	Input 1 meter	IN_1001	400	0C80-0C81
	Input 2 meter	IN_1002	401	0C82-0C83
	Input 3 meter	IN_1003	402	0C84-0C85
	Input 4 meter	IN_1004	403	0C86-0C87
	Input 5 meter	IN_1005	404	0C88-0C89
	Input 6 meter	IN_1006	405	0C8A-0C8B
	Input 7 meter	IN_1007	406	0C8C-0C8D
	Input 8 meter	IN_1008	407	0C8E-0C8F
CARD 2	Input 1 meter	IN_2001	408	0C90-0C91
	Input 2 meter	IN_2002	409	0C92-0C93
	Input 3 meter	IN_2003	410	0C94-0C95
	Input 4 meter	IN_2004	411	0C96-0C97
	Input 5 meter	IN_2005	412	0C98-0C99
	Input 6 meter	IN_2006	413	0C9A-0C9B
	Input 7 meter	IN_2007	414	0C9C-0C9D
	Input 8 meter	IN_2008	415	0C9E-0C9F
CARD 3	Input 1 meter	IN_3001	416	0CA0-0CA1
	Input 2 meter	IN_3002	417	0CA2-0CA3
	Input 3 meter	IN_3003	418	0CA4-0CA5
	Input 4 meter	IN_3004	419	0CA6-0CA7
	Input 5 meter	IN_3005	420	0CA8-0CA9
	Input 6 meter	IN_3006	421	0CAA-0CAB
	Input 7 meter	IN_3007	422	0CAC-0CAD
	Input 8 meter	IN_3008	423	0CAE-0CAF

4.7.2.1.b Alarm based on input status

When a variable code corresponding to the status of an expansion card input is selected, an alarm can be activated in one of two possible ways: direct or inverse logic.

To configure the alarms using direct logic, with respect to the input, [i.e., the alarm activates (value = 1) when the input activates (value = 1)], the parameters should be configured as follows:

$MAX = 1$ and $MIN = -1$.

To configure the alarms using inverse logic, with respect to the input, [i.e., the alarm activates (value = 0) when the input deactivates (value = 1)], the parameters should be configured as follows:

$MAX = 0$ and $MIN = 0$.

4.7.2.2. Configuration of relay outputs

On this screen, equations are configured for the alarms that are applied to activate the system outputs. Equations can be configured using AND (*) and/or OR (+) functions between one or more of the 16 previously configured alarms (see Section 4.7.2.1., Alarm Configuration) in order to activate each one of the system's 4 relay outputs.

To modify the card configuration parameters, press the *EDIT* button (F4). Select the output to be configured and press *SET* to begin editing.

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 1			
OUT 01	00*00*00*00*00*00*00*00		
OUT 02	00*00*00*00*00*00*00*00		
OUT 03	00*00*00*00*00*00*00*00		
OUT 04	00*00*00*00*00*00*00*00		

IN

AL
EDIT

Edit the two digits in the equation that correspond to the appropriate alarm(s). Between the two digits corresponding to the alarm, an "*" or "+" sign can be entered. These correspond to the AND or OR functions, respectively, and will be applied between the alarms configured.

Press (F3) to return to the *ALARMA 01* screen (Section 4.7.2.1).

Press (F1) to return to the *INPUTS* screen (Section 4.7.2.3).



WARNING: The value 00 in the outputs activation equation means that nothing at all should be done. Thus, it should only be entered at the end of the equation. If the value 00 is entered at the beginning of the equation, the **CVMk2** will not make the calculation or activate the corresponding output.

4.7.2.3. Configuration of digital inputs

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 1			
Input 01			
Weight	0010		
Dec. Pos.	0		
<div> <input type="button" value="OUT"/> <input type="button" value="NEXT"/> <input type="button" value="EDIT"/> </div>			

The card inputs are also configured in two different ways depending on whether the user desires to configure the input as an incremental counter or a two-state logic input (ON/OFF).

SIZE = 0000

By setting the input size to zero, the input will be configured for ON/OFF input status. When the input is configured as Boolean, it is not necessary to configure the next menu option, *DEC. POS.*

SIZE ≠ 0000

When an input size other than zero is configured, this is configured as an incremental pulse counter, which can have a maximum counter value of 10M. The value to enter is the multiplier for each input pulse.

DEC. POS.: Indicate the decimal positions that the corresponding input counter should have.

The options available in the lower menu include:

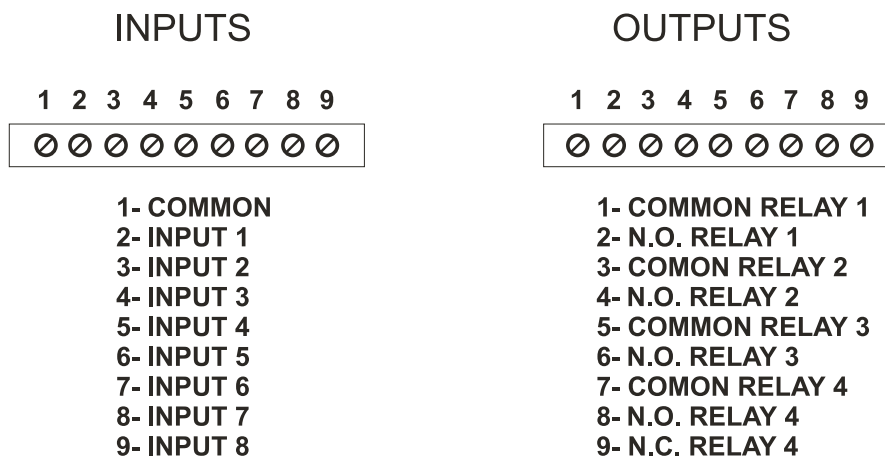
NEXT(F2). This increases the input number from 1 to a maximum of 08 to access its configuration. From the 08 input configuration screen, pressing F2 (*NEXT*) again will take the user back to the 01 input configuration screen.

OUT (F1): Press this button to access the alarms configuration screen, Section 4.7.2.1.

To save the parameters modified on any screen, press **OK (F4)** before exiting. To exit edit mode without saving the changes, press **ESC (F3)**.

4.7.2.4. Card Connections

The connection of the card inputs and outputs is shown in the following figure:



4.7.2.5. Expansion card parameters

To see the parameters of the expansion card, you have to intro in menu, select cards, and go to the card to see the parameters.

Menu	Card 1	Card 2	Card 3
Card 1	Card 1		
IN 01	00000000		
IN 02	00000000		
IN 03	00000000		
IN 04	00000000		
IN 05	00000000		
IN 06	03979776		
IN 07	90225152		
IN 08	20800000		
INFO			

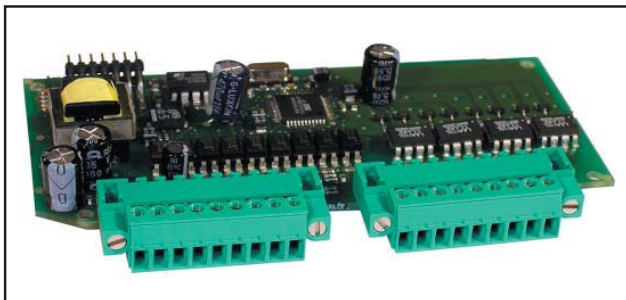
The picture shows the status of the inputs of the cards or the number of impulses that has conuted each one.

Is possible to edit names to each input to recognise them if whe are centralizing impulses of differents devices.

4.7.2.6. Characteristics

CHARACTERISTIC	VALUE	UNIT
LOGICAL INPUTS		
Type of input	Voltage free contact	
Type of coupling	Optically isolated input	
Maximum peak voltage	24	V dc
Minimum times	t_{on} 40	ms
	t_{off} 40	ms
RELAY OUTPUT		
Voltage/Current	250	V a.c
	3	A
Minimum relay load	1	V a.c
	1	mA
Mechanical life	5×10^6	cycles
Electrical life at rated load	NA: 5×10^4 , NC: 3×10^4	cycles
CONNECTIONS		
Maximum torque	0.3	Nm
Rigid conductor cross section	0,05..1 (AWG 30...18)	mm ²

4.7.3 - 8 ANALOGUE INPUTS AND 4 ANALOGUE OUTPUTS



Read Section 4.7.0., Inserting Expansion Cards.

To access the configuration of the card with 8 digital inputs and 4 analogue outputs, enter the configuration menu (*MENU* ---> *CONFIG.*), and in the CARDS menu, select the position where the card is inserted. Press *SET* to enter in the card menu.

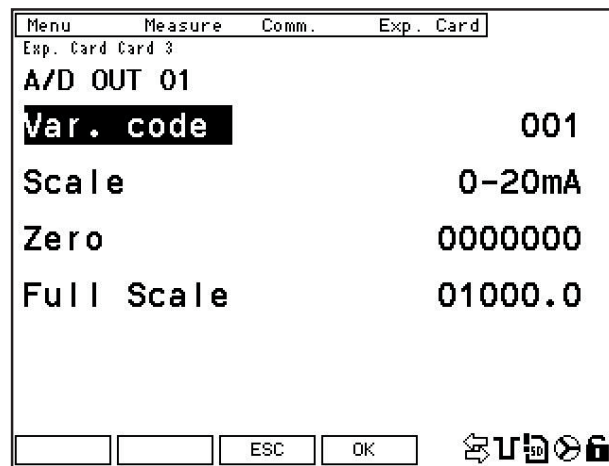
Menu	Measure	Comm.	Exp. Card
Measure	Main		Card 1
			Card 2
			Card 3
V. avg.	229		
P. total	172.340	kW	
S. total	172.340	kVA	
PF. avg.	0.999		
Freq.	50.00	Hz	
<div>INFO</div> <div>MAX</div> <div>MIN</div> <div></div>			

To access the card configuration parameters, press the *EDIT* button (F4). Select the analogue output to be configured and press *SET* to enter edit mode.

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 3			
A/D OUT 01			
Var. code			001
Scale			0-20mA
Zero			0000000
Full Scale			01000.0
<div></div> <div></div> <div>ESC</div> <div>OK</div>			

4.7.3.1. Analogue outputs configurations

The card's analogue outputs configuration screen is shown in the following figure:



The analogue outputs' configuration parameters follow:

VAR. CODE: Real time electric variable code to be assigned to the output (See (Chapter 8.3, Modbus Memory Map, to see the codes for all variables).
Energy code not permitted.

SCALE: It is possible to select between 0 and 4, which correspond to scales 0...20 mA and 4...20 mA, respectively.

ZERO: The variable should be assigned this value to have an output of 0 or 4 mA (depends on the scale selected).

BOTTOM OF SCALE: The variable should be assigned this value to have an output of 20 mA.

The function buttons give us the following options when in edit mode:

ESC: Exit the current menu without saving changes.

OK: Confirm and save the changes made.

The different buttons that appear on this screen are:

NEXT: This button is clicked to increase the output number up to a maximum of 4 (A/D OUT 04). Click it again to return to output 01 (A/D OUT 01).

IN: From any screen, click on this button to go to the analogue inputs' configuration screen. (Section 4.7.3.2. Configuration of Analogue Inputs)

EDIT: Click on this option to access the edit menu. The arrow buttons are used to select the parameter to be modified (in bold). Enter by pressing the **SET** Button.

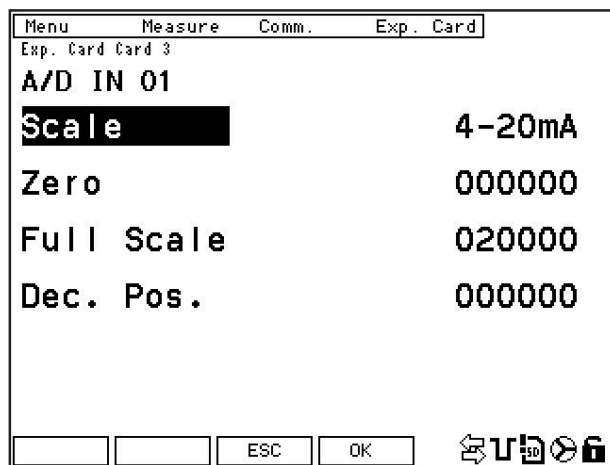
4.7.3.2. Alarm based on analogue inputs

To configure alarms based on the expansion card analogue input values, enter the corresponding input code. The code that corresponds to each input depends on the input number to be selected and the position in which the card is inserted (see attached table).

CARD POSITION	VARIABLE	SYMBOL	CODE	MODBUS ADDRESS
CARD 1	Analogue input 1	AD_1001	424	0CB2-0CB3
	Analogue input 2	AD_1002	425	0CB4-0CB5
	Analogue input 3	AD_1003	426	0CB6-0CB7
	Analogue input 4	AD_1004	427	0CB8-0CB9
	Analogue input 5	AD_1005	428	0CBA-0CBB
	Analogue input 6	AD_1006	429	0CBC-0CBD
	Analogue input 7	AD_1007	430	0CBE-0CBF
	Analogue input 8	AD_1008	431	0CC0-0CC1
CARD 2	Analogue input 1	AD_2001	432	0CC2-0CC3
	Analogue input 2	AD_2002	433	0CC4-0CC5
	Analogue input 3	AD_2003	434	0CC6-0CC7
	Analogue input 4	AD_2004	435	0CC8-0CC9
	Analogue input 5	AD_2005	436	0CCA-0CCB
	Analogue input 6	AD_2006	437	0CCC-0CCD
	Analogue input 7	AD_2007	438	0CCE-0CCF
	Analogue input 8	AD_2008	439	0CD0-0CD1
CARD 3	Analogue input 1	AD_3001	440	0CD2-0CD3
	Analogue input 2	AD_3002	441	0CD4-0CD5
	Analogue input 3	AD_3003	442	0CD6-0CD7
	Analogue input 4	AD_3004	443	0CD8-0CD9
	Analogue input 5	AD_3005	444	0CDA-0CDB
	Analogue input 6	AD_3006	445	0CDC-0CDD
	Analogue input 7	AD_3007	446	0CDE-0CDF
	Analogue input 8	AD_3008	447	0CE0-0CE1

4.7.3.3. Analogue inputs configurations

The card's analogue inputs configuration screen is shown in the following figure:



The different buttons that appear on this screen are:

NEXT: This button is clicked to increase the input number to a maximum of 8 (*A/D IN 08*). Click it again to return to input 01 (*A/D IN 01*).

OUT: From any input screen, click on this option to access the analogue outputs' configuration screen. (See Section 4.7.3.1)

EDIT: Click on this option to access the parameters edit menu. The arrow buttons are used to select the parameter to be modified (in bold) and access the parameters by pressing **SET**.

The analogue inputs' configuration parameters follow:

SCALE: Desired input range. Choose between 0...20 mA or 4...20 mA.

ZERO: The value to be viewed at the origin of the axis (4 or 20 mA).

BOTTOM OF SCALE.: The value to be viewed when the input is set at 20 mA.

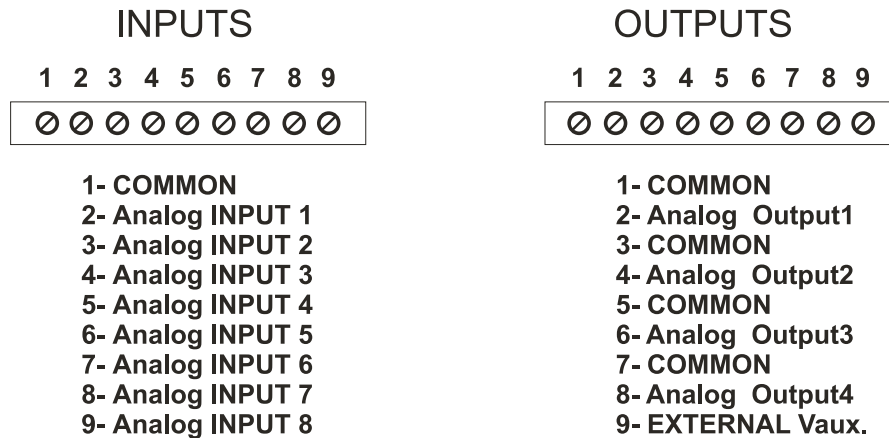
DEC. POS.: Decimal point position.

The following menu options will appear on the parameters' edit screen.

ESC: Exit the current menu without saving changes.

OK: Save the changes made and exit the edit screen.

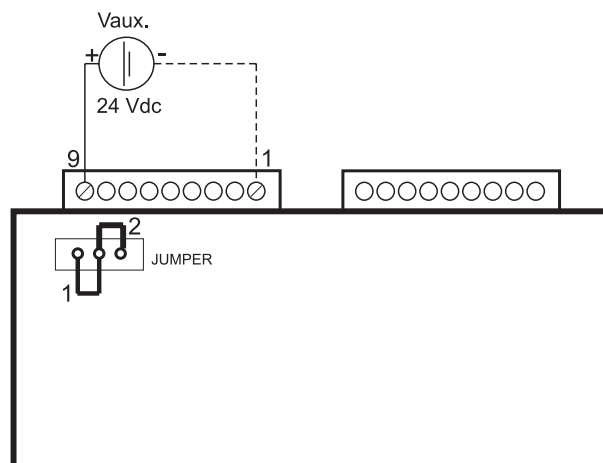
The connection of the card inputs and outputs is shown in the following figure:



The card permits external power supply for the analogue outputs, if necessary.

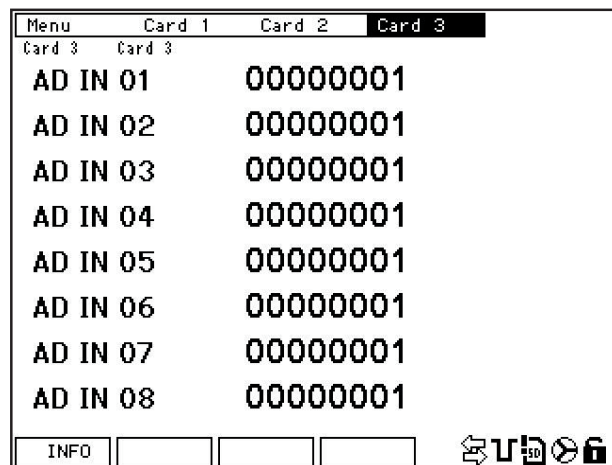
If a 24 Vdc power supply is needed for the analogue outputs (or when the load connected to the outputs is greater than 500 Ω), the outputs can be powered by an external power supply. In order to supply the outputs with an external power supply, change the position of the plate jumper to position 2, as indicated in the figure.

To connect the source, connect the positive cable to terminal No. 9 and the negative cable to any of the ground connections.



4.7.3.4. Expansion card parameters

To see the parameters of the expansion card, you have to intro in *MENU*, select *CARDS*, and go to the card to see the parameters.



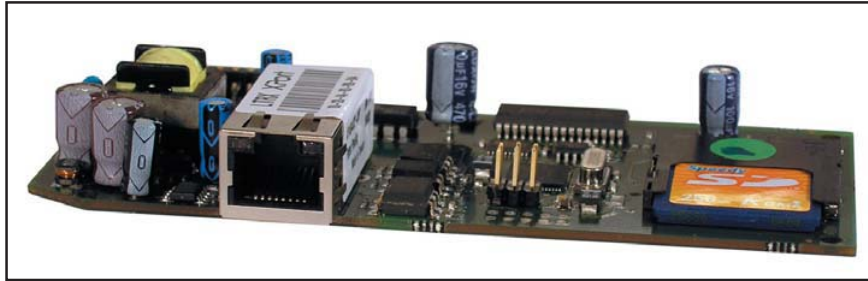
The picture shows the status of the inputs of the cards or the number of impulses that has conuted each one.

Is possible to edit names to each input to recognice them if whe are centralizing impulses of differents devices.

4.7.3.5. Characteristics

CHARACTERISTIC	VALUE	UNIT
ANALOGUE OUTPUTS		
Maximum internal/external voltage	24	V d.c
Rated output range	0/4 _ 20 mA	mA d.c
Linearity	1	%
Load resistance range	< 500	Ω
Output range points	4000	
ANALOGUE INPUTS		
Type of measurement	Current	
Rated input range	0/4 _ 20 mA	mA d.c
Measurement precision	1	%
Input impedance	200	Ω
CONNECTIONS		
Rigid/flexible conductor cross section	0,05..1 (AWG 30...18)	mm ²
Maximum torque	0,3	Nm
MECHANICAL		
Terminals protection	IP 20	

4.7.4 - ETHERNET AND SD MEMORY



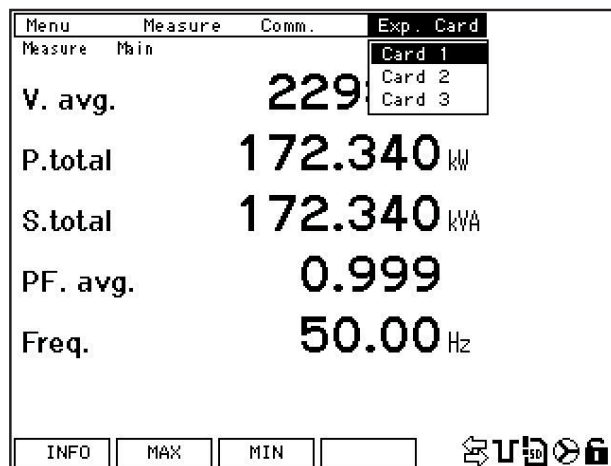
Read Section 4.7.0., Inserting Expansion Cards.



WARNING: When an SD card is installed in the system, it is automatically formatted. It is recommended not to install cards with documents that should be preserved.


The card format should be FAT 16 and the maximum capacity is 2 Gb. Neither FAT 32 nor HCSD formats are accepted.

To access the Ethernet and SD memory card configuration, enter the configuration menu (*MENU* ---> *CONFIG.*), and in the *CARDS* menu, select the position where the card is inserted.



In the Ethernet and SD memory card configuration screen, it is possible to delete every file saved to the memory. The data saved is basically separated into two formats as seen in the figure: quality events with the *.EVQ extension and the standard registries with the *.STD extension.

A single *.EVQ events file is generated, in which all the corresponding events are stored. The *.STD files are automatically generated every day.

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 2			
Clear STD			no
Clear EVQ			no
Format			no
Extract			no
<input type="text"/> <input type="text"/> <input type="text"/>			<input type="button" value="EDIT"/> 

To modify the card configuration parameters, press the *EDIT* button (F4). Select the option to be configured and press *SET* to begin editing.

It is possible to select between *YES* or *NO* values using the up/down arrow buttons, and the selection is confirmed with the *OK KEY*.

Edit screen options follow:

ESC: Exit the current menu without saving changes.

OK: Save the changes made and exit the edit screen.

Parameters that can be configured on this screen follow:

DELETE STD: Delete the last day stored in SD memory (*.STD).

DELETE EVQ: Delete the quality file stored in SD memory (*.EVQ).

FORMAT: Delete all files stored in SD memory.

4.7.4.1. Network and communications Protocol

The **CVMk2's** Ethernet card and SD memory are specifically designed to communicate in Ethernet networks with Modbus/TCP protocol.

With this system, all the RS-485 communication BUS wiring is extraordinarily optimised, thus optimising the IT infrastructure already created and facilitating its installation.

4.7.4.2. IP Address Configuration

The ARP commands can be used to configure the Ethernet card's IP address.

As for the Windows ARP command, the PC ARP table must have at least one IP address defined in addition to its own IP address. If the ARP table is empty, the command will return an error message. From a command window, type in "arp-a", to verify that there is at least one entry in the ARP table. If the ARP table does not exist or the machine using it is the only one in the table, ping any other IP address on the network to generate a new entry in the table.

- a) Once that is done, enter the following command to assign the IP address to the expansion card connection. Example:

```
c:\ arp -s 191.12.3.77 00-20-4a-xx-xx-xx.
```

- b) Now, execute a telnet to port 1. The connection attempt will always fail, but the **CVMk2** will change its IP to the one previously assigned. Example:

```
c:\ telnet 191.12.3.77 1
```

- c) Finally, execute a telnet to port 9999 and configure all the required parameters. Then, it is possible to begin configuration of the expansion card's Ethernet converter. It is very important to save the changes before exiting the configuration menu. Example:

```
c:\ telnet 191.12.3.77 9999
```



WARNING: The IP assigned to the **CVMk2** with the *arp* commands is temporary and the system will recover its original IP when it loses the power supply. To save the new IP in the system, enter the configuration menu, verify the modifications and exit the menu after saving changes. Accordingly, the new IP will be saved in the analyzer.

Connection with the master system is made with Ethernet cables consisting of four pairs of twisted pair wires (screened). The card is connected on one end while the corporate network's electronics (hub or switch) is connected on the other end.

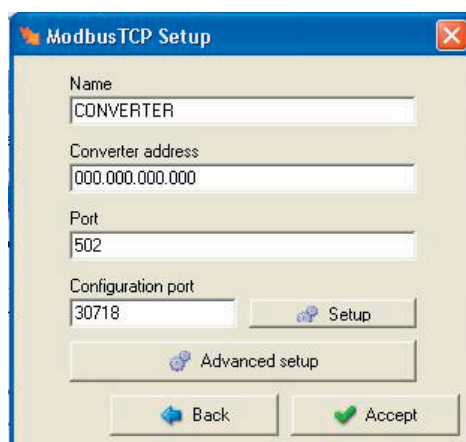
If a computer or device is directly connected through its Ethernet port, the Ethernet cable wiring should have a special provision for said communication.

It is also possible to configure the **CVMk2's** expansion card IP address using Power Studio or **PowerStudio Scada** by **CIRCUTOR**. (Said software can be downloaded from www.circutor.es).

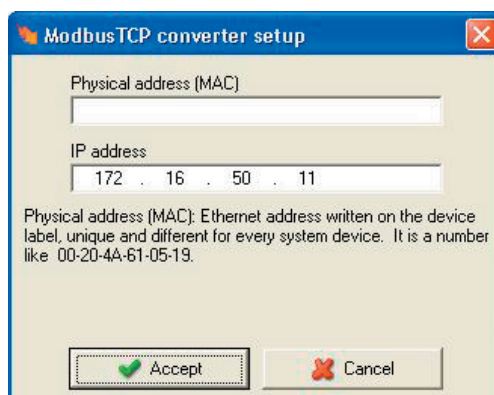
Once installed, the **CVMk2** device should be selected, and the TCP2RS Modbus/TCP converter should be selected as communications, as illustrated in the figure:



Then, assign a name and the desired IP address to the converter. The IP address should be within the PC's same range of addresses.



It will then return an error, since it will not find the device with the IP that was assigned. The following message will appear:



Enter the Ethernet card's MAC address and click accept. The software will send the new IP address to the analyzer's expansion card.

4.7.4.3. SD card configuration

Once the card is inserted, continue with its configuration. To do so, select the *MENU* option from the upper bar on the display and press *SET* to access the drop-down menu.

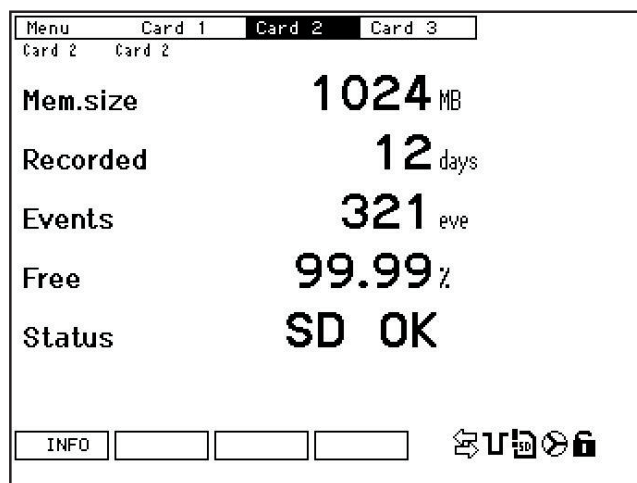
From the three options that appear on the drop-down menu (card 1, card 2 or card 3), count from the top side of the system to select the position where the expansion card is inserted.

NOTE: If there is no card inserted in the position selected, the message *NO CARD* will appear on screen

Confirm the selection with the *SET* button, and continue with the card configuration.

4.7.4.4. SD Card parameters

To view the memory card parameters, enter the *MENU*, select *CARDS*, and navigate to the corresponding card to see the characteristics.



MEMORY SPACE: This indicates the real capacity of the SD card.

REGISTRY: This provides the days recorded since start or from the last format.

EVENTS: This indicates the number of voltage events detected since start or from the last formatting.

FREE: This indicates the percentage of free memory space.




STATUS: The memory status is indicated with text as well as with the icon on the bottom of the screen.

a) **SD OK:** The memory card is functioning properly

b) **NO SD:** There is no card inserted.

c) **WRITE PROT:** The card is write protected.

d) **ERROR:** There is a problem with the SD card, and it should be formatted.

-  Correct SD memory status.
-  Incorrect SD memory status.
-  Extraction of SD card enabled.

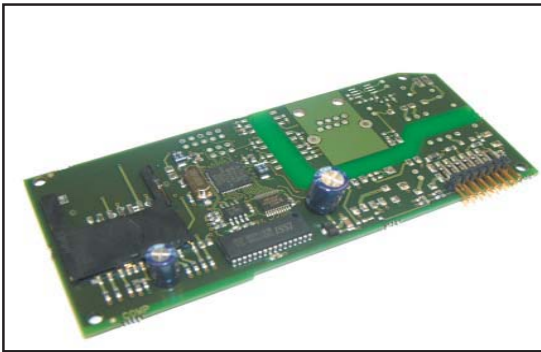


If there is a card error, it is advised to format the card. If the error persists after formatting the SD card, make sure that it is SD FAT 16 format and that the capacity is equal to or less than 2 Gb. Any other format or greater capacity will not work. If the error persists, replace the memory card.

4.7.4.5. Ethernet card characteristics

ETHERNET OUTPUT	
Network protocol	RJ-45 Ethernet
Communication protocol	Modbus-TCP
Speed	10baseT / 100baseTx compatible
SD CARD	
Model	SD
Size	2 Gb
Format	FAT 16

4.7.5 SD MEMORY



Read Section 4.7.0., Inserting Expansion Cards.



WARNING: When an SD card is installed in the system, it is automatically formatted. It is recommended not to install cards with documents that should be preserved.

The card format should be FAT 16 and the maximum capacity is 2 Gb. Neither FAT 32 nor HCSD formats are accepted.

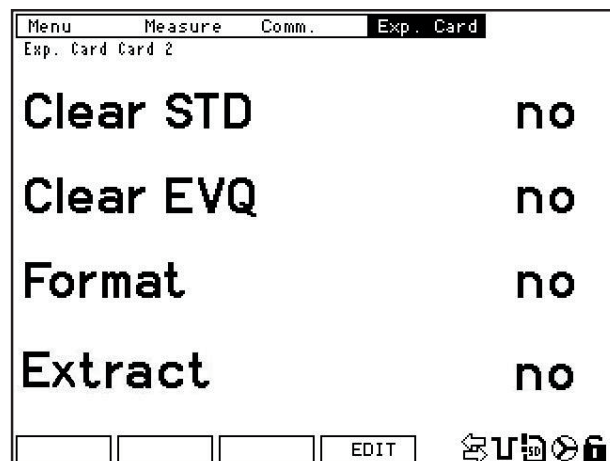
4.7.5.1. SD Card configuration

Once the card is inserted, continue with its configuration. To do so, select the *MENU* option from the upper bar on the display and press *SET* to access the drop-down menu.

From the three options that appear on the drop-down menu (card 1, card 2 or card 3), count from the top side of the system to select the position where the Ethernet expansion card is inserted.

NOTE: If there is no card inserted in the position selected, the message *NO CARD* will appear on screen

Confirm the selection with the *SET* button, and continue with the card configuration.



The data saved is basically separated into two formats as seen in the figure: quality events with the *.EVQ extension and the standard registries with the *.STD extension.

A single *.EVQ events file is generated, in which all the corresponding events are stored. The *.STD files are automatically generated every day.

To modify the card configuration parameters, press the *EDIT* button (F4). Select the option to be configured and press *SET* to begin editing.

The value can be toggled between *YES* and *NO* using the up/down arrow buttons, and the value is confirmed with *OK*. If *YES* is selected, this indicates that the user wishes to delete the selected file.

The Edit screen options follow:

ESC: Exit the current menu without saving changes.

OK: Save the changes made and exit the edit screen.

Parameters that can be configured on this screen follow:

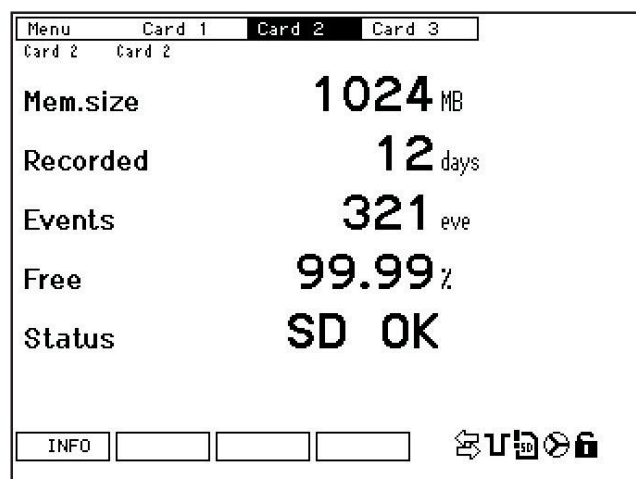
DELETE STD: Delete the last day stored in SD memory (*.STD).

DELETE EVQ: Delete the quality file stored in SD memory (*.EVQ).

FORMAT: Delete all files stored in SD memory.

4.7.5.2. SD card parameters

To view the memory card parameters, enter the *MENU*, select *CARDS*, and navigate to the corresponding card to see the characteristics.



Parameters that can be viewed on this screen follow:

MEMORY SPACE: Capacity of the SD card.

REGISTRY: Days recorded since start or from the last format.

EVENTS: Number of voltage events detected since start or from the last formatting.

FREE: Percentage of free memory space.

STATUS: Memory status.

- a) *SD OK*: The card is functioning properly
- b) *NO SD*: There is no card inserted.
- c) *WRITE PROT*: The card is write protected.
- d) *ERROR*: There is a problem with the SD card, and it should be formatted.



If there is a card error, it is advised to format the card. If the error persists after formatting the SD card, make sure that it is SD FAT 16 format and that the capacity is equal to or less than 2 Gb. Any other format or greater capacity will not work. If the error persists, replace the memory card.

4.7.5.3. Expansion card icons



Correct SD memory status.



Incorrect SD memory status.

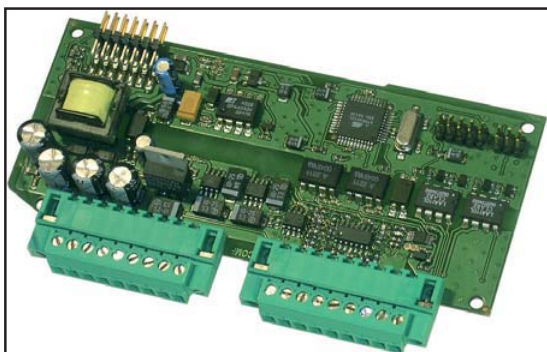


Extraction of SD card enabled.

4.7.5.4. Ethernet output characteristics

SD CARD	
Model	SD
Size	2 Gb
Format	FAT 16




4.7.6 4 ANALOGUE OUTPUTS ± 5 MA AND 4 STATIC OUTPUTS



Read Section 4.7.0., Inserting Expansion Cards.




4.7.6.1. Analog outputs ± 5 mA card configuration

To access the configuration of the card with 4 analog and 4 statics outputs, enter the configuration menu (*MENU* ---> *CONFIG.*) in the CARDS menu, select the position where the card is inserted. Press *SET* to enter in the card menu.

Menu	Measure	Comm.	Exp. Card
Measure	Main		Card 1 Card 2 Card 3
V. avg.	229		
P. total	172.340	kW	
S. total	172.340	kVA	
PF. avg.	0.999		
Freq.	50.00	Hz	
<input type="button" value="INFO"/> <input type="button" value="MAX"/> <input type="button" value="MIN"/> <input type="button" value="SET"/>			  

4.7.6.2. Analog outputs ± 5 mA configuration

To access the outputs configuration parameters, press the *EDIT* button (F4). Select the analogue output to be configured and press *SET* to enter edit mode.

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 3			
A/D OUT 01			
Var. code	001		
Scale	0-20mA		
Zero	0000000		
Full Scale	01000.0		
<input type="button" value="ESC"/> <input type="button" value="OK"/>			  

The different Keys that appear in the screen are:

NEXT: It increases the output number until number 4 (*R/D OUT 04*). If we press *NEXT* again, returns to output number 1 (*R/D OUT 01*).

DIG: Pressing that key we can go to alarm screens configuration (Section 4.7.6.2).

EDIT: Press to edit the parameters of the analog outputs. Move with the arrows to select the parameter to modify and press SET to enter the value.

The parameters that we can modify are:

VAR. CODE: That value in the electrical variable code that we want to assign to the (see variable code table). Are not possible energy code.

VARL - 5mA: Select the value that corresponds to -5 mA in the oputput.

VARL +5mA: elect the value that corresponds to +5 mA in the oputput.

In the edition screen appears the keys:

ESC: Used to go back without saving changes.

OK: Used to confirm / save changes and go out of editor mode.

4.7.6.3. Alarms configuration

The parameters of the alarms configuration have double meaning depending on the electrical variable selected in *VAR.CODE* section. We can classify in two groups:

- a). Electrical Variable.
- b). Energy Variable.

Alarm 1: *ALARM 01*

VAR.CODE:

- a). This is the code of electrical variable which we want assign one alarm (see variable codes table).
- b). Select one energy variable (f.e. 129 Active energy)

MAXIMUM:

- a). Maximum value of the variable to active the alarm.
- b). This is the pulse value of this alarm.

Example: *000.010*. The alarm will be activated each 10 W•h.

MINIMUM:

- a). Minimum value of the variable to active the alarm.
- b). This value has no sense with energy parameter.

DELAY ON:

- a). Minimum time (in seconds) that the condition has to be true to activate the alarm.
- b). Number of blocs of 10 ms that will be activated the alarm to generate the pulse ON.

Example: *000010*. The alarm will be activated during 100 ms.

DELAY OFF:

- a). Minimum time (in seconds) the condition has to be false to deactivate the alarm.
- b). Number of blocs of 10 ms that will be deactivated the alarm to generate the pulse OFF.

The key *NEXT* increases the screen since the alarm *15*. If we push *NEXT* again we will pass to the equations screen.


The equations are the physical outputs of the device. From *OUT 01* to *OUT 04*.

We can go to analog output screen configuration pressing *ANL* key. (Section 4.7.6.1). To go to equations screen press *ECU* (Section 4.7.6.4). To go to alarm screen press *DIG* (Section 4.7.6.3).

4.7.6.4. Static outputs configuration

Menu	Measure	Comm.	Exp. Card
Exp. Card Card 1			
OUT 01	00*00*00*00*00*00*00*00		
OUT 02	00*00*00*00*00*00*00*00		
OUT 03	00*00*00*00*00*00*00*00		
OUT 04	00*00*00*00*00*00*00*00		

IN

AL
EDIT


The outputs of the expansion card are configuring in that screen. The transistor are called *OUT 01*, *OUT 02*, *OUT 03* and *OUT 04*.

Each output has one equation line where can create one equation with 8 of the 16 alarms configured before (chapter 4.7.6.2) using AND (*) / OR (+) functions.

4.7.6.5. Outputs wiring

A. OUTPUTS

1	2	3	4	5	6	7	8	9
○	○	○	○	○	○	○	○	○

- 1- COMMON
- 2- Analogic output 1
- 3- COMMON
- 4- Analogic output 2
- 5- COMMON
- 6- Analogic output 3
- 7- COMMON
- 8- Analogic output 4
- 9- No used

T. OUTPUTS

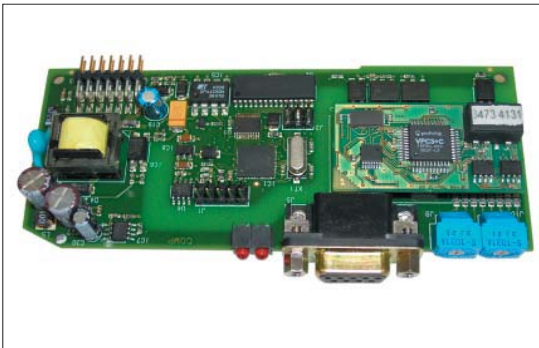
1	2	3	4	5	6	7	8	9
○	○	○	○	○	○	○	○	○

- 1- COMMON
- 2- COMMON
- 3- COMMON
- 4- COMMON
- 5- COMMON
- 6- Transistor ouput 1
- 7- Transistor ouput 2
- 8- Transistor ouput 3
- 9- Transistor ouput 4

4.7.6.6. Technical Features

CHARACTERISTICS	VALUE	UNIT
ANALOGICAL OUTPUTS		
Output range	± 5	mA c.c
Lineality	1	%
Load resistance	< 1000	Ω
Output range	4000	points
STATIC OUTPUTS		
Nominal voltage	< 100	Vcc / Vac
Non repetitive voltage pk	350	V. pk.
Nominal current	100	mA
Maximum power of dissipation	0,8	W
Maximum R _{ON}		
Repetitive current during t=1s	120	mA
Maximum current t=10ms	350	mA
CONNECTIONS		
Wire section	0,05..1 (AWG 30...18)	mm ²
Maximum torque	0,3	Nm
MECHANICAL		
Protecction	IP 20	

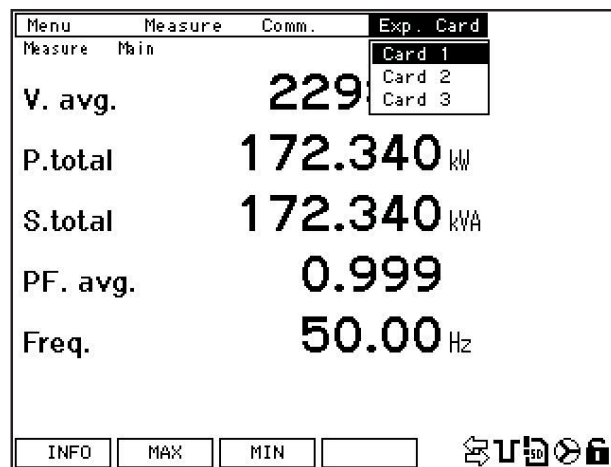
4.7.7 PROFIBUS COMMUNICATIONS CARD



Read Section 4.7.0., Inserting Expansion Cards.

4.7.7.1. Profibus card configuration

To access the configuration of the card of profibus protocol, enter the configuration menu (*MENU* ---> *CONFIG.*). in the EXP. CARDS menu, select the position where the card is inserted. Press *SET* to enter in the card menu.



This card has no parameters to configure. Only the peripheral number (Slave ID) explained in chapter 4.7.7.3

Going into configuration menu only will appear: *CARD. OK* or *CARD NOK*.

4.7.7.2. Card parameters

To visualize the parameters that CVMk2 shows referring to the profibus communications card, you have to go to the cards menu:

MENU --> *EXP. CARD* --> *CARD X**.

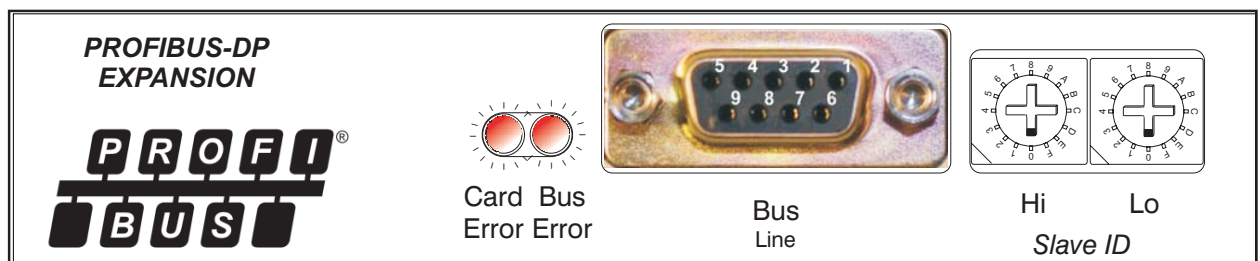
(*) Value 1, 2 or 3, depending on the card position.

The screen shows the parameters:

Periph num 0
 Bus Status ACTIVE / INACTIVE.

The default peripheral number is 0 but it will change to the configured by the user when the communications starts. To configure slave ID see chapter 4.7.7.3.
 The bus status shows if the bus is working or not.

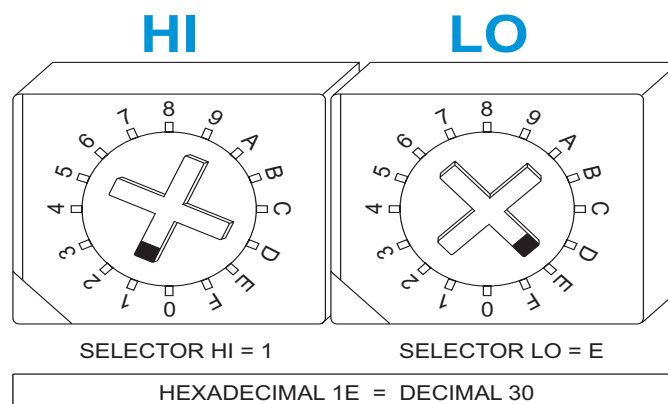
4.7.7.3. Slave number configuration



To configure the slave ID of the device we have to use the blue selectors of the card (Slave ID).

The selectors are two to codify the slave number in hexagesimal code. The one HI corresponds to the HI part of the value and the LO one, corresponds to the low part of the code.

See example of the picture:



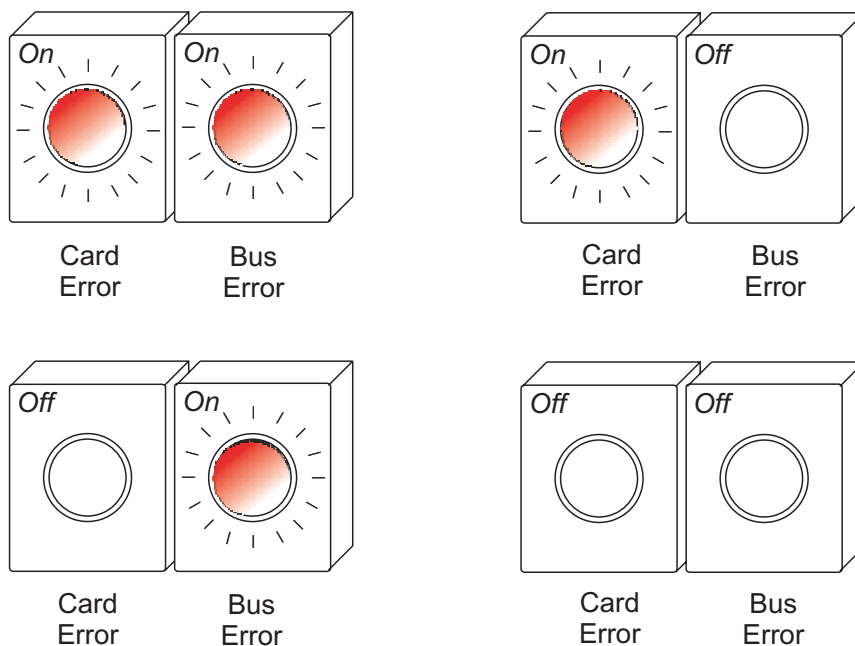
The different speeds that the card supports are:

- 19,2 kbs
- 93,75 kbs
- 187,5 kbs
- 500 kbs
- 1500 kbs
- 3000 kbs
- 6000 kbs
- 12000 kbs

4.7.7.4. Leds information

The profibus card has two LEDS that indicates the status of the card and the communications bus.

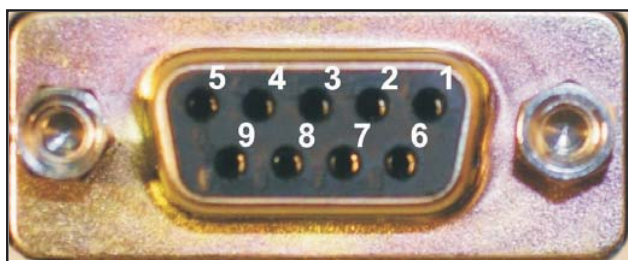
All the possibilities of the LED's status are showed in the next picture.



On: Led ON means error.

Off: Led OFF means that works correctly

4.7.7.5. Profibus connector



The DB-9 connector has the following configuration:

1. Shield.
2. -.
3. "B" Non inverting input/output signal from profibus.
4. -.
5. "M5" GND. Data reference potential.
6. "P5" 5V supply voltage.
7. -.
8. "A" Inverting input/output signal from profibus.
9. -.

4.7.7.6. GSD Modules

The GSD modules are configured as the table bellow.

The table shows the number of each module, the parameters inside and the total size of the module.

MOD	PARAMETERS	BYTE	SIZE
1	Single voltages ph-n	12	52
	Phase currents	12	
	Phase-Phase voltages	12	
	Power Factor	12	
	Frequency	4	
2	Power	48	48
3	Average values	12	44
	Neutral values	8	
	Three-phase values	24	
4	Energy	48	48
5	THD V / I	32	32
6	THD odd / even	64	64
7	Unbalanced / Asimetry / Flicker	44	44
8	Odd voltage harmonics (15°)	72	72
9	Odd current harmonics (15°)	72	72
10	Digital Input 1 / Analog Inputs 2	64	64
11	Digital Input 2 / Analog Inputs 3	64	64
12	Digital Input 3 / Analog Inputs 1	64	64
13	Cos φ	12	12



The limits of the Profibus protocol to charge the GSD modules are:

- Máximum 4 modules.
- Total maximum size 244 bytes.