

DAB-84

Analog and Digital Data Acquisition and Reproduction Card



Instruction Manual

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1.0 General Informations.

The **DAB-84** card permits the Data acquisition, both analogue and digital, and the related reproduction respectively at dedicated inputs and outputs.

The unit acquires the data and convert them in a message packet that may be sent to another similar unit through a **RS-485 Serial Port** both in **Wire** and **Wireless Mode**, using an adequate **Radiomodem**.

The unit can also receive a message packet from the serial line and convert it into a analogue and/or digital data available at the respective outputs.

The communication timing is expressly designed for the **Wireless communication**, naturally slower than cable communication, and the transmitted or received packet **must be** in the **9.600 bps, 8 data bits, No parity and 1 Stop bit** format. The serial port speed is internally set, and it's generally suitable for both wire and wireless communication.

The DAB-84 card presents **four Digital Inputs, two Analog Inputs** and, consequently **four Digital Outputs and two Analog Outputs**. A digital **Alarm Output** and the **RS-485 Serial Port** completes the unit.

The **Alarm Output** is activated by a fault in communication and it's **automatically reset** when a **normal communication is restored**. Please see the paragraphs **5.2.3** and **5.2.4** for the **Alarm** functionality and setting.

The DAB-84 card may be connected to others DAB-84 to expand both digital than analogue inputs, if necessary. The connection between the principal unit, generally called **Master**, and the **Expansion** units is made by a **flat-cable** connection, used also to connect the Master with a generic **Auxiliary** unit. A maximum of **three expansion** cards and **one Auxiliary** card may be connected to the Master unit. To simplify the wiring, this flat cable includes the **supply** and the **manual reset** lines besides the data line.

It's possible realise both **Point to Point** than **Point to Multipoint** communication networks. In the last case a **ModBus protocol in RTU mode** is implemented for communication.

The card **configuration** is realised by a **Dipswitches bank** and a **selection Jumper**.

The card is contained in an **anodised Aluminium** box covered with a transparent **Plexi-glass** panel. The metallic box is **electrically connected** to the **negative pole** of the **supply input**. In according to the safety rules, this metallic box, and consequently the negative pole of the supply, **must be connected to ground**.

In the bottom of the enclosure is mounted a metallic locking system to fix the device onto a **Ω Din Guide**.

NOTE: This device **is not compliant** with the **Directives on the Human Operators Security** so, it **cannot be used** to drive any device, mechanical, electrical and so on, that may create a **situation of risk** to an operator.

1.0.1 CE conformity.

The **DAB-84** card is in according to the **CE directory** under the following directives and related modifications:

2006/95/CE "Low Voltage" Directive

2006/42/CE "Machinery" Directive

2004/108/CE "Electromagnetic Compatibility" Directive

Moreover, in the development of the homologation procedures, have been applied all the following norms and/or technical requirements:

IEC 61326-1 EMC requirements

EN 61010-1 Safety requirements for electrical equipments

The DAB-84 card is CE compliant if all wires connected to all digital and analogue inputs and outputs and to the supply input are shorter than 3 meters (3 yd. and 3.37 in.)

1.1 Communication Modes.

The DAB-84 card may be used to realise a telemetering/telecontrol network both in **Point to Point** and **Point to Multipoint** modes.

The operating communication mode is selected by the **Identification Address** set into the card. If this address is equal to **0**, the unit works in **Point to Point Mode** while every address from **1** to **31** allows the **Point to Multipoint Mode**.

The address is set using the switches from **5** to **1** of the Dipswitches bank as explained in the § 5.2.1. The **Master/Expansion Jumper** on the right side of the box configure the unit as **Master**, if single, or as **Expansion**, if connected to a Master unit. The jumper configuration is explained in the § 5.1.

1.1.1 Point to Point communication.

Setting the **Identification Address = 0** the unit works in **Point to Point** mode. In this case the network consists in two units, one for each point. Both **local** and **remote** units **must** be configured as **Master** and, to avoid **collisions** during the communication, in one of these the **automatic repetition must be disabled**, as explained in the § 5.2.2. If used, the **Expansion** units **must be** in the **same number** in each side of the system.

In this operating mode a **message exchange** between the units is present to allow the **mutual update** of the outputs in according with the related inputs level. The **message length** is of **maximum 26 Bytes**, if all expansion cards are present.

The communication beginning may be originated by a **status change** in **anyone** of the **digital inputs**, by the **periodic repetition** or by both of them. The **Analogue Inputs cannot begin** a communication so, if the DAB-84 cards are used to measure only analogue parameters, a **periodic repetition must be activated**.

In a **normal operating condition** each sending causes an **answer** from the remote unit that must be correctly received within a suitable **timeout** and, in its absence, the sending card comes into in a **repetition procedure** until a correct

answer is detected, after which it returns in the normal operating condition. The communication beginning from a status change is the condition to obtain the **minimum number** of transmissions but may be not adequate to transfer the analog parameters therefore, the better communication system is the **periodic repetition**, that may be configured with cycles from **1 second** to **1 hour** as shown in the Table 8 of the § 5.2.2. In this operating mode at the supply switch-on, or after a manual reset, the card waits **2 seconds**, to stabilise the analog sensors, after which sends the first communication. This moment is the **initial time** of the periodic repetition counter. If a correct answer is received from the remote unit, the system will remain idle until the following sending, originated by the **repetition time expiry**, if no one change occurs, or **before**, at the **changing** of anyone of the digital inputs. In this case the periodic repetition counter is **reset** and restarts from this moment.

If, for any reason, a correct answer is **not detected**, the unit come into the repetition procedure, in which the message is repeated in **groups of three close transmissions**, spaced of **30 seconds**.

The **repetition time interval** between the three sending depends on the **periodic repetition time selected** in the dipo-switches bank. If this time is of **1 second**, the repetition time interval is set to **1 second** while for higher values it is set to **4 seconds**.

A **communication fault Alarm** is activated after **3** or **9 failed transmissions**, depending on the dipswitch No. 10 setting, as explained in the § 5.2.4.

The **expansion cards** will be used if the required number of analog and/or digital inputs/outputs exceed the available on a single card. In this way it's possible to obtain until **8** analogue inputs and outputs and **16** digital inputs and outputs.

These additional cards **must be configured as Expansions**, using the lateral Jumper as explained in the § 5.1. The **serial ports RS-485** of these additional cards **are inactive** because the communication process is managed by the **Master unit** so the serial ports of any expansion cards **must be unconnected**.

As the Master unit also the expansion unit has an **Internal Identification Address** that may be set using the dip Nos. **5** and **4** of the dipo-switches bank. It's important to notice as this address **is not the same** of the address utilised by the Master Unit but, in this case may be considered as a **sub-address** for the data sent into the correct expansion card. The setting of these addresses is explained in the § 5.2.

Activating an input in the local unit the communication logic activates the homologous output in the remote unit and vice-versa. This procedure is even valid when, in both local and remote units, are present one or more expansions.

1.1.2. Point to Multi-Point communication with ModBus protocol in RTU mode.

In a **Point to Multipoint** network, the **central unit** is a **intelligent DTE** such as a **Computer** or a **PLC unit**. The communication begins **always** from the **central unit** and **all peripherals** are used as **slaves** and **cannot begin** a communication. Generally the central unit uses a **Polling** to enquire each peripherals, using a **ModBus protocol in RTU Mode**.

In the simplest case each peripheral unit consist in one DAB-84 card that **must be set** with an **Identification Address** from **1** to **31**, using the Dipo-switches bank, as explained in the § 5.2.1.

A peripheral may be realised also with more than one DAB-84 card, if is necessary an higher number of analog or digital inputs or outputs. These additional cards **must be set** as **Expansions** and **must have an Internal Identification Address** set from **1** to **3**, as specified in the § 5.2.

This **Internal Identification Address** is operating into the peripherals and it doesn't appear in the **address** of the query sent from the central unit of the network, but it permits the correct writing or reading of the inputs/outputs of the expansion cards in each peripherals.

The **functions** available from the **ModBus protocol** used in the DAB-84 units are the following:

- A – (0x01) Read Coils.** It permits to **read** the **status** of the **Digital Outputs**. In system with a single DAB-84, the **addressing range** of this function covers the **0** to **3** range. Each additional expansion adds **4 addresses**, so a complete system operates with a function range from **0** to **15**.
- B – (0x02) Read Discrete Input.** It permits to **read** the **status** of the **Digital Inputs**. The **addressing range** of this function, follows the same considerations explained for the Read Coils function.
- C – (0x03) Read Holding Register.** It permits to **read** of the values stored in both **Digital to Analog converters** that drive the **Analog Outputs**. The **addresses range** of this function covers the **0** to **1** range and, as explained for the previous functions, each additional expansion adds **2 addresses**, so a complete system operates in the range **0** to **7**.
- D – (0x04) Read Input Register.** It permits to **read** the value of the **Analogue Inputs** after the **Analogue to Digital conversion**. The **addresses range** of this function follows the same rules explained for the Read Holding Register function.
- E – (0x05) Write Single Coil.** It permits to **write** each **Digital Outputs** to permit its **updating**. The **addresses range** follows the rules explained for the Read Coils function and, of course, to update each digital output it's necessary to write each register one at a time, specifying the correct address.
- F – (0x06) Write Single Register.** It permits to **write** the value stored in each **Digital to Analogue converter** to permit its **updating**. The same rules explained for the addresses range of the Read Holding register function must be applied to this function and, of course, the register updating requires the indication of the address of the register to be updated.
- G – (0x0F) Write Multiple Coils.** It permits to **write** an **ensemble** of **Digital Outputs**, sending only **one** message. Of course, the addresses of the **ensemble** of Digital Output to be written **must be specified** into the message. The **ad-**

dresses range of this function is the same of the Read Coils function .

H – (0x10) Write Multiple Register. Similarly to the Write Multiple Coils function, it permits to **write an ensemble of Digital to Analog converters**, sending **only one** message. As above specified, the addresses of the ensemble of DACs to be written must be indicated into the message. The **addresses range** of this function is the same of the Write Single Register function.

The following Table 1 shown the equivalence between the **address** of the **Discrete Inputs and Coils** functions in the **ModBus protocol** and the **Digital Inputs and Outputs** of the DAB-84 card.

Table 1: Equivalence between the addresses of the **Discrete Inputs** and **Coils** functions and digital I/O of the DAB-84.

Address	Digital Input	Digital Output
00	Input 1 of the Master	Output 1 of the Master
01	Input 2 of the Master	Output 2 of the Master
02	Input 3 of the Master	Output 3 of the Master
03	Input 4 of the Master	Output 4 of the Master
04	Input 1 of the 1st expansion card	Output 1 of the 1st expansion card
05	Input 2 of the 1st expansion card	Output 2 of the 1st expansion card
06	Input 3 of the 1st expansion card	Output 3 of the 1st expansion card
07	Input 4 of the 1st expansion card	Output 4 of the 1st expansion card
08	Input 1 of the 2nd expansion card	Output 1 of the 2nd expansion card
09	Input 2 of the 2nd expansion card	Output 2 of the 2nd expansion card
10	Input 3 of the 2nd expansion card	Output 3 of the 2nd expansion card
11	Input 4 of the 2nd expansion card	Output 4 of the 2nd expansion card
12	Input 1 of the 3rd expansion card	Output 1 of the 3rd expansion card
13	Input 2 of the 3rd expansion card	Output 2 of the 3rd expansion card
14	Input 3 of the 3rd expansion card	Output 3 of the 3rd expansion card
15	Input 4 of the 3rd expansion card	Output 4 of the 3rd expansion card

As appears from the above table, in presence of the only Master unit, only the addresses from **00** to **03** are **valid** while the following ones are **illegal** and aren't accepted. The addresses range of the ModBus function is **automatically extended** at the connection of one or more expansion cards, depending on their number. For example, the addition of one expansion card automatically set the address range from **0** to **7**, instead of from **0** to **3**. The address assigned to the expansion card must be the lowest possible, depending in the number of connected expansions, so, for example, the **1st** expansion card will have the address **1**, the **2nd** the address **2** and so on. This isn't a request of the Master unit but, of course, it's the simplest method to assign the addresses.

The following **Table 2** shows the equivalence between the **addresses** of the **Input Registers** and **Holding Registers** functions, in the **ModBus protocol** and the **Analog Inputs and Outputs** of the DAB-84 card.

Table 2: Equivalence between the addresses of the **Input** and **Holding Registers** function and analog I/O of the DAB-84.

Address	Analog Input	Analog Output
00	Input 1 of the Master	Output 1 of the Master
01	Input 2 of the Master	Output 2 of the Master
02	Input 1 of the 1st expansion card	Output 1 of the 1st expansion card
03	Input 2 of the 1st expansion card	Output 2 of the 1st expansion card
04	Input 1 of the 2nd expansion card	Output 1 of the 2nd expansion card
05	Input 2 of the 2nd expansion card	Output 2 of the 2nd expansion card
06	Input 1 of the 3rd expansion card	Output 1 of the 3rd expansion card
07	Input 2 of the 3rd expansion card	Output 2 of the 3rd expansion card

Also for these functions are valid all considerations explained for addresses assignment of the Discrete Inputs and Coils function.

To utilise the DAB-84 cards with the **ModBus protocol** it's necessary to install in the **Central unit** of the system a dedicated software supporting this communication protocol. Are available a lot of versions of SCADA software, supporting the ModBus protocol, configurable practically, for all the applications.

2.0 Technical Data.

In the following paragraph are listed the technical data of the DAB-84 card.

2.0.1 Absolute maximum ratings.

These values indicate the maximum value that each parameter can assume and their overcoming **can damage irreversibly** the device or cause an operating condition **beyond** the **safety condition** with a considerable reduction of the reliability of the whole system. The following Table 3 shows these maximum ratings.

Table 3: Absolute Maximum Rating of the DAB-84 card.

Parameter	Description	Value
V_S	Supply Voltage	+ 36 Vdc
I_S	Current consumption	500 mAdc
I_{AN-OUT}	Output current of the analog sensor supply ⁽¹⁾	35 mAdc
I_{AN-INP}	Analog Input current ⁽²⁾	60 mA continuous, 325 mA for 0.1 seconds
V_{O-AN}	Voltage drop of each Analog Output ⁽³⁾	36 Vdc
$V_{O-AN-INS}$	Insulation between Analog Outputs and ground	50 Vdc
I_{O-DIG}	Digital Outputs Current (max relay current) ⁽⁴⁾	3 Adc/Aac
V_{O-DIG}	Voltage across Digital Outputs	250 Vdc/Vac
$V_{O-DIG-INS}$	Insulation between Digital Inputs and/or ground	250 Vac
V_{I-DIG}	Voltage at the Digital Inputs	30 Vdc/Vac
$V_{I-DIG-INS}$	Insulation between Digital Inputs and ground	40 Vdc/Vac
$I_{O-RS485}$	RS-485 Serial Port current ⁽⁵⁾	85 mAdc
$V_{RS485-GND}$	Voltage between RS-485 Serial Port and ground ⁽⁵⁾	- 7 → +12 Vdc

NOTES:

- (1) Available current to energise a two-wire 4-20mA transducer. The “no load” voltage is of +15,65 ± 0,25 Vdc with an internal resistance of 47 Ω.
- (2) Each Analog Input is protected against overcurrents by a **Fast Blow fuse** of 50mA in 5 x 20 mm (0.2 x 0.8 inch) format. This fuse **never must be replaced** with an **higher current** one, to avoid the **destruction** of the **precision Current to Voltage converter**.
- (3) Maximum voltage across the Analog Outputs. Neglecting the voltage drops across the cables and the receiver input, this is the **maximum supply voltage** of the analog output.
- (4) The maximum current flowing into each Digital Output depends on the load typology:
In **direct current** are allowed the following values: **3A @ 30V / 0,35A @ 110V / 0,2A @ 220V**.
In **single-phase alternate current** at 220Vac are allowed the following values: **3A @ cosφ=1 / 1A @ cosφ=0,2**.
The **maximum switchable power** of a **single phase “squirrel-cage” asynchronous motor** is **100 VA**.
- (5) At nominal line load of **60 Ω**. The interface chip determines both the maximum outgoing current and the maximum voltage between inputs and ground.

2.0.2 Operating characteristics.

The following Table 4 shows the **recommended operating characteristics** of the DAB-84 card.

Table 4: Recommended operating characteristics of the DAB-84 card.

Parameter	Description	Value	Notes
V_S	Supply Voltage	9 – 30 Vdc	Negative pole connected to ground (chassis).
I_S	Current consumption ⁽¹⁾	≤ 500 mA	Single card, all I/O activated at 8 Vdc supply.
P_{AV}	Idle power consumption ⁽²⁾	~ 720 mW	Single card, all I/O idle.
V_{I-DIG}	Digital Inputs applicable Voltage ⁽³⁾	5 – 24 V	AC/DC, separated inputs without common polarity.
Z_{I-DIG}	Digital Inputs internal impedance ⁽⁴⁾	2 kΩ	Resistive with radio frequency internal filter.
I_{AN-INP}	Analog Input Current	0–20 mA	Referred to ground, negative pole of the supply.
Z_{AN-INP}	Analog Input Impedance ⁽⁵⁾	78 Ω ±3Ω	Across the input and ground.
V_{AN-INP}	Analog Input Voltage	0 – 1.62 V	Measured across input and ground.
V_{O-DIG}	Digital Output Voltage	220 Vac/dc	Separated outputs protected by 275Vac varistor.
I_{O-DIG}	Digital Output Current	≤ 3 Aac/dc	Depending on load type. See § 2.0.1 note [4].
I_{O-AN}	Analog Outputs Current ⁽⁶⁾	4 – 20 mA	Separated outputs and insulated respect ground.
V_{O-AN}	Analog Outputs compliance ⁽⁷⁾	8 – 30 Vdc	Separated outputs and insulated respect ground.
Baud Rate	Data Speed	9.600 bps	1,200 to 19,200 bps on request.
Bit di Dati	Data Bits number	8 bit	
Bit di Start	Start Bits number	1 bit	
Parità	Parity Bit value	N(othing)	E(ven) or O(dd) on request.

NOTES:

- (1) Due to the presence of the switching supply units the power consumption is **practically constant** respect to the supply voltage variations.
- (2) Indicates the power consumption with all inputs and outputs idle and with all transducer and serial port disconnected. At voltage V the idle current consumption can be calculated by $I = P/V$. For example at $V = 12$ Vdc the related idle current is $I = 0.72 / 12 = 0.06$ A = 60 mAdc.
- (3) All **alternating** voltages and currents are intended **RMS sinusoidal** at main frequency of 50 or 60 Hz. Lower main frequency are **not admitted**.
- (4) The input impedance determines the current consumption of the digital input. It varies from 1.9 to 12 mAdc, allowing the input driving by an electronic device such as an “**Open Collector**” transistor or an “**Open Drain**” Mosfet.
- (5) The analog input impedance is the sum of the **sampling resistor (60Ω)** plus the dc resistance of the noise filter inductor (~2.5Ω) and the dc resistance of the fuse (~15Ω). The sampling resistor tolerance is 1%.
- (6) The analog outputs are **linear** in the 2 – 20 mA range so it's possible to show the **transducer failure condition** or the **Open current loop** condition.
- (7) Each analog output is equivalent to a **Current Generator** and the V_{O-AN} value indicates its operating voltage range. Due to the **passive two-wire configuration**, each output is energised by the current loop therefore this value indicates the **voltage drop** across the output. This voltage, increased by the cable losses and the input voltage across the external current/voltage converter, determines the **minimum supply voltage** must be applied at each analog output.

3.0 Circuit description.

The DAB-84 unit contains a **µController** section, a **Digital Input** and **Output Interface** section, an **Analog Input** and **Output Interface** section, and, finally, a **Power Supply** section, to energise all the others.

3.0.1 µController section.

It utilise a **PIC18F4423** micro-controller energised at **5 Vdc**, to allow the acquisition and reproduction of all digital and/or analog data, the data communication through the RS-485 Serial Port directed to the external Radiomodem or DTE, the data communication with the expansions and auxiliary card, if presents, and, finally, manage the ModBus protocol.

3.0.2 Inputs and outputs digital interfaces and RS-485 Serial Port interface.

The digital inputs are connected through **AC opto-couplers** while the digital outputs and **alarm output** use a **Relay** contact. A dedicated RS-485 interface chip is used in the communication port. The use of a relay contact into all digital outputs permit the direct actuation of a **small** or **medium loads**, using the **single phase AC mains** at **115/230 Vac** with **3 A** of peak current.

3.0.3 Analog Inputs and Outputs interfaces.

The DAB-84 accept **analog input signals** in the **0-20 mA** standard and **reproduce** the **analog signals** in the **2- 20 mA**, probably the most used system to carry analog signals in the industrial environment, for its great advantages respect to the line attenuation, the noise interference and errors. The extension of the input current range and the linearity of the analog output in the 2 –20 mA range allows the transfer of the **Open Loop/Transducer failure** condition as in a wired system.

Each input contains a **precision Current to Voltage converter**, to translate the 0-20 mA into the 0 –5 Vdc required by the **12 bit** analog to digital converters into the micro-controller and is protected against over-current by a **50 mA fast blow fuse**. The **input impedance** of each input, referred to ground, is of **78 ±3 Ω** and causes a input voltage drop of **1.56 Vdc ±60 mVdc**.

The **Analog Outputs** receive the data to be send in digital format and convert it in analog 2-20 mA format using a **12 bit** serial **DAC** and a high precision **voltage to current converter**. Since both analog outputs draws their supply from the current loop the, the current **never can be null**. The **minimum current** in the loop can be measured after the turning on transient or after a manual reset. This value is generally included in the **350 – 1,000 µA** range.

Each analog output is **insulated** respect both the other and to the ground, and it's equivalent to a **passive two-wire sensor**, therefore an external supply source is required for their operation.

3.0.4 Supply section.

The utilisation of a switch-mode supply unit allows the card to accept a supply input voltage in the range from 8 to 36 Vdc. The **negative pole** of the supply **is connected** to ground and to the **metallic chassis**. The first internal switch-mode supply reduce the input voltage to **5 Vdc** to energise the micro-controller and digital interface sections. A second switch-mode supply unit generate the supply voltage of the current to voltage converter and the external transducers.

The supply section is protected against **polarity reversal** and against **over-current** using a series diode and a fast blow fuse. The energy consumption, depending on the status of digital outputs, is **practically constant** in the whole input voltage range, and the maximum current consumption occurs at the minimum supply voltage.

4.0 Connections.

All supply, analog and digital inputs and outputs, alarm output and RS-485 serial port connections are realised with **screw connectors**. The connectors for expansions and auxiliary cards are located on the sides of the box and they are a male holder for **flat-cable** female connector. These flat-cable carries the communication line between the master unit and the expansions/auxiliary card and the **supply lines**, in order to simplify the wiring.

NOTE: To avoid any problem of **short-circuits** between any input/output contact and/or between any contacts and the ground, it's important to use adequate wire termination, in particular if a **stranded wire** is used. During the wire clamping, do not apply an excessive pressure and torque on the screw connector, to avoid damages to both the printed circuit board and to the screw connector.

5.0 Configuration of the unit by Dipswitches and Jumper.

The operating mode of the DAB-84 card is selected by the Dipswitches bank and the lateral Jumper.

5.1 Master/Expansion configuration Jumper.

This jumper is located on the right side of the box, near the auxiliary card connector, and allows the configuration of the card as **Master** or as **Expansion**, moving the **short-circuit** jumper to the required position.

If configured as **Master**, the card is completely independent and all its features are available, otherwise, as **Expansion**, the card **must be connected** to a **Master unit** and some features as, for example the **alarm output**, the **RS-485 serial port communication**, are inhibited and also the Dipswitches changes their functionality.

A **single card must be always set as Master** and this is the **default setting** after the production testing.

The following Table 5 on page 7 shows the operating condition of the DAB-84 card in both Master and Expansion configuration.

Table 5: Features of the unit as function of the **Master** or **Expansion** configuration.

Jumper position	Operating Mode	RS-485 Serial Port	Addressing	Repetition Time	Safe Mode	Alarm Delay
MST	Master	Active	Unit identifier from 0 to 31	Active	Available	Available
EXP	Expansion	Inhibited	Internal Identifier from 1 to 3	Inhibited	Inhibited	Inhibited

In the **expansion mode** the data communication between the Master unit and all expansion cards travels over a communication port on the flat-cable while the RS-485 serial port is completely inhibited and must not be connected. In the following paragraphs are explained the addressing, the safe mode and the alarm delay configuration.

5.2 Dipswitches.

This dipswitches bank allows the configuration when the card is set as **Master**. Each dip is **active** if it is in **ON** position and their functions are shown in the following Table 6.

Table 6: Function of each dipswitch.

Position	Binary Weight	Function	Master		Expansion
			Point to Point	Point to Multipoint	Any modes
Dip 1	16	Addressing	OFF	To be set depending on the desired address. Value range from 1 to 31 , as explained in the following Table 7.	Not active
Dip 2	8	Addressing	OFF		Not active
Dip 3	4	Addressing	OFF		Not active
Dip 4	2	Addressing	OFF		Expansion Address: value range from 1 to 3
Dip 5	1	Addressing	OFF		
Dip 6	4	Time selection	Set the repetition time as explained in Table 8	Not active	Not active
Dip 7	2	Time selection			
Dip 8	1	Time selection			
Dip 9	1	Safe Mode	Selectable	Not active	Not active
Dip 10	1	Alarm Delay	Selectable	Not active	Not active

5.2.1 Point to Point and Point to Multipoint address configuration.

The communication mode is selected by the **address** set in the card. This address is set by the dipswitches Nos. 1,2,3,4 and 5, as above explained. In this bank the **LSB** is the dipswitch No. 5 and the **MSB** is the No. 1. The following Table 7 shows the dipswitch set as function of the desired address. As is shown, the dipswitches Nos. 5 and 4 are used, in the **expansion card**, as an **internal address** to select both inputs and outputs.

Table 7: Setting of the addresses dipswitches.

Address	Dip 1	Dip 2	Dip 3	Dip 4	Dip 5	Notes
0	OFF	OFF	OFF	OFF	OFF	Set Point to Point communication mode.
1	OFF	OFF	OFF	OFF	ON	Multipoint mode / Expansion card internal address.
2	OFF	OFF	OFF	ON	OFF	Multipoint mode / Expansion card internal address.
3	OFF	OFF	OFF	ON	ON	Multipoint mode / Expansion card internal address.
4	OFF	OFF	ON	OFF	OFF	Multipoint mode.
5	OFF	OFF	ON	OFF	ON	Multipoint mode.
6	OFF	OFF	ON	ON	OFF	Multipoint mode.
7	OFF	OFF	ON	ON	ON	Multipoint mode.
8	OFF	ON	OFF	OFF	OFF	Multipoint mode.
9	OFF	ON	OFF	OFF	ON	Multipoint mode.
10	OFF	ON	OFF	ON	OFF	Multipoint mode.
11	OFF	ON	OFF	ON	ON	Multipoint mode.
12	OFF	ON	ON	OFF	OFF	Multipoint mode.
13	OFF	ON	ON	OFF	ON	Multipoint mode.
14	OFF	ON	ON	ON	OFF	Multipoint mode.
15	OFF	ON	ON	ON	ON	Multipoint mode.
16	ON	OFF	OFF	OFF	OFF	Multipoint mode.
17	ON	OFF	OFF	OFF	ON	Multipoint mode.
18	ON	OFF	OFF	ON	OFF	Multipoint mode.
19	ON	OFF	OFF	ON	ON	Multipoint mode.
20	ON	OFF	ON	OFF	OFF	Multipoint mode.
21	ON	OFF	ON	OFF	ON	Multipoint mode.
22	ON	OFF	ON	ON	OFF	Multipoint mode.
23	ON	OFF	ON	ON	ON	Multipoint mode.
24	ON	ON	OFF	OFF	OFF	Multipoint mode.
25	ON	ON	OFF	OFF	ON	Multipoint mode.

Address	Dip 1	Dip 2	Dip 3	Dip 4	Dip 5	Notes
26	ON	ON	OFF	ON	OFF	Multipoint mode.
27	ON	ON	OFF	ON	ON	Multipoint mode.
28	ON	ON	ON	OFF	OFF	Multipoint mode.
29	ON	ON	ON	OFF	ON	Multipoint mode.
30	ON	ON	ON	ON	OFF	Multipoint mode.
31	ON	ON	ON	ON	ON	Multipoint mode.

5.2.2 Configuration of the repetition times in automatic sending condition.

In the **Point to Point** communication mode it's available the periodic sending of a message to read or set the status of all the analog and digital inputs and outputs. The time period is set by the dipswitches Nos. **8**, **7** and **6** in which the dip No. **8** is the **LSB** while the dip No. **6** is the **MSB**.

The following Table 8 shows the dipswitches set as function of the desired repetition time.

Table 8: Setting the time repetition dipswitches in **Point to Point** mode.

Repetition Time	Dip 6	Dip 7	Dip 8	Notes
No repetition	OFF	OFF	OFF	Starting message by the change in a digital input status ⁽¹⁾ .
1 second	OFF	OFF	ON	Periodic sending and by digital input status change ⁽¹⁾ .
5 seconds	OFF	ON	OFF	Periodic sending and by digital input status change ⁽¹⁾ .
30 seconds	OFF	ON	ON	Periodic sending and by digital input status change ⁽¹⁾ .
1 minute	ON	OFF	OFF	Periodic sending and by digital input status change ⁽¹⁾ .
5 minutes	ON	OFF	ON	Periodic sending and by digital input status change ⁽¹⁾ .
20 minutes	ON	ON	OFF	Periodic sending and by digital input status change ⁽¹⁾ .
60 minutes	ON	ON	ON	Periodic sending and by digital input status change ⁽¹⁾ .

NOTE:

(1) The status change, originating a message transmission, may be occur on one of any digital inputs.

Independently from the Repetition time setting, the message is sent or at the repetition time expiry or when a digital input changes its status. The **Analogue inputs cannot start a message transmission**.

To avoid collisions between messages in the Point to Point mode, one of the two cards must be set without repetition time. In fact, if enabled, the two repetition times are equals or one can be chosen as an integer multiple of the other so, the collision probability may be high.

The unit in which is set up the repetition time, must be placed into the control centre of the network. In this way the Communication Alarm can be monitored and managed, under necessity.

The choice of the repetition time depends on the application and must be selected as function of the variation speed of the measured parameter. For example if this parameter is analog, the repetition time must be sufficiently short to follow correctly the input variations.

These time intervals are set into the firmware of the μ Controller and may be suitable for the majority of the applications. On request they may be changed to allow the maximum functionality.

5.2.3 "Safe Mode" configuration.

The dipswitch No. **9** in ON position enables the "**Safe Mode**" operation. In this operating mode, at the fall of the communication, **all outputs are forced in the 0 condition**, i.e. **all digital outputs are "Open"** and **all analogue outputs are set to 0**, equivalent to an output current of **0 mA** and, at the same time, the **Communication Alarm** output is activated. As appears in the Table 8, the **minimum time of 1 second is not compliant with the directives on the Human Operators security**, therefore this device **must not be used** to control any mechanical device that could create a risk for the operator. In the following § 5.2.4 are shown more information on the Communication Alarm.

5.2.4 Communication Alarm functionality and its delay time configuration.

This paragraph it's **very important** for the use of the DAB-84 unit because explains the functionality of the **Communication Alarm** and the reason because this device **must not be used** to drive any device that could create a risk for human security. In the **Point to Point** mode both unit are able to show the Communication Alarm when, for any cause, the communication between the units stops, for example for an interference in the radio channel. When a message is sent, the sending unit waits an answer from the other unit, independently from the cause that originate this transmission (repetition or status change of a digital input). If the communication is **regular**, an answer message comes from the other unit, so that the repetition cycle proceeds under the time set by the dipswitches. If there isn't an answer, the unit repeats the message twice, waiting the answer and, in its absence, the sending unit sends again the message after **30 seconds**. In absence of the answer this cycle is continuously repeated and, after **9 attempts** and a total time in the range from **1 minute and 9 seconds** up to **1 minute and 36 seconds**, depending on the selected repetition time, will be activated the **Communication Alarm**.

The dipswitch **No. 10** set the delay time before the activation of the Communication Alarm. If the dip is in **OFF position**, the alarm is activated **after three attempts**, otherwise in **ON position**, it is activated **after the 9th**. If the **repetition time is less than 1 minute**, the dip No. 10 **must be** in the **OFF position**, to avoid excessive delays. Because the **Communication Alarm** controls the status of both analog and digital outputs, if the **Safe Mode is enabled**, appears evident as the **minimum time** before the activation of the Safe Mode is of about **3 or 12 seconds**. This time **is not compliant** with the safety directives because **is too long**, therefore the DAB-84 **must not be used** as control system of **any devices**, mechanical, electrical and so on, that could create risks for the operator safety. The **Communication Alarm** is automatically **deleted** when is restored a regular communication, so all outputs, forced to **0** if the **Safe Mode** is enabled, come back to the correct value, restoring the system operation. As well for this reason, the DAB-84 must not be used to control devices that may be potentially dangerous for the operator safety.

6.0 Mechanical characteristics.

The whole apparatus is closed in an **anodised Aluminium** box with a **Plexi-glass** cover fixed with four knurled knobs. On the bottom side of the box a **DIN Guide bracket** is present to allow a simple insertion in the related **Ω DIN guide**. The weight of the apparatus is **15.16 ± 0.3 oz. av.**

The following Figure 1 shows the outline drawings of the DAB-84.

Fig. 1: DAB-84 outline drawings.

