

I.M.C.S.

DISTRIBUTED ELECTRONICS CONTROL SYSTEM

PROGRAMMING AND DESCRIPTION MANUAL VER 1.4

1. INTRODUCTION.....	4
2. CPU - DS01A.....	5
2.1 HARDWARE CHARACTERISTICS.....	5
2.1.1 MICROPROCESSOR INTEL 80386.....	5
2.1.2 RAM MEMORY.....	5
2.1.3 EPROM MEMORY.....	5
2.1.4 FLASH MEMORY.....	5
2.1.5 RS232 SERIAL LINE.....	5
2.1.6 RS485 SERIAL LINE - DIDNET.....	5
2.1.7 ANALOG-DIGITAL CONVERTER.....	6
2.1.8 MATHEMATICAL CO-PROCESSOR.....	6
2.2 ELECTRIC CONNECTIONS.....	7
2.2.1 M1 terminal board.....	7
2.2.2 M2 terminal board.....	7
2.2.3 M3 terminal board.....	8
2.2.4 M4 terminal board.....	8
2.2.5 BUS 1.....	8
2.2.6 BUS 2.....	8
2.3 FLASH-EPROM CONFIGURATION.....	9
2.3.1 Flash memory formatting.....	9
2.3.2 Loading the configuration files.....	9
2.3.3 Master.ini and Slave.ini.....	10
2.3.4 Loading the IsaGraf project.....	11
2.4 RDWARE REFRESH TIMES.....	12
2.5 CONNECTION DIAGRAM.....	13
2.6 CONNECTION CABLES.....	14
2.6.1 PC CABLES ← → DS01.....	14
2.6.2 DS01 ← → DS01 CABLES.....	14
2.7 DS01B CPU WITH BATTERY BACK-UP.....	15
2.7.1 Firmware version.....	15
2.7.2 Isagraf setting.....	15
2.7.3 Battery replacement.....	15
2.8 CONNECTION SCHEME SECOND SERIAL LINE RS 232.....	16
2.9 CONNECTIN BETWEEN TWO OR MORE DS01X THOUGH MODBUS IN RS 485.....	17
3. DS10B CARD.....	18
3.1 HARDWARE CHARACTERISTICS.....	18
3.2 ELECTRIC CONNECTIONS.....	19
3.2.1 M1 terminal board.....	19
3.2.2 M2 terminal board.....	19
3.2.3 M3 terminal board.....	19
3.2.4 M4 terminal board.....	20
3.2.5 M5 terminal board.....	20
3.2.6 M6 terminal board.....	20
3.2.7 M7 terminal board.....	20
3.2.8 M8 terminal board.....	21
3.2.9 M9 terminal board.....	21
3.2.10 M10 terminal board.....	21
3.2.11 M11 terminal board.....	21
3.2.12 M12 terminal board.....	22

3.2.13	<i>INPUT BUS terminal board</i>	22
3.2.14	<i>OUTPUT BUS 1 terminal board</i>	22
3.2.15	<i>OUTPUT BUS2 terminal board</i>	22
3.3	SOFTWARE CONFIGURATION	23
3.4	DS10B1 OPTION : RAPID ANALOG INPUTS	23
3.5	CONNECTION DIAGRAM	24
4.	DS13A CARD	25
4.1	HARDWARE CHARACTERISTICS	25
4.2	ELECTRIC CONNECTIONS	25
4.2.1	<i>M1 terminal board</i>	25
4.2.2	<i>M2 terminal board</i>	25
4.2.3	<i>M3 terminal board</i>	25
4.2.4	<i>M4 terminal board</i>	26
4.2.5	<i>INPUT BUS terminal board</i>	26
4.2.6	<i>OUTPUT BUS terminal board</i>	26
4.3	SOFTWARE CONFIGURATION	27
4.4	CONNECTION DIAGRAM	28
5.	DS13B CARD	29
5.1	HARDWARE CHARACTERISTICS	29
5.2	ELECTRIC CONNECTIONS	29
5.2.1	<i>M1 terminal board</i>	29
5.2.2	<i>M2 terminal board</i>	29
5.2.3	<i>M3 terminal board</i>	29
5.2.4	<i>M4 terminal board</i>	30
5.2.5	<i>INPUT BUS terminal board</i>	30
5.2.6	<i>OUTPUT BUS terminal board</i>	30
5.3	SOFTWARE CONFIGURATIONS	31
5.4	CONNECTION DIAGRAM	32
6.	DS16B CARD	33
6.1	HARDWARE CHARACTERISTICS	33
6.2	ELECTRIC CONNECTIONS	34
6.2.1	<i>M1A terminal board</i>	34
6.2.2	<i>M1B terminal board</i>	34
6.2.3	<i>M2 terminal board</i>	34
6.2.4	<i>M3 terminal board</i>	34
6.2.5	<i>M4 terminal board</i>	35
6.2.6	<i>M5 terminal board</i>	35
6.2.7	<i>INPUT BUS terminal board</i>	35
6.2.8	<i>OUTPUT BUS terminal board</i>	35
6.3	SOFTWARE CONFIGURATION	36
6.4	CONNECTION DIAGRAM	37
7.	DS17B CARD	38
7.1	HARDWARE CHARACTERISTICS	38
7.2	ELECTRIC CONNECTIONS	39
7.2.1	<i>M1A terminal board</i>	39
7.2.2	<i>M1B terminal board</i>	39
7.2.3	<i>M2 terminal board</i>	39
7.2.4	<i>M3 terminal board</i>	39
7.2.5	<i>M4 terminal board</i>	40
7.2.6	<i>M5 terminal board</i>	40
7.2.7	<i>INPUT BUS terminal board</i>	40
7.2.8	<i>OUTPUT BUS terminal board</i>	40
7.3	SOFTWARE CONFIGURATION	41
7.4	CONNECTION DIAGRAM	42
8.	DS18A CARD	43
8.1	HARDWARE CHARACTERISTICS	43

8.2	ELECTRIC CONNECTIONS	44
8.2.1	<i>M1 terminal board</i>	44
8.2.2	<i>M2 terminal board</i>	44
8.2.3	<i>M3 terminal board</i>	44
8.2.4	<i>M4 terminal board</i>	45
8.2.5	<i>M5 terminal board</i>	45
8.2.6	<i>M6 terminal board</i>	45
8.2.7	<i>M7 terminal board</i>	45
8.2.8	<i>M8 terminal board</i>	46
8.2.9	<i>M9 terminal board</i>	46
8.2.10	<i>M10 terminal board</i>	46
8.2.11	<i>M11 terminal board</i>	46
8.2.12	<i>M12 terminal board</i>	47
8.2.13	<i>INPUT BUS terminal board</i>	47
8.2.14	<i>OUTPUT BUS terminal board</i>	47
8.3	SOFTWARE CONFIGURATION	48
8.4	CONNECTION DIAGRAM.....	49
8.5	ENCODER CONNECTION.....	50
9.	DS26A CARD.....	51
9.1	HARDWARE CHARACTERISTICS.....	51
9.2	ELECTRIC CONNECTIONS	52
9.2.1	<i>M1 terminal board</i>	52
9.2.2	<i>M2 terminal board</i>	52
9.3	CONNECTION DIAGRAM.....	52

1. INTRODUCTION

I.M.C.S. is the new generation of MACNO control systems for several automation applications, in particular for the control of injection presses, blowers and pressure casting, designed and produced by TDE MACNO S.p.A.

It has been designed following a distributed architecture of control and of the I/O; it has allowed for the creation of a series of cards which make it possible to bring the electronics close to the sensors and actuators, linking them by means of a two-wire cable. This solution results in economical electronics while ensuring maximum performance, but it also allows for a significant reduction of cabling costs.

A software system (IsaGRAF), working in a Windows environment, has made it possible to improve the machine's performances as well as facilitating the different library functions typical of press applications.

ISaGRAF is a CASE (Computer Aided Software Engineering) package which uses PLC programming methods, in compliance with the IEC 1131-3 standard thus allowing for:

- structured functional block programming
- library storing
- on line and single step debugging
- programming with ladder, grafcet, functional blocks, instruction list, structured text

Both programming and debugging actions are performed using a standard PC.

2. CPU - DS01A

2.1 HARDWARE CHARACTERISTICS

DS01A is the main management card for the PLC. Its main features are:

- CPU Microprocessor 80386 EX
- 512 Kbyte RAM Memory
- 512 EPROM/FLASH EPROM/EEPROM
- 1 RS232 Serial Line
- 1 high-speed RS485 Serial Line
- 1 Analog/Digital Converter, 12 bit
- Mathematical co-processor (Optional)

2.1.1 MICROPROCESSOR INTEL 80386

It is in charge of all the actual management operations for the system.

2.1.2 RAM MEMORY

The RAM memory is where the whole programme is loaded when the card is started. Through this area it is possible to access the debugging function with the resident programme in order to check its functioning and correct any errors.

2.1.3 EPROM MEMORY

This is the memory area where the “boot” programme of the card is located, the actual operational system for the management of the DS01A.

2.1.4 FLASH MEMORY

This is the memory area that contains the configuration programme of the card with all the ISaGRAF libraries and the PLC programme. Under normal conditions, when the card is turned on the content of this memory is copied onto the RAM area to allow for diagnostic operations (Debug) and change the various registers.

2.1.5 RS232 SERIAL LINE

The card contains a 9-pole male floating chamber connector for serial communication RS232. Through this port the download operations of the configurations files for the card are performed, download of the plc programme and debugging of the latter, communication with MODBUS protocols using operator interface terminals or supervisions.

2.1.6 RS485 SERIAL LINE - DIDNET

The card manages a serial port RS485 with 781Kbaud used for DIDNET network communication between several DS01A cards. When using this port it is essential to use the twisted and shielded cable. The jumpers near the connectors allow for the introduction at the ends of the network of the 100 - 120 Ohm closing resistor. They also allow for the introduction of Pull-Up and Pull-Down resistors for the powering of the serial line.

2.1.7 ANALOG-DIGITAL CONVERTER

The card contains a 12 bit analog-digital converter for a better reading of all the analog signals from the field such as linear transducers, potentiometers etc.

2.1.8 MATHEMATICAL CO-PROCESSOR

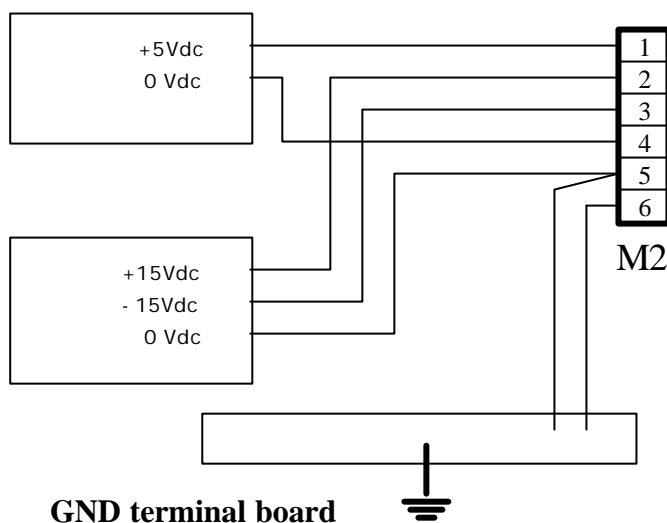
For applications such as stops or where there are numerous calculations to perform including profiles or closed rings, it is possible to improve the execution times by introducing a mathematical co-processor. In the standard card the component is not installed, it is therefore necessary to put in a specific request.

2.2 ELECTRIC CONNECTIONS

The card requires double powering. It needs a 5Volt Dc power for the logic part and a ± 15 Volt Dc power for the powering of the analog part.

In the case of the 5Volt powering it should always be within a $\pm 2\%$ tolerance level, values outside this range might cause problems in serial communication. In the case of the analog signal there is greater tolerance because a value of around $\pm 3\%$ can be tolerated.

An element which should not be underestimated is the connection method. All connections need to be with zeroes in common at the centre of the star, as shown in the diagram:



N.B. The maximum length of the cables between the power supply and the M2 terminal board is 50 cm.

2.2.1 M1 terminal board

For the time being the M1 terminal board is not managed.

2.2.2 M2 terminal board

This terminal board which connects the power supplies should be connected as follows:

Pin 1.....+ 5 Volt Dc
Pin 2..... +15 Volt Dc
Pin 3..... -15 Volt Dc
Pin 4..... 0 Volt logic
Pin 5..... 0 Volt analog
Pin 6..... GND terminal

2.2.3 M3 terminal board

It is the terminal board for the connection of several DS01A cards in a network. The port is an RS485 and its pins correspond to:

Pin 1.....+ Tx\Rx
Pin 2.....- Tx\Rx
Pin 3..... GND terminal board

2.2.4 M4 terminal board

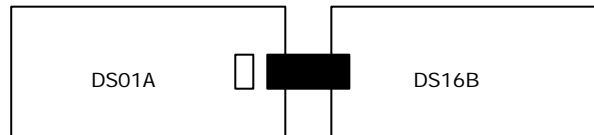
It is a terminal board for internal use.

2.2.5 BUS 1

The connector described as Bus 1 is used to connect the card in question with the other I/O cards by means of a “Sandwich” connection, i.e. when the card is mounted on spacers placed on cards such as DS10B or DS18A etc. This method uses this exit of the bus because it allows for a short connection between the two cards.

2.2.6 BUS 2

The connector described as Bus 2 mirrors the connector Bus 1 in order to allow for a short connection between cards with respective positions as shown in the diagram:



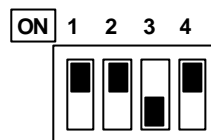
2.3 FLASH-EPROM CONFIGURATION

The configuration procedure of the card is necessary in order to define the operation systems of the CPU, for example if the card should work in a network with several cards or not, therefore if the card in question is a n MASTER or a SLAVE, the communication speed of the serial lines and other parameters.

Let us therefore consider the different steps to follow for a correct card configuration.

2.3.1 Flash memory formatting

In order to perform this operation we need to begin by turning the Dip3 on the card in the OFF position, as in the drawing, then power the system.



In this way the CPU turns to the configuration mode, allowing for reading or writing on the Flash memory.

By formatting the Flash memory you also ensure the total erasing of the memory through the command from the PC.

..\Isaformat.bat

from the ISAFUT subdirectory the system proceeds to erase the memory.

2.3.2 Loading the configuration files

Once the formatting has been completed you can download the configuration files previously prepared. If the card is not in a network, it is sufficiently to use the command from the PC

..\Dlall.bat

through which the file isadse.bin present in the subdirectories \CMD SWAT.386 is downloaded. If the card is used in a network with other cards, it is necessary to proceed to the configuration of the files **master.ini** and **slave.ini** depending on the composition of the network and then to use the PC commands

..\Dmaster.bat

for the first and

..\Dslave.bat

for the second.

2.3.3 Master.ini and Slave.ini

Let us now consider these files in more detail, starting from Master.ini

```
[ISANETV1.0]

[Slave_Nb]
1      ; This figure defines the slave number (1 = Master)

[Layer2]
1      ; Address ( 1 .. 15)
1      ; MasterF ( 0 = slave, 1 = master)
1      ; Communication port ( 0 = COM1, 1 = COM2)
781250 ; Communication speed 781250 130208 115200
8N2 BREAK RS485 DMA DS01 ; Layer2Par

; Station definition
[DEFINE_STATION]
2      ; Address of the Remote station
0      ; Information on the network drivers used only for prot. of the Profibus type
0      ; RemotelsMasterF used only for prot. of the Profibus type

; Station definition
[DEFINE_STATION]
3      ; Address of the Remote station
0      ; Information on the network drivers used only for prot. of the Profibus type
0      ; RemotelsMasterF used only for prot. of the Profibus type

; Station definition
[DEFINE_STATION]
4      ; Address of the Remote station
0      ; Information on the network drivers used only for prot. of the Profibus type
0      ; RemotelsMasterF used only for prot. of the Profibus type

; List of the available slaves ModBus
[MBServer]
2      ; Slave ModBus number
2      ; DIDNET address of the slave
0      ; ServerIsMasterF (0 = slave, 1 = master)
12     ; Slave Port (ModBus Task)

; List of the available slaves ModBus
[MBServer]
3      ; Slave ModBus number
3      ; DIDNET address of the slave
0      ; ServerIsMasterF (0 = slave, 1 = master)
12     ; Slave Port (ModBus Task)

; List of the available slaves ModBus
[MBServer]
4      ; Slave ModBus number
4      ; DIDNET address of the slave
0      ; ServerIsMasterF (0 = slave, 1 = master)
12     ; Slave Port (ModBus Task)

; List of the ports through which the local server Modbus accepts clients
[MBClient]
0      ; DriverNb 0 ==> RS232 (direct ISAGRAF workbench), 1 ==> DIDNET
0      ; Port ComPort(0,1) or ServerPort(0..255)
[MBClient]
1      ; DriverNb 0 ==> RS232, 1 ==> DIDNET (remote ISAGRAF workbench)
12     ; Port ComPort(0,1) or ServerPort(0..255)
[MBClient]
1      ; DriverNb 0 ==> RS232, 1 ==> DIDNET (remote ISAGRAF workbench)
13     ; Port ComPort(0,1) or ServerPort(0..255)
[MBClient]
1      ; DriverNb 0 ==> RS232, 1 ==> DIDNET (remote ISAGRAF workbench)
14     ; Port ComPort(0,1) or ServerPort(0..255)
```

,and now the Slave.ini:

```
[ISANETV1.0]

[Slave_Nb]
2      ; This figure defines the slave number (1 = Master)

[Layer2]
2      ; Address (1 .. 15)
0      ; MasterF ( 0 = slave, 1 = master)
1      ; Communication port ( 0 = COM1, 1 = COM2)
781250 ; Communication speed 781250 130208 115200
8N2 BREAK RS485 DMA DS01 ; Layer2Par

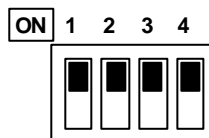
; List of the available slaves ModBus
[MBServer]
1      ; Slave ModBus number
1      ; DIDNET address of the slave
1      ; ServerIsMasterF ( 0 = slave, 1 = master)
12     ; Slave Port (ModBus Task)

; List of the ports through which the local server Modbus accepts clients
[MBClient]
0      ; DriverNb 0 ==> RS232 (direct ISAGRAF workbench), 1 ==> DIDNET
0      ; Port ComPort(0,1) or ServerPort(0..255)
[MBClient]
1      ; DriverNb 0 ==> RS232, 1 ==> DIDNET (remote ISAGRAF workbench)
12     ; Port ComPort(0,1) or ServerPort(0..255)
```

You will have noticed that the two files have the same structure, but one is more complete than the other. These two examples have been drawn up for the configuration of a Master and a Slave number 2. To complete the network it is therefore necessary to create a file also for slave 3 and 4. The internal analysis of the file Dslave.bat shows that it simply retrieves the file Slave.ini, and therefore it is possible to create additional files .bat, for example Dslave2.bat, Dslave3.bat etc. which retrieve their own files .ini.

2.3.4 Loading the IsaGraf project

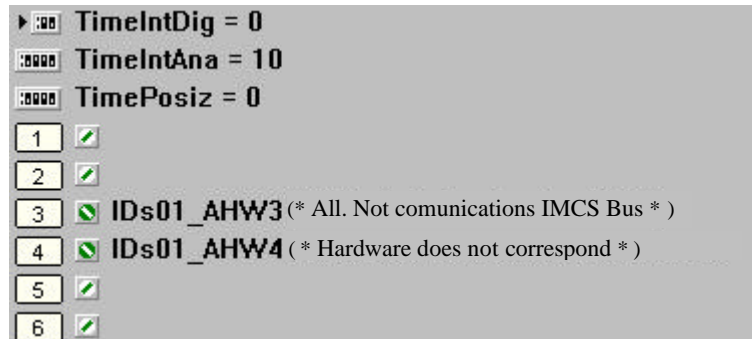
Once the configuration procedure for the card has been completed, it is necessary to turn off the card, position the Pin3 of the dip-switch to On, then reload.



At this point it is possible either to reload the project or PLC programme prepared with ISaGRAF and to debug the system (for more detailed information please refer to the relevant instruction manual).

2.4 RDWARE REFRESH TIMES

The refresh times for the digital and analog I/O can be defined by the user on the ISaGRAF programme from the Menu Tools -> IO Connection using the following settings:



TimeIntDig: defines the refresh interruption of the digital I/O. By setting 0 as in the example we have a reading of the inputs which is followed by the execution of the PLC programme and by the actuation of the outputs. By introducing a value, for example 5, the reading and writing of the digital I/O is performed every 5 milliseconds, even if the real actuation of the outputs always follows the execution of the PLC programme.

TimeIntAna: defines the refresh interruption of the analog I/O in milliseconds.

At the moment it is not used because refresh takes place only at the end of the PLC cycle.

TimePosiz: defines the interrupt time module reserved to positioning management blocks used by the card DS18 or DS10 with a basic time of 1msec.

Apart from the parameters that can be defined by the user, this page provides for a brief debugging of the card by means of 6 virtual digital inputs.

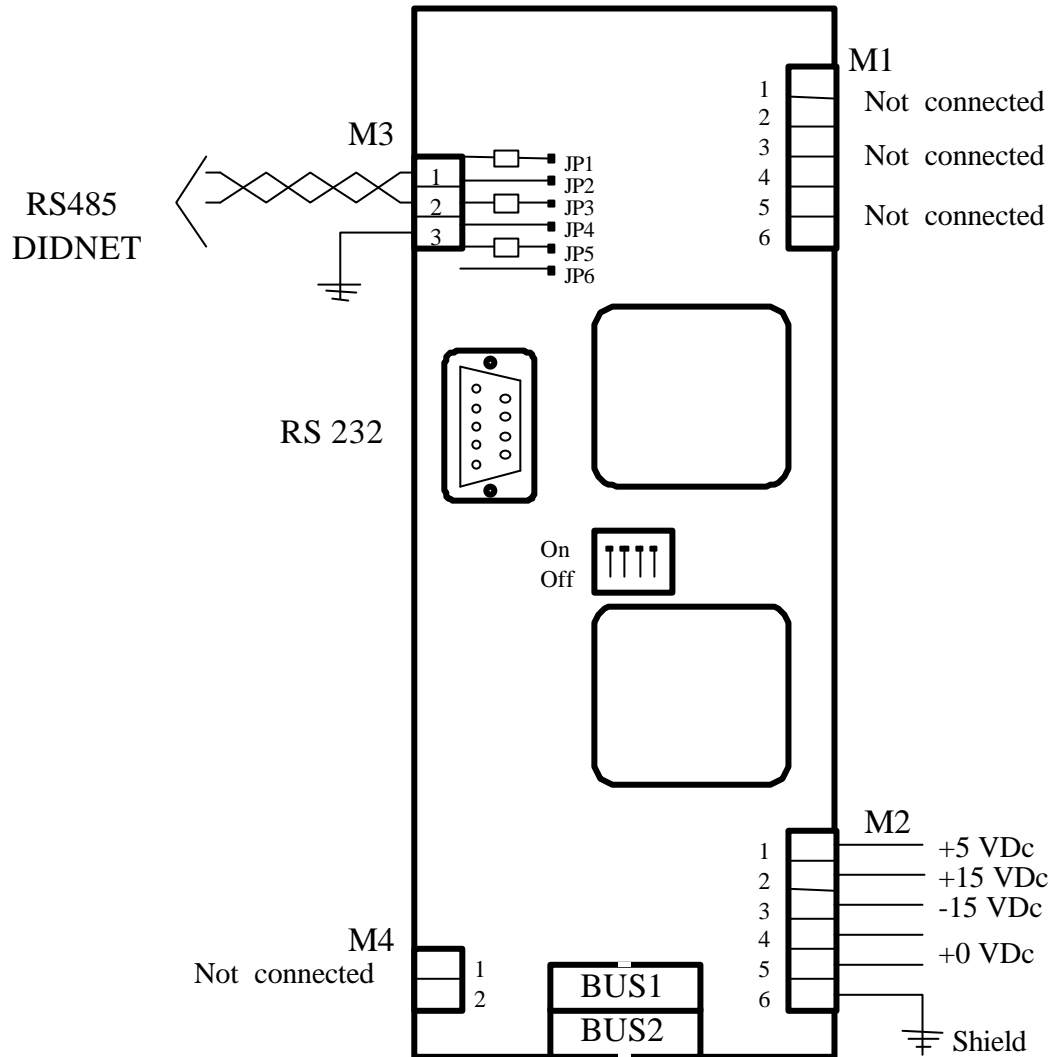
The first and second bit are for internal use.

The third bit indicates whether there is communication with the connected I/O cards.

The fourth bit shows if the hardware connected to the bus corresponds to the one stated in the PLC programme.

The fifth and sixth bit are for internal use.

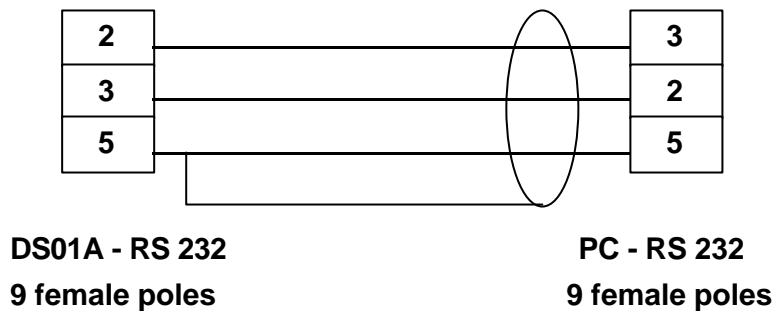
2.5 CONNECTION DIAGRAM



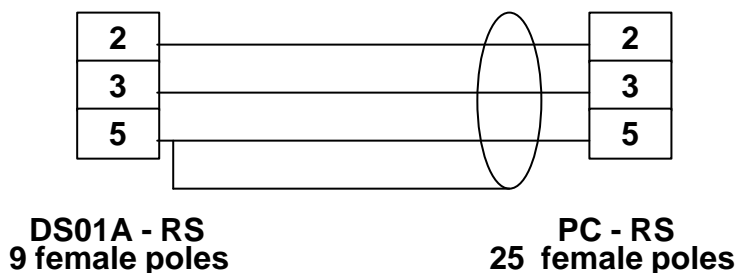
2.6 CONNECTION CABLES

2.6.1 PC CABLES ← → DS01

For the interfacing between the card DS01A and personal computer you use the serial port RS 232 present on the card and one of the communication ports on the PC with the following cables:

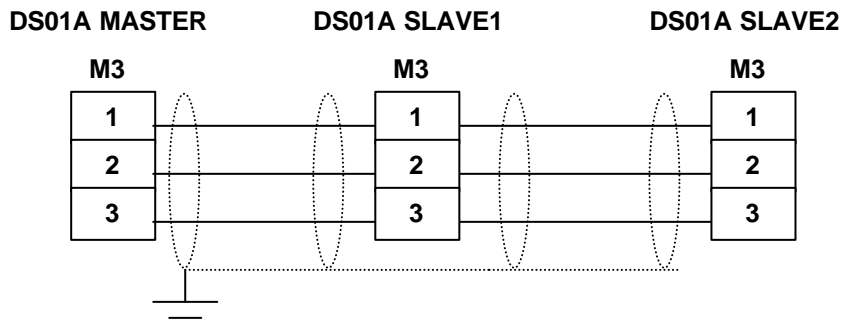


25-pole cable diagram:



2.6.2 DS01 ← → DS01 CABLES

To connect different DS01A cards in the MASTER – SLAVES configuration you need to use a twisted shielded cable minimum 3 x 0.5 mm² having a maximum length of 50 m with a characteristic impedance of 120 Ω.



The card also contains jumpers for Pull-Up, Pull-Down and network termination, defined in the drawing as JP1- JP2, JP3 - JP4 and JP5 - JP6.

On the edges of the network you need to close the jumpers for termination and Pull- Up and Down (in the example the DS01 Master and DS01 Slave2).

In all remaining DS01 the jumpers should be eliminated (for example Slave1).

2.7 DS01B CPU with battery back-up

2.7.1 Firmware version

The OEM firmware version to be used for the battery back-up is the **OEM 1.33**. It is recommended to use the new DS01 IO declaration. In its description there is the bit of the battery fault.

2.7.2 Isagraf setting

It is possible to store two variables' types:

- 1) **Booleane variables**
- 2) **Integer variables**

The **booleane variables** are under the following address: 0x7e000. Each of them needs a byte. Maximum 1024 bytes are available for a max. total amount of 1024 variables.

The **integer variables** are under the following address: 0x7e400. Each of them needs four bytes. Maximum 4096 bytes are available for a max. total amount of 1024 variables.

Isagraf requires other two fields for the timer and messages variables that are not implemented now. Anyway, you can use the following values:

for the timer variables 0x7f400,0

for the messages variables 0x7f800,0

To set the addresses, do as follows:

- 1) Open the project
- 2) Select from the menu the command **Make**
- 3) Select from the sub-menu the command **Application Run Time Options**
- 4) A window “**Application Run Time Options**” will appear, then set for the retained variables the following string: **0x7e000,1024,0x7e400,1024,0x7f400,128,0x7f680,0**

In the dictionary when you define a booleane or an analogue variable it is possible to select the retained variable type or not.

2.7.3 Battery replacement

The system can store in the back-up variables till the exhaustion of the battery.

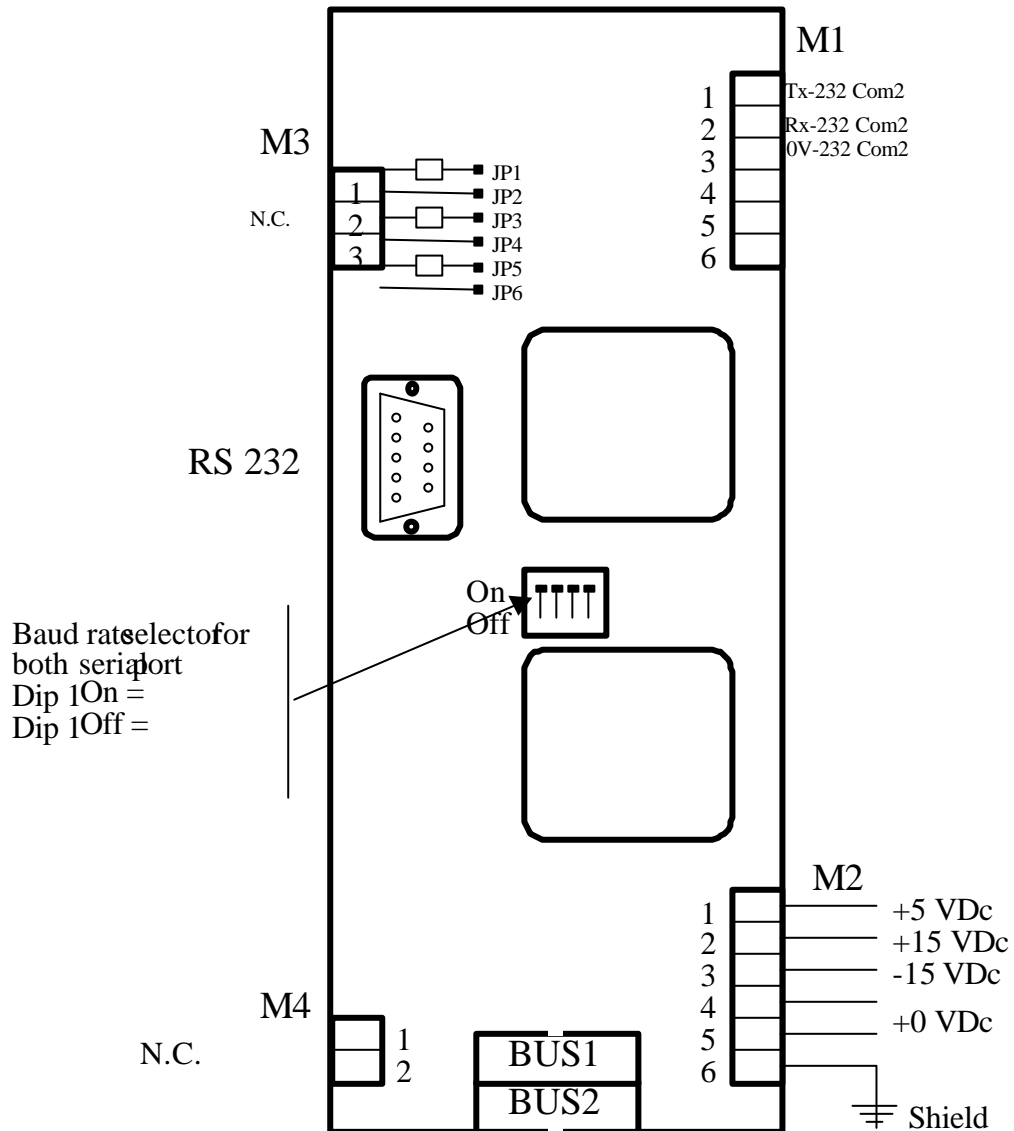
When the voltage of the battery is under 2,5V, its exhaustion is signalled through the first virtual connector of the DS01 board on the IsaGraf Rack.

In this case you have to replace the battery as soon as possible: it is to do with the system switched on to avoid loss of the data.

There is no control of data store in the back-up area.

2.8 CONNECTION SCHEME second serial line RS 232

In the option DS01x with double serial line RS232 the connection of the second port is as described in the drawing hereinafter:



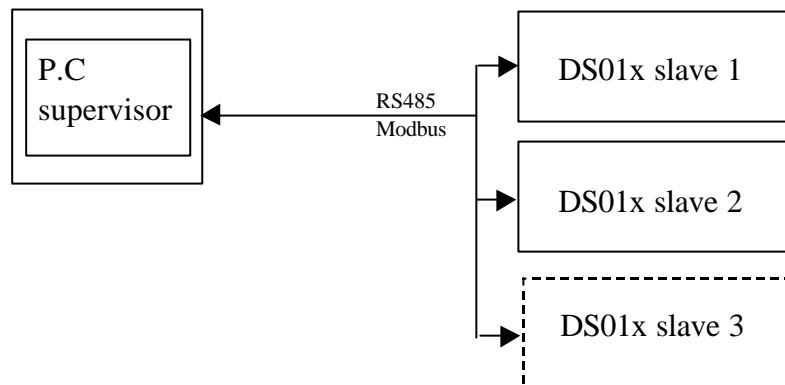
2.9 Connectin between two or more DS01X though Modbus in RS 485

It is possible to connect two or more boards DS01x through RS485 in Modbus slave protocol. Just utilise the version 1.34 or further versions and add into flash the Modbus.ini file where the slave number for each DS01x is declared. One example follows:

```
[SLAVE_NB]  
1
```

To do the download you can use the Dlall1.bat file as an example (for a slave nr.1). For the connection cable see the chapter about DS01A.

Typical connection:



3. DS10B CARD

3.1 HARDWARE CHARACTERISTICS

DS10B is a card for the Input-Output management of the digital and analog type. Due to its hardware characteristics it is best applied wherever you need to manage actuators such as solenoid valves up to a level of 3 Ampere with 24Vdc without using interface relays. Its main features are:

- 24 Digital Inputs 24Vdc
- 16 Digital Outputs 24 Vdc - 3 Ampere (coupling)
- 8 Analog Inputs ± 10 Vdc - Ris.12bit
- 8 Analog Outputs ± 10 Vdc - Ris.12bit
- 2 interface conn. for serial bus I.M.C.S synchronous

3.2 ELECTRIC CONNECTIONS

The card is connected with the other cards of the DS series through the Input and Output Bus ports. From the Bus the card receives ± 15 Volt Dc for the powering of its own components, whereas for the powering of the sensors or actuators you need to connect the following terminal boards.

3.2.1 M1 terminal board

The M1 terminal board is connected to the analog inputs from 1 to 4, respectively from pin 8 to pin 1:

Pin 1.....+ Analog Input 4
Pin 2..... - Analog Input 4
Pin 3.....+ Analog Input 3
Pin 4..... - Analog Input 3
Pin 5.....+ Analog Input 2
Pin 6..... - Analog Input 2
Pin 7.....+ Analog Input 1
Pin 8..... - Analog Input 1

3.2.2 M2 terminal board

The M2 terminal board is connected to the analog inputs from 5 to 8, respectively from pin 8 to pin 1:

Pin 1.....+ Analog Input 8
Pin 2..... - Analog Input 8
Pin 3.....+ Analog Input 7
Pin 4..... - Analog Input 7
Pin 5.....+ Analog Input 6
Pin 6..... - Analog Input 6
Pin 7.....+ Analog Input 5
Pin 8..... - Analog Input 5

3.2.3 M3 terminal board

It is the terminal board for the connection of the zero volts of the card and grounds. It is very important to make sure connections are made as follows:

Pin 1..... GND terminal
Pin 2..... not to be connected
Pin 3..... 0 Volt of the digital inputs
Pin 4..... 0 Volt of the digital inputs
Pin 5..... 0 Volt of the digital inputs
Pin 6..... 0 Volt of the digital inputs
Pin 7..... 0 Volt of the digital inputs
Pin 8..... 0 Volt of the digital inputs

3.2.4 M4 terminal board

This is the terminal board for the connection of the first digital input byte.

Pin 1.....	Digital input 8
Pin 2.....	Digital input 7
Pin 3.....	Digital input 6
Pin 4.....	Digital input 5
Pin 5.....	Digital input 4
Pin 6.....	Digital input 3
Pin 7.....	Digital input 2
Pin 8.....	Digital input 1

3.2.5 M5 terminal board

This is the terminal board for the connection of the second digital input byte.

Pin 1.....	Digital input 16
Pin 2.....	Digital input 15
Pin 3.....	Digital input 14
Pin 4.....	Digital input 13
Pin 5.....	Digital input 12
Pin 6.....	Digital input 11
Pin 7.....	Digital input 10
Pin 8.....	Digital input 9

3.2.6 M6 terminal board

This is the terminal board for the connection of the third digital input byte.

Pin 1.....	Digital input 24
Pin 2.....	Digital input 23
Pin 3.....	Digital input 22
Pin 4.....	Digital input 21
Pin 5.....	Digital input 20
Pin 6.....	Digital input 19
Pin 7.....	Digital input 18
Pin 8.....	Digital input 17

3.2.7 M7 terminal board

The M7 terminal board is connected to the analog outputs from 1 to 4 respectively from pin 8 to pin 1:

Pin 1.....	+ Analog Output 4
Pin 2.....	- Analog Output 4
Pin 3.....	+ Analog Output 3
Pin 4.....	- Analog Output 3
Pin 5.....	+ Analog Output 2
Pin 6.....	- Analog Output 2
Pin 7.....	+ Analog Output 1
Pin 8.....	- Analog Output 1

3.2.8 M8 terminal board

The M8 terminal board is connected to the analog outputs from 5 to 8 respectively from pin 8 to pin 1:

Pin 1.....+ Analog Output 8
Pin 2..... - Analog Output 8
Pin 3.....+ Analog Output 7
Pin 4..... - Analog Output 7
Pin 5.....+ Analog Output 6
Pin 6..... - Analog Output 6
Pin 7.....+ Analog Output 5
Pin 8..... - Analog Output 5

3.2.9 M9 terminal board

This is the terminal board for the connection of the first digital output nibble.

Pin 1..... 24 Vdc powering
Pin 2..... 24 Vdc powering
Pin 3..... Digital output 4
Pin 4..... Digital output 3
Pin 5..... Digital output 2
Pin 6..... Digital output 1
Pin 7..... 0 Volt digital outputs
Pin 8..... 0 Volt digital outputs

3.2.10 M10 terminal board

This is the terminal board for the connection of the second digital output nibble.

Pin 1..... 24 Vdc powering
Pin 2..... 24 Vdc powering
Pin 3..... Digital output 8
Pin 4..... Digital output 7
Pin 5..... Digital output 6
Pin 6..... Digital output 5
Pin 7..... 0 Volt digital outputs
Pin 8..... 0 Volt digital outputs

3.2.11 M11 terminal board

This is the terminal board for the connection of the third digital output nibble.

Pin 1..... 24 Vdc powering
Pin 2..... 24 Vdc powering
Pin 3..... Digital output 12
Pin 4..... Digital output 11
Pin 5..... Digital output 10
Pin 6..... Digital output 9
Pin 7..... 0 Volt digital outputs
Pin 8..... 0 Volt digital outputs

3.2.12 M12 terminal board

This is the terminal board for the connection of the fourth digital output nibble.

Pin 1	24 Vdc powering
Pin 2	24 Vdc powering
Pin 3	Digital output 16
Pin 4	Digital output 15
Pin 5	Digital output 14
Pin 6	Digital output 13
Pin 7	0 Volt digital outputs
Pin 8	0 Volt digital outputs

3.2.13 INPUT BUS terminal board

The InputBus terminal board is used to connect the card to the bus, then directly to a DS01A or through the Output Bus of another card.

3.2.14 OUTPUT BUS 1 terminal board

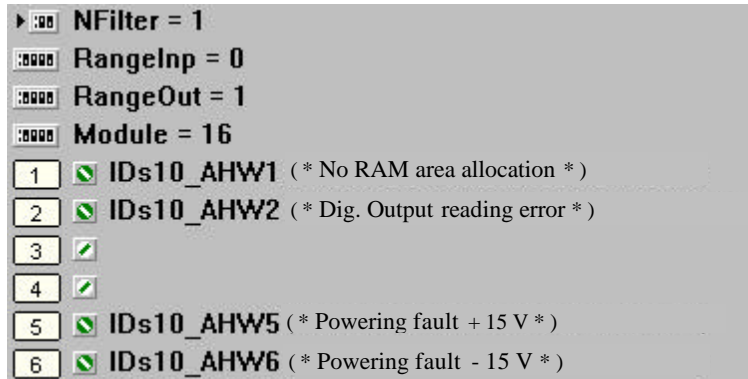
The OutputBus1 connector is used for any connection with other cards of the DS series in the “Sandwich” mode.

3.2.15 OUTPUT BUS2 terminal board

The OutputBus connector is used for any connection with other cards of the DS series in the on-line mode.

3.3 SOFTWARE CONFIGURATION

Some of the configurations can be defined by the user with the programming package ISaGRAF from the Menu Tools -> IO Connection through the following settings:



Nfilter: allows for the setting of the number of readings to calculate the average analog input.

RangeInp: Defines the type of reading of analog inputs, 0 = only posit. (0..10V) 1 = Bipolar. (+/- 10V) Val. to PLC in mV

RangeOut: Defines the type of writing of the analog outputs, 0 = only posit. (0..10V) 1 = Bipolar. (+/- 10V) Val. to PLC in mV

Module: defines the number of cycles for the reading and activation of Analog I/O.

Apart from the parameters that can be defined by the user, this page provides a brief debugging of the card by means of six virtual digital inputs.

The first bit indicates that the Ram memory for the allocation of variables is exhausted.

The second bit informs about any hardware failure in one or more digital outputs. The alarm is set off for open circuit (if the load is smaller than 300mA), for short circuit (the output continues to drive a minimal current while waiting for the short circuit to be removed) or for thermal protection (the component behaves as if there were a short circuit)

The third bit is not relevant for the user.

The fourth bit is not relevant for the user.

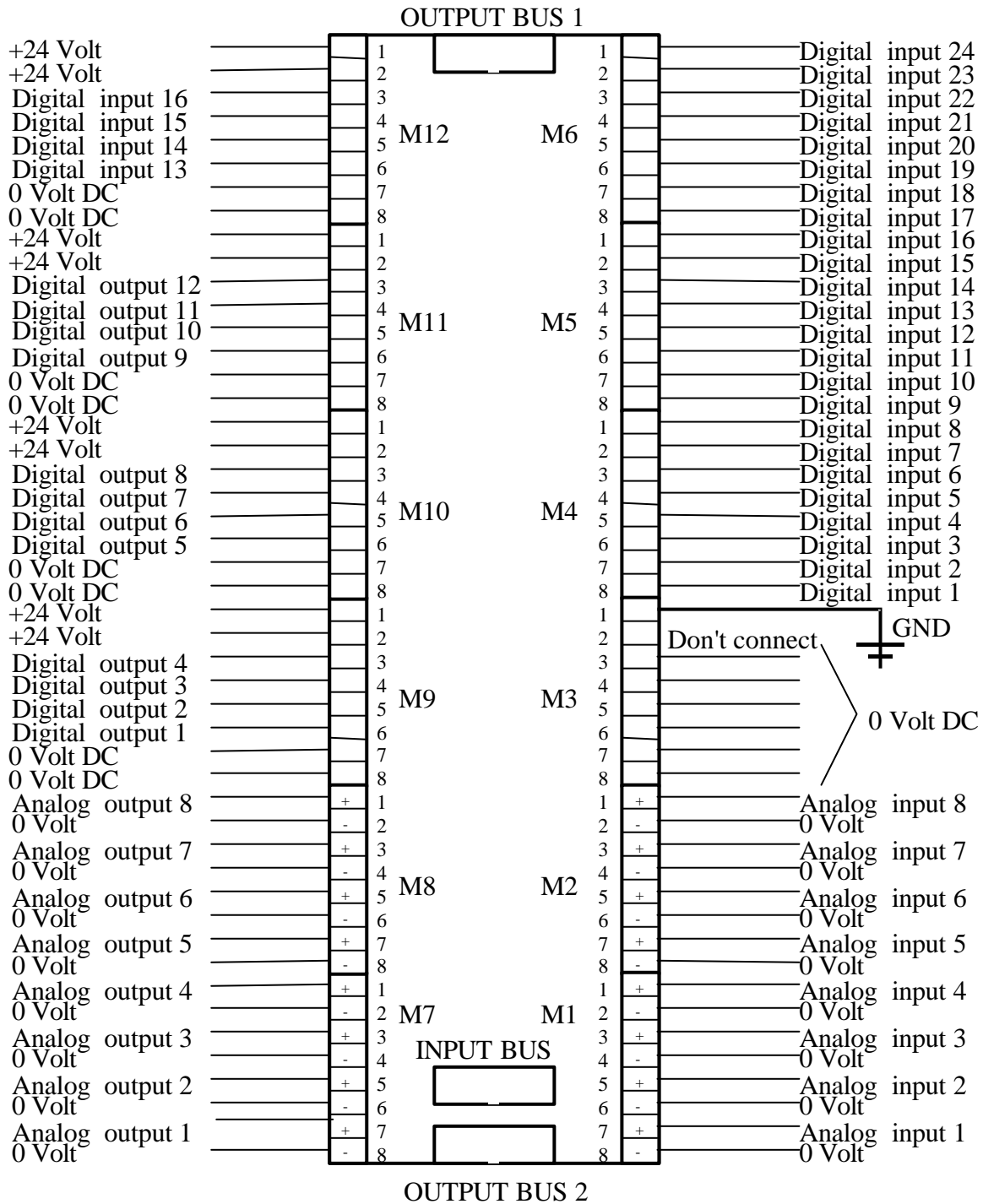
The fifth bit indicates undervoltage or overvoltage in the +15Vdc signal from the bus.

The sixth bit indicates undervoltage or overvoltage in -15Vdc signal from the bus.

3.4 DS10B1 option : rapid analog inputs

In this option there are no filters on the analog inputs.

3.5 CONNECTION DIAGRAM



4. DS13A CARD

4.1 HARDWARE CHARACTERISTICS

DS13A is a card used to read ten temperature sensors including thermocouples of type J or of type K. There are also two inputs for thermo-resistors PT100 with two threads for the compensation of the cold joint. Considering its characteristics, this card is normally used for the control of areas to be heated in conjunction with cards having digital outputs. The card is therefore provided with:

- ten Thermocouple Inputs - Res.12bit
- two Thermo-resistor Inputs PT100 - Res.12bit
- two interface conn. for serial bus I.M.C.S synchronous

4.2 ELECTRIC CONNECTIONS

The card is connected through the Input Bus port with other cards of the DS series. From the Bus the cards receives voltages amounting to ± 15 Volt Dc for the powering of its own components, whereas for the connections of the sensors you need to connect the following terminal boards.

4.2.1 M1 terminal board

Terminal board M1 is connected to the first three temperature inputs and part of the fourth.

Pin 1.....+ Input Thermocouple 1
Pin 2..... - Input Thermocouple 1
Pin 3.....+ Input Thermocouple 2
Pin 4..... - Input Thermocouple 2
Pin 5..... not to be connected
Pin 6.....+ Input Thermocouple 3
Pin 7..... - Input Thermocouple 3
Pin 8.....+ Input Thermocouple 4

4.2.2 M2 terminal board

Terminal board M2 is connected to the fifth and sixth temperature inputs and part of the fourth and seventh.

Pin 1..... - Input Thermocouple 4
Pin 2..... not to be connected
Pin 3.....+ Input Thermocouple 5
Pin 4..... - Input Thermocouple 5
Pin 5.....+ Input Thermocouple 6
Pin 6..... - Input Thermocouple 6
Pin 7..... not to be connected
Pin 8.....+ Input Thermocouple 7

4.2.3 M3 terminal board

Terminal board M3 is connected to the last three temperature inputs and part of the seventh.

Pin 1..... - Input Thermocouple 7
Pin 2..... + Input Thermocouple 8
Pin 3..... - Input Thermocouple 8
Pin 4..... not to be connected
Pin 5..... + Input Thermocouple 9
Pin 6..... - Input Thermocouple 9
Pin 7..... + Input Thermocouple 10
Pin 8..... - Input Thermocouple 10

4.2.4 M4 terminal board

This is the terminal board for the connection of the PT100 thermo-resistors.

Pin 1..... + Input PT100 - 1
Pin 2..... - Input PT100 - 1
Pin 3..... + Input PT100 - 2
Pin 4..... - Input PT100 - 2

4.2.5 INPUT BUS terminal board

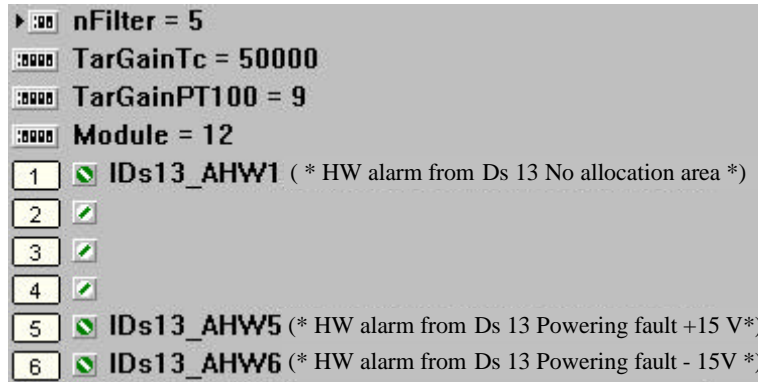
The InputBus connector is used to connect the card to the bus, then directly to a DS01A or through the Output Bus of another card.

4.2.6 OUTPUT BUS terminal board

The OutputBus connector can be used for any connection of other cards of the DS series in series with the latter.

4.3 SOFTWARE CONFIGURATION

Some of the configurations can be defined by the user with the programming package ISaGRAF from the Menu Tools -> IO Connection through the following settings:



Nfilter: allows for the setting of the number of readings to calculate the average of the temperature input.

TarGainTc: allows for the gauging of the thermocouple input gain, set at 50 mVolt (not to be changed).

TarGainPT100: allows for the gauging of the thermoresistor input gain, set at 9 (not to be changed).

Module: defines the number of cycles for the reading and activation of the Analog I/O.

Apart from the parameters that can be defined by the user, this page provides a brief debugging of the card through six digital virtual inputs.

The first bit indicates whether the RAM memory for the allocation of variables is present or not.

The second bit is for internal use.

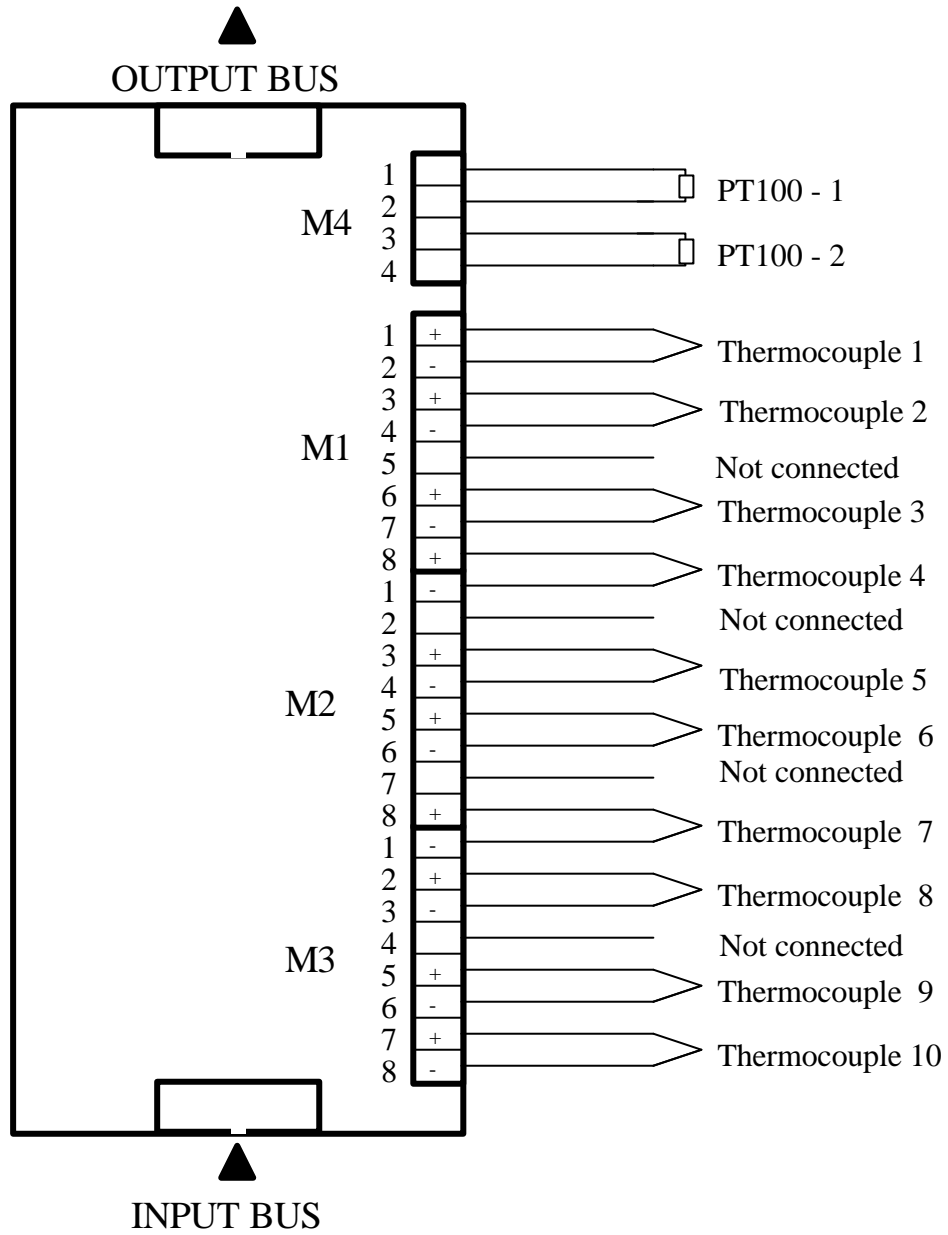
The third bit is for internal use.

The fourth bit is for internal use.

The fifth bit indicates undervoltage or overvoltage of the +15Vdc signal from the bus.

The sixth bit indicates undervoltage or overvoltage of the -15Vdc signal from the bus.

4.4 CONNECTION DIAGRAM



5. DS13B CARD

5.1 HARDWARE CHARACTERISTICS

DS13B is a card for the reading of ten temperature sensors with PT100 thermoresistors with two wires. Given the characteristics of this card, it is generally used for the control of areas to be heated, in conjunction with cards having digital outputs. The card is therefore provided with:

- ten PT100 Thermoresistor Outputs - Res.12bit
- two interface conn. for serial bus I.M.C.S synchronous

5.2 ELECTRIC CONNECTIONS

The card is connected through the Input Bus port with other cards of the DS series. From the Bus the card receives voltages amounting to ± 15 Volt Dc for the powering of its own components, whereas for the connections between sensors you need to connect the following terminal boards.

5.2.1 M1 terminal board

Terminal board M1 is connected to the first three temperature inputs and part of the fourth.

Pin 1.....+ Input PT100 - 1
Pin 2..... - Input PT100 - 1
Pin 3.....+ Input PT100 - 2
Pin 4..... - Input PT100 - 2
Pin 5..... not to be connected
Pin 6.....+ Input PT100 - 3
Pin 7..... - Input PT100 - 3
Pin 8.....+ Input PT100 - 4

5.2.2 M2 terminal board

Terminal board M2 is connected to the fifth and sixth temperature input and part of the fourth and seventh.

Pin 1..... - Input PT100 - 4
Pin 2..... not to be connected
Pin 3.....+ Input PT100 - 5
Pin 4..... - Input PT100 - 5
Pin 5.....+ Input PT100 - 6
Pin 6..... - Input PT100 - 6
Pin 7..... not to be connected
Pin 8.....+ Input PT100 - 7

5.2.3 M3 terminal board

Terminal board M3 is connected to the last three temperature inputs and part of the seventh.

Pin 1..... - Input PT100 - 7
Pin 2..... + Input PT100 - 8

Pin 3..... - Input PT100 - 8
Pin 4..... not to be connected
Pin 5..... + Input PT100 - 9
Pin 6..... - Input PT100 - 9
Pin 7..... + Input PT100 - 10
Pin 8..... - Input PT100 - 10

5.2.4 M4 terminal board

Terminal board M4 on this card is not connected.

Pin 1..... not to be connected
Pin 2..... not to be connected
Pin 3..... not to be connected
Pin 4..... not to be connected

5.2.5 INPUT BUS terminal board

The InputBus connector is used to connect the card to the bus, then directly to a DS01B or through the Output Bus of another card.

5.2.6 OUTPUT BUS terminal board

The OutputBus connector can be used for any connection of other cards of the DS series in series with the latter.

5.3 SOFTWARE CONFIGURATIONS

Some of the configurations can be defined by the user with the programming package ISaGRAF from the Menu Tools -> IO Connection through the following settings:



Nfilter: allows for the setting of the number of readings to calculate the average of the temperature input.

Module: defines the number of cycles for the reading and activation of the Analog I/O.

Apart from the parameters that can be defined by the user, this page provides a brief debugging of the card through six digital virtual inputs.

The first bit indicates that the RAM memory for the allocation of resources is exhausted.

The second bit is for internal use.

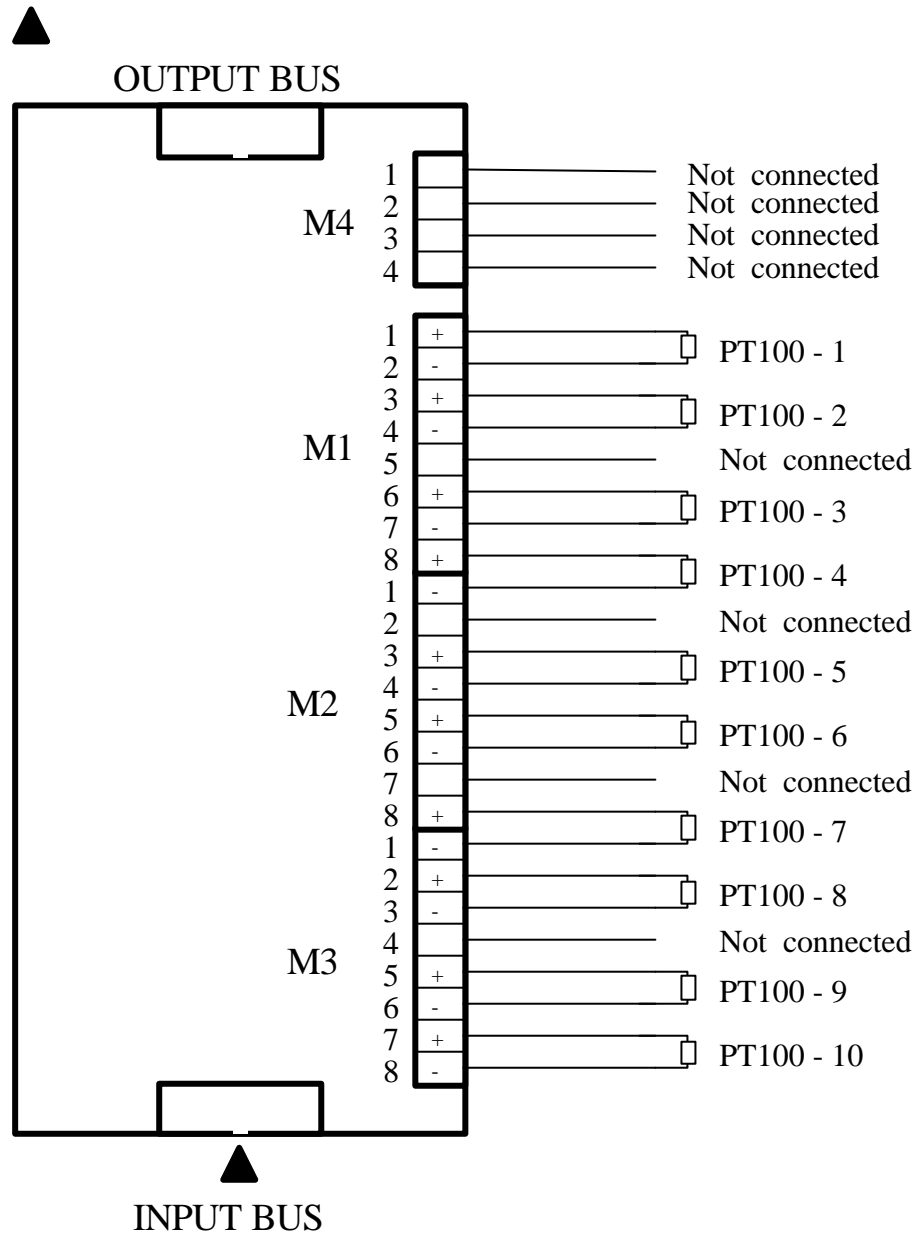
The third bit is for internal use.

The fourth bit is for internal use.

The fifth bit indicates undervoltage or overvoltage of the +15Vdc signal from the bus.

The sixth bit indicates undervoltage or overvoltage of the -15Vdc signal from the bus.

5.4 CONNECTION DIAGRAM



6. DS16B CARD

6.1 HARDWARE CHARACTERISTICS

DS16B is a card used for Input-Output management of the digital type. Due to its hardware characteristics it is especially suitable wherever there is a need to manage low-consumption actuators, such as static relays for heaters, or through interface relays thus including any type of digital actuator.

Through suitable programming it is possible to carry out repeat readings of the outputs or exploit such inputs (from repeat reading) to double their number, though not being able to use the related outputs. Its main features are:

- Sixteen 24Vdc Digital Inputs
- Sixteen 24 Vdc Digital Outputs – 1 Ampere with repeat reading
- Two interface conn. for serial bus I.M.C.S synchronous

or

- Thirty-two 24Vdc Digital Inputs
- Two interface conn. for serial bus I.M.C.S synchronous

6.2 ELECTRIC CONNECTIONS

The card is connected through the Input Bus ports to other cards of the DS series. From the Bus the card receives voltages amounting to ± 15 Volt Dc for the powering of its own components, whereas to power the sensors or actuators it is necessary to connect the following terminal boards.

6.2.1 M1A terminal board

Terminal board M1A is connected with the voltage for the powering of digital inputs and outputs:

Pin 1.....	Powering +24 VDC
Pin 2.....	Powering +24 VDC
Pin 3.....	Powering +24 VDC
Pin 4.....	Powering +24 VDC

6.2.2 M1B terminal board

Terminal board M1B is connected with the zero reference volts for the digital inputs and outputs:

Pin 1.....	0 Volt digital
Pin 2.....	0 Volt digital
Pin 3.....	not to be connected
Pin 4.....	GND

6.2.3 M2 terminal board

Terminal board M2 is connected with the first “byte” for digital inputs respectively from pin 1 to pin 8:

Pin 1.....	Digital Input 1
Pin 2.....	Digital Input 2
Pin 3.....	Digital Input 3
Pin 4.....	Digital Input 4
Pin 5.....	Digital Input 5
Pin 6.....	Digital Input 6
Pin 7.....	Digital Input 7
Pin 8.....	Digital Input 8

6.2.4 M3 terminal board

Terminal board M3 is connected with the second “byte” for digital inputs respectively from pin 1 to pin 8:

Pin 1.....	Digital Input 9
Pin 2.....	Digital Input 10
Pin 3.....	Digital Input 11
Pin 4.....	Digital Input 12
Pin 5.....	Digital Input 13
Pin 6.....	Digital Input 14
Pin 7.....	Digital Input 15
Pin 8.....	Digital Input 16

6.2.5 M4 terminal board

It is the terminal board for the connection of the first digital output “byte” or the third digital input “byte”:

Pin 1.....	Digital Output 1 or Digital Input 17
Pin 2.....	Digital Output 2 or Digital Input 18
Pin 3.....	Digital Output 3 or Digital Input 19
Pin 4.....	Digital Output 4 or Digital Input 10
Pin 5.....	Digital Output 5 or Digital Input 21
Pin 6.....	Digital Output 6 or Digital Input 22
Pin 7.....	Digital Output 7 or Digital Input 23
Pin 8.....	Digital Output 8 or Digital Input 24

6.2.6 M5 terminal board

It is the terminal board for the connection of the second digital output “byte” or the fourth digital input “byte”:

Pin 1.....	Digital Output 9 or Digital Input 25
Pin 2.....	Digital Output 10 or Digital Input 26
Pin 3.....	Digital Output 11 or Digital Input 27
Pin 4.....	Digital Output 12 or Digital Input 28
Pin 5.....	Digital Output 13 or Digital Input 29
Pin 6.....	Digital Output 14 or Digital Input 30
Pin 7.....	Digital Output 15 or Digital Input 31
Pin 8.....	Digital Output 16 or Digital Input 32

6.2.7 INPUT BUS terminal board

The InputBus connector is used to connect the card to the bus. Its position in the hardware and overall configuration of the rack depends on how many cards there are between it and the DS01A card.

6.2.8 OUTPUT BUS terminal board

The OutputBus connector is used for any connection of other cards in the DS series with the latter.

6.3 SOFTWARE CONFIGURATION

The card DS16B can be interpreted by the PLC in two ways which can be defined by the user through the selection of the “Equipment” (with the programming package ISaGRAF from the MenuTools -> IO Connection) as **ds16i32** or as **ds16_17** as shown by items 2 and 3 in the diagram.

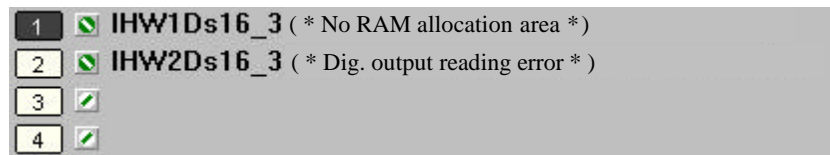
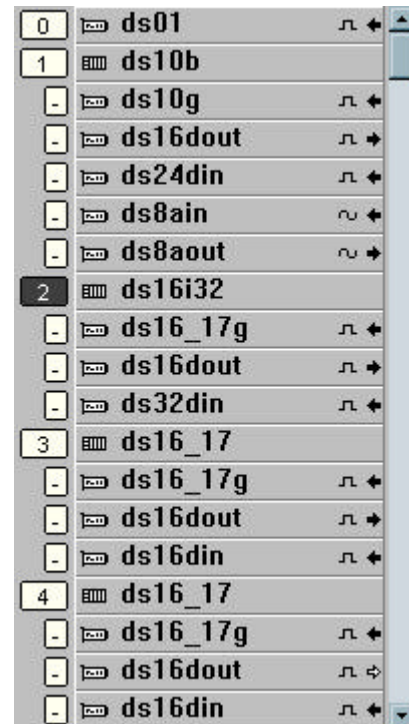
In both cases, however, the card does not allow for specific software settings but only for operational debugging with the following bits:

The first bit indicates that the RAM memory for the allocation of the variables is exhausted.

The second bit informs about any hardware failure in one or more digital outputs. The alarm is set off for open circuit (if the load is smaller than 300mA), for short circuit (the output continues to drive a minimal current while waiting for the short circuit to be removed) or for thermal protection (the component behaves as if there were a short circuit)

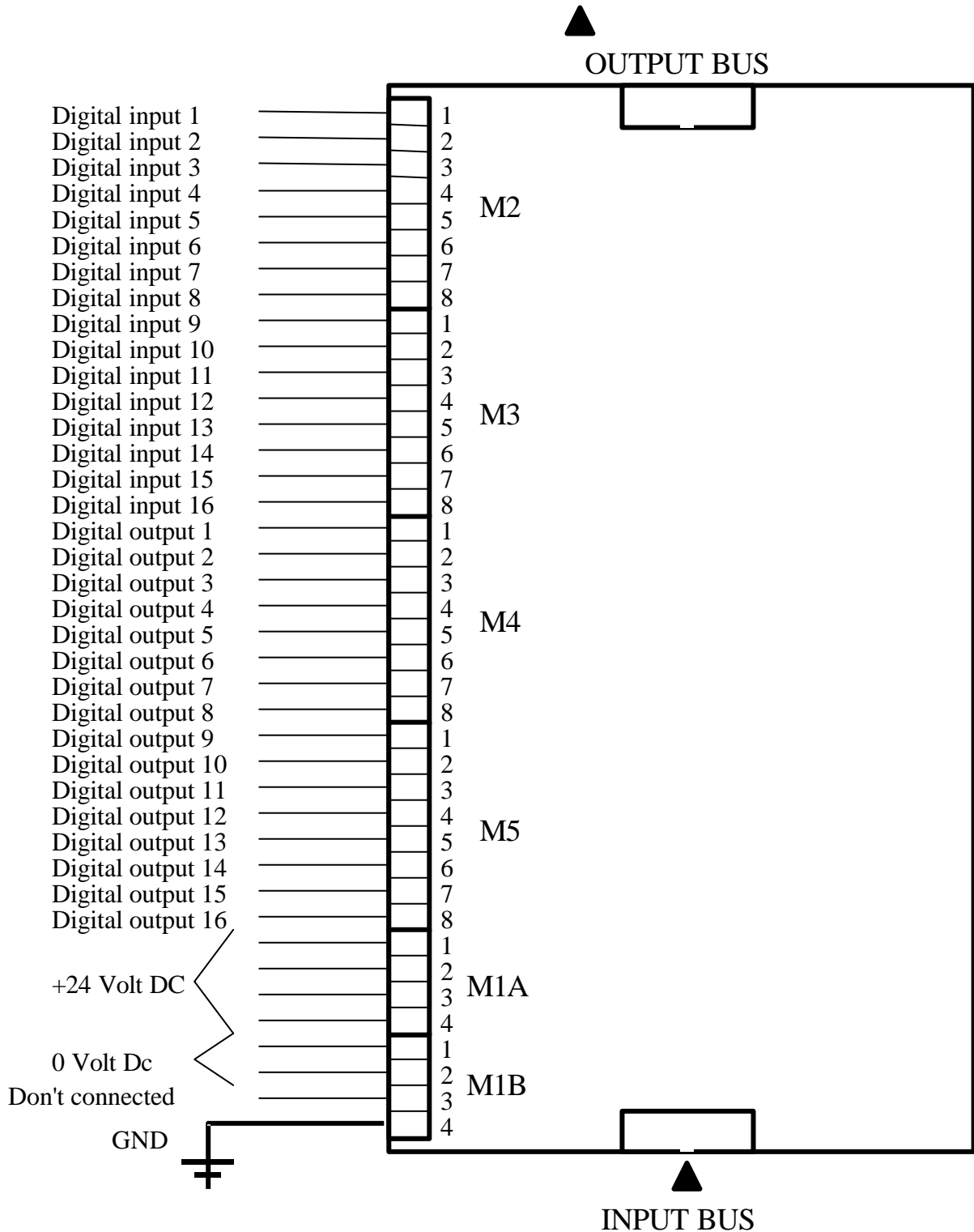
The third bit is for internal use.

The fourth bit is for internal use.



N.B. Bit 2 signals these alarms only if, in the description of the DS01 card, TIMEINTDIG has been selected as > 5 msec or = 0 msec.

6.4 CONNECTION DIAGRAM



7. DS17B CARD

7.1 HARDWARE CHARACTERISTICS

DS17B is a card for the Input-Output management of a digital type. Due to its hardware characteristics it is particularly suitable for the management of pneumatic, oleodynamic solenoid valves or other actuators which absorb up to two Ampere at 24 Vdc, without the support of interface relays.

Its main features are:

- Sixteen Digital Inputs 24Vdc
- Sixteen Digital Outputs 24 Vdc - 2Ampere with repeat reading
- Two interface conn. for serial bus I.M.C.S synchronous

7.2 ELECTRIC CONNECTIONS

The card is connected through the Input Bus ports with other cards of the DS series. From the Bus the cards receives voltages amounting to ± 15 Volt Dc for the powering of its own components, whereas for the connections of the sensors you need to connect the following terminal boards.

7.2.1 M1A terminal board

Terminal board M1A is connected with the powering voltage for the digital inputs and outputs:

Pin 1..... +24 Vdc Powering
Pin 2..... +24 Vdc Powering
Pin 3..... +24 Vdc Powering
Pin 4..... +24 Vdc Powering

7.2.2 M1B terminal board

Terminal board M1B is connected with the zero reference volts for the digital inputs and outputs:

Pin 1..... 0 Volt digital
Pin 2..... 0 Volt digital
Pin 3..... not to be connected
Pin 4..... GND

7.2.3 M2 terminal board

Terminal board M2 is connected with the first digital input “byte”, from pin 1 to pin 8 respectively:

Pin 1..... Digital Input 1
Pin 2..... Digital Input 2
Pin 3..... Digital Input 3
Pin 4..... Digital Input 4
Pin 5..... Digital Input 5
Pin 6..... Digital Input 6
Pin 7..... Digital Input 7
Pin 8..... Digital Input 8

7.2.4 M3 terminal board

Terminal board M3 is connected with the second digital input “byte”, from pin 1 to pin 8 respectively:

Pin 1..... Digital Input 9
Pin 2..... Digital Input 10
Pin 3..... Digital Input 11
Pin 4..... Digital Input 12
Pin 5..... Digital Input 13
Pin 6..... Digital Input 14

Pin 7..... Digital Input 15
Pin 8..... Digital Input 16

7.2.5 M4 terminal board

This is the terminal board for the connection of the first digital output “byte”:

Pin 1..... Digital Output 1
Pin 2..... Digital Output 2
Pin 3..... Digital Output 3
Pin 4..... Digital Output 4
Pin 5..... Digital Output 5
Pin 6..... Digital Output 6
Pin 7..... Digital Output 7
Pin 8..... Digital Output 8

7.2.6 M5 terminal board

This is the terminal board for the connection of the second digital output “byte”:

Pin 1..... Digital Output 9
Pin 2..... Digital Output 10
Pin 3..... Digital Output 11
Pin 4..... Digital Output 12
Pin 5..... Digital Output 13
Pin 6..... Digital Output 14
Pin 7..... Digital Output 15
Pin 8..... Digital Output 16

7.2.7 INPUT BUS terminal board

The InputBus connector serves the purpose of connecting the card to the bus. Its position within the hardware configuration of the rack depends on how many cards there are between it and the DS01A card.

7.2.8 OUTPUT BUS terminal board

The OutputBus connector is used for any connection with other cards of the DS series in a series with the latter.

7.3 SOFTWARE CONFIGURATION

Card DS17B does not allow for particular software settings; it is defined through the selection of the “Equipment” (with the programming package ISaGRAF from the Menu Tools -> IO Connection) as **ds16_17**.

The rack, as shown by the diagram below, provides only operational debugging with the following bits:

The first bit indicates that the RAM memory for the allocation of the variables is exhausted.
The second bit informs about any hardware failure in one or more digital outputs. The alarm is set off for open circuit (if the load is smaller than 300mA), for short circuit (the output continues to drive a minimal current while waiting for the short circuit to be removed) or for thermal protection (the component behaves as if there were a short circuit)

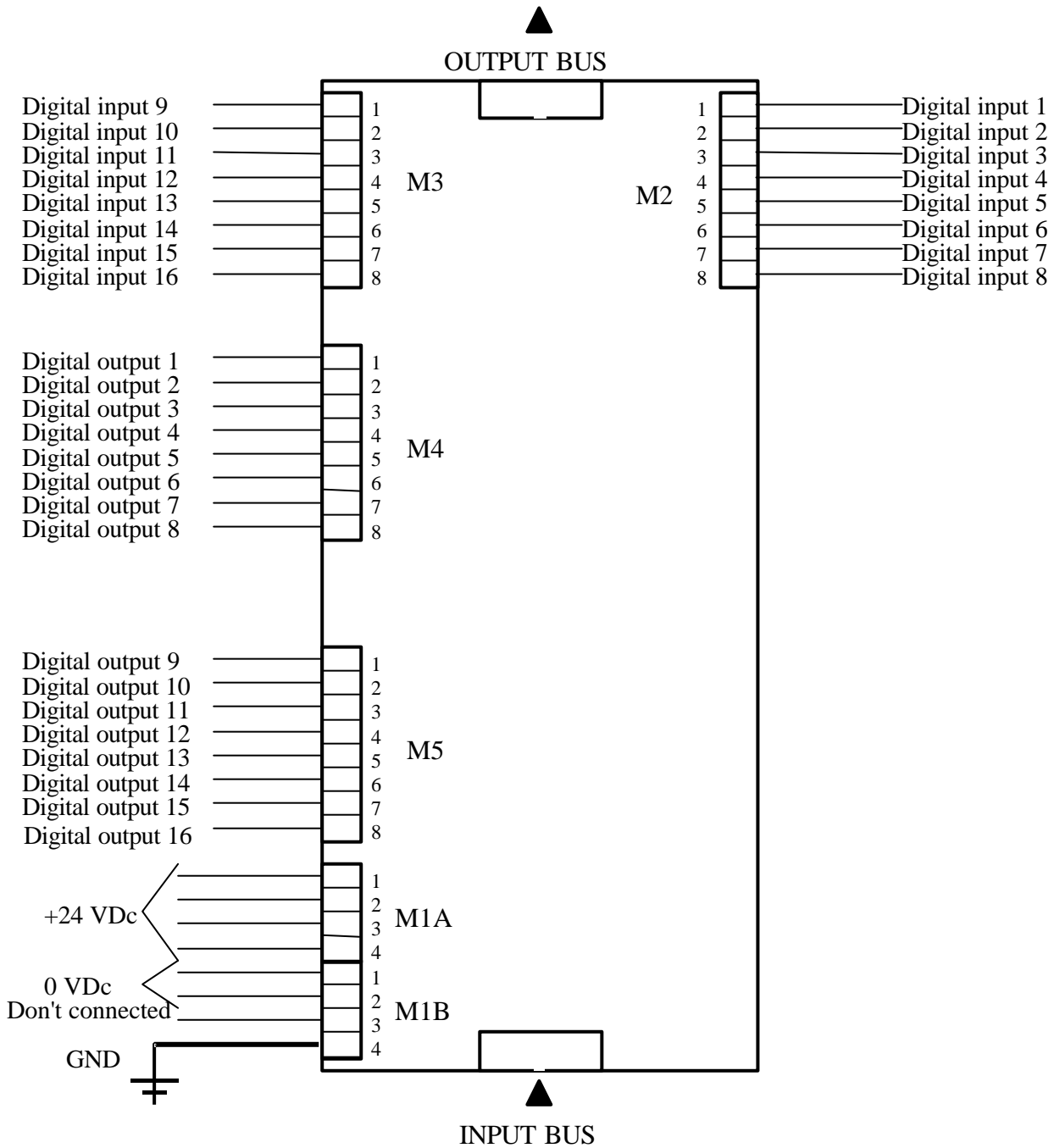
The third bit is not relevant for the user.

The fourth bit is not relevant for the user.

1	<input checked="" type="checkbox"/>	IHW1Ds17_4 (* HW alarm from Ds 17 No allocation area *)
2	<input checked="" type="checkbox"/>	IHW2Ds17_4 (* HW alarm from Ds 17 Dig. output reading error *)
3	<input type="checkbox"/>	
4	<input type="checkbox"/>	

N.B. Bit 2 signals these alarms only if, in the description of the DS01 card, TIMEINTDIG has been selected as > 5 msec or = 0 msec.

7.4 CONNECTION DIAGRAM



8. DS18A CARD

8.1 HARDWARE CHARACTERISTICS

DS18A is a card with the Input-Output management of both analog and digital type, as well as with the control of some incremental encoder inputs. Due to its hardware characteristics it is most effective wherever it is necessary to manage stops up to four axes. Generally speaking, in order to reduce execution times, it is advisable to use the mathematical co-processor (optional) on the card DS01A.

Therefore, to sum up, its main features are:

- Eight Optically isolated Digital Inputs
- Eight Digital Outputs with Relay
- Four Analog Outputs ± 10 Vdc - Res.12bit
- Four incremental encoder Inputs +Top0 +Z0 optically isolated
- Eight Analog Outputs ± 10 Vdc - Ris.12bit
- Two interface conn. for serial bus I.M.C.S synchronous

8.2 ELECTRIC CONNECTIONS

The card is connected through the Bus ports with other cards of the DS series. From the Bus the card receives voltages amounting to ± 15 Volt Dc for the powering of its own components, whereas for the powering of sensors or actuators you need to connect the following terminal boards.

8.2.1 M1 terminal board

Terminal board M1 is connected to the first relay digital output “nibble”. The maximum power allowed on the contact is 1.25 A with max voltage 250 VAC on resistive load:

Pin 1.....	Output Relay 1
Pin 2.....	Output Relay 1
Pin 3.....	Output Relay 2
Pin 4.....	Output Relay 2
Pin 5.....	Output Relay 3
Pin 6.....	Output Relay 3
Pin 7.....	Output Relay 4
Pin 8.....	Output Relay 4

8.2.2 M2 terminal board

Terminal board M2 is connected to the second relay digital output “nibble”.

Pin 1.....	Output Relay 5
Pin 2.....	Output Relay 5
Pin 3.....	Output Relay 6
Pin 4.....	Output Relay 6
Pin 5.....	Output Relay 7
Pin 6.....	Output Relay 7
Pin 7.....	Output Relay 8
Pin 8.....	Output Relay 8

8.2.3 M3 terminal board

Terminal board M3 is connected to the first encoder input. The maximum applicable frequency is 200KHz and the type of input can be LINE-DRIVER (5 Volt), PUSH-PULL or OPEN-COLLECTOR (14 Volt). The counting capacity is 32 bit with hardware reset sequence of the counting.

Pin 1.....	Px 0 mechanical Encoder 1 (+)
Pin 2.....	Px 0 mechanical Encoder 1 (-)
Pin 3.....	Top 0 Encoder 1 (+)
Pin 4.....	Top 0 Encoder 1 (-)
Pin 5.....	Channel A Encoder 1 (+)
Pin 6.....	Channel A Encoder 1 (-)
Pin 7.....	Channel B Encoder 1 (+)
Pin 8.....	Channel B Encoder 1 (-)

8.2.4 M4 terminal board

Terminal board M4 is connected with the second encoder input.

Pin 1	Px 0 mechanical Encoder 2 (+)
Pin 2	Px 0 mechanical Encoder 2 (-)
Pin 3	Top 0 Encoder 2 (+)
Pin 4	Top 0 Encoder 2 (-)
Pin 5	Channel A Encoder 2 (+)
Pin 6	Channel A Encoder 2 (-)
Pin 7	Channel B Encoder 2 (+)
Pin 8	Channel B Encoder 2 (-)

8.2.5 M5 terminal board

Terminal board M5 is connected with the third encoder input.

Pin 1	Px 0 mechanical Encoder 3 (+)
Pin 2	Px 0 mechanical Encoder 3 (-)
Pin 3	Top 0 Encoder 3 (+)
Pin 4	Top 0 Encoder 3 (-)
Pin 5	Channel A Encoder 3 (+)
Pin 6	Channel A Encoder 3 (-)
Pin 7	Channel B Encoder 3 (+)
Pin 8	Channel B Encoder 3 (-)

8.2.6 M6 terminal board

Terminal board M6 is connected with the fourth encoder input.

Pin 1	Px 0 mechanical Encoder 4 (+)
Pin 2	Px 0 mechanical Encoder 4 (-)
Pin 3	Top 0 Encoder 4 (+)
Pin 4	Top 0 Encoder 4 (-)
Pin 5	Channel A Encoder 4 (+)
Pin 6	Channel A Encoder 4 (-)
Pin 7	Channel B Encoder 4 (+)
Pin 8	Channel B Encoder 4 (-)

8.2.7 M7 terminal board

Terminal board M7 is connected with the first digital input “nibble”, respectively from pin 1 to pin 8. The inputs are of the optically isolated type.

Pin 1	Digital Input 1
Pin 2	Digital Input 1
Pin 3	Digital Input 2
Pin 4	Digital Input 2
Pin 5	Digital Input 3
Pin 6	Digital Input 3
Pin 7	Digital Input 4
Pin 8	Digital Input 4

8.2.8 M8 terminal board

Terminal board M8 is connected with the second digital input “nibble”, respectively from pin 1 to pin 8.

Pin 1.....	Digital Input 5
Pin 2.....	Digital Input 5
Pin 3.....	Digital Input 6
Pin 4.....	Digital Input 6
Pin 5.....	Digital Input 7
Pin 6.....	Digital Input 7
Pin 7.....	Digital Input 8
Pin 8.....	Digital Input 8

8.2.9 M9 terminal board

Terminal board M9 is connected with the analog outputs from 1 to 4, respectively from pin 1 to pin 8:

Pin 1.....	+ Analog Output 1
Pin 2.....	- Analog Output 1
Pin 3.....	+ Analog Output 2
Pin 4.....	- Analog Output 2
Pin 5.....	+ Analog Output 3
Pin 6.....	- Analog Output 3
Pin 7.....	+ Analog Output 4
Pin 8.....	- Analog Output 4

8.2.10 M10 terminal board

Terminal board M10 is connected with the analog outputs from 5 to 8, respectively from pin 1 to pin 8:

Pin 1.....	+ Analog Output 5
Pin 2.....	- Analog Output 5
Pin 3.....	+ Analog Output 6
Pin 4.....	- Analog Output 6
Pin 5.....	+ Analog Output 7
Pin 6.....	- Analog Output 7
Pin 7.....	+ Analog Output 8
Pin 8.....	- Analog Output 8

8.2.11 M11 terminal board

This is the terminal board for the connection of the four analog inputs.

Pin 1.....	+ Analog Input 1
Pin 2.....	+ Analog Input 1
Pin 3.....	+ Analog Input 2
Pin 4.....	+ Analog Input 2
Pin 5.....	+ Analog Input 3
Pin 6.....	+ Analog Input 3

Pin 7..... + Analog Input 4
Pin 8..... + Analog Input 4

8.2.12 M12 terminal board

At the moment this terminal board is not managed, therefore there is no need to connect it.

Pin 1..... not connected
Pin 2..... not connected
Pin 3..... not connected
Pin 4..... not connected

8.2.13 INPUT BUS terminal board

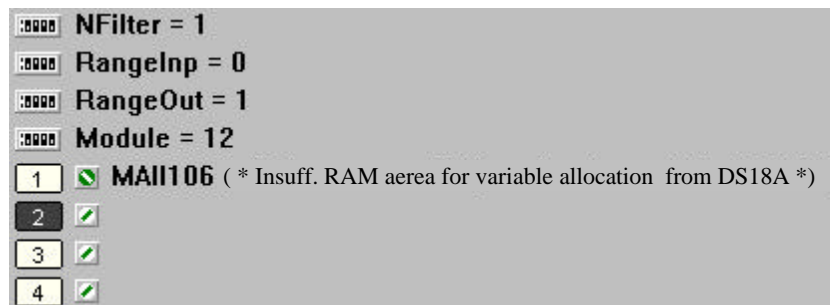
The InputBus connector is used to connect the card to the bus. Its position in the overall hardware configuration of the rack depends on how many cards there are between it and the DS01A card.

8.2.14 OUTPUT BUS terminal board

The OutputBus connector is used for any connection of other cards in the DS series with the latter.

8.3 SOFTWARE CONFIGURATION

Some of the configurations can be defined by the user with the programming package ISaGRAF from the Menu Tools -> IO Connection through the following settings:



Nfilter: allows for the setting of the number of readings to calculate the average analog input.

RangeInp: Defines the type of reading of analog inputs, 0 = only posit. (0..10V) 1 = Bipolar. (+/- 10V) Val. to PLC in mV

RangeOut: Defines the type of writing of the analog outputs, 0 = only posit. (0..10V) 1 = Bipolar. (+/- 10V) Val. to PLC in mV

Module: defines the number of cycles for the reading and activation of Analog I/O.

Apart from the parameters that can be defined by the user, this page provides a brief debugging of the card by means of four virtual digital inputs.

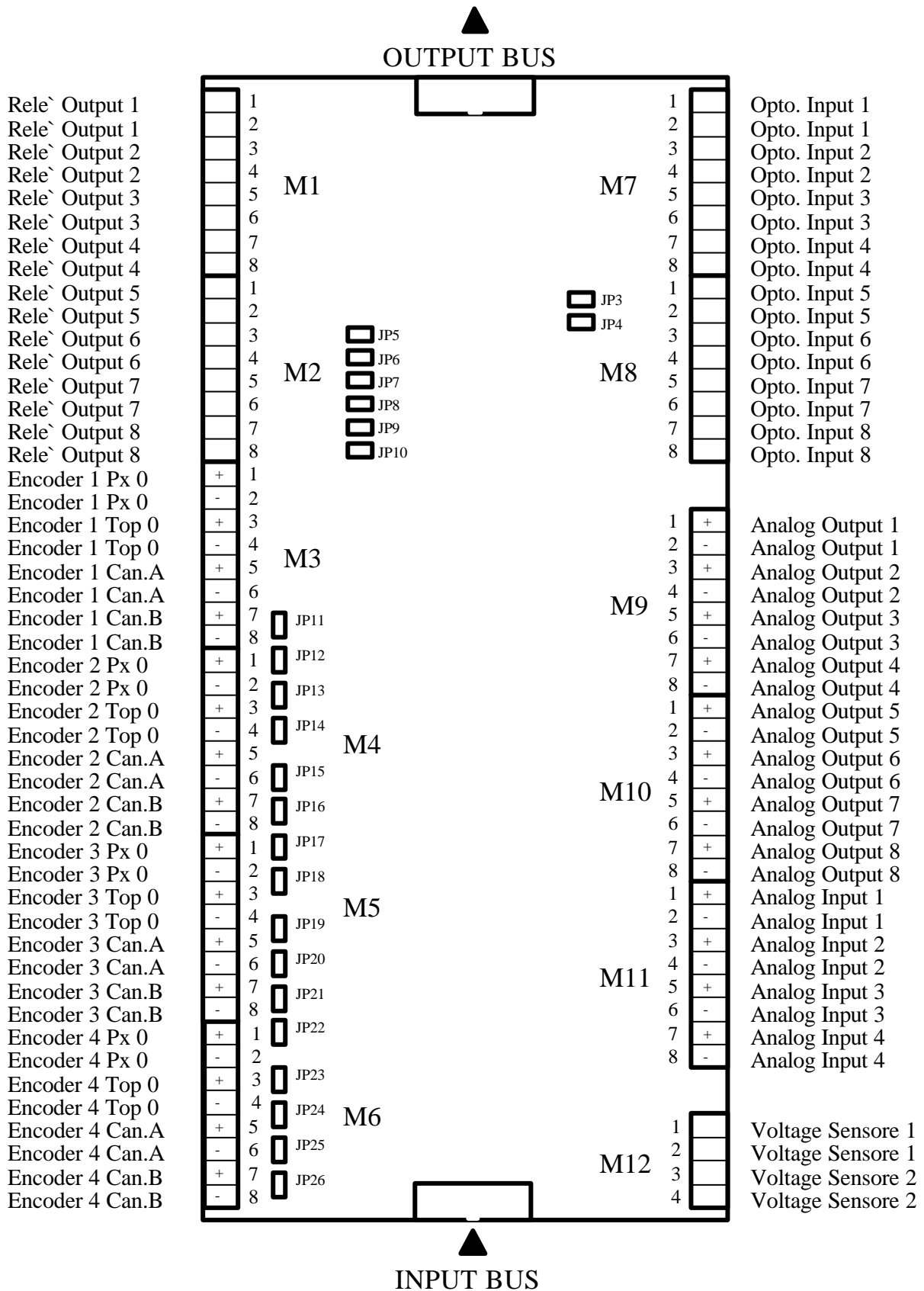
The first bit indicates that the RAM memory for the allocation of variables is exhausted.

The second bit is for internal use.

The third bit is for internal use.

The fourth bit is for internal use.

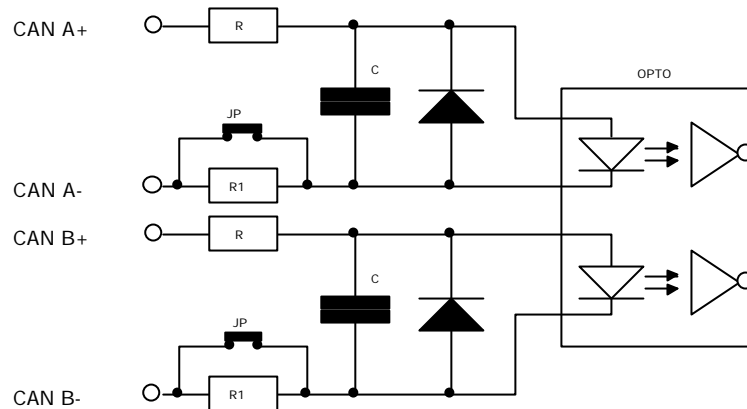
8.4 CONNECTION DIAGRAM



8.5 ENCODER CONNECTION

In the diagram below you see the encoder input circuit; it consists of an optoisolator with in series some resistors to be by-passed or not through the appropriate jumpers that are placed on the card.

N.B. The encoder must be able to supply a minimum current of 10mA.



These jumpers have the following functions:

- JP3 Selects polarity TOP0 Encoder 3
- JP4 Selects polarity 0 Mechanical Encoder 3
- JP5 Selects polarity 0 Mechanical Encoder 0
- JP6 Selects polarity TOP0 Encoder 0
- JP7 Selects polarity 0 Mechanical Encoder 1
- JP8 Selects polarity TOP0 Encoder 1
- JP9 Selects polarity 0 Mechanical Encoder 2
- JP10 Selects polarity TOP0 Encoder 2

- JP11 Sel. voltage 0 Mechanical Axis 0 Open = 15Vdc Closed = 5Vdc
- JP12 Sel. voltage TOP0 Encoder 0 Open = 15Vdc Closed = 5Vdc
- JP13 Sel. voltage Chan.A Encoder 0 Open = 15Vdc Closed = 5Vdc
- JP14 Sel. voltage Chan.B Encoder 0 Open = 15Vdc Closed = 5Vdc
- JP15 Sel. voltage 0 Mechanical Axis 1 Open = 15Vdc Closed = 5Vdc
- JP16 Sel. voltage TOP0 Encoder 1 Open = 15Vdc Closed = 5Vdc
- JP17 Sel. voltage Chan.A Encoder 1 Open = 15Vdc Closed = 5Vdc
- JP18 Sel. voltage Chan.B Encoder 1 Open = 15Vdc Closed = 5Vdc

- JP19 Sel. voltage 0 Mechanical Axis 2 Open = 15Vdc Closed = 5Vdc
- JP20 Sel. voltage TOP0 Encoder 2 Open = 15Vdc Closed = 5Vdc
- JP21 Sel. voltage Chan.A Encoder 2 Open = 15Vdc Closed = 5Vdc
- JP22 Sel. voltage Chan.B Encoder 2 Open = 15Vdc Closed = 5Vdc
- JP23 Sel. voltage 0 Mechanical Axis 3 Open = 15Vdc Closed = 5Vdc
- JP24 Sel. voltage TOP0 Encoder 3 Open = 15Vdc Closed = 5Vdc
- JP25 Sel. voltage Chan.A Encoder 3 Open = 15Vdc Closed = 5Vdc
- JP26 Sel. voltage Chan.B Encoder 3 Open = 15Vdc Closed = 5Vdc

9. DS26A CARD

9.1 HARDWARE CHARACTERISTICS

DS26A is a card used to provide the powering necessary to the IMCS system, keeping a galvanic insulation with respect to the 24Vdc powering voltage.

To sum up, its main characteristics are the following:

- One powering Input 18 – 30 Vdc
- One Output +5 Vdc 2.5A
- One Output + 15 Vdc 0.5A
- One Output - 15 Vac 0,5A
- One interface conn. for serial bus I.M.C.S

N.B. The connection cable with the IMCS bus or with the connector of the DS01A card should not be longer than 30 cm.

9.2 ELECTRIC CONNECTIONS

9.2.1 M1 terminal board

Terminal board M1 is connected with the input powering. The voltage should be 24 Vdc and it is galvanically separated from the output voltages:

Pin 1..... Ground connection
Pin 2..... Connection 0V
Pin 3..... Connection 24 Vdc

9.2.2 M2 terminal board

Terminal board M2 has at its disposal the necessary voltages for the IMCS bus.

Pin 1..... Output 5 Vdc
Pin 2..... Output + 15 Vdc
Pin 3..... Output - 15 Vdc
Pin 4..... Output 0 V (5 V)
Pin 5..... Output 0 V (15 V)
Pin 6..... Ground connection

9.3 CONNECTION DIAGRAM

