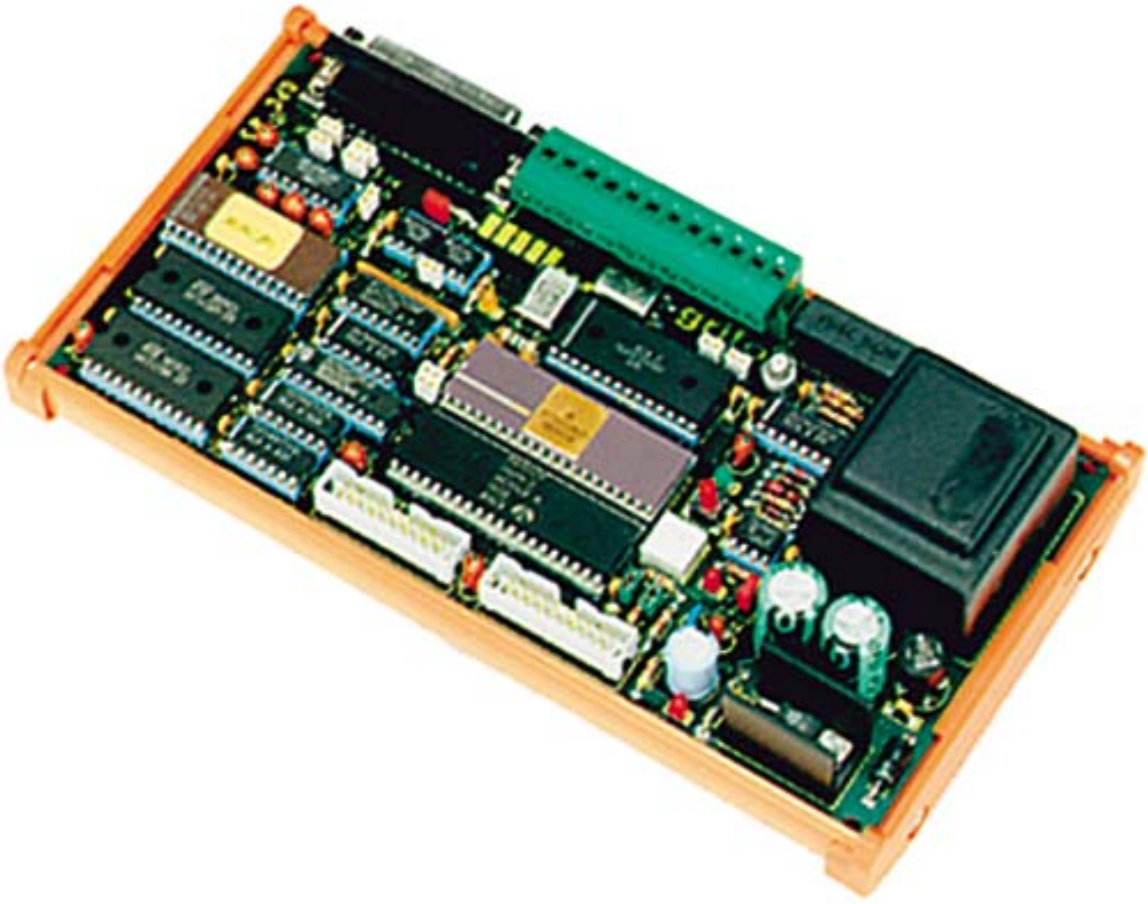
GPC® 05

General Purpose Controller 6805

TECHNICAL MANUAL



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GPC® 05 Edition 5.10 *Rel. 05 June 2003*

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TECHNICAL MANUAL

Microprocessor 146805 MOTOROLA; 8K EPROM and 4K SRAM backed with Lithium; 32 I/O TTL lines; RTC; serial line in RS 232 or 422-485; Watch Dog; 1 Timer Counter; on board power supply. Low consumption; suitable for rails DIN 46277-1 and 3.

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GENERAL INDEX

FIGURES INDEX

INTRODUCTION

The use of these devices has turned - IN EXCLUSIVE WAY - to specialized personnel.

The purpose of this handbook is to give the necessary information to the cognizant and sure use of the products. They are the result of a continual and systematic elaboration of data and technical tests saved and validated from the manufacturer, related to the inside modes of certainty and quality of the information.

GENERAL FEATURES

CPU card **GPC® 05** is a very powerful control and management module capable to solve several indutrial automation problemetics. The card features standard BLOCK formati size 100x195 mm. It can be mounted directly on an isolating rail support type DIN 46277-1 and DIN 46277-3. This allows to install the electronic card with electromechanic structures in the electric panel, eliminating the typical overprices for installation to the field, like Rack, Back Pannel, etc.

The card features the microprocessor MC146805 of MOTOROLA which is provided with several internal peripherals to enhance module functionality. Development and debugging of application programs can be done with only the **GPC® 05**, because all the hardware essential for a first approach is already on the board and software packages to easy its use are available. The on board serial port is enouch to reach and use its remarkable resources.

The card is provided with its own supply section so it can be supplied directlIn addition, the card features a set of comfortable **Abaco®** standard connectors to interface to the external world also using I/O BLOCK modules or the user-made hardware.

- Card format 100x195 mm. for rails DIN 46277-1 and DIN 46277-3
- CPU MC146805 of Motorola with quartz 5 MHz
- 12 K of RAM/EPROM of which 4 K RAM and 8 K of EPROM
- Backed SRAM module with Real Time Clock
- 32 lines of I/O TTL completely manageable through peripheral 65C21
- 1 Timer Counter resolution 16 bit with compare functions
- 1 serial line settable as RS 232; RS 422 or as RS 485 with Baud Rate settable up to 19200 Baud
- On board UART is 65C51 Rockwell
- Watch Dog software manageable and disconnectable
- Power supply: from mains 230 Vac; or +5 Vdc; 55 mA
- Availability of languages and high level environments for firmware develpment; with a Monitor-
- Debugger in the on board EPROM; Assembler; HTC-05; C compiler;etc.

Here follows a description of the board's sections and the operations they perform. To easily locate such section on verify their connections please refer to figure 1.

CPU

GPC® 05 uses processor MOTOROLAMC146805E2:

- 8 bit CPU;
- 112 bytes of internal SRAM;
- 16 I/O lines bit level settable;
- 8 bit Timer Counter, with programmable prescaler;
- wide set of istructions, enhanced bit management;
- code area optimization;
- very low consumption;

For further information, please refer to specific documentation of the manufacturing company or to appendix C of this manual.

Memories

Board can have up to 12 K of SRAM/EPROM, divided in 8 K EPROM and 4 K RAM. According to the application, the board can be provided with backed SRAM, when data keeping is requested with no power supply. **GPC® 05** has two sockets for static SRAM (IC 16 and IC 17); each can keep:

- no device;
- SRAM 2 Kx8: 6116 or compatible;
- backed SRAM 2 Kx8 : MK48Z02 or compatible;
- backed SRAM 2 Kx8 + backed Real Time Clock: MK48T02 or compatible;

With Real Time Clock, by software date and time can be managed. Memory devices are allocated in microprocessor addressing space by a specific circuitery. For further information, please refer to chapters “HARDWARE DESCRIPTION” and “PERIPHERAL DEVICES SOFTWARE DESCRIPTION”.

Clock devices

GPC® 05 features two different clocks for CPU (5 MHz) and baud rate generator (3.6864 MHz). This allows to change CPU clock without having to change the software and to obtain best performances in communication.

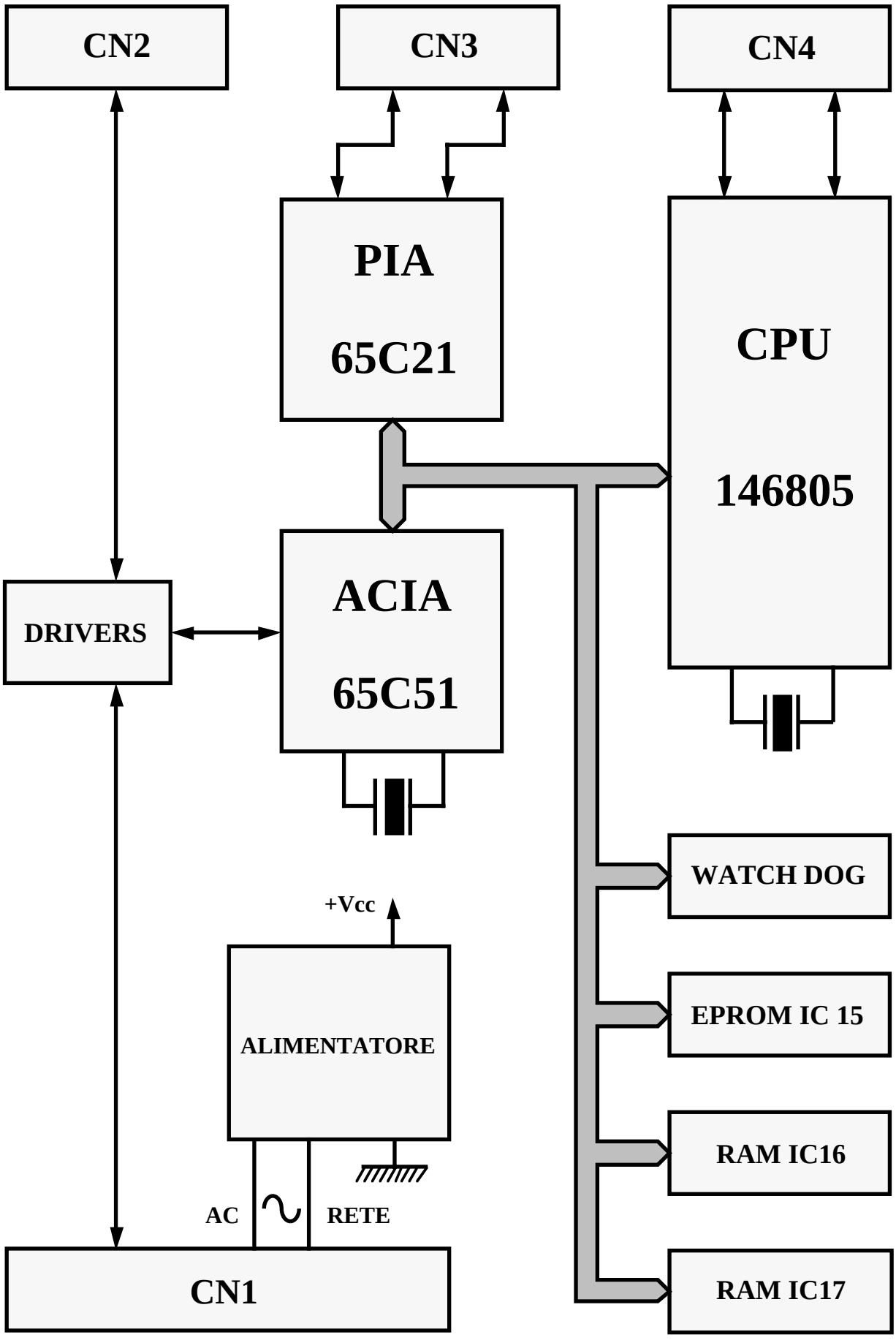

FIGURE 1 : BLOCK DIAGRAM

Serial communication

Seriale communication is completely software manageable, baud rate can be up to 38400 Baud.
It can be set by programming on board ACIA 65C51 di cui la scheda é provvista, so for further information, please refer to specific documentation of the manufacturing company.
By hardware, through a set of comfortable jumpers, it is possible to select amongst Full Duplex or Half Duplex and RS 232, RS 422 or RS 485.

Power supply

GPC® 05 has on board power supply.
A specific circuit generates all the voltages needed by on board electronic starting from mains 220 Vac.
This section reduces the overall card consumption, this allows it to supply loads not greater than 200 mA on +5 Vcc.
Providing external +5 Vcc power supply to **GPC® 05** through connector CN1, this limit can change.
.

Peripheral devices

GPC® 05 is designed for control automation.
Its on board components solve problems of this field:

-PIA 65C21: two 8 bit parallel ports, up to 16 TTL logic I/O lines, direction bit-level settable.
This allows non-intelligent peripheral management also when communication handshake is software managed.
It can be programmed through four registers in CPU addressing space.

- ACIA 65C51: peripheral that manages one serial line.
It can be used to communicate to any system with a line in RS 232, RS 422 or RS 485.
By software, baud rate, data bits, stop bits, parity and hardware handshakes status can be set.
This can be doneprogramming four registers in CPU addressing space.

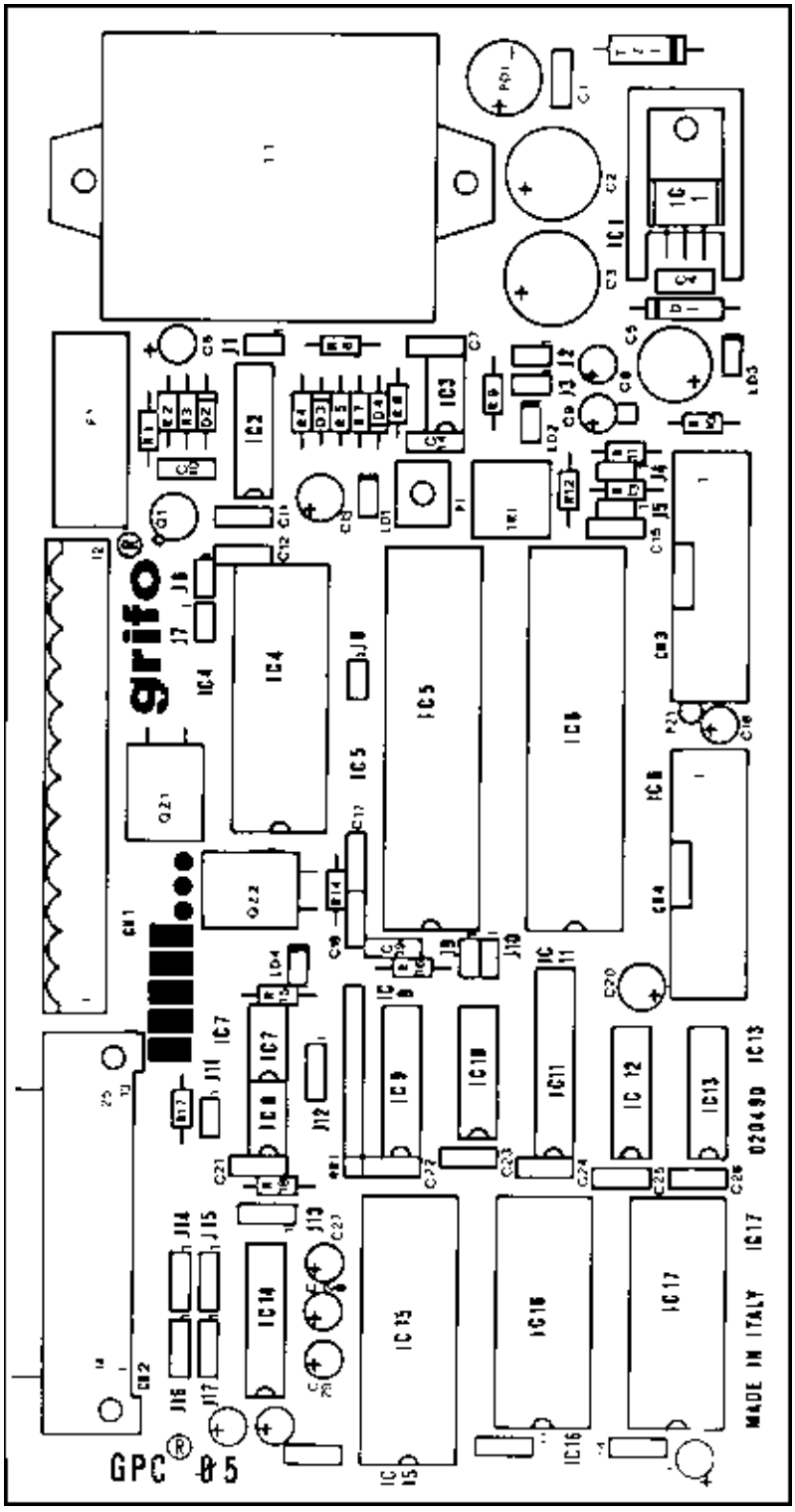

FIGURE 2 : COMPONENTS MAP

- RTC MK48T02: 2 K SRAM module provided with Real Time Clock that manages automatically date and time.
This component is optional (as said in chapter “Memory devices”), backed by internal battery and completely software managed, by programming eight registers in CPU addressing space.
For further information, please refer to specific documentation of the manufacturing company.

Watch Dog

GPC® 05 has one Watch Dog that allows to exit infinite loops or other anomamous conditions if used. It is an astable circuit with intervent time form about 2 ms up to 370 ms, giving extremely high safety to overall system.
It is completely software managed, by programming specific registers in CPU addressing space.
Intervent time can be changed by user request, modifing a specific RC network.

Control logic

All registers and peripheral on the board are mapped by a specific control logic circuitery that allocates them in CPU addressing space.
For further information, please refer to chapter “Peripheral mapping”.
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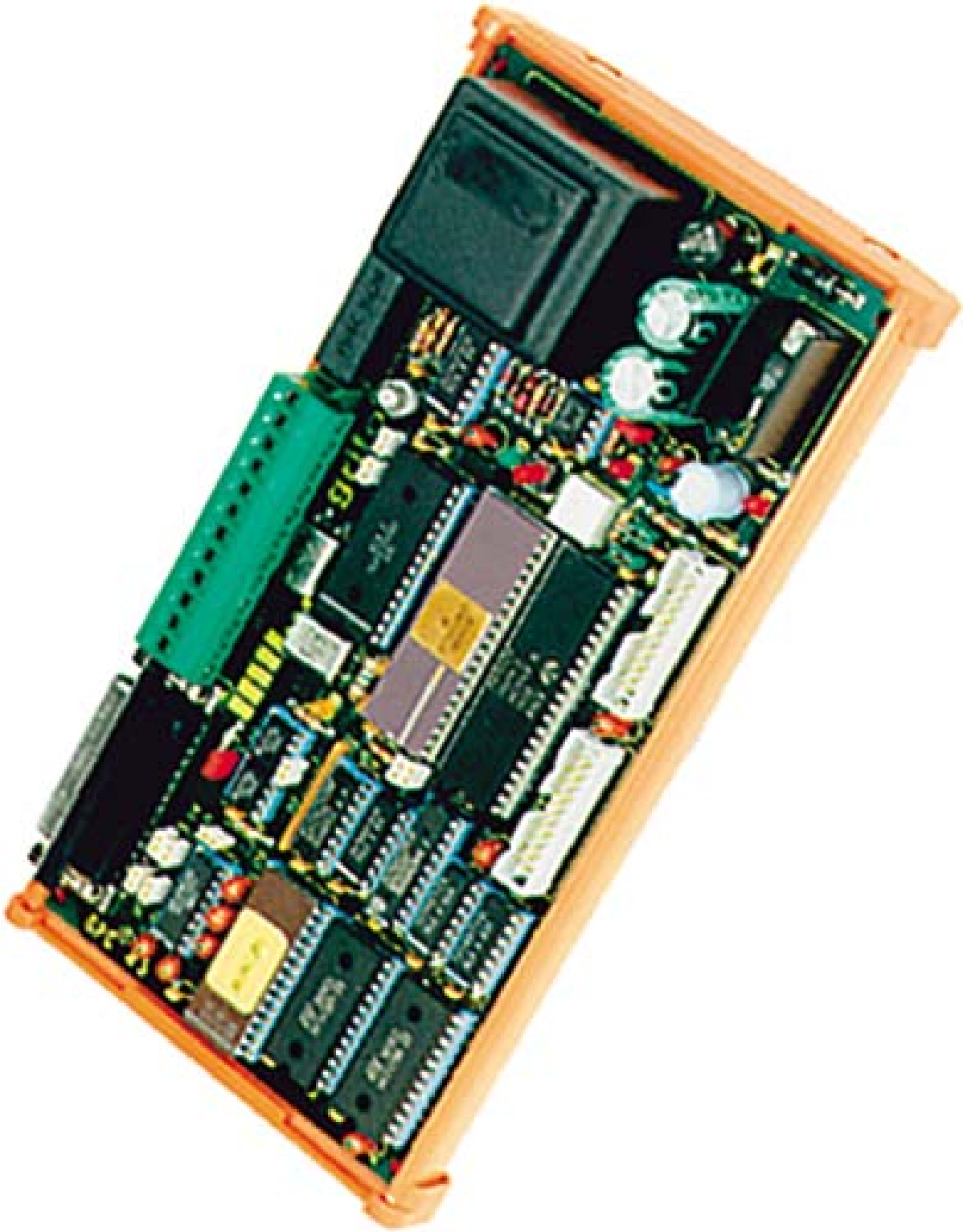


FIGURE 3 : CARD PHOTO GPC® 05

TECNICAL FEATURES

General features

Resources	16 I/O programmable TTL (146805) 16 I/O programmable TTL (65C21) 1 Timer Counter with 8 bit (146805) 1 bidirezional line RS 232, RS 422 or RS 485 1 astable Watch Dog hardware 1 local reset key 1 Real Time Clock
Memory addressable	IC 15: EPROM 2764 (8 K x 8) IC 16: RAM da 8 K x 8 IC 17: RAM da 8 K x 8
CPU	MOTOTOROLA MC146805E2

Physical features

Size	EUROCARD Format: 100 x 200 mm
Weight	540 g
Connectors	CN1: 12 pins quick release screw termianl connector CN2: 25 pns D type female CN3: 20 pins low profile vertical M CN4: 20 pins low profile vertical M
Temperature range	from 10 to 40 Centigrad degreeses
Umidità relativa	from 20% up to 90% (without condense)

Caratteristiche elettriche

Power supply	220 Vac; 50 Hz
Fuse	50 mA; 250 V fast
Voltage for electronic	+5 Vcc
Current consumption	70 mA

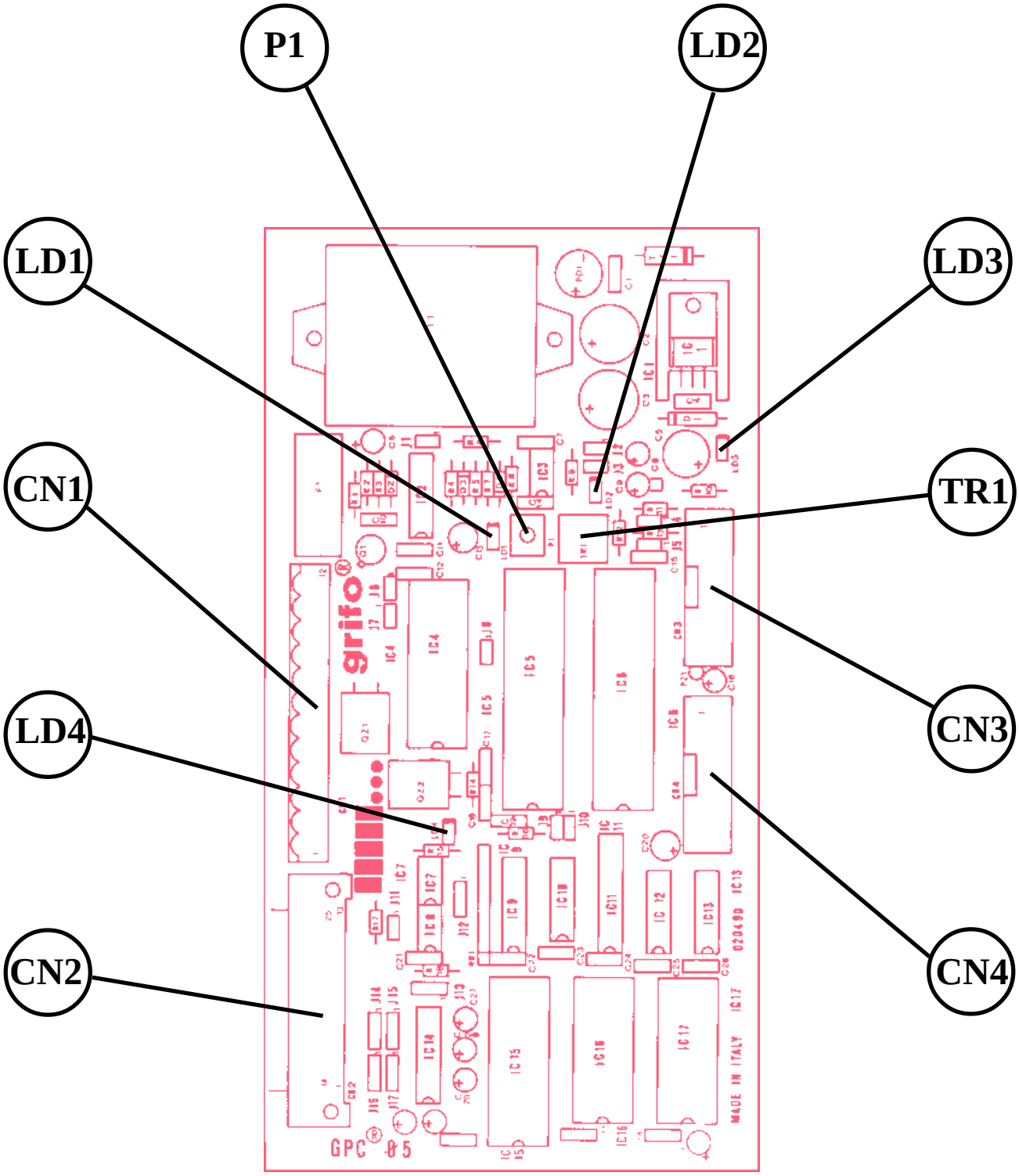


FIGURE 4 : CONNETTORS, LEDS, TRIMMER, RESET KEY, ETC. LOCATION .

INSTALLATION

In this chapter there are the information for a right installation and correct use of the card. The user can find the location and functions of each connectors, LEDs, jumpers, trimmers, etc. and some explanatory diagrams.

ConneCTIONS

The **GPC®05** module has 4 connectors that can be linkeded to other devices or directly to the field, according to system requirements. In this paragraph there are connectors pin out, a short signals description (including the signals direction) and connectors location (see figures 4, 8, 10 and 16).

CN1 - Quick release screw terminal connector

CN1 is a 12 pins quick release screw terminal connector.
CN1 allows to provide power supply (AC or DC) and use the serial line both in RS 232 and in RS 422 or RS 485.

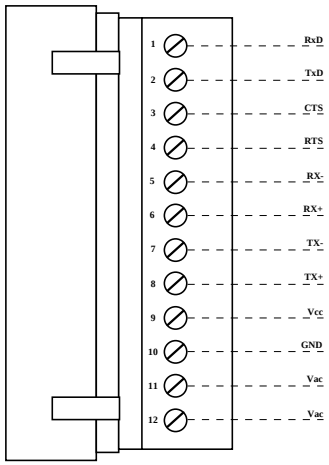


FIGURE 5 : CN1 - QUICK RELEASE SCREW TERMINAL CONNECTOR

Signals descripion:

RxD = I - Receive Data RS 232.
TxD = O - Trasmit Data RS 232.
CTS = I - Clear To Send RS 232.
RTS = O - Request To Send RS 232.
RX- = I - Receive Data Negative RS 422-485
RX+ = I - Receive Data Positive RS 422-485.
TX- = O - Trasmit Data Negative RS 422-485.
TX+ = O - Trasmit Data Positive RS 422-485.
Vcc = I/O - +5 Vcc stabilized power supply.
GND = - Ground line.
Vac = I - Mains power supply 220 Vac.

CN2 - Connector RS 232

CN2 is a D type 25 pins female connector, that carries RS 232 signals.
Signals location on this connector depends on jumper J14, J15, J16, J17.
As described in paragraph "3 pins jumpers", they allow to select the interface between DTE o DCE.
Following figure shows DTE pin out, where the 4 above mentioned jumpers are connected this way:

J14 -> 1-2; J15 -> 1-2; J16 -> 1-2; J17 -> 1-2

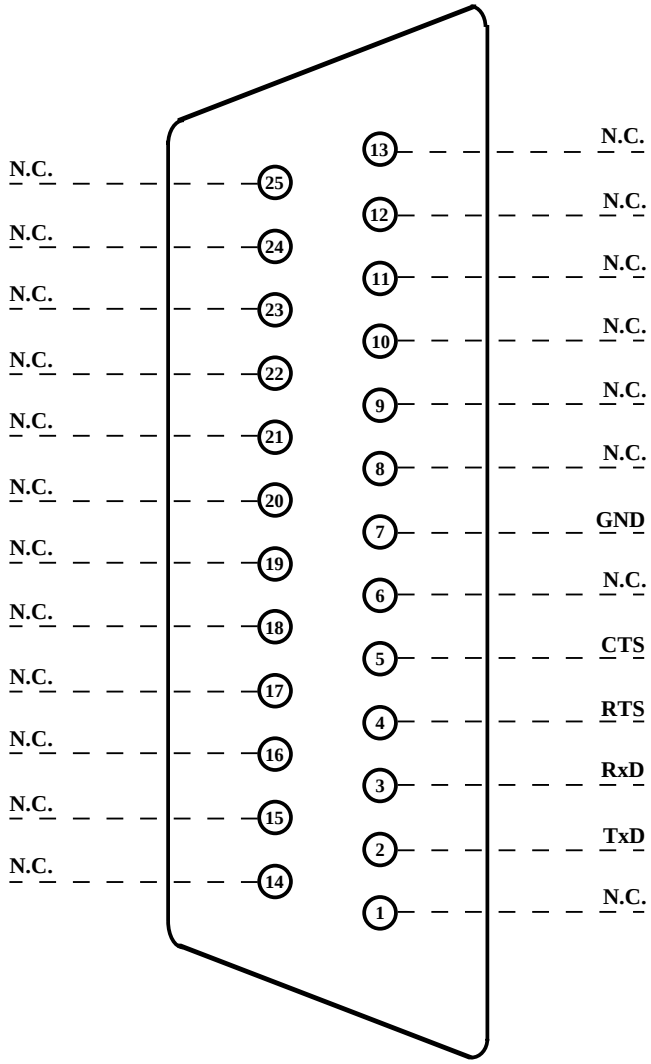


FIGURE 6 : CN2 - CONNECTOR RS 232

Signals description:

RxD = I - Receive Data RS 232.
TxD = O - Trasmit Data RS 232.
CTS = I - Clear To Send RS 232.
RTS = O - Request To Send RS 232.
GND = - Ground.
N.C. = - Not Connected.

CN3 - Connector for I/O of PIA 65C21

Connector CN3 (20 pins low profile) connectes programmable interface PIA 65C21 and the field through two parallel 8 bit ports
Signals on this connector are TTL.

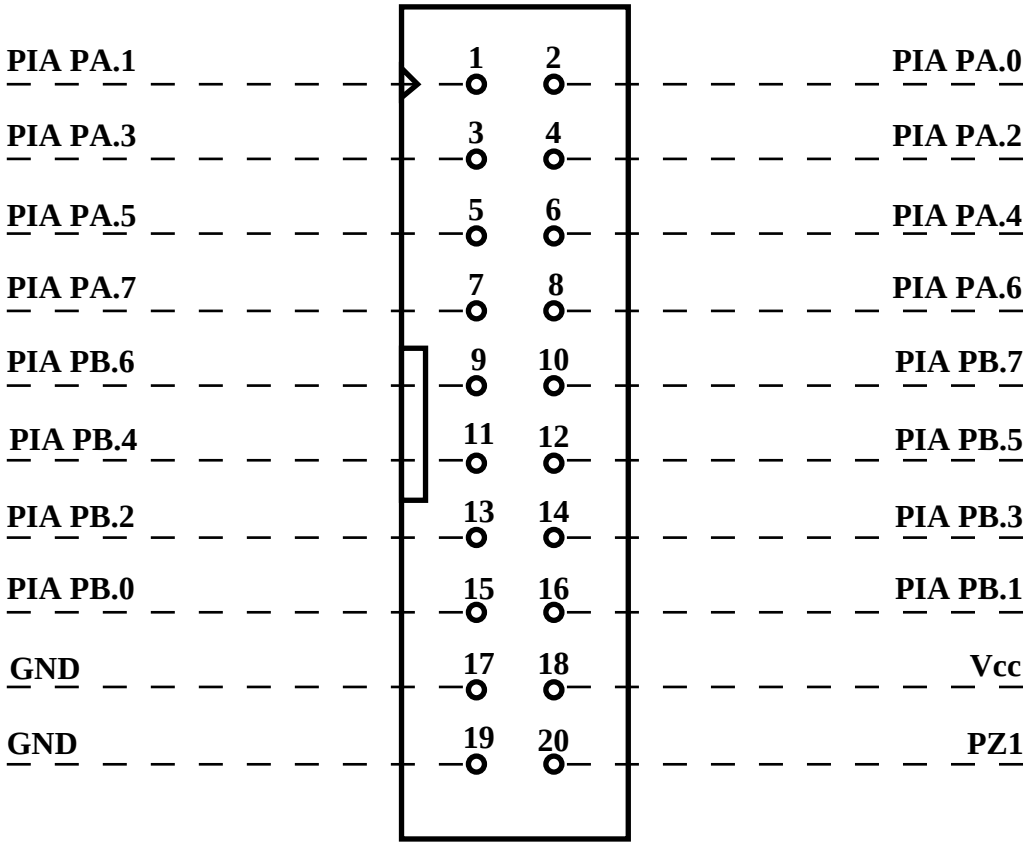


FIGURE 7 : CN3 - CONNECTOR FOR I/O OF PIA 65C21

Signals description:

PIA PA.n = I/O- n-th signal port A of PIA 65C21.
PIA PB.n = I/O- -th signal port B of PIA 65C21.
GND = - Ground.
Vcc = O- Power supply +5 Vcc.
PZ1 = - Pod PZ1 available to the user.

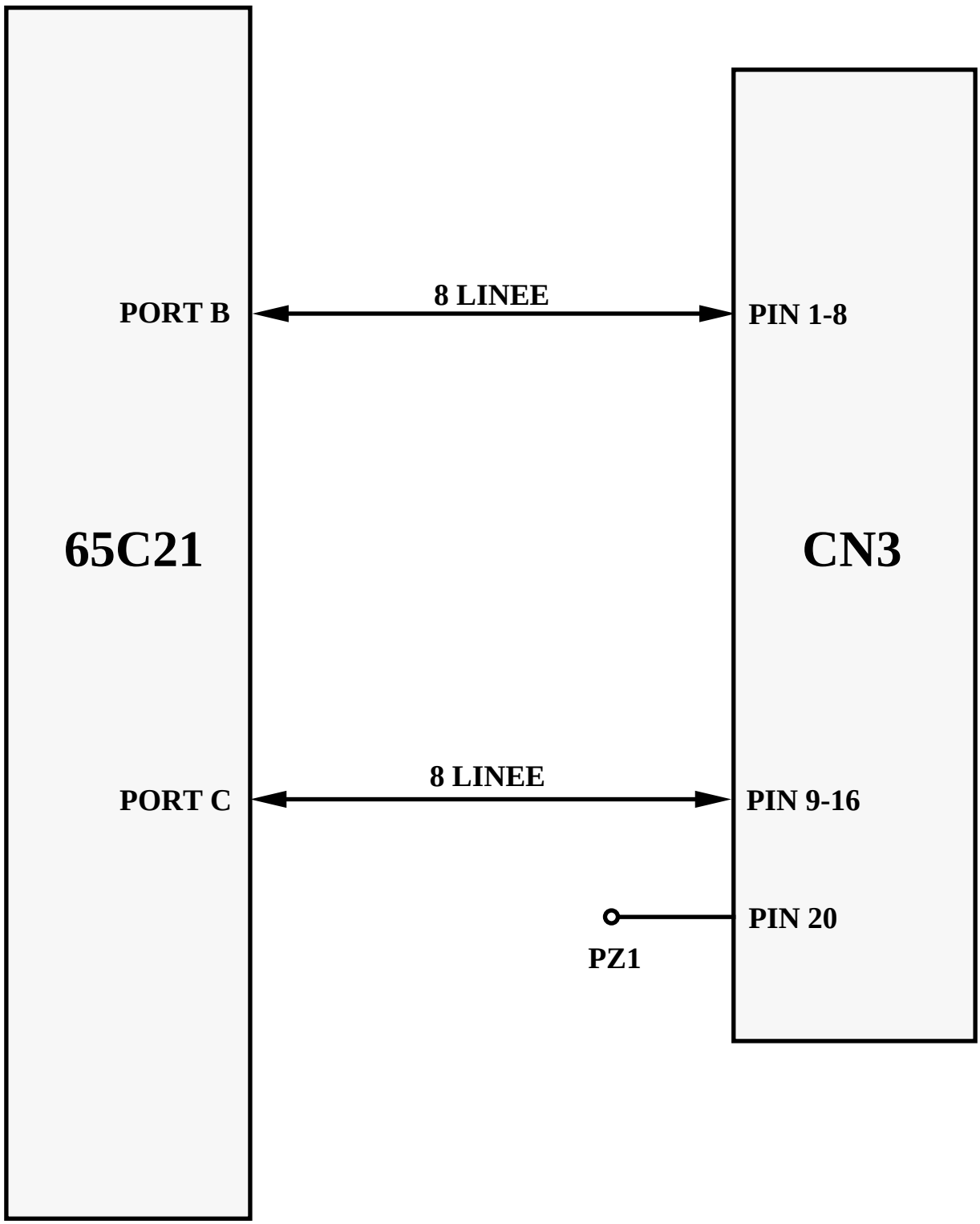


FIGURE 8 : BLOCK DIAGRAM OF I/O 65C21

CN4 - Connector for I/O of MC146805

Connector CN4 (20 pins low profile) connectes programmable interface MC146805 and the field through two parallel 8 bit ports, A and B.
There are also an input for Timer Counter and and interrupt line.
Signals on this connector are TTL.

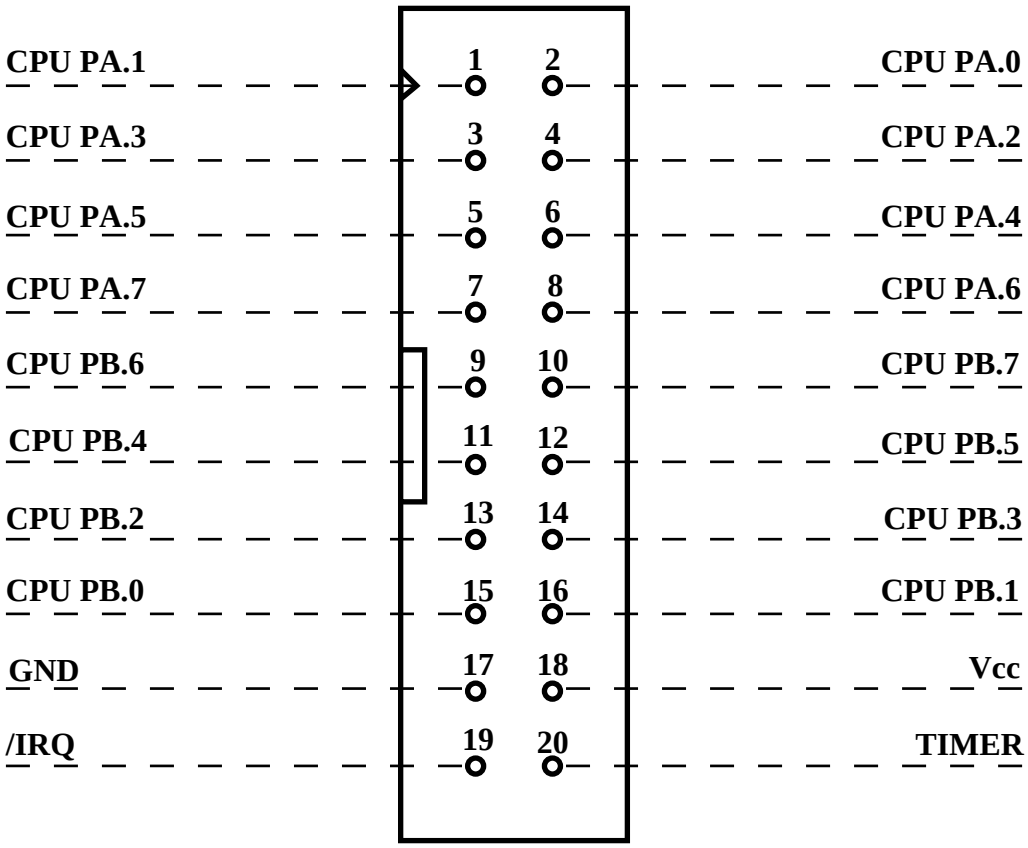


FIGURE 9 : CN4 - CONNECTOR FOR I/O OF MC146805

Signals description:

CPU PA.n = I/O- n-th signal port A of CPU MC146805.
CPU PB.n = I/O- n-th signal port B of CPU MC146805.
GND = - Ground.
Vcc = O- Power supply +5 Vcc.
TIMER = I - Input for Timer Counter of CPU MC146805.
/IRQ = I - External interrupt of CPU MC146805.

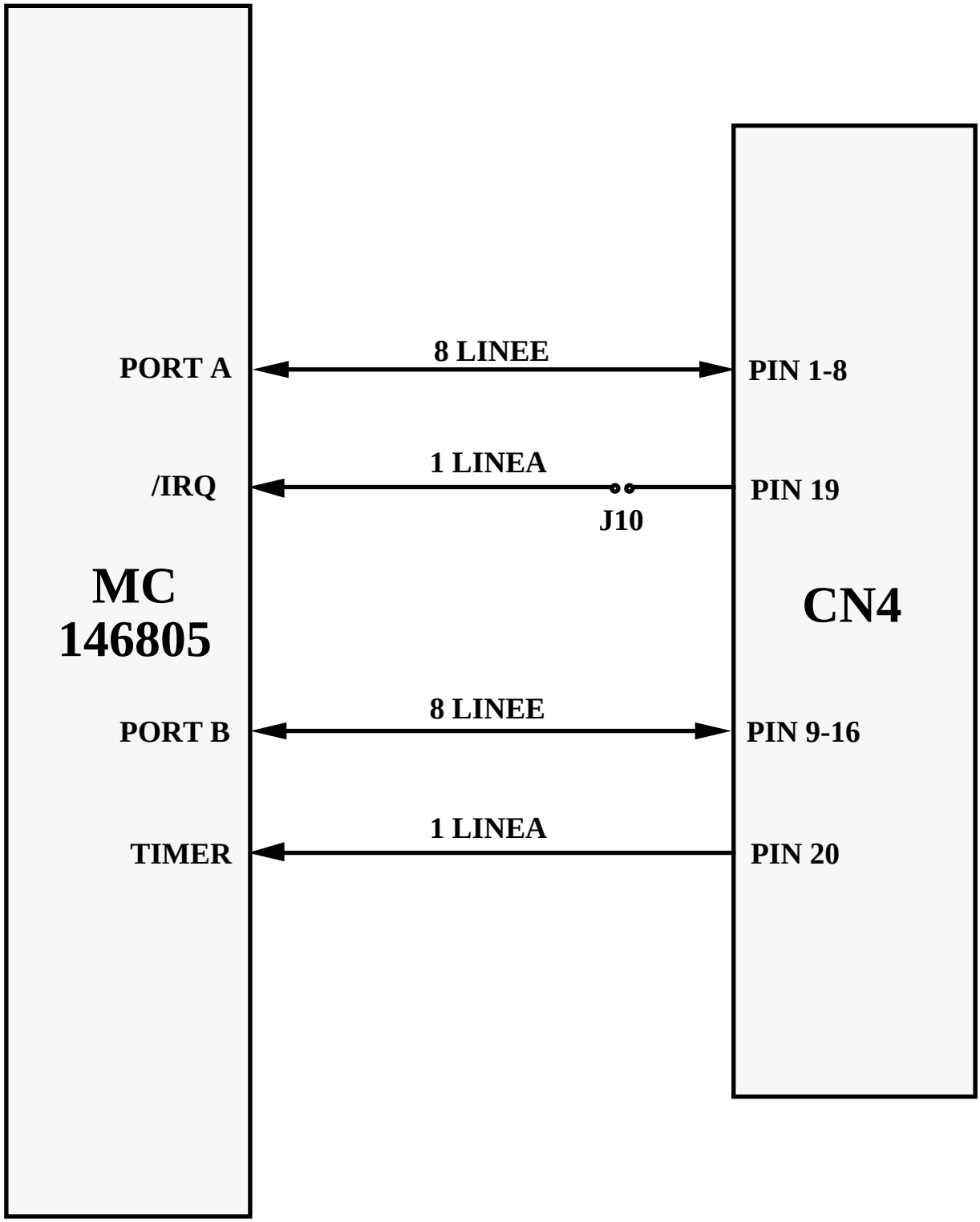


FIGURE 10 : BLOCK DIAGRAM OF I/O MC146805 CPU

Visual signalations

GPC® 05 is provided with four LEDs to signal status conditions:

LD1 - Green, is lit when a software retrigger of Watch Dog happens.

LD2 - Red, is lit when Watch Dog intervents.

LD3 - Red, is lit when +5 Vcc power supply is present.

LD4 - Yellow, shows status of handshake /DTR managed by ACIA 65C51. Active status (low) lits the LED and viceversa.

The main function of LEDs is to inform the user about card status, with a simple visual indication and in addition to this, LEDs make easier the debug and test operations of the complete system. To recognize the LED location on the card, please refer to figure 4.

Reset key

Key P1 activates /RESET signal on the board.
After pressing and releasing P1, EPROM program restarts from a total reset condition.
Main purpose of this key is exiting from infinite loop conditions.

Trimmers

GPC® 05 features a trimmer TR1 that regulates Watch Dog intervent time.
Counter clockwise terminal position is the longest intervent time, variation rate is about 1:24.
Please remark that intervent time setting is related also to jumpers J2 and J3 (for further information please refer to paragraph “Watch Dog intervent time selection”).
To easily locate trimmer please refer to figure 4.

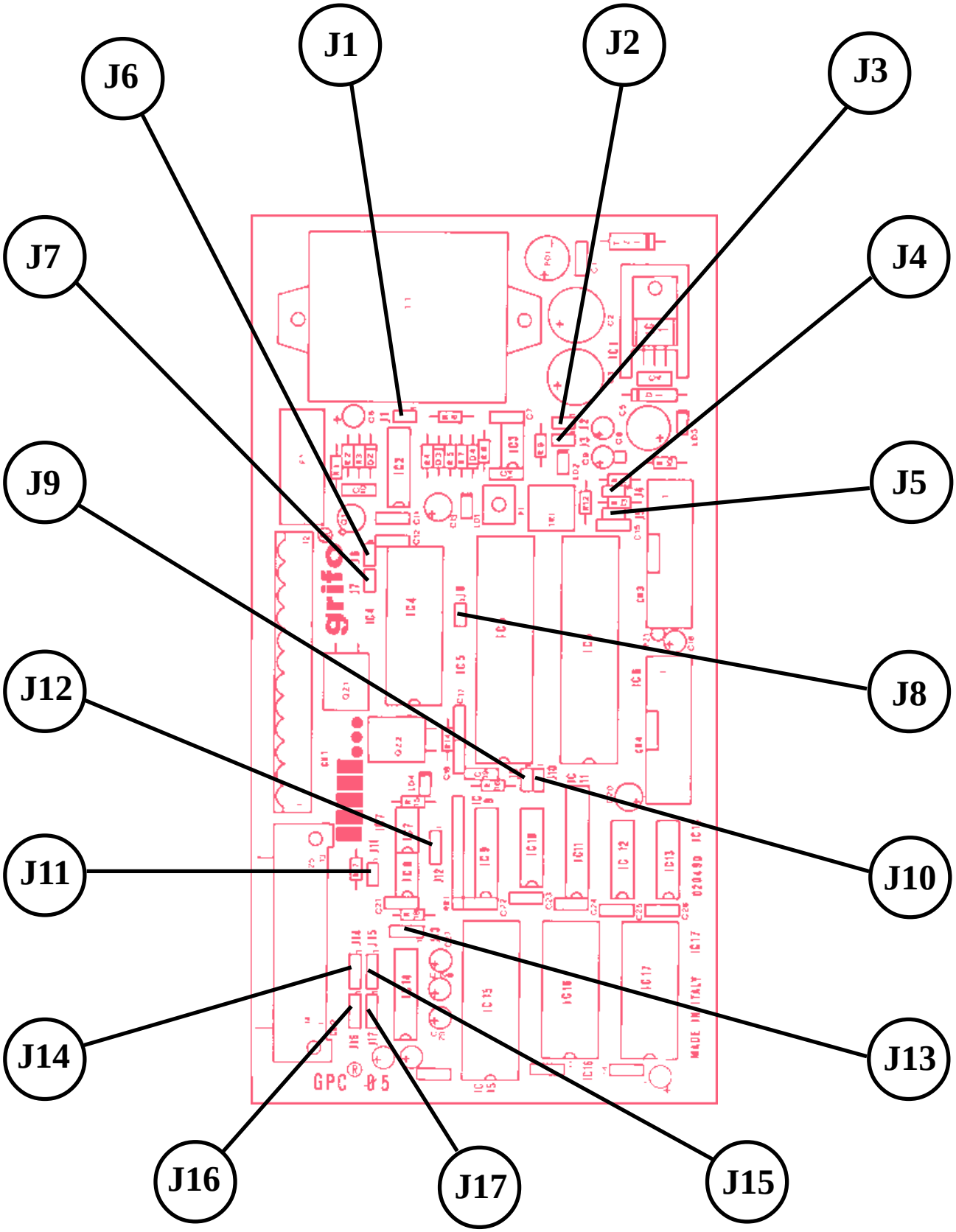


FIGURE 11 : JUMPERS LOCATION

Jumpers

On **GPC® 05** there are 17 jumpers for card configuration. Connecting these jumpers, the user can define for example peripheral devices functionality, serial communication interface and so on. Here below is the jumpers list, location and function:

JUMPERS	N PINS	PURPOSE
J1	2	Connects Watch Dog to Reset
J2	2	Selects "long" intervent time for WD
J3	2	Selects "short" intervent time for WD
J4	2	Sets status of control signal CA1 of PIA 65C21
J5	2	Sets status of control signal CB1 of PIA 65C21
J6	2	Sets status of handshake /DCD of ACIA 65C51
J7	2	Sets status of handshake /DSR of ACIA 65C51
J8	2	Sets status of handshake /CTS of ACIA 65C51, in case of RS 422 or RS 485 communication
J9	2	Connects CPU Timer Counter in "instruction count" mode
J10	2	Connects /IRQ of CPU to connector CN4
J11	2	Connects termination resistor to reception signal of RS 422-485
J12	3	Selects Half Duplex or Full Duplex in RS 422 or RS 485 communication
J13	3	Selects serial comunication between RS 232 or RS 422-485
J14	3	Selects interface DTE or DCE for signal CTS, on CN2
J15	3	Selects interface DTE or DCE for signal RTS, on CN2
J16	3	Selects interface DTE or DCE for signal RxD, on CN2
J17	3	Selects interface DTE or DCE for signal TxD, on CN2

FIGURE 12 : JUMPERS SUMMARIZING TABLE

The following tables describe all the right connections of **GPC® 05** jumpers with their relative functions.
To recognize these valid connections, please refer to the board printed diagram (serigraph) or to figure 2 of this manual, where the pins numeration is listed; for recognizing jumpers location, please refer to figure 11 again.
The "*" denotes the default connection, or on the other hand the connection set up at the end of testing phase, that is the configuration the user receives.

2 pins Jumpers:

JUMPERS	CONNECTION	PURPOSE	DEF.
J1	not connected	Does not connect Watch Dog to Reset	*
	connected	Connects Watch Dog to Reset	
J2	not connected	Does not select "long" intervent time for Watch Dog	
	connected	Selects "long" intervent time for Watch Dog	*
J3	not connected	Does not select "short" intervent time for Watch Dog	
	connected	Selects "short" intervent time for Watch Dog	*
J4	not connected	Does not connect control signal CA1 of PIA 65C21 to ground	
	connected	Connects control signal CA1 of PIA 65C21 to ground	*
J5	not connected	Does not connect control signal CB1 of PIA 65C21 to ground	
	connected	Connects control signal CB1 of PIA 65C21 to ground	*
J6	not connected	Does not connect handshake /DCD of ACIA 65C51 to ground, keeping it deactivated (=high)	
	connected	Connects handshake /DCD of ACIA 65C51 to ground, setting it activated (=low)	*
J7	not connected	Does not connect handshake /DSR dell'ACIA 65C51 to ground, keeping it deactivated (=high)	
	connected	Connects handshake /DSR of ACIA 65C51 to ground, setting it activated (=low)	*

FIGURE 13 : 2 PINS JUMPERS TABLEPART 1

JUMPERS	CONNECTION	PURPOSE	DEF.
J8	not connected	Does not connect handshake /CTS of ACIA 65C21 to ground (for RS 232)	*
	connected	Connects handshake /CTS of ACIA 65C21 to ground, setting it active (low) when serial line is set in RS 422-485	
J9	not connected	Does not connect TIMER of CPU to signal LI, levinag it connected only to pin 20 of CN4	*
	connected	Connects TIMER of CPU to signal LI, to use Timer Counter as instructions counter	
J10	not connected	Does not connect interrupt /IRQ of CPU to pin 19 of CN4	*
	connected	Connects interrupt /IRQ of CPU to pin 19 of CN4, to manage interrupts from the field	
J11	not connected	Does not connect termination resistor to RS 422 or RS 485 reception line	*
	connected	Connects termination resistor to RS 422 or RS 485 reception line	

FIGURE 14 : 2 PINS JUMPERS TABLE PART 2

3 pins Jumpers:

JUMPERS	CONNECTION	PURPOSE	DEF.
J12	no connection	Selects Full Duplex communication on RS 422-485 serial line, with transmission driver always enabled	
	position 1-2	Selects Full Duplex communication on RS 422-485 serial line, transmission driver can be disabled	*
	position 2-3	Selects Half Duplex communication on RS 422-485 serial line	
J13	position 1-2	Selects serial communication in RS 422-485	
	position 2-3	Selects serial communication in RS 232	*
J14	position 1-2	Connects handshake CTS to pin 5 of CN2	*
	position 2-3	Connects handshake CTS to pin 4 of CN2	
J15	position 1-2	Connects handshake RTS to pin 4 of CN2	*
	position 2-3	Connects handshake RTS to pin 5 of CN2	
J16	position 1-2	Connects handshake RxD to pin 3 of CN2	*
	position 2-3	Connects handshake RxD to pin 2 of CN2	
J17	position 1-2	Connects handshake TxD to pin 2 of CN2	*
	position 2-3	Connects handshake TxD to pin 3 of CN2	

FIGURE 15 : 3 PINS JUMPERS TABLE

The "*" denotes the default connection, or on the other hand the connection set up at the end of testing phase, that is the configuration the user receives.

Serial communication selection

GPC® 05 is provided with a serial line that can be bufferd in RS 232 o in RS 422-485.
This selection is made by hardware, moving jumpers and installing drivers, as described.
By software, all parameters of physic protocol and handshake signals can be changed programming the registers of ACIA 65C51.
Here follow a description of all possible configurations, please remark that jumpers not mentioned here do not affect communication/

- J13 in position 2-3 -> serial line in RS 232.
In this case jumpers J6 and J7 can be set as the user prefers and can be managed as generic digital inputs, while handshake /DTR allows to manage LED LD4 as an activity LED.

- J13 in position 1-2 -> serial line in RS 422-485. In questo caso i jumpers J6 e J7 sono ancora In this case jumpers J6 and J7 can be set as the user prefers and can be managed as generic digital inputs, while handshake /DTR has the following meaning:

  - J12 not connected -> allows to manage LED LD4 as an activity LED.
    RS 422-485 communication is in Full Duplex (4 wires) and only point-to-point, infact transmission driver is always actived.

  - J12 in connection 1-2 -> communication is in Full Duplex (4 wires) for a multi point system, infact transmission driver can be disabled activing (setting to low) handshake /DTR. This latter has abilitation function and its status is visualized by LD4.

  - J12 in connection 2-3 -> communication is in Half Duplex (2 wires) for a multi point system, infact one driver can be enabled in reception or transmission, manageing handshake /DTR.
    This latter sets communication direction (active = low = reception, deactived = high = transmission), its status is visualized by LD4.

In case of serial line in RS 422-485, jumper J11 can connect termination resistor on reception line. This resistor must be always present in point-to-point systems, while in case of multi-point connections it must be connected olny in the farest boards, that is on the edges of the commmunication line.
Jumper J8 can be connected to keep actived handshake /CTS in case the driver for RS 232 (IC 14) is not mounted.
If this latter component is present, jumper J8 MUST be connected to avoid electric conflicts.

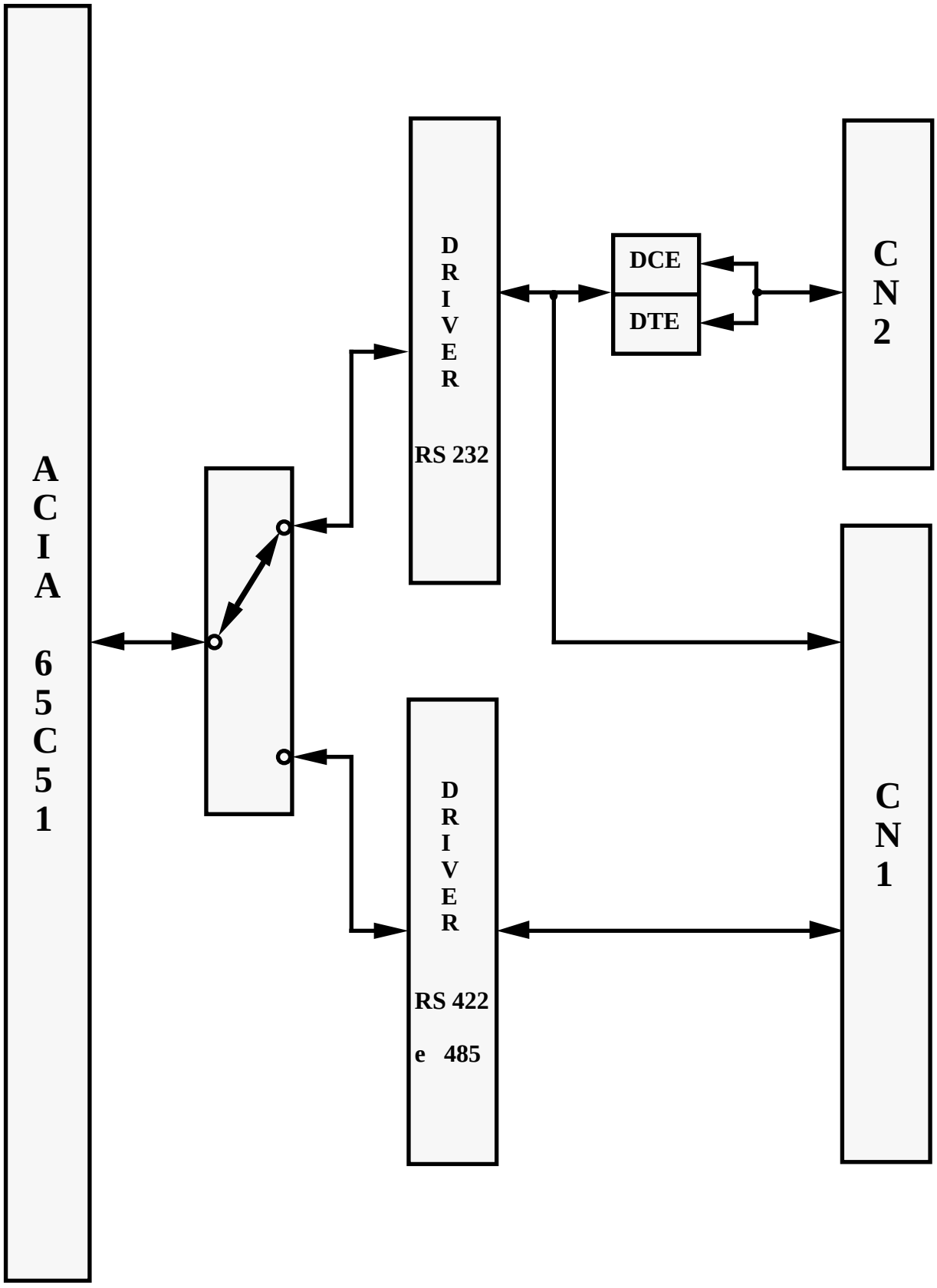


FIGURE 16 : SERIAL COMMUNICATION BLOCK DIAGRAM

Pin Out connector CN2

Connector CN2 features RS 232 serial line signals.
Jumpers J14, J15, J16 and J17 allow to select DTE (Data Terminal Equipment) or DCE (Data Comunication Equipment) pin out. In detail:

J14, J15, J16, J17 in connection 1-2 -> interface DTE
J14, J15, J16, J17 in connection 2-3 -> interface DCE

This allows to connect **GPC® 05** directly to terminals, modem, computers, etc. without having to use specific communication cables.

Watch Dog intervent time selection

GPC® 05 has an efficent and easy to manage Watch Dog circuitery.
By hardware, intervent time, that is time between to consecutive triggers, can be selected.
Here follows the description on how to obtain these times, please remark that C. means connected, N.C. means not connected, X means that it doesn't care, MINIMUM means counter clockwise terminal position of the trimmer and MAXIMUM means clockwise terminal position of the trimmer.

J1	J2	J3	TR1	TIME
N.C.	X	X	X	-
C.	N.C.	N.C.	MINIMUM	1,5 ms
C.	N.C.	N.C.	MAXIMUM	36 ms
C.	N.C.	C.	MINIMUM	2,7 ms
C.	N.C.	C.	MAXIMUM	66 ms
C.	C.	N.C.	MINIMUM	15 ms
C.	C.	N.C.	MAXIMUM	350 ms
C.	C.	C.	MINIMUM	16 ms
C.	C.	C.	MAXIMUM	360 ms

FIGURE 17 : WATCH DOG INTERVENT TIMES SELECTION TABLE

Please refer to chapter “HARDWARE DESCRIPTION” for information about Watch Dog retrigger.

HARDWARE DESCRIPTION

IntroduCTION

In this chapter are reported all information about card use, related to hardware features of **GPC® 05**. For example, the registers addresses, the memory allocation and peripheral devices software management are described below.

ON board resources mapping

The card devices addresses are managed from a control logic, realized with CMOS programamble logic.
This control logic allocates memory and peripheral devices with very low power consumption.
Control logic allocates all devices in 8K bytes of memory of course avoiding CPU reserved addresses.
Summarizing the control logic allocates:

- 8 KByte of EPROM on IC 15
- 2 KByte of RAM on IC 16 (+ eventual RTC)
- 2 KByte of RAM on IC 17 (+ eventual RTC)
- PIA 65C21
- ACIA 65C51
- Retrigger of Watch Dog

The addresses listed here and in the following paragraphs cannot be reallocated.
Following block diagram indicates only addresses of external devices; please refer to manufacturer documentation for further information.

Memories mapping

GPC® 05 manages up to 12 KByte of memory, paged into the memory space by control logic. Following configurations are supported:

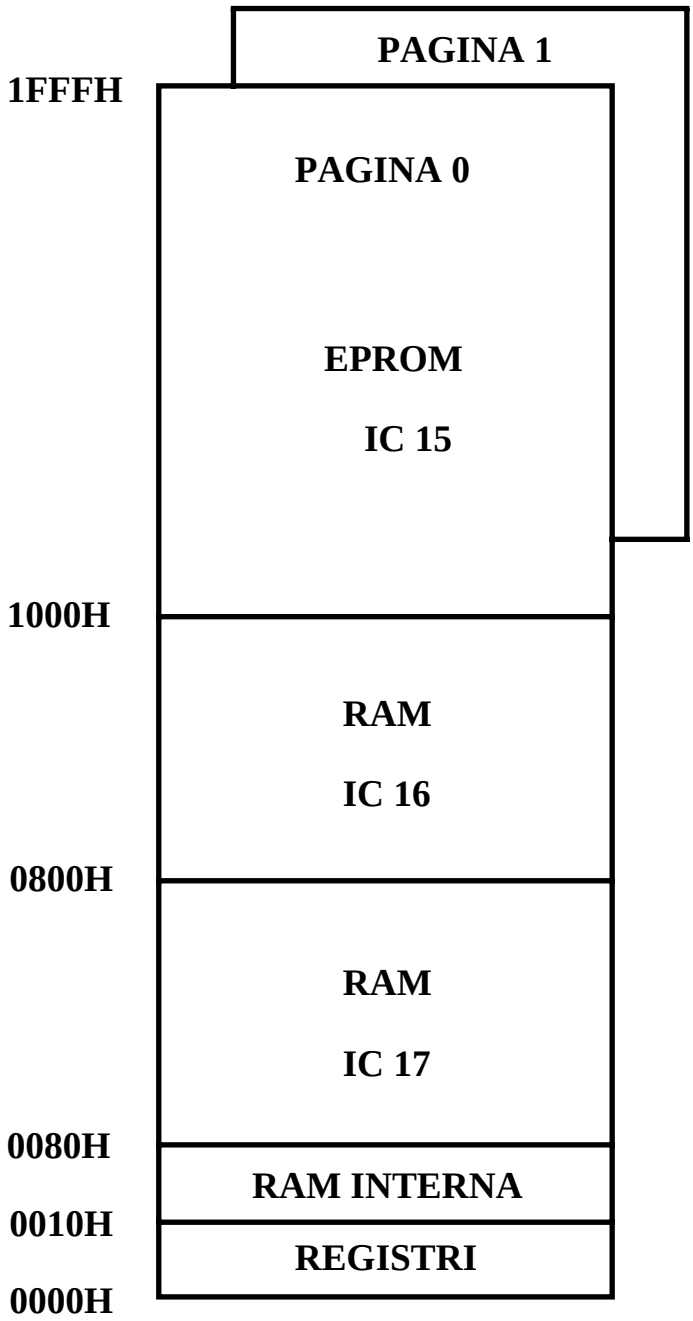


FIGURE 18 : MEMORY MAPPING

Addressing of 12 K of SRAM+EPROM in a maximum space of 8 K can be done by paging the EPROM.
This latter is splitted into two pages of 4 KBytes.
Page selection is done by software programming signal CA2 of PIA 65C21.
In detail:

CA2 = 0 (low) -> select page 0 of EPROM
CA2 = 1 (high) -> select page 1 of EPROM

At power on or reset, signal CA2 is set to 1, so code stored in page 1 is executed.
Please remark correspondance between pages and physical addresses:

0000H ≤ page 0 ≤ 0FFFH

1000H ≤ page 1 ≤ 1FFFH

PERIPHERAL ADDRESSES

HEre follow peripheral addresses, located in microprocessor addressing space, to avoid conflict problems.
Next table shows addresses, meanings and direction of peripheral devices registers (only the external ones to microprocessor):

PERIPHERAL	ADDRESS	R/W	MEANING
PORT I/O CPU	0000H	R/W	Port A Data Register of CPU
	0001H	R/W	Port B Data Register of CPU+WD
	0004H	R/W	Port A Data Direction Register of CPU
	0005H	R/W	Port B Data Direction Register of CPU+WD
TIMER COUNTER CPU	0008H	R/W	Timer Data Register of CPU
	0009H	R/W	Timer Control Register+WD
PIA 65C21	0002H	R/W	Read PIBA, Write Output Register Port A, Data Direction Register Port A
	0003H	R/W	Read PIBB,Write Output Register Port B, Data Direction Register Port B+WD
	0006H	R/W	Control Register Port A
	0007H	R/W	Control Register Port B+WD
ACIA 65C51	000CH	R/W	Read Receive Data Register, Write Trasmit Data Register
	000DH	R/W	Read Status Register, Write Programmed Reset+WD
	000EH	R/W	Command Register
	000FH	R/W	Control Register+WD

FIGURE 19 : PERIPHERALS ADDRESSES TABLE

Please refer to next paragraph for meaning of registers.

Peripherals Programming

In case of problems, please refer to manufacturer documentation.

Watch Dog

Watch Dog retrigger on **GPC® 05**, is performed simply accessing in reading registers WD.
These registers share the same addresses of other peripherals, but this does not create a confict, because access in reading does not affect other peripherals.
To prevent astable Watch Dog intervent, it must be retriggered at regular intervals shorter than selected intervent time.
If this is not done and J11 connects this circuit to Reset, the board is reset.

Backed SRAM tamponata + RTC

This peripheral is mapped in 2K Bytes contiguous, where 8 Bytes can have a double purpose in case Real Time Clock is present (MK48Z02 o MK48T02).
2 KBytes of SRAM are always accessible through simple memory acces operations described in paragraph “Memory mapping”.
In case RTC is present, eight internal registers are used. Here follow names and meanings:

REGISTER	ADDRESS ON IC 17	ADDRESS ON IC 16
CNT	07F8H	0FF8H
SEC	07F9H	0FF9H
MIN	07FAH	0FFAH
ORE	07FBH	0FFBH
SETT	07FCH	0FFCH
GIO	07FDH	0FFDH
MES	07FEH	0FFEH
ANN	07FFH	0FFFH

FIGURE 20 : REGISTERS ADDRESSING TABLE OF SRAM+RTC MK48T02

These registers allow to get and set date and time.

ANN = A7 A6 A5 A4 A3 A2 A1 A0
where: A7-A0 = Year (00-99) in BCD.

MES = 0 0 0 M4 M3 M2 M1 M0
where: M4-M0 = Month (01-12) in BCD.

GIO = 0 0 D5 D4 D3 D2 D1 D0
where: D5-D0 = Day (01-31) in BCD.

SETT = 0 FT 0 0 0 S2 S1 S0
where: S2 S1 S0 = Day of week:
0 0 1 = Sunday
0 1 0 = Monday
0 1 1 = Tuesday
1 0 0 = Wednesday
1 0 1 = Thurday
1 1 0 = Friday
1 1 1 = Saturday
FT = Test of count and frequency.

ORE = KS 0 O5 O4 O3 O2 O1 O0
where: KS = Bit to start clock count.
O5-O0 = Hours (00-23) in BCD.

MIN = 0 M6 M5 M4 M3 M2 M1 M0
where: M6-M0 = Minutes (00-59) in BCD.

SEC = ST S6 S5 S4 S3 S2 S1 S0
where: S6-S0 = Seconds (00-59) in BCD.
ST = Bit to stop clock count.

CNT = W R S C4 C3 C2 C1 C0
where: W = Bit to select write operation.
R = Bit to select read operation.
S = Bit of sign for compensation combination.
C4-C0 = Compensation combination.

Timer Counter CPU 146805

Please refer to manufacturer documentation or to appendix C.

Port I/O CPU 146805

Please refer to manufacturer documentation or to appendix C.

PIA 65C21

Please refer to manufacturer documentation or to appendix C.

ACIA 65C51

Please refer to manufacturer documentation or to appendix C.

Commands of MONI05

A	Show and modify accumulator.
B	Set BREAK-POINT.
C	Show and modify status flag register(CC).
D	Display memory
F	FILL memory.
G	Go to location.
L	Load S-RECORD.
M	Show and modify memory.
P	Show and modify program counter.
R	Show microprocessor status.
S	Trace with intercactive single step.
T	Trace with interactive execution end.
W	Enable or disable WAIT.
X	Show and modify INDEX-REGISTER.
CNTRL C	Reset of monitor.

Description of commands of MONI05

Command: A

Show and change conternt of CPU register A.
Example:

>A A : <current value in hex> _

To change the value, just insert the new hex value.
Example:

>A A : <current value in hex> <new value in hex>

>_

In case data input is not valid, character ? indicates and error and enables to correct input.

Command: B

Sets break-point, very useful for debug, infacts stops program execution and shows CPU and registers status.
Example:

>B
breakpoint : <value in hex> _

to change current value just insert new value in hex.
Example:

>B
breakpoint : <current value in hex> <new value in hex>
>_

In case data input is not valid, character ? indicates and error and enables to correct input.

Command: C

Shwo and change register CC of CPU.
Example:

>C CC : <valore corrente in hex> _

to change current value just insert the new value in hexadecimal.
Example:

>C CC : <valore corrente in hex> <nuovo valore in hex>
>_
In case data input is not valid, character ? indicates and error and enables to correct input.

Command: D

Shows memory.
Example:

>D _

now insert start address and stop address in hexadecimal.

Example:

>D <start address in hex> <stop address in hex>
<start address in hex> <1 value in hex> ... <16 value in hex> <1 ascii>...<16ascii>
.....
.....
<stop address in hex> <1 value in hex> ... <16 value in hex> <1 ascii>...<16ascii>
>_

In caso data input is not valid, character ? indicates and error and enables to correct input.
As shown, memory dump is made of three fields: the first shows address of 16 bytes block, the second shows hexadecimal values of bytes and the third shows their ASCII code.

Command: F

Fills memory.

>F _

now insert start address, stop address and new value for memory.
Example:

>F <start address in hex> <stop address in hex> <new value in hex>
>_

In case data input is not valid, character ? indicates and error and enables to correct input.

Command: G

Execute code stored in memory.
Example:

>G _

insert start address of program.
Example:

>G <address>_

In caso data input is not valid, character ? indicates and error and enables to correct input.
If a break-point is encountered, execution stops and all registers are printed to the screen.

Command: L

Loads a file containing S-Records (MOTOROLA hexadecimal codification) in memory.
Example:

>L_

now monitor is ready to receive file.
When the whole file has been received and stored in memory, MONI05 prints “OK” and the prompt again.
Please remark that monitor exits from LOAD FILE condition, only when receivers end-of-file record that is “S9”.

Command: M

Modifies memory.
Example:

>M _

now insert address of memory location that has to be displayed and changed.
Example:

>M <address>
<address> <value in hex> _

several operations can be done from now:
- type “/” to replace current value with new value.
- type “:” to show from another address.
- type “CR or SPACE” to show value at next address.
- type “- or “^” to show value at previous address.
- type “Q” to exit Mand go back to prompt.

Command: P

Show and change register PC of CPU.
Example:

>P PC : <current value in hex> _

to change current value just insert new hexadecimal value.
Example:

>P PC : <current value in hex> <new value in hex>
>_
In case data input is not valid, character ? indicates and error and enables to correct input.

Command: R

Shows CPU registers and disassemblememory location pointed by PC.
Example:

>R PC : <val. > SP : <val. > A : <val. > X : <val. > CC : <val. > <disassembled>
>_

Command: S

Execute a program in “single-step” mode, that is and instruction at the time
This command executes instruction pointed by PC, increments PC and shows CPU registers, just like with command R.

Example:

>S PC : <val. > SP : <val. > A : <val. > X : <val. > CC : <val. > <disassemble>
>_

Command: T

Similar to command S, but TRACE is performed continuously.
When this command is in execution, some keys have special meaning:
- pressing SPACE stops or restarts execution.
- arrow keys manage trace like command S
- pressing CR exits command T but only if SPACE has been previously pressed.

Command: W

Enables or disables wait.
Example:

>W wait state : on / off
>_

This command is bistable, that is it complements the status of wait (ON / OFF).

Command: X

Show and change X (index-register) ofCPU.
Example:
>X X : <current value in hex> _

to change current value, just insert new hexadecimal value.
Example:

>X X : <corrent value in hex> <new value in hex>
>_

In case data input is not valid, character ? indicates and error and enables to correct input.

Command: CONTROL - C

Resets monitor, shows prompt and performs default initialization.

TERM05-Communication program for MONI05

TERM05 is a communication for **GPC® 05**, performs a terminal emulator for monitor program MONI05.
TERM05 allows to use all monitor commands, load a file, execute it, etc.
It is an executable program, so just type its pathname on PC to execute it.
Starting window shows **grifo®** data and available commands (F7 to load a file, F10 to exit).
To start the communication just reset **GPC®** 05.
If connection is correct, presentation and prompt of MONI05 should appear on the screen and the work session may begin.
Please remark that before loading a file (F7) it is essential to type command L, so MONI05 starts loading the file
Otherwise, F7 is ignored and an acoustic signal is emitted..

Both MONI05 and TERM05 use the following physical communication protocol:

BAUD RATE = 2400 baud
STOP BIT = 1 bit
BIT x CHR = 8 bit
PARITY = None.
HANDSHAKE = CTS and RTS

Physycal connection

Here follows the connection to perform between a PC and **GPC® 05** with DCE pin-out on connector CN2:

CN2 GPC® 05 COM1 P.C. DB25

2 <——————————————————————————— 2
3 ———————————————————————————> 3
4 <——————————————————————————— 4
5 ———————————————————————————> 5
7 ——————————————————————————— 7

EXTERNAL CARDS FOR GPC® 05

GPC® 05 can be connected to a wide range of block modules and operator interface system produced by **grifo®**, or to many system of other companies.
Here is an example of some cards:

FBC - WIRE TO CARD

Flat Block Contact

This interconnection system "wire to board" allows the connection to many type of flat cable connectors to terminal for external connections. Connection for DIN Ω rails.

IBC 01

Interface Block Comunication

Conversion card for serial communication, 2 RS 232 lines; 1 RS 422-485 line; 1 optical fibre line; selecatble DTE/DCE interface; quick connection for DIN 46277-1 and 3 rails.

OBI 01 - OBI 02

Opto BLOCK Input NPN-PNP

Interface between 16 NPN, PNP optocoupled and displayed input lines, with screw terminal and **Abaco®** standard I/O 20 pins connector; power supply section; connection for DIN Ω rails.

TBO 01 - TBO 08

Transistor BLOCK Output

Interface for **ABACO®** standard I/O 20 pins connector; 16 or 8 transistor output lines 45 Vdc 3 A open collector; screw terminal; optocoupled and displayed lines; connection for DIN 247277-1 and 3 rails.

RBO 01

Relé BLOCK Output

Interface for **ABACO®** standard I/O 20 pins connector; 8 displayed 5A or 10A relays; screw terminal; connection for DIN Ω rails.

XBI 01

miXed BLOCK Input-Output

Interface for **ABACO®** standard I/O 20 pins connector; 8 transistor output lines 45 Vdc 3A; 8 input lines; screw terminal; optocoupled and displayed I/O lines; connection for DIN 247277-1 and 3 rails.

DEB 01

Didactic Experimental Board

Supporting card for 16 TTL I/O lines use. It includes: 16 keys, 16 LEDs, 4 digits, 16 keys matrix keyboard, Centronics printer interface, LCD display and fluorescent display interface, **GPC® 68** I/O connector, field connection with screw terminal..

QTP 24 - QTP 24P

Quick Terminal Panel 24 keys with Parallel interface

Intelligent user panel equipped with Fluorescent or LCD display, LEDs backlit, 20x2 or 20x4 characters; RS 232, RS 422, RS 485 or current loop serial line; serial E2 for set up and message. Pssibility of re-naming keys, LEDs and panel name by inserting label with new name into the proper slot; 24 Keys and 16 LEDs with blinking attribute and buzzer manageable by software; built in power supply; RTC option, reader of magnetic badge and relay. The QTP 24P is low cost no intelligent (passive) version. It is directly driven from 16 TTL I/O lines; high level languages supported.

QTP G28

Quick Terminal Panel - LCD Graphic, 28 keys

LCD display 240x128 pixels, CFC backlit; Optocoupled RS 232 line and additional RS 232/422/485/ C. L. line; CAN line controller; E^2 for set up; RTC and RAM lithium backed; primary graphic object; possibility of re-naming keys, LEDs and panel name; 28 keys and 16 LEDs with blinking attribute and buzzer manageable by software; Buzzer; built-in power supply; reader of magnetic badge and relay option.

IAF N42

Interface Adapter Fluorescent display NEC

Interfacce bztween 16 I/O TTL on standard ABACO® connector and fluorescent display of family NEC FCXX-XKA.

APPENDIX A: JUMPERS LOCATION

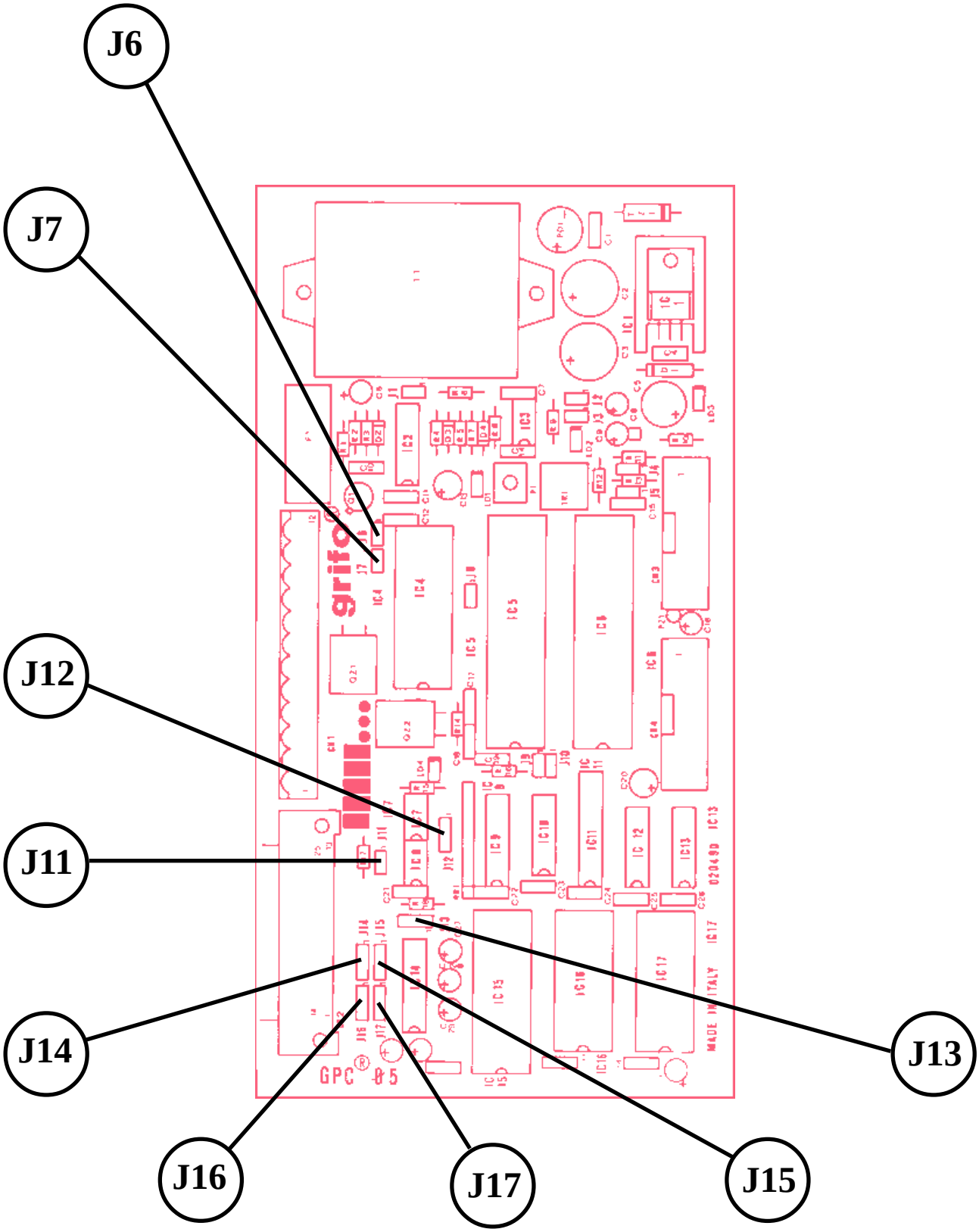


FIGURE 21 : SERIAL COMMUNICATION JUMPERS LOCATION

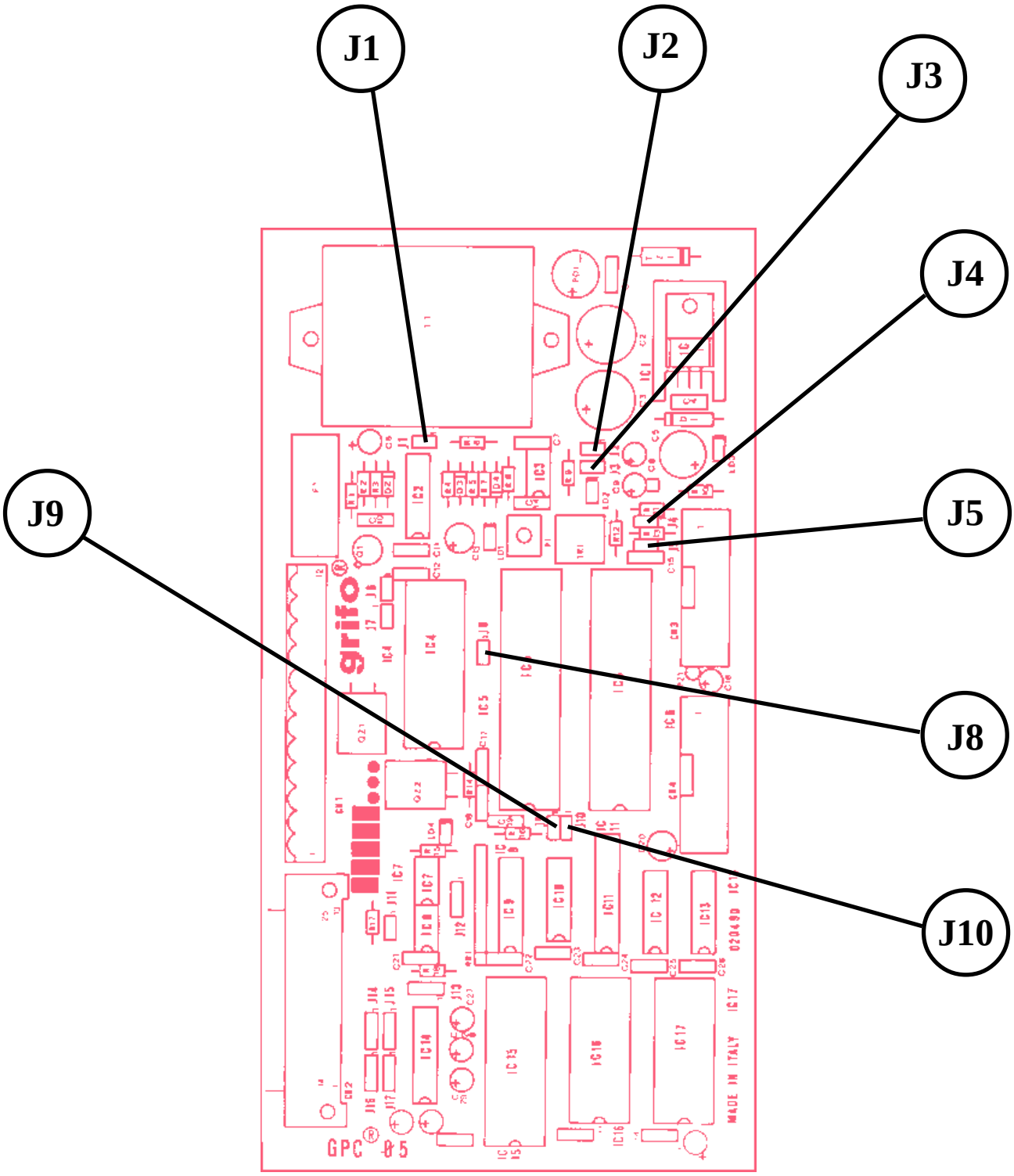


FIGURE 22 : WATCH DOG AND WORKING MODE JUMPERS LOCATION

APPENDICE B: ALPHABETICAL INDEX

M

N

P

R

S

T

W

APPENDIX C : ON BOARD COMPONENTS

MOTOROLA Semiconductors

Colvilles Road, Kelvin Estate - East Kilbride/Glasgow - SCOTLAND

grifo®

tel.051/892052
40016 San Giorgio di Piano
(Bologna - Italy)

MC146805E2

Advance Information

CMOS

(HIGH PERFORMANCE SILICON GATE)

8-BIT
MICROPROCESSOR

8-BIT MICROPROCESSOR UNIT

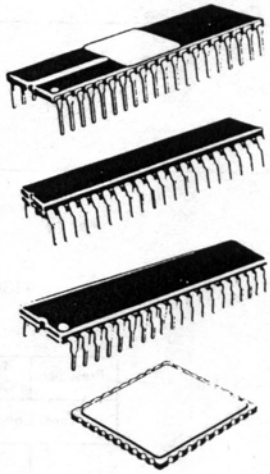
The MC146805E2 Microprocessor Unit (MPU) belongs to the M6805 Family of Microcomputers. This 8-bit fully static and expandable microprocessor contains a CPU, on-chip RAM, I/O, and TIMER. It is a low-power, low-cost processor designed for low-end to mid-range applications in the consumer, automotive, industrial, and communications markets where very low power consumption constitutes an important factor. The following are the major features of the MC146805E2 MPU:

HARDWARE FEATURES

- Typical Full Speed Operating Power of 35 mW @ 5 V
- Typical WAIT Mode Power of 5 mW
- Typical STOP Mode Power of 25 μW
- 112 Bytes of On-Chip RAM
- 16 Bidirectional I/O Lines
- Internal 8-Bit Timer with Software Programmable 7-Bit Prescaler
- External Timer Input
- Full External and Timer Interrupts
- Multiplexed Address/Data Bus
- Master Reset and Power-On Reset
- Capable of Addressing Up to 8K Bytes of External Memory
- Single 3- to 6-Volt Supply
- On-Chip Oscillator
- 40-Pin Dual-In-Line Package
- Chip Carrier Also Available

SOFTWARE FEATURES

- Similar to the MC6800
- Efficient Use of Program Space
- Versatile Interrupt Handling
- True Bit Manipulation
- Addressing Modes with Indexed Addressing for Tables
- Efficient Instruction Set
- Memory Mapped I/O
- Two Power Saving Standby Modes



L SUFFIX
CERAMIC PACKAGE
CASE 715

S SUFFIX
CERDIP PACKAGE
CASE 734

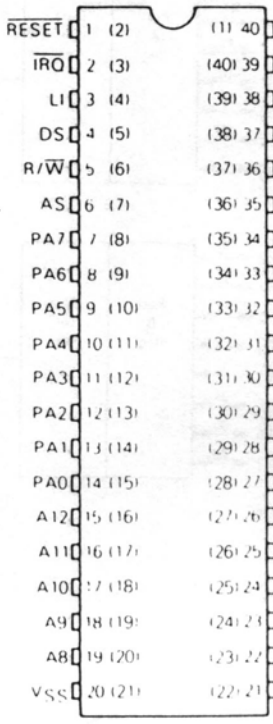
P SUFFIX
PLASTIC PACKAGE
CASE 711

Z SUFFIX
CHIP CARRIER
CASE 761

GENERIC INFORMATION

Package Type	Frequency (MHz)	Temperature	Generic Number
Ceramic	1.0	0°C to 70°C	MC146805E2L
L Suffix	1.0	-40°C to 85°C	MC146805E2CL
Cerdip	1.0	0°C to 70°C	MC146805E2S
S Suffix	1.0	-40°C to 85°C	MC146805E2CS
Plastic	1.0	0°C to 70°C	MC146805E2P
P Suffix	1.0	-40°C to 85°C	MC146805E2CP
Leadless Chip Carrier	1.0	0°C to 70°C	MC146805E2Z
Z Suffix	1.0	-40°C to 85°C	MC146805E2CZ

PIN ASSIGNMENT



Pin numbers in parentheses represent equivalent Z suffix chip carrier pins.

This document contains information on a new product. Specifications and information herein

ADI 850 R3