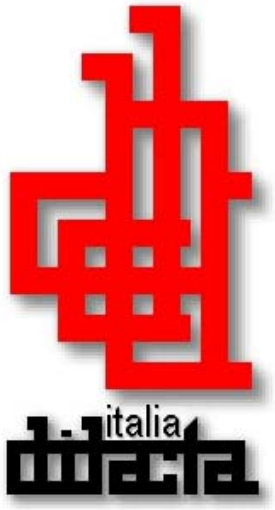
Didacta Italia

RD5 NT

Didactic Robot with 5 Axes

User's Manual



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User's Manual

This manual illustrates the technical characteristics and operating instructions of the system Didacta RD5 NT Didactic Robot with 5 Axes, giving the instructor or the student a specific knowledge of the unit and its applications.

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SECTION I

GENERAL DESCRIPTION OF THE ROBOT AND ITS CONTROL MODULE

General characteristics of the robot and its control module

* Composition of the set
  - one robot, ref. RD5NT
  - a control module, ref. 45000
  - a power supply box.

* Robot RD5NT

- 4 interlocked movements
  . Base
  . Shoulder
  . Elbow
  . Wrist

• the control of each movement is by means of a geared-motor block (1/500) supplied with + and - 12 V voltages.
The reproduction voltage is ensured by a linear rotary potentiometer anchored to the geared-motor block and supplied with +10 and -10 V voltages.

- 1 open cycle movement
  . Gripper

• gripper control is the same as for the foregoing movements, but there is no reproduction potentiometer.

- Characteristics

DC motors/2.5 Watts/CCL potentiometers with plastic layer.
. Movement in height:
. Base displacement : 293°
. Shoulder displacement : 107°
. Elbow displacement : 284°
. Wrist displacement : 360°

. Gripper - automatic stop by means of a microswitch on opening
- adjustable closing speed.
. Motor control voltage 12 V DC.
. Reference voltage for the potentiometer: + and - 10 V.

* 45000 control module

- The control module makes it possible - by means of any computer with interface series RS 232 V24 or an expansion kit with USART (or ACIA) TTL outputs - to control and monitor:
  . 5 interlocked movements
  . 1 open cycle movement
  . 8 inputs
  . 8 outputs.

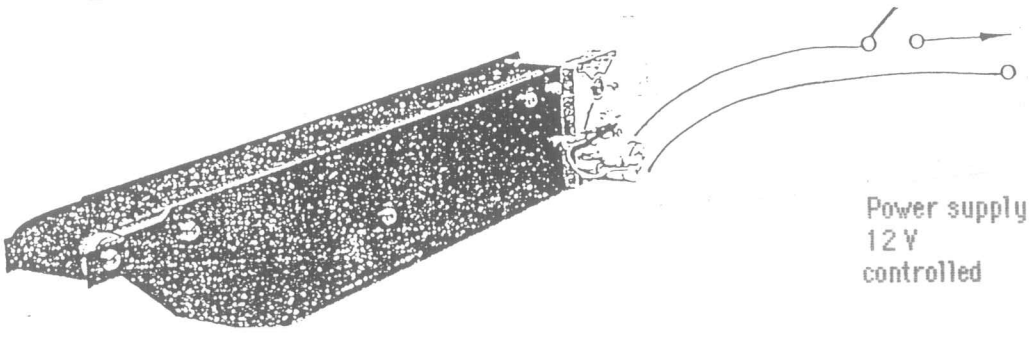
- Interlocked movements

- The main characteristics of the robot are modified.
  Limit values (stops) are electronically determined.

- Characteristics of the robot with module 45000 (which limits angular rotation):
  . Resolution :1024
  . Repeatability
  . Accuracy
  . Base movement: :261°
  . Shoulder movement : 85°
  . Elbow movement :249°
  . Wrist movement :180°

- Open loop movement
- The control voltage produced by the board makes it possible to control the speed of the non-interlocked movement (that is, the gripper).

- Inputs
- 8 inputs available. They enable the surrounding environment to be controlled.
  . Piece location sensors
  . Location of any other item.



- Outputs
- 8 "all-or-nothing" outputs available. The outputs (dry relay contact) make it possible to control external elements, such as:
  . small conveyors of the RD5DNT unit

- General characteristics of board 45000

- control of 5 interlocked movements
  - control voltage: ± 12 V
  - reproduction voltage: - 10 V < VR < + 10 V
- Control of a non-interlocked movement
  - control voltage: - 12 V to + 12V
- Inputs
  - active level : 0 V (board ground)
  - passive level: 5 V up to 50V
- Outputs
  - Dry contact (24V DC/2A)
- Power supply voltages
  - +15V, - 15V, + 5 V
- Connections
  Robot - flat cable with 2 CANON type 25-point sockets
  Computer - DIN 5-pin socket and CANON type 25-point connector
  Power supply - internal (being developed)
  external (with cables - identification colors)

Observations

. Jacks make it possible to have access to data on the interlocking.

. A number of loops can be opened and the filters can be modified or replaced.

. The communication parameters can be modified:

. speed	:50 to 9600 bauds
. stop bit	:1 or 2
. parity	:with or without
. parity	:even or odd.

. Fuses provide protection against polarity inversion of power supply voltages.

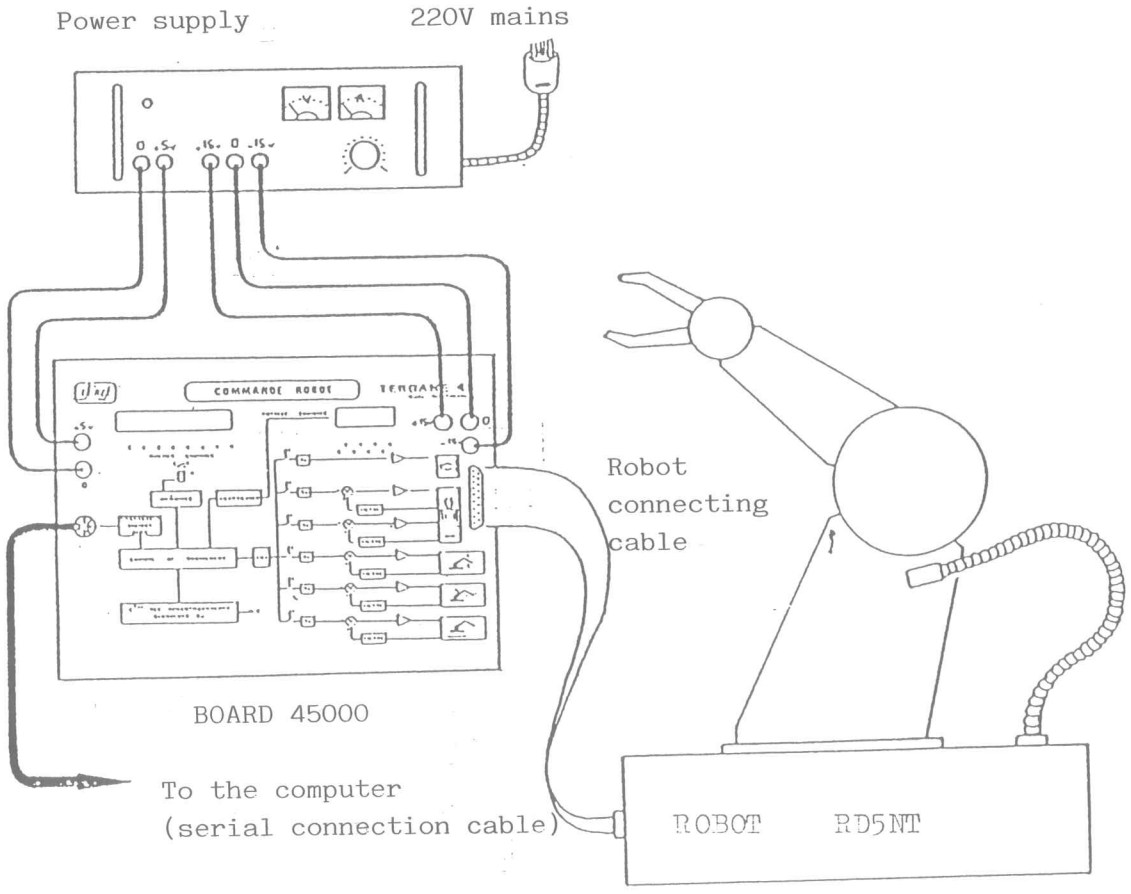
* Power supply box

. It makes it possible to power the 4500 module from 110V/50 Hz or 220 V 50 Hz mains.

- voltage + 15 V 1.5A
- voltage - 15 V 1.5A
- voltage + 5V 3A

. Network protection is by means of a fuse.

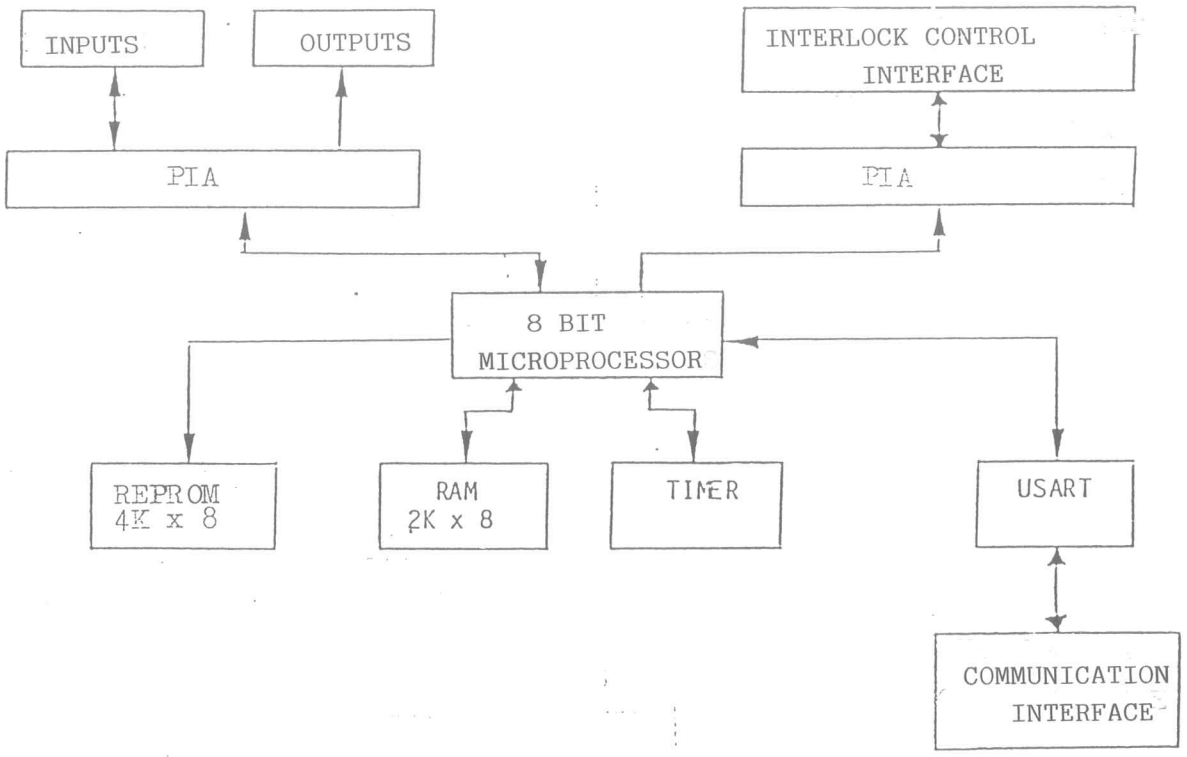
CONNECTION BETWEEN THE ROBOT AND THE CONTROL MODULE



SECTION II
FUNCTIONAL CHAINS OF THE ROBOT

MANAGEMENT INTERFACE

* Synoptic view

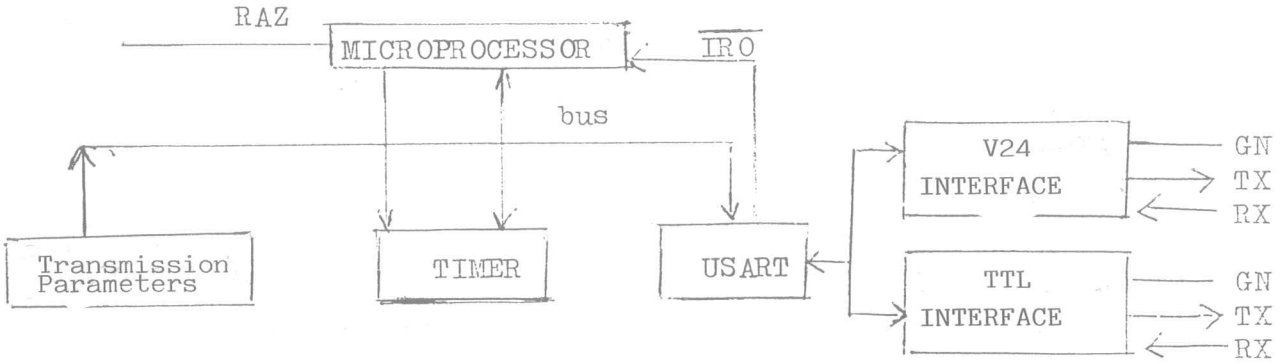


Guided by an 8 bit 6802 Motorola microprocessor, the set manages:

- the serial communication interface
- the interlock control interface
- 8 inputs
- 8 outputs.

THE SERIAL COMMUNICATION INTERFACE

* Synoptic view



- Two interfaces available:
  - V 24 (line signal + 12V, - 12V).
  - TTL (line signal 0V, +4.5V)
    Compatible with expansion kits.

* Generals

- At power-on and when the "RAZ" button is depressed, the microprocessor reads the communication parameter straps:

- transfer speed
- number of stop bits
- parity
- even or odd parity.

- the microprocessor reads the data and sets:

- the TIMER so that it will hand over to the USART the transmission or reception clock.
- the USART so that it will transmit or receive words in the desired format.

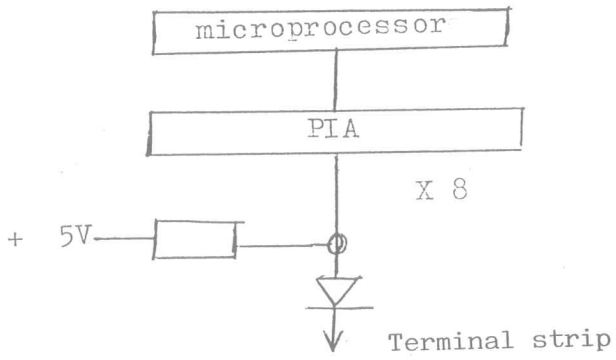
Observations:

. the word to be transmitted is 8 bit long
. basic clock of the timer : 921600 Hz
. USART division factor: 16.

- Transmission and reception are controlled through IRQ interrupts (receiving register full, transmission register empty).

INPUTS

* Synoptic view



* Generals

- The microprocessor analyses the inputs every 10 ms
- An input is regarded as active and retransmitted towards the main computer via the serial connection if both the following conditions occur simultaneously:

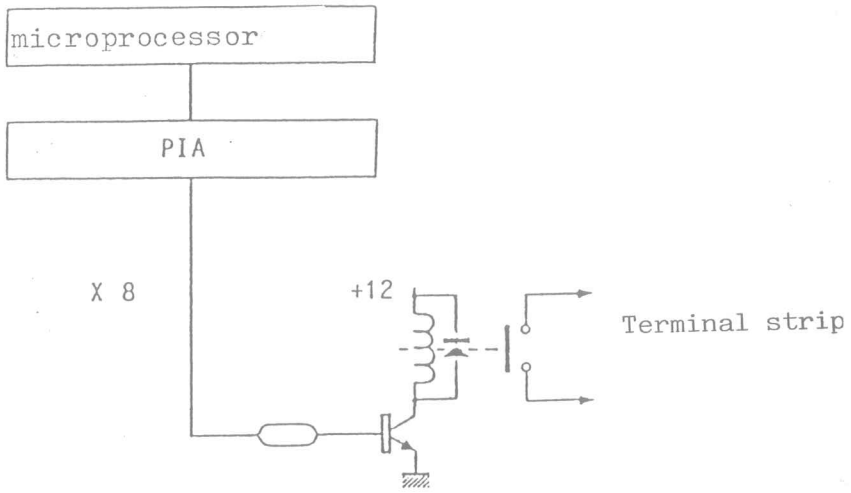
1. The computer must request the input (1 to 8)
2. The input shifts onto (or is on) level 0V.

Observations

1. If an input is activated without the computer having requested it, it is not retransmitted to the computer.
2. Wait for an input does not prevent the execution of another command.

OUTPUTS

* Synoptic view



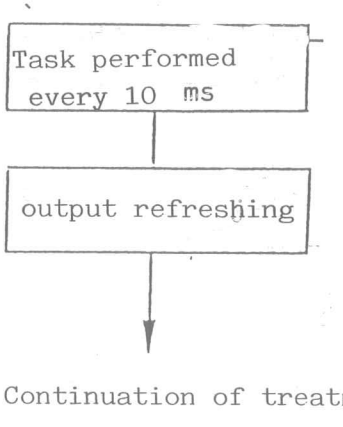
* Generals

- The microprocessor refreshes the outputs every 10 ms
- Outputs are governed by the control system via the serial connection.

Observations

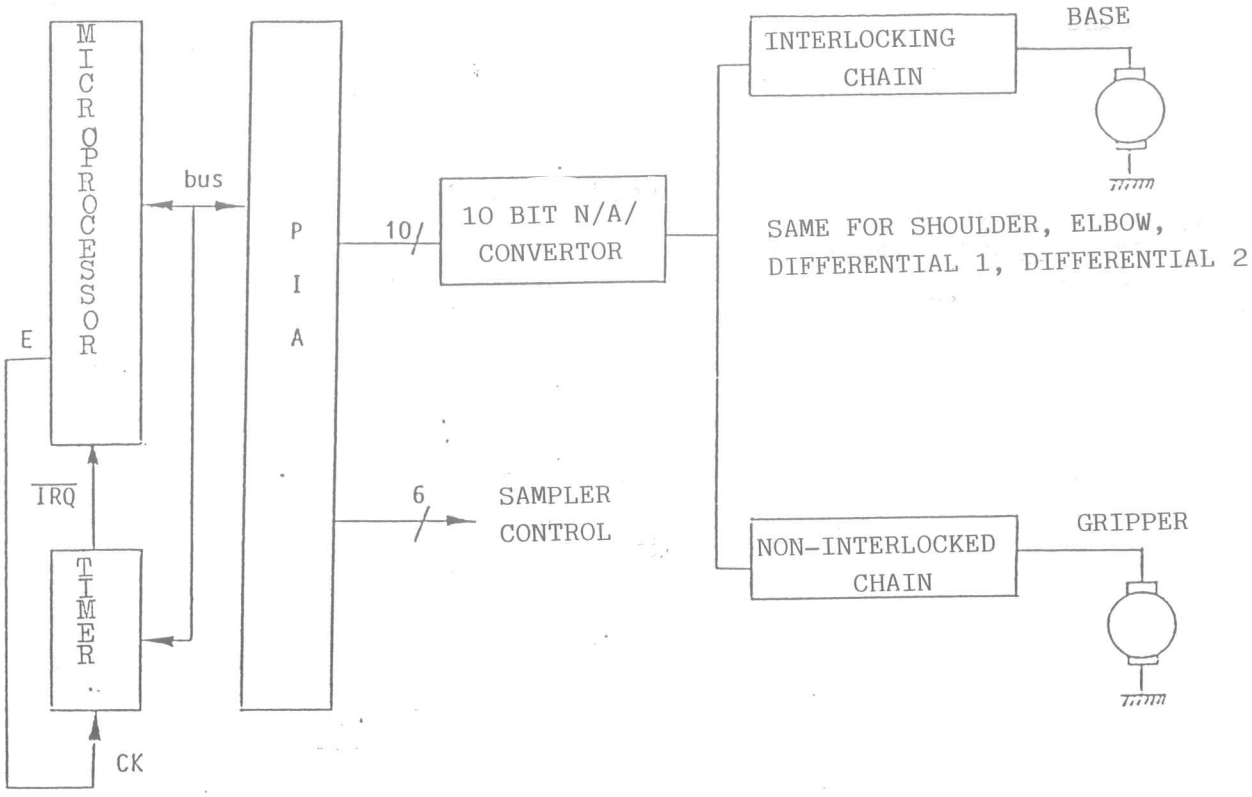
1. At power-up, or when RAZ is depressed or upon a change in parameter, the outputs are forced to zero (contacts open).
2. Several outputs can be activated simultaneously.

* Organization



INTERLOCK CONTROL INTERFACE

* Synoptic view



* General data on interlock control

• at power up and each time "RAZ" is depressed, the microprocessor starts:
- the TIMER (10 ms)
- the movement and logit output control board
- interrupts.

• every 10 minutes, the microprocessor:
- examines the movement board and refreshes the analog information for each through a N/A converter and a sampler/locking device.
- activates the logic outputs
- analyses the status of logic inputs

• Refreshing rate (100 Hz) is amply sufficient to maintain the control information.

• When the main processing unit sends out a command via the serial connection, the latter is analysed. If the analysis is correct, the element in the relative board is updates.

* General data on interlock

• direct chain
This consists of:
- a comparator
- a low-pass filter
- a power amplifier which makes it possible to control the motor.

• return chain
This consists of:
- a reproduction potentiometer
- a phase advance filter
- a "sommateur" which makes it possible to adjust the movement displacement.

GENERAL WIRING

1 IBM PC/COMPATIBLE