

D. CARATTERISTICHE

INDICE

PAG.

E-1	<u>PIASTRA BASE</u>
E-14	<u>PIASTRA GOVERNO VIDEO</u>
E-31	<u>PIASTRA PIGGY BACK</u>
E-32	<u>TASTIERA</u>
E-33	<u>ALIMENTATORE</u>
E-34	<u>PIASTRA BUS CONVERTER</u>
E-37	<u>PIASTRA ESPANSIONE VIDEO</u>
E-41	<u>PIASTRA DI INTERFACCIA COMUNICAZIONE MULTIFUNZIONE</u>

INDICE

PAG.

D-1 CARATTERISTICHE

IN PREPARAZIONE

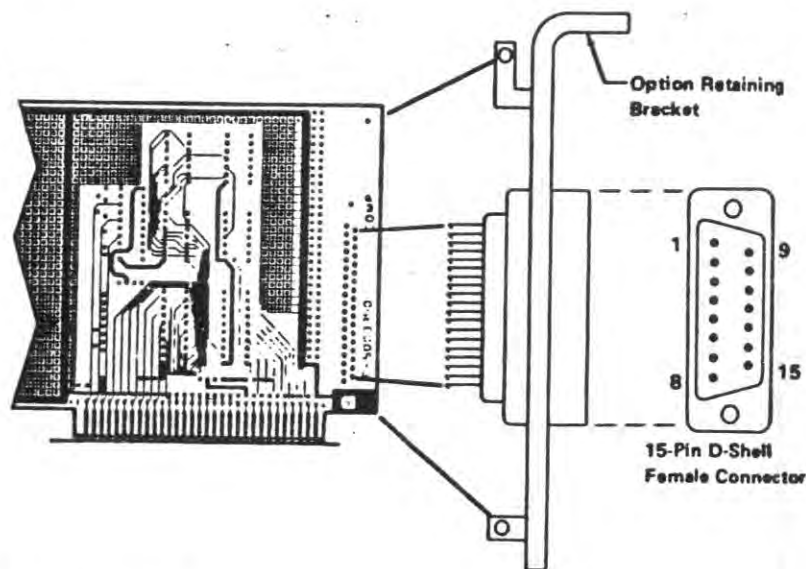
E. SCHEMI LOGICI

## Prototype Card External Interface

If a connector is required for the card function, then you should purchase one of the recommended connectors (manufactured by Amp) or equivalent listed below:

Connector Size	Part Number (Amp)
9-pin D-shell (Male)	205865-1
9-pin D-shell (Female)	205866-1
15-pin D-shell (Male)	205867-1
15-pin D-shell (Female)	205868-1
25-pin D-shell (Male)	205857-1
25-pin D-shell (Female)	205858-1
37-pin D-shell (Male)	205859-1
37-pin D-shell (Female)	205860-1

The following example shows a 15-pin, D-shell, female connector attached to a prototype card.



Component Side

## IBM Asynchronous Communications Adapter

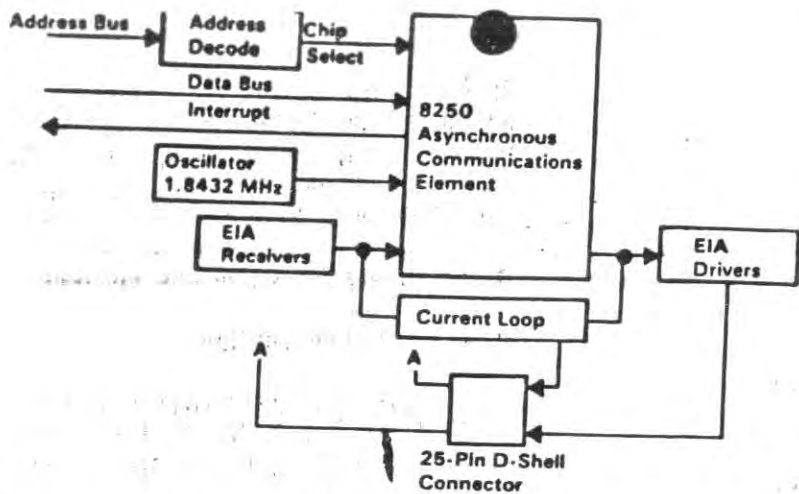
The asynchronous communications adapter system control signals and voltage requirements are provided through a 2 by 31 position card-edge tab. Two jumper modules are provided on the adapter. One jumper module selects either RS-232C or current-loop operation. The other jumper module selects one of two addresses for the adapter, so two adapters may be used in one system.

The adapter is fully programmable and supports asynchronous communications only. It will add and remove start bits, stop bits, and parity bits. A programmable baud rate generator allows operation from 50 baud to 9600 baud. Five, six, seven or eight bit characters with 1, 1-1/2, or 2 stop bits are supported. A fully prioritized interrupt system controls transmit, receive, error, line status and data set interrupts. Diagnostic capabilities provide loopback functions of transmit/receive and input/output signals.

The heart of the adapter is a INS8250 LSI chip or functional equivalent. Features in addition to those listed above are:

- Full double buffering eliminates need for precise synchronization.
- Independent receiver clock input.
- Modem control functions: clear to send (CTS), request to send (RTS), data set ready (DSR), data terminal ready (DTR), ring indicator (RI), and carrier detect.
- False-start bit detection.
- Line-break generation and detection.

All communications protocol is a function of the system microcode and must be loaded before the adapter is operational. All pacing of the interface and control signal status must be handled by the system software. The following figure is a block diagram of the asynchronous communications adapter.



Asynchronous Communications Adapter Block Diagram

## Modes of Operation

The different modes of operation are selected by programming the 8250 asynchronous communications element. This is done by selecting the I/O address (hex 3F8 to 3FF primary, and hex 2F8 to 2FF secondary) and writing data out to the card. Address bits A0, A1, and A2 select the different registers that define the modes of operation. Also, the divisor latch access bit (bit 7) of the line control register is used to select certain registers.

I/O Decode (in Hex)		Register Selected	DLAB State
Primary Adapter	Alternate Adapter		
3F8	2F8	TX Buffer	DLAB=0 (Write) DLAB=0 (Read) DLAB=1 DLAB=1
3F8	2F8	RX Buffer	
3F8	2F8	Divisor Latch LSB	
3F9	2F9	Divisor Latch MSB	
3F9	2F9	Interrupt Enable Register	
3FA	2FA	Interrupt Identification Registers	
3FB	2FB	Line Control Register	
3FC	2FC	Modem Control Register	
3FD	2FD	Line Status Register	
3FE	2FE	Modem Status Register	

### I/O Decodes

Hex Address 3F8 to 3FF and 2F8 to 2FF												Register
A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	DLAB		
1	1/0	1	1	1	1	1	x	x	x	0	Receive Buffer (read), Transmit Holding Reg. (write)	
							0	0	0	0	Interrupt Enable	
							0	1	0	x	Interrupt Identification	
							0	1	1	x	Line Control	
							1	0	0	x	Modem Control	
							1	0	1	x	Line Status	
							1	1	0	x	Modem Status	
							1	1	1	x	None	
							0	0	0	1	Divisor Latch (LSB)	
							0	0	1	1	Divisor Latch (MSB)	

**Note:** Bit 8 will be logical 1 for the adapter designated as primary or a logical 0 for the adapter designated as alternate (as defined by the address jumper module on the adapter).

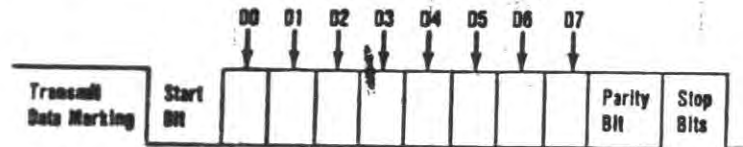
A2, A1 and A0 bits are "don't cares" and are used to select the different register of the communications chip.

### Address Bits

## Interrupts

One interrupt line is provided to the system. This interrupt is IRQ4 for a primary adapter or IRQ3 for an alternate adapter, and is positive active. To allow the communications card to send interrupts to the system, bit 3 of the modem control register must be set to 1 (high). At this point, any interrupts allowed by the interrupt enable register will cause an interrupt.

The data format will be as follows:



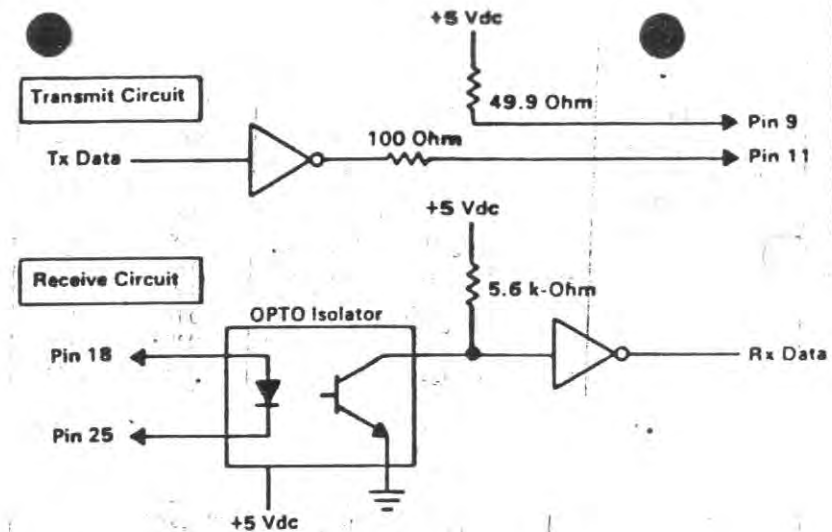
Data bit 0 is the first bit to be transmitted or received. The adapter automatically inserts the start bit, the correct parity bit if programmed to do so, and the stop bit (1, 1-1/2, or 2 depending on the command in the line-control register).

## Interface Description

The communications adapter provides an EIA RS-232C-like interface. One 25-pin D-shell, male type connector is provided to attach various peripheral devices. In addition, a current loop interface is also located in this same connector. A jumper block is provided to manually select either the voltage interface, or the current loop interface.

The current loop interface is provided to attach certain printers provided by IBM that use this particular type of interface.

- Pin 18 + receive current loop data
- Pin 25 - receive current loop return
- Pin 9 + transmit current loop return
- Pin 11 - transmit current loop data



### Current Loop Interface

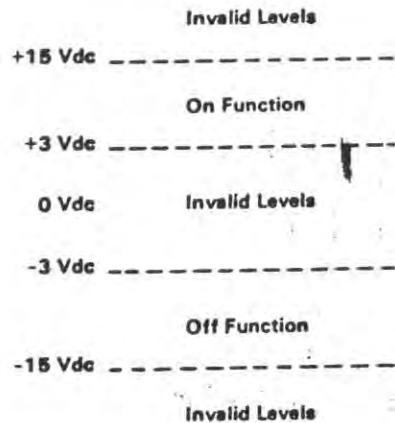
The voltage interface is a serial interface. It supports certain data and control signals, as listed below.

- Pin 2 Transmitted Data
- Pin 3 Received Data
- Pin 4 Request to Send
- Pin 5 Clear to Send
- Pin 6 Data Set Ready
- Pin 7 Signal Ground
- Pin 8 Carrier Detect
- Pin 20 Data Terminal Ready
- Pin 22 Ring Indicator

The adapter converts these signals to/from TTL levels to EIA voltage levels. These signals are sampled or generated by the communications control chip. These signals can then be sensed by the system software to determine the state of the interface or peripheral device.

## Voltage Interchange Information

Interchange Voltage	Binary State	Signal Condition	Interface Control Function
Positive Voltage =	Binary (0)	= Spacing	= On
Negative Voltage =	Binary (1)	= Marking	= Off



The signal will be considered in the "marking" condition when the voltage on the interchange circuit, measured at the interface point, is more negative than  $-3$  Vdc with respect to signal ground. The signal will be considered in the "spacing" condition when the voltage is more positive than  $+3$  Vdc with respect to signal ground. The region between  $+3$  Vdc and  $-3$  Vdc is defined as the transition region, and considered an invalid level. The voltage that is more negative than  $-15$  Vdc or more positive than  $+15$  Vdc will also be considered an invalid level.

During the transmission of data, the "marking" condition will be used to denote the binary state "1" and "spacing" condition will be used to denote the binary state "0."

For interface control circuits, the function is "on" when the voltage is more positive than  $+3$  Vdc with respect to signal ground and is "off" when the voltage is more negative than  $-3$  Vdc with respect to signal ground.

## INS8250 Functional Pin Description

The following describes the function of all INS8250 input/output pins. Some of these descriptions reference internal circuits.

**Note:** In the following descriptions, a low represents a logical 0 (0 Vdc nominal) and a high represents a logical 1 ( $+2.4$  Vdc nominal).

### Input Signals

**Chip Select (CS0, CS1,  $\overline{\text{CS2}}$ ), Pins 12-14:** When CS0 and CS1 are high and  $\overline{\text{CS2}}$  is low, the chip is selected. Chip selection is complete when the decoded chip select signal is latched with an active (low) address strobe ( $\overline{\text{ADS}}$ ) input. This enables communications between the INS8250 and the processor.

**Data Input Strobe (DISTR,  $\overline{\text{DISTR}}$ ) Pins 22 and 21:** When DISTR is high or  $\overline{\text{DISTR}}$  is low while the chip is selected, allows the processor to read status information or data from a selected register of the INS8250.

**Note:** Only an active DISTR or  $\overline{\text{DISTR}}$  input is required to transfer data from the INS8250 during a read operation. Therefore, tie either the DISTR input permanently low or the  $\overline{\text{DISTR}}$  input permanently high, if not used.

**Data Output Strobe (DOSTR,  $\overline{\text{DOSTR}}$ ), Pins 19 and 18:** When DOSTR is high or  $\overline{\text{DOSTR}}$  is low while the chip is selected, allows the processor to write data or control words into a selected register of the INS8250.

**Note:** Only an active DOSTR or  $\overline{\text{DOSTR}}$  input is required to transfer data to the INS8250 during a write operation. Therefore, tie either the DOSTR input permanently low or the  $\overline{\text{DOSTR}}$  input permanently high, if not used.



**Address Strobe ( $\overline{ADS}$ ), Pin 25:** When low, provides latching for the register select (A0, A1, A2) and chip select (CS0, CS1, CS2) signals.

**Note:** An active  $\overline{ADS}$  input is required when the register select (A0, A1, A2) signals are not stable for the duration of a read or write operation. If not required, tie the  $\overline{ADS}$  input permanently low.

**Register Select (A0, A1, A2), Pins 26-28:** These three inputs are used during a read or write operation to select an INS8250 register to read from or write to as indicated in the table below. Note that the state of the divisor latch access bit (DLAB), which is the most significant bit of the line control register, affects the selection of certain INS8250 registers. The DLAB must be set high by the system software to access the baud generator divisor latches.

DLAB	A2	A1	A0	Register
0	0	0	0	Receiver Buffer (Read), Transmitter Holding Register (Write)
0	0	0	1	Interrupt Enable
X	0	1	0	Interrupt Identification (Read Only)
X	0	1	1	Line Control
X	1	0	0	Modem Control
X	1	0	1	Line Status
X	1	1	0	Modem Control Status
X	1	1	1	None
1	0	0	0	Divisor Latch (Least Significant Bit)
1	0	0	1	Divisor Latch (Most Significant Bit)

**Master Reset (MR), Pin 35:** When high, clears all the registers (except the receiver buffer, transmitter holding, and divisor latches), and the control logic of the INS8250. Also, the state of various output signals (SOUT, INTRPT, OUT 1, OUT 2, RTS, DTR) are affected by an active MR input. Refer to the "Asynchronous Communications Reset Functions" table.

**Receiver Clock (RCLK), Pin 9:** This input is the 16 x baud rate clock for the receiver section of the chip.

**Serial Input (SIN), Pin 10:** Serial data input from the communications link (peripheral device, modem, or data set).

**Clear to Send ( $\overline{CTS}$ ), Pin 36:** The  $\overline{CTS}$  signal is a modem control function input whose condition can be tested by the processor by reading bit 4 (CTS) of the modem status register. Bit 0 (DCTS) of the modem status register indicates whether the  $\overline{CTS}$  input has changed state since the previous reading of the modem status register.

**Note:** Whenever the CTS bit of the modem status register changes state, an interrupt is generated if the modem status interrupt is enabled.

**Data Set Ready ( $\overline{DSR}$ ), Pin 37:** When low, indicates that the modem or data set is ready to establish the communications link and transfer data with the INS8250. The  $\overline{DSR}$  signal is a modem-control function input whose condition can be tested by the processor by reading bit 5 (DSR) of the modem status register. Bit 1 (DDSR) of the modem status register indicates whether the  $\overline{DSR}$  input has changed since the previous reading of the modem status register.

**Note:** Whenever the DSR bit of the modem status register changes state, an interrupt is generated if the modem status interrupt is enabled.

**Received Line Signal Detect ( $\overline{RLSD}$ ), Pin 38:** When low, indicates that the data carrier had been detected by the modem or data set. The  $\overline{RLSD}$  signal is a modem-control function input whose condition can be tested by the processor by reading bit 7 (RLSD) of the modem status register. Bit 3 (DRLSD) of the modem status register indicates whether the  $\overline{RLSD}$  input has changed state since the previous reading of the modem status register.

**Note:** Whenever the RLSD bit of the modem status register changes state, an interrupt is generated if the modem status interrupt is enabled.



**Ring Indicator ( $\overline{RI}$ ), Pin 39:** When low, indicates that a telephone ringing signal has been received by the modem or data set. The  $\overline{RI}$  signal is a modem-control function input whose condition can be tested by the processor by reading bit 6 (RI) of the modem status register. Bit 2 (TERI) of the modem status register indicates whether the  $\overline{RI}$  input has changed from a low to high state since the previous reading of the modem status register.

**Note:** Whenever the RI bit of the modem status register changes from a high to a low state, an interrupt is generated if the modem status register interrupt is enabled.

**VCC, Pin 40:** +5 Vdc supply.

**VSS, Pin 20:** Ground (0 Vdc) reference.

## Output Signals

**Data Terminal Ready ( $\overline{DTR}$ ), Pin 33:** When low, informs the modem or data set that the INS8250 is ready to communicate. The DTR output signal can be set to an active low by programming bit 0 (DTR) of the modem control register to a high level. The  $\overline{DTR}$  signal is set high upon a master reset operation.

**Request to Send ( $\overline{RTS}$ ), Pin 32:** When low, informs the modem or data set that the INS8250 is ready to transmit data. The RTS output signal can be set to an active low by programming bit 1 (RTS) of the modem control register. The  $\overline{RTS}$  signal is set high upon a master reset operation.

**Output 1 ( $\overline{OUT 1}$ ), Pin 34:** User-designated output that can be set to an active low by programming bit 2 (OUT 1) of the modem control register to a high level. The  $\overline{OUT 1}$  signal is set high upon a master reset operation.

**Output 2 ( $\overline{OUT 2}$ ), Pin 31:** User-designated output that can be set to an active low by programming bit 3 (OUT 2) of the modem control register to a high level. The  $\overline{OUT 2}$  signal is set high upon a master reset operation.

**Select Out (CSOUT), Pin 24:** When high, indicates that the chip has been selected by active CS0, CS1, and CS2 inputs. No data transfer can be initiated until the CSOUT signal is a logical 1.

**Driver Disable (DDIS), Pin 23:** Goes low whenever the processor is reading data from the INS8250. A high-level DDIS output can be used to disable an external transceiver (if used between the processor and INS8250 on the D7-D0 data bus) at all times, except when the processor is reading data.

**Baud Out ( $\overline{BAUDOUT}$ ), Pin 15:** 16 x clock signal for the transmitter section of the INS8250. The clock rate is equal to the main reference oscillator frequency divided by the specified divisor in the baud generator divisor latches. The  $\overline{BAUDOUT}$  may also be used for the receiver section by typing this output to the RCLK input of the chip.

**Interrupt (INTRPT), Pin 30:** Goes high whenever any one of the following interrupt types has an active high condition and is enabled through the IER: receiver error flag, received data available, transmitter holding register empty, or modem status. The INTRPT signal is reset low upon the appropriate interrupt service or a master reset operation.

**Serial Output (SOUT), Pin 11:** Composite serial data output to the communications link (peripheral, modem, or data set). The SOUT signal is set to the marking (logical 1) state upon a master reset operation.

## Input/Output Signals

**Data Bus (D7-D0), Pins 1-8:** This bus comprises eight tri-state input/output lines. The bus provides bidirectional communications between the INS8250 and the processor. Data, control words, and status information are transferred through the D7-D0 data bus.

**External Clock Input/Output (XTAL1, XTAL2), Pins 16 and 17:** These two pins connect the main timing reference (crystal or signal clock) to the INS8250.

## Programming Considerations

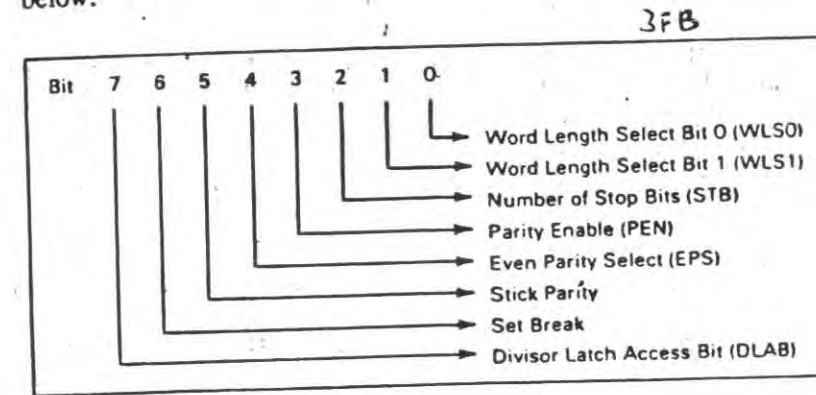
The INS8250 has a number of accessible registers. The system programmer may access or control any of the INS8250 registers through the processor. These registers are used to control INS8250 operations and to transmit and receive data. A table listing and description of the accessible registers follows.

Register/Signal	Reset Control	Reset State
Interrupt Enable Register	Master Reset	All Bits Low (0-3 Forced and 4-7 Permanent)
Interrupt Identification Register	Master Reset	Bit 0 is High, Bits 1 and 2 Low Bits 3-7 are Permanently Low
Line Control Register	Master Reset	All Bits Low
Modem Control Register	Master Reset	All Bits Low
Line Status Register	Master Reset	Except Bits 5 and 6 are High
Modem Status Register	Master Reset	Bits 0-3 Low Bits 4-7 - Input Signal
SOUT	Master Reset	High
INTRPT (RCVR Errors)	Read LSR/MR	Low
INTRPT (RCVR Data Ready)	Read RBR/MR	Low
INTRPT (RCVR Data Ready)	Read IIR/ Write THR/MR	Low
INTRPT (Modem Status Changes)	Read MSR/MR	Low
OUT 2	Master Reset	High
RTS	Master Reset	High
DTR	Master Reset	High
OUT 1	Master Reset	High

Asynchronous Communications Reset Functions.

## Line-Control Register

The system programmer specifies the format of the asynchronous data communications exchange through the line-control register. In addition to controlling the format, the programmer may retrieve the contents of the line-control register for inspection. This feature simplifies system programming and eliminates the need for separate storage in system memory of the line characteristics. The contents of the line-control register are indicated and described below.



Line-Control Register (LCR)

**Bits 0 and 1:** These two bits specify the number of bits in each transmitted or received serial character. The encoding of bits 0 and 1 is as follows:

Bit 1	Bit 0	Word Length
0	0	5 Bits
0	1	6 Bits
1	0	7 Bits
1	1	8 Bits

transmitted or received serial character. Bit 2 is a logical 0, one stop bit is generated or checked in the transmit or receive data, respectively. If bit 2 is logical 1 when a 5-bit word length is selected through bits 0 and 1, 1-1/2 stop bits are generated or checked. If bit 2 is logical 1 when either a 6-, 7-, or 8-bit word length is selected, two stop bits are generated or checked.

**Bit 3:** This bit is the parity enable bit. When bit 3 is a logical 1, a parity bit is generated (transmit data) or checked (receive data) between the last data word bit and stop bit of the serial data. (The parity bit is used to produce an even or odd number of 1's when the data word bits and the parity bit are summed.)

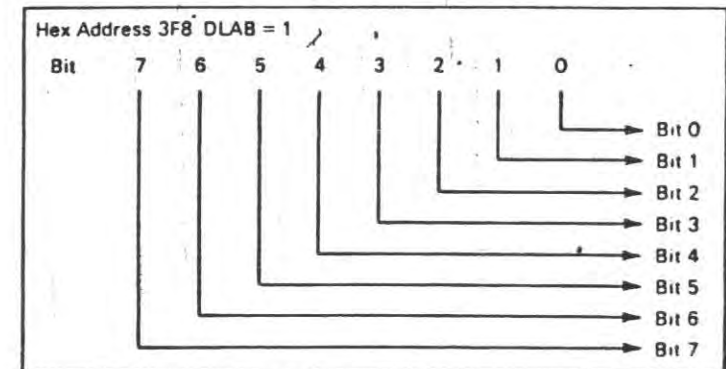
**Bit 4:** This bit is the even parity select bit. When bit 3 is a logical 1 and bit 4 is a logical 0, an odd number of logical 1's is transmitted or checked in the data word bits and parity bit. When bit 3 is a logical 1 and bit 4 is a logical 1, an even number of bits is transmitted or checked.

**Bit 5:** This bit is the stick parity bit. When bit 3 is a logical 1 and bit 5 is a logical 1, the parity bit is transmitted and then detected by the receiver as a logical 0 if bit 4 is a logical 1, or as a logical 1 if bit 4 is a logical 0.

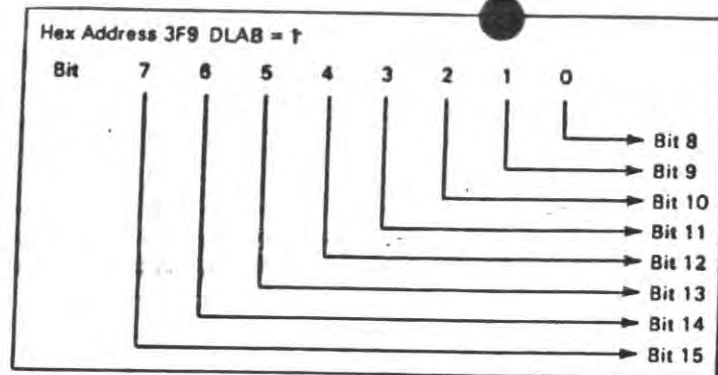
**Bit 6:** This bit is the set break control bit. When bit 6 is a logical 1, the serial output (SOUT) is forced to the spacing (logical 0) state and remains there regardless of other transmitter activity. The set break is disabled by setting bit 6 to a logical 0. This feature enables the processor to alert a terminal in a computer communications system.

**Bit 7:** This bit is the divisor latch access bit (DLAB). It must be set high (logical 1) to access the divisor latches of the baud rate generator during a read or write operation. It must be set low (logical 0) to access the receiver buffer, the transmitter holding register, or the interrupt enable register.

The INS8250 contains a programmable baud rate generator that is capable of taking the clock input (1.8432 MHz) and dividing it by any divisor from 1 to  $(2^8-1)$ . The output frequency of the baud generator is  $16 \times$  the baud rate [divisor # = (frequency input)/(baud rate  $\times$  16)]. Two 8-bit latches store the divisor in a 16-bit binary format. These divisor latches must be loaded during initialization in order to ensure desired operation of the baud rate generator. Upon loading either of the divisor latches, a 16-bit baud counter is immediately loaded. This prevents long counts on initial load.



Divisor Latch Least Significant Bit (DLL)



Divisor Latch Most Significant Bit (DLM)

The following figure illustrates the use of the baud rate generator with a frequency of 1.8432 MHz. For baud rates of 9600 and below, the error obtained is minimal.

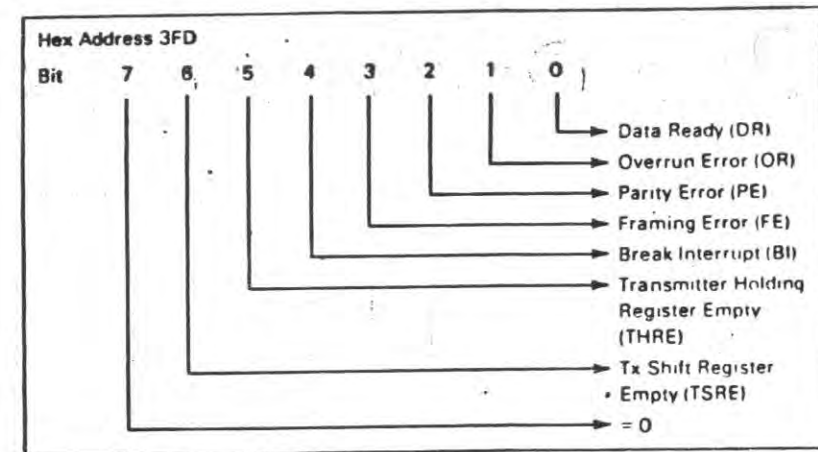
Note: The maximum operating frequency of the baud generator is 3.1 MHz. In no case should the data rate be greater than 9600 baud.

Desired Baud Rate	Divisor Used to Generate 16x Clock		Percent Error Difference Between Desired and Actual
	(Decimal)	(Hex)	
50	2304	900	—
75	1536	600	—
110	1047	417	0.026
134.5	857	359	0.058
150	768	300	—
300	384	180	—
600	192	0C0	—
1200	96	060	—
4800	64	040	—
2000	58	03A	0.69
2400	48	030	—
3600	32	020	—
4800	24	018	—
7200	16	010	—
9600	12	00C	—

Baud Rate at 1.843 MHz

## Line Status Register

This 8-bit register provides status information on the processor concerning the data transfer. The contents of the line status register are indicated and described below:



Line Status Register (LSR)

**Bit 0:** This bit is the receiver data ready (DR) indicator. Bit 0 is set to a logical 1 whenever a complete incoming character has been received and transferred into the receiver buffer register. Bit 0 may be reset to a logical 0 either by the processor reading the data in the receiver buffer register or by writing a logical 0 into it from the processor.

**Bit 1:** This bit is the overrun error (OE) indicator. Bit 1 indicates that data in the receiver buffer register was not read by the processor before the next character was transferred into the receiver buffer register, thereby destroying the previous character. The OE indicator is reset whenever the processor reads the contents of the line status register.

**Bit 2:** This bit is the parity error (PE) indicator. Bit 2 indicates that the received data character does not have the correct even or odd parity, as selected by the even parity-select bit. The PE bit is set to a logical 1 upon detection of a parity error and is reset to a logical 0 whenever the processor reads the contents of the line status register.



**Bit 3:** This bit is the framing error (FE) indicator. Bit 3 indicates that the received character did not have a valid stop bit. Bit 3 is set to a logical 1 whenever the stop bit following the last data bit or parity is detected as a zero bit (spacing level).

**Bit 4:** This bit is the break interrupt (BI) indicator. Bit 4 is set to a logical 1 whenever the received data input is held in the spacing (logical 0) state for longer than a full word transmission time (that is, the total time of start bit + data bits + parity + stop bits).

**Note:** Bits 1 through 4 are the error conditions that produce a receiver line status interrupt whenever any of the corresponding conditions are detected.

**Bit 5:** This bit is the transmitter holding register empty (THRE) indicator. Bit 5 indicates that the INS8250 is ready to accept a new character for transmission. In addition, this bit causes the INS8250 to issue an interrupt to the processor when the transmit holding register empty interrupt enable is set high. The THRE bit is set to a logical 1 when a character is transferred from the transmitter holding register into the transmitter shift register. The bit is reset to logical 0 concurrently with the loading of the transmitter holding register by the processor.

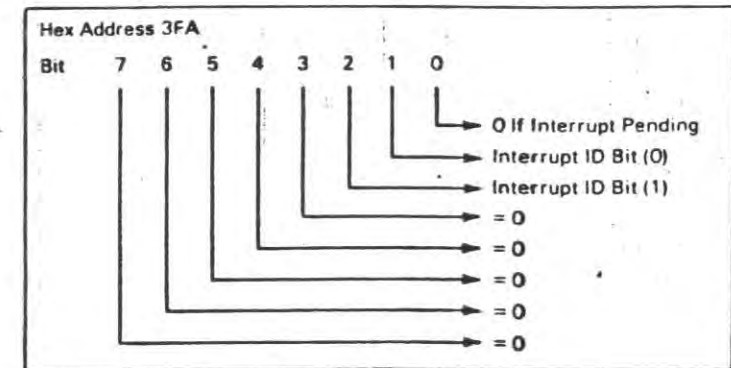
**Bit 6:** This bit is the transmitter shift register empty (TSRE) indicator. Bit 6 is set to a logical 1 whenever the transmitter shift register is idle. It is reset to logical 0 upon a data transfer from the transmitter holding register to the transmitter shift register. Bit 6 is a read-only bit.

**Bit 7:** This bit is permanently set to logical 0.

## Interrupt Identification Register

The INS8250 has an on-chip interrupt capability that allows for complete flexibility in interfacing to all the popular microprocessors presently available. In order to provide minimum software overhead during data character transfers, the INS8250 prioritizes interrupts into four levels: receiver line status (priority 1), received data ready (priority 2), transmitter holding register empty (priority 3), and modem status (priority 4).

Information indicating that a prioritized interrupt is pending and the type of prioritized interrupt is stored in the interrupt identification register. Refer to the "Interrupt Control Functions" table. The interrupt identification register (IIR), when addressed during chip-select time, freezes the highest priority interrupt pending, and no other interrupts are acknowledged until that particular interrupt is serviced by the processor. The contents of the IIR are indicated and described below.



Interrupt Identification Register (IIR)

**Bit 0:** This bit can be used in either a hard-wired prioritized or polled environment to indicate whether an interrupt is pending and the IIR contents may be used as a pointer to the appropriate interrupt service routine. When bit 0 is a logical 1, no interrupt is pending and polling (if used) is continued.

**Bits 1 and 2:** These two bits of the IIR are used to identify the highest priority interrupt pending as indicated in the "Interrupt Control Functions" table.

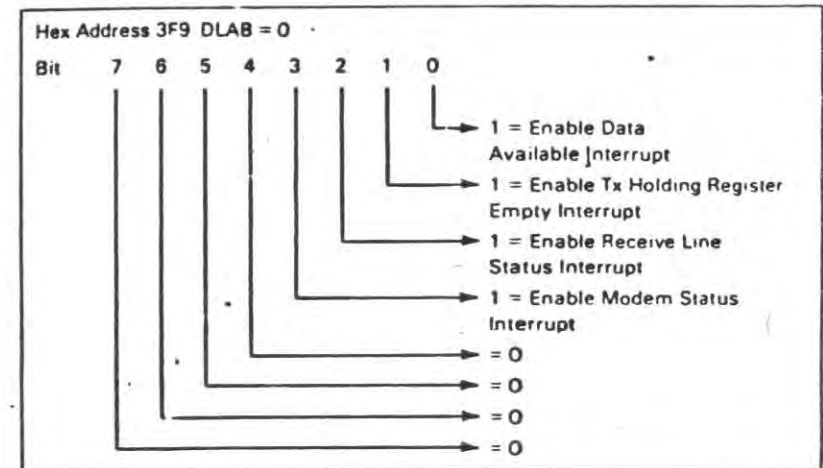
**Bits 3 through 7:** These five bits of the IIR are always logical 0.

Interrupt ID Register			Interrupt Set and Reset Functions			
Bit 2	Bit 1	Bit 0	Priority Level	Interrupt Type	Interrupt Source	Interrupt Reset Control
0	0	1	—	None	None	—
1	1	0	Highest	Receiver Line Status	Overflow Error or Parity Error or Framing Error or Break Interrupt	Reading the Line Status Register
1	0	0	Second	Received Data Available	Receiver Data Available	Reading the Receiver Buffer Register
0	1	0	Third	Transmitter Holding Register Empty	Transmitter Holding Register Empty	Reading the IIR Register (if source of interrupt) or Writing into the Transmitter Holding Register
0	0	0	Fourth	Modem Status	Clear to Send or Data Set Ready or Ring Indicator or Received Line Signal Direct	Reading the Modem Status Register

Interrupt Control Functions

## Interrupt Enable Register

This eight-bit register enables the four types of interrupt of the INS8250 to separately activate the chip interrupt (INTRPT) output signal. It is possible to totally disable the interrupt system by resetting bits 0 through 3 of the interrupt enable register. Similarly, by setting the appropriate bits of this register to a logical 1, selected interrupts can be enabled. Disabling the interrupt system inhibits the interrupt identification register and the active (high) INTRPT output from the chip. All other system functions operate in their normal manner, including the setting of the line status and modem status registers. The contents of the interrupt enable register are indicated and described below:



Interrupt Enable Register (IER)

**Bit 0:** This bit enables the received data available interrupt when set to logical 1.

**Bit 1:** This bit enables the transmitter holding register empty interrupt when set to logical 1.

**Bit 2:** This bit enables the receiver line status interrupt when set to logical 1.

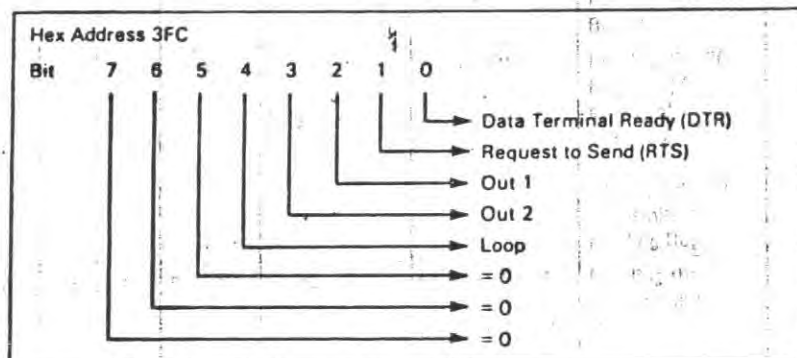


**Bit 3:** This bit enables the modem status interrupt when set to logical 1.

**Bits 4 through 7:** These four bits are always logical 0.

## Modem Control Register

This eight-bit register controls the interface with the modem or data set (or peripheral device emulating a modem). The contents of the modem control register are indicated and described below:



Modem Control Register (MCR)

**Bit 0:** This bit controls the data terminal ready ( $\overline{DTR}$ ) output. When bit 0 is set to logical 1, the  $\overline{DTR}$  output is forced to a logical 0. When bit 0 is reset to a logical 0, the  $\overline{DTR}$  output is forced to a logical 1.

**Note:** The  $\overline{DTR}$  output of the INS8250 may be applied to an EIA inverting line driver (such as the DS1488) to obtain the proper polarity input at the succeeding modem or data set.

**Bit 1:** This bit controls the request to send ( $\overline{RTS}$ ) output. Bit 1 affects the  $\overline{RTS}$  output in a manner identical to that described above for bit 0.

**Bit 2:** This bit controls the output 1 ( $\overline{OUT 1}$ ) signal, which is an auxiliary user-designated output. Bit 2 affects the  $\overline{OUT 1}$  output in a manner identical to that described above for bit 0.

**Bit 3:** This bit controls the output 2 ( $\overline{OUT 2}$ ) signal, which is an auxiliary user-designated output. Bit 3 affects the  $\overline{OUT 2}$  output in a manner identical to that described above for bit 0.

**Bit 4:** This bit provides a loopback feature for diagnostic testing of the INS8250. When bit 4 is set to logical 1, the following occurs: the transmitter serial output (SOUT) is set to the marking (logical 1) state; the receiver serial input (SIN) is disconnected; the output of the transmitter shift register is "looped back" into the receiver shift register input; the four modem control inputs ( $\overline{CTS}$ ,  $\overline{DRS}$ ,  $\overline{RLSD}$ , and  $\overline{RI}$ ) are disconnected; and the four modem control outputs ( $\overline{DTR}$ ,  $\overline{RTS}$ ,  $\overline{OUT 1}$ , and  $\overline{OUT 2}$ ) are internally connected to the four modem control inputs. In the diagnostic mode, data that is transmitted is immediately received. This feature allows the processor to verify the transmit- and receive-data paths of the INS8250.

In the diagnostic mode, the receiver and transmitter interrupts are fully operational. The modem control interrupts are also operational but the interrupts' sources are now the lower four bits of the modem control register instead of the four modem control inputs. The interrupts are still controlled by the interrupt enable register.

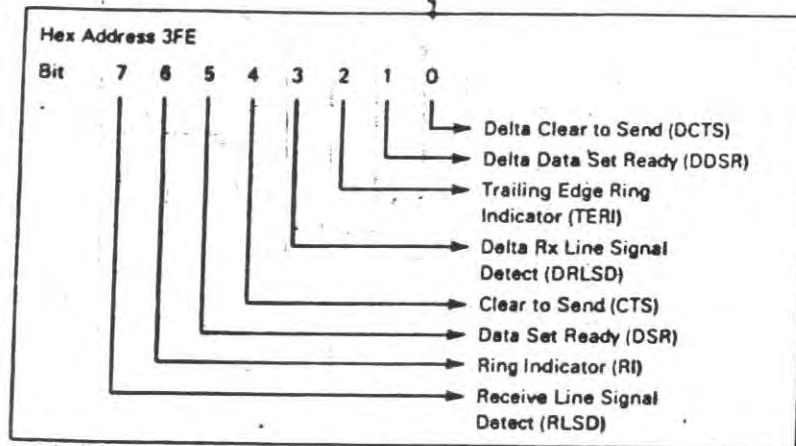
The INS8250 interrupt system can be tested by writing into the lower four bits of the modem status register. Setting any of these bits to a logical 1 generates the appropriate interrupt (if enabled). The resetting of these interrupts is the same as in normal INS8250 operation. To return to normal operation, the registers must be reprogrammed for normal operation and then bit 4 of the modem control register must be reset to logical 0.

**Bits 5 through 7:** These bits are permanently set to logical 0.

## Modem Status Register

This eight-bit register provides the current state of the control lines from the modem (or peripheral device) to the processor. In addition to this current-state information, four bits of the modem status register provide change information. These bits are set to a logical 1 whenever a control input from the modem changes state. They are reset to logical 0 whenever the processor reads the modem status register.

The content of the modem status register are indicated and described below:



Modem Status Register (MSR)

**Bit 0:** This bit is the delta clear to send (DCTS) indicator. Bit 0 indicates that the  $\overline{CTS}$  input to the chip has changed state since the last time it was read by the processor.

**Bit 1:** This bit is the delta data set ready (DDSR) indicator. Bit 1 indicates that the  $\overline{DRS}$  input to the chip has changed since the last time it was read by the processor.

**Bit 2:** This bit is the trailing edge of ring indicator (TERI) detector. Bit 2 indicates that the  $\overline{RI}$  input to the chip has changed from an on (logical 1) to an off (logical 0) condition.

**Bit 3:** This bit is the delta received line signal detector (DRLSD) indicator. Bit 3 indicates that the  $\overline{RLSD}$  input to the chip has changed state.

**Note:** Whenever bit 0, 1, 2, or 3 is set to a logical 1, a modem status interrupt is generated.

**Bit 4:** This bit is the complement of the clear to send ( $\overline{CTS}$ ) input. If bit 4 (LOOP) of the MCR is set to a logical 1, this is equivalent to RTS in the MCR.

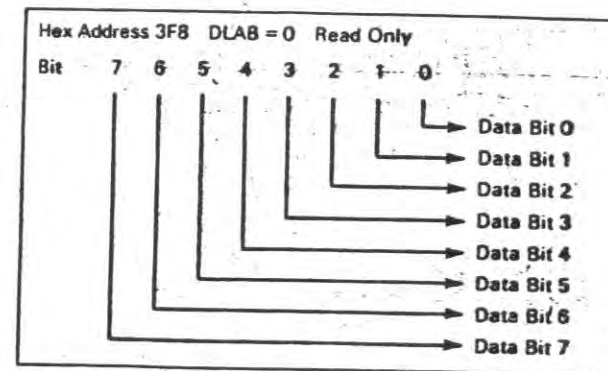
**Bit 5:** This bit is the complement of the data set ready ( $\overline{DSR}$ ) input. If bit 4 of the MCR is set to a logical 1, this bit is equivalent to DTR in the MCR.

**Bit 6:** This bit is the complement of the ring indicator ( $\overline{RI}$ ) input. If bit 4 of the MCR is set to a logical 1, this bit is equivalent to OUT 1 in the MCR.

**Bit 7:** This bit is the complement of the received line signal detect ( $\overline{RLSD}$ ) input. If bit 4 of the MCR is set to a logical 1, this bit is equivalent to OUT 2 of the MCR.

## Receiver Buffer Register

The receiver buffer register contains the received character as defined below:

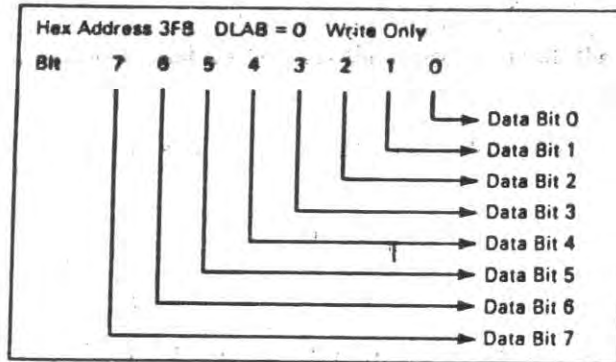


Receiver Buffer Register (RBR)

Bit 0 is the least significant bit and is the first bit serially received.

## Transmitter Holding Register

The transmitter holding register contains the character to be serially transmitted and is defined below:



Transmitter Holding Register (THR)

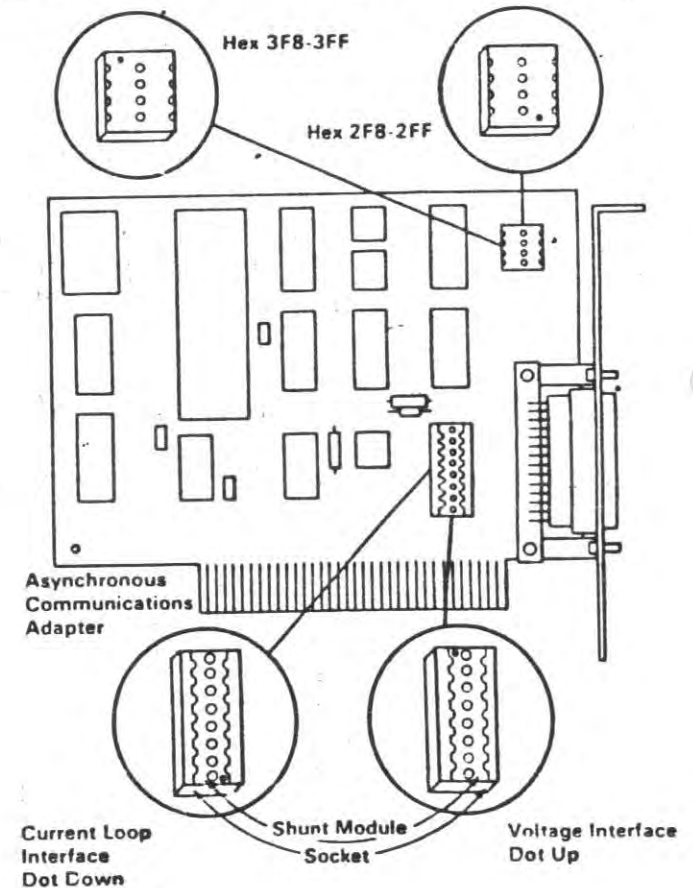
Bit 0 is the least significant bit and is the first bit serially transmitted.

## Selecting the Interface Format and Adapter Address

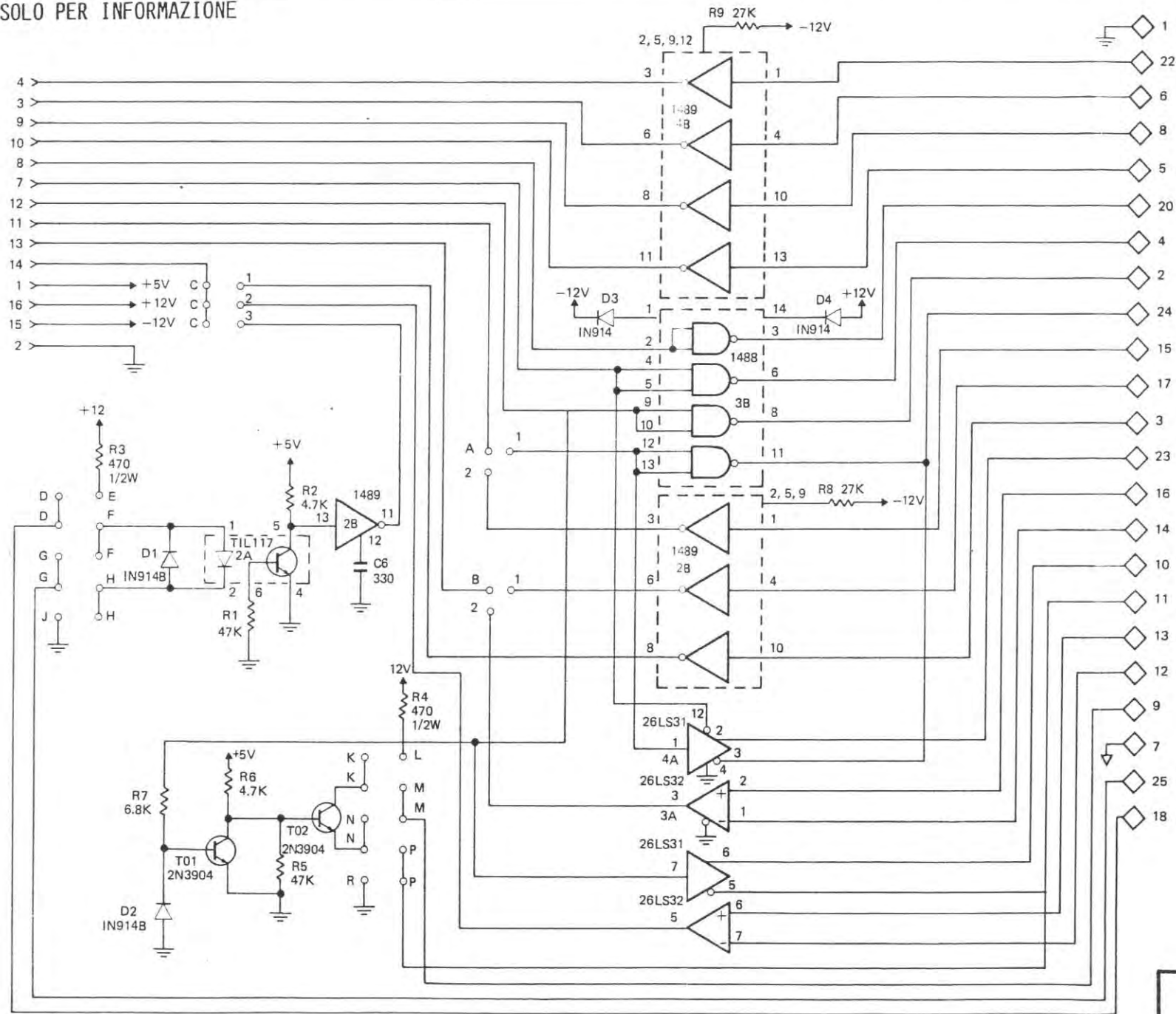
The voltage or current loop interface and adapter address are selected by plugging the programmed shunt modules with the locator dots up or down. See the figure below for the configurations.

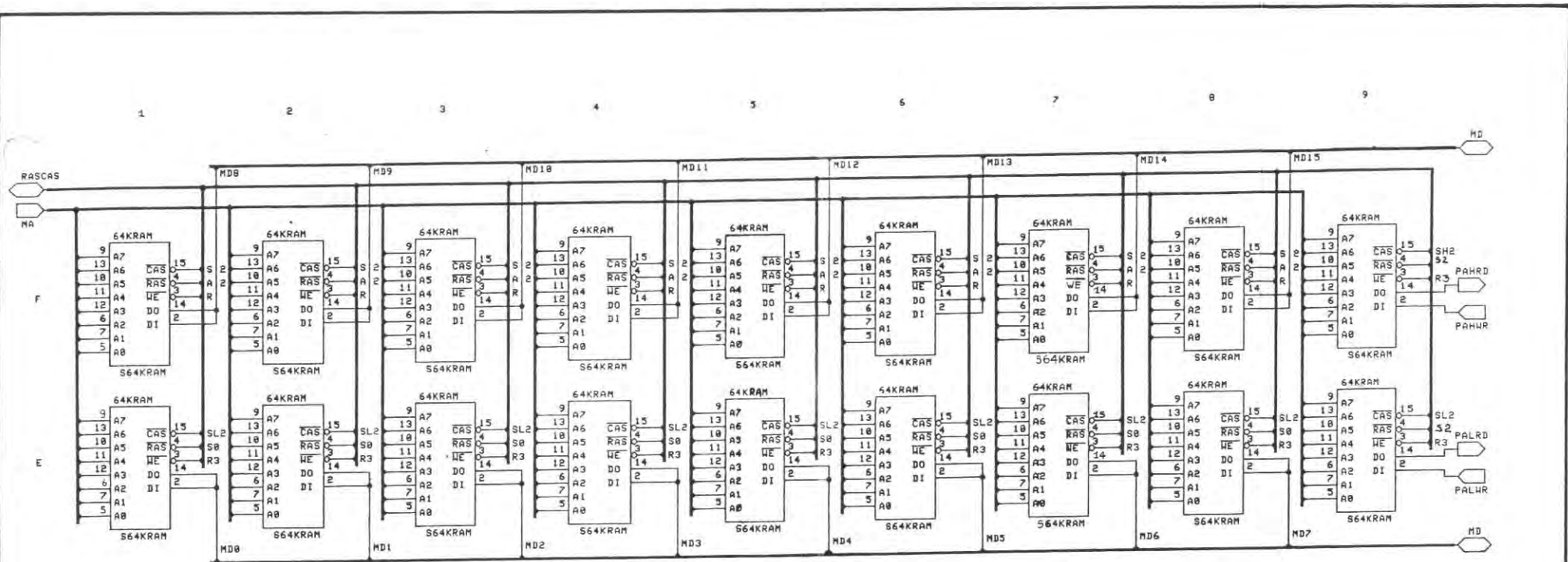
Module Position  
for Primary Asynchronous  
Adapter

Module Position  
for Alternate Asynchronous  
Adapter



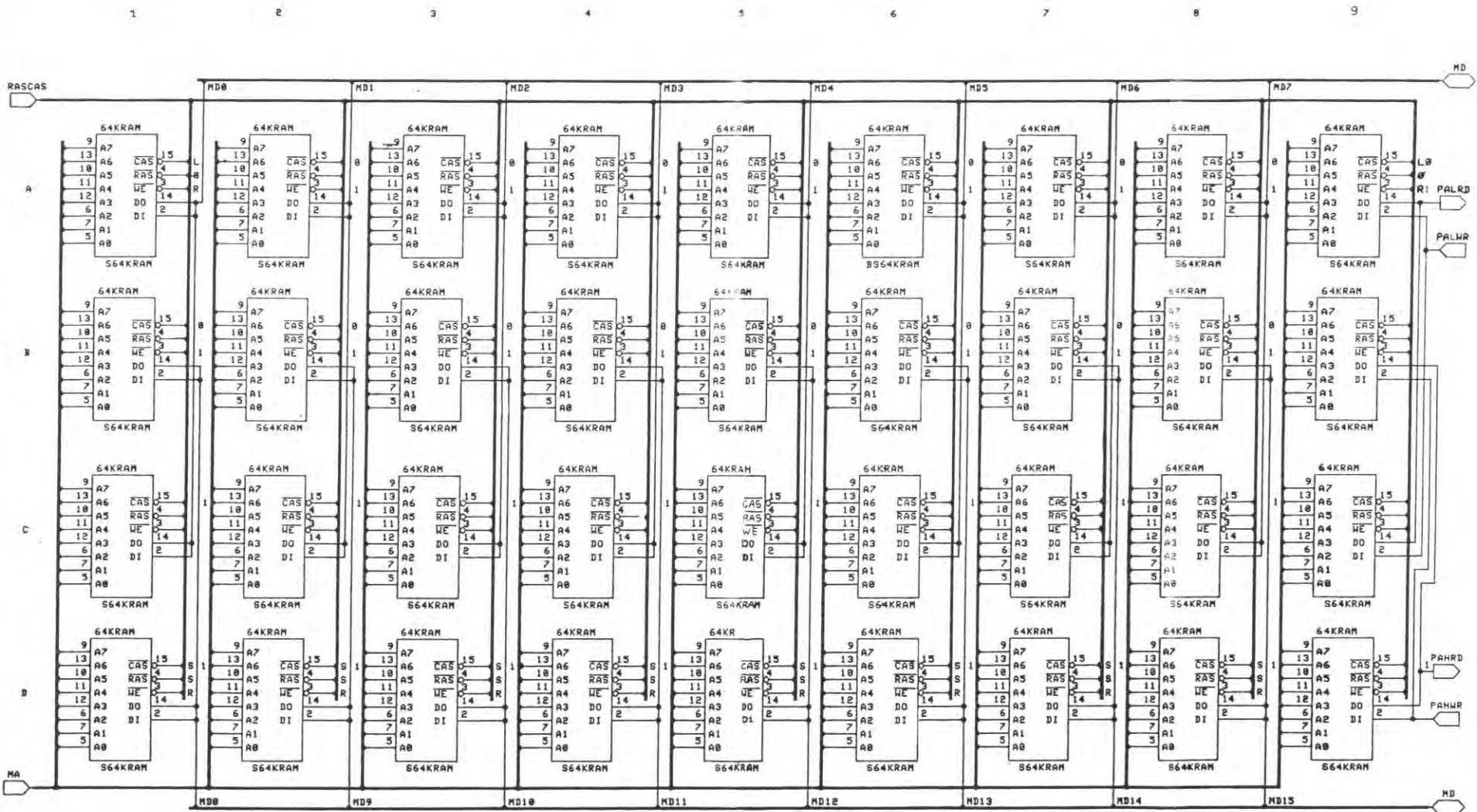
SOLO PER INFORMAZIONE



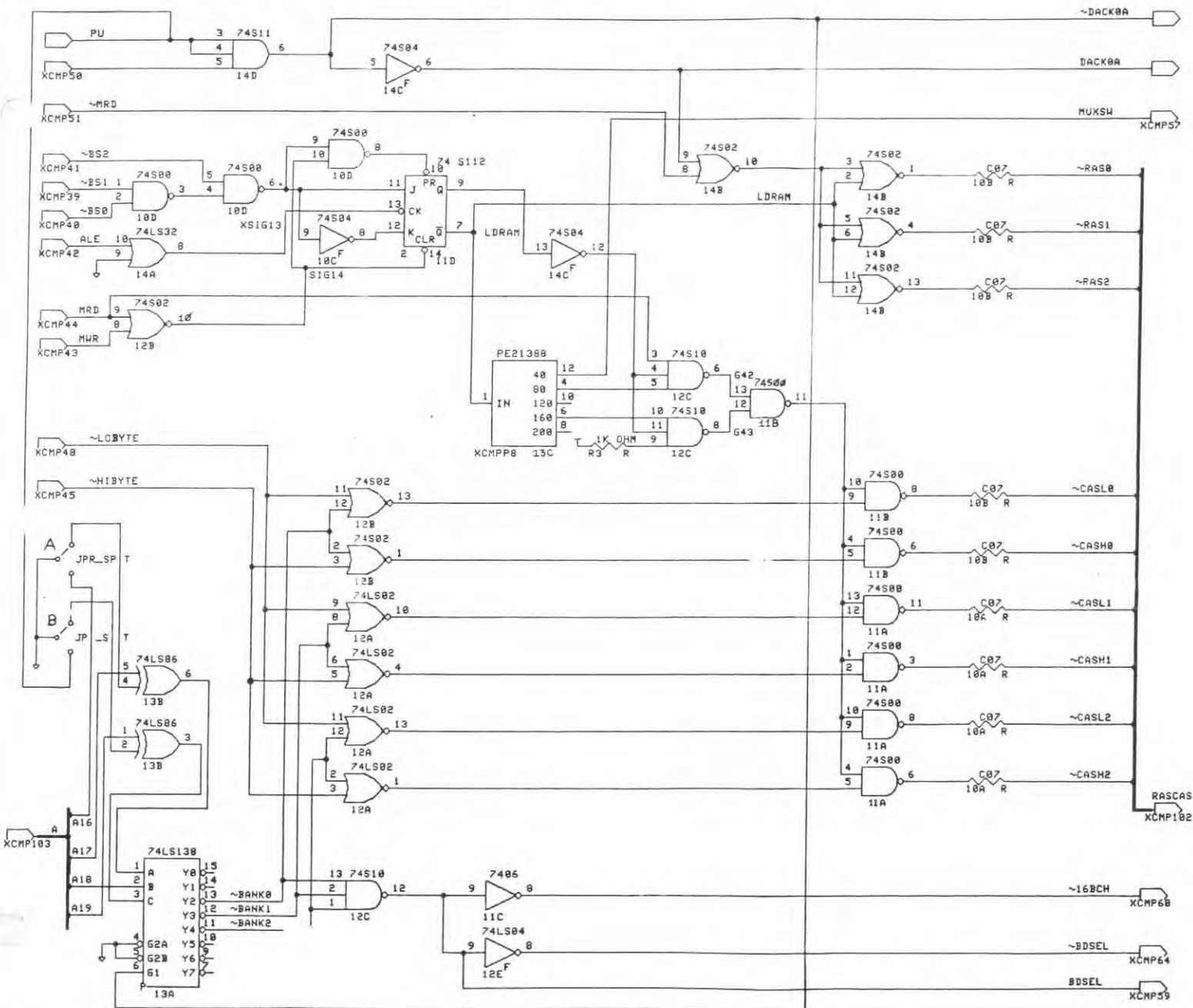


SOLO PER INFORMAZIONE

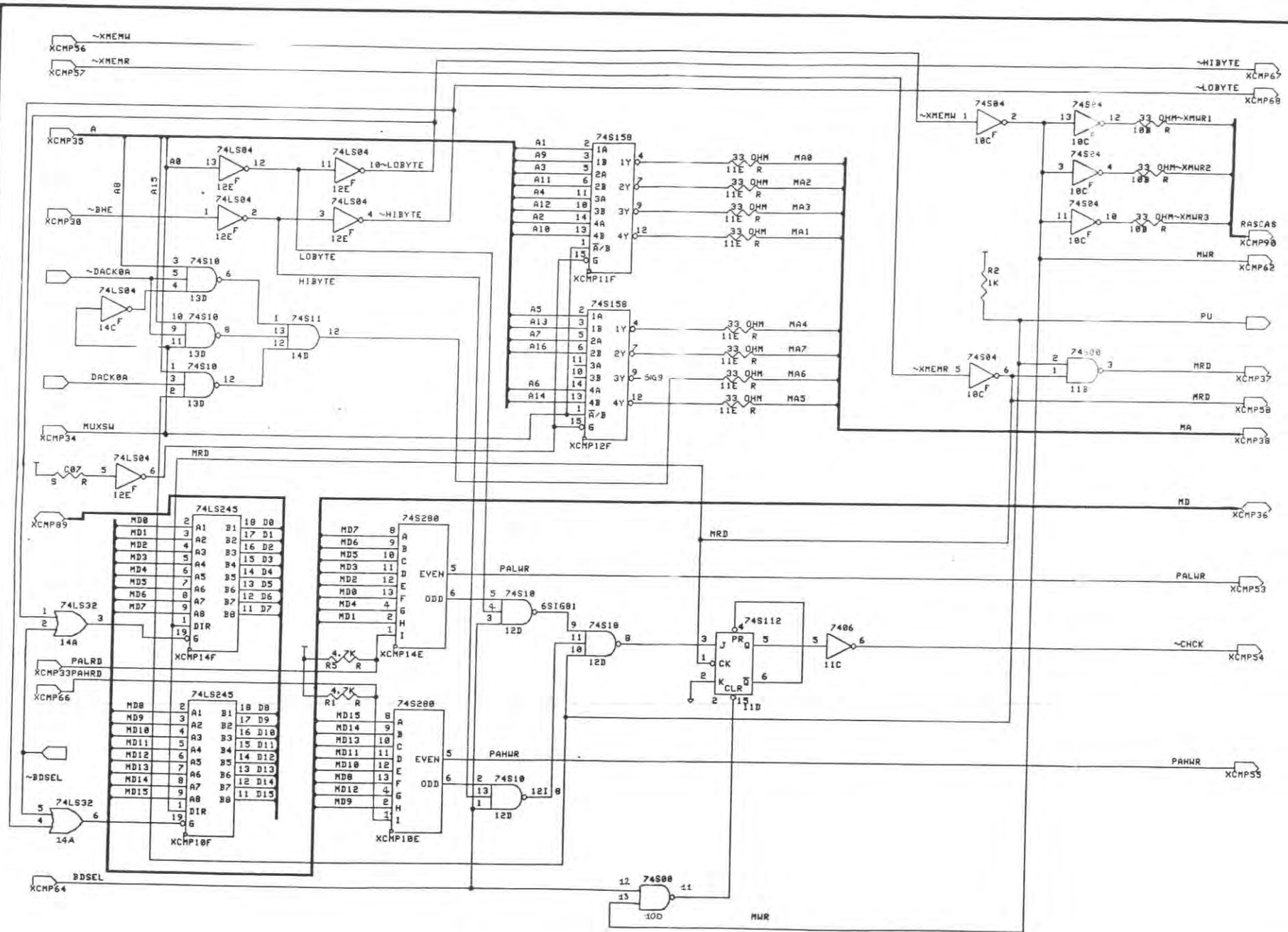






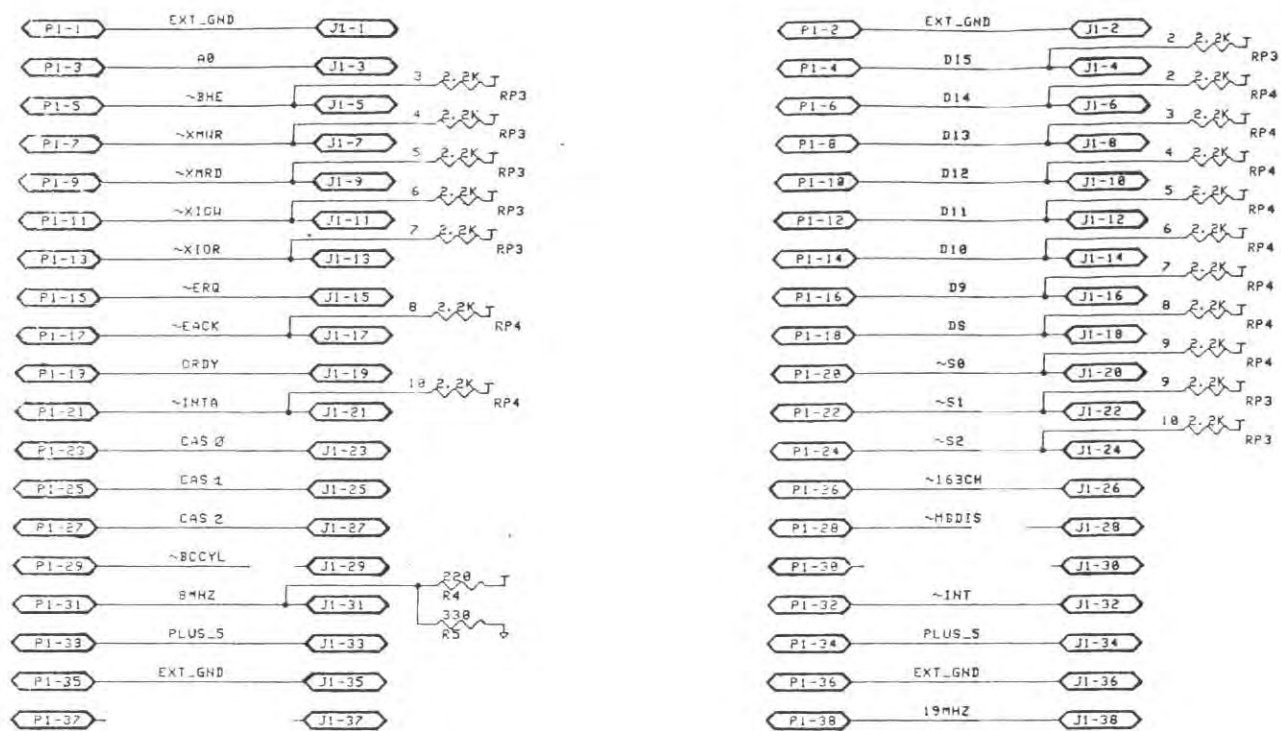


SOLO PER INFORMAZIONE

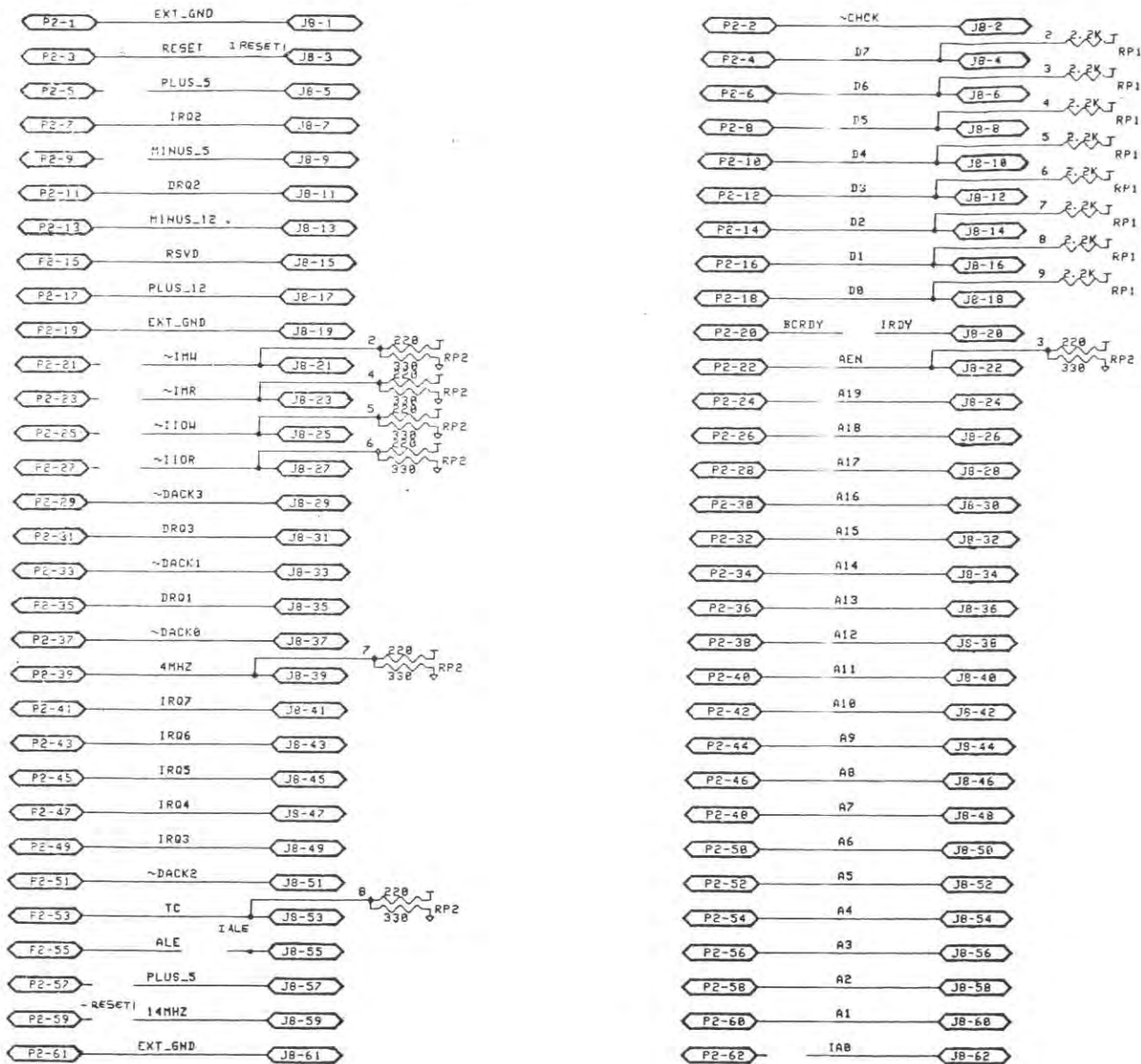


SOLO PER INFORMAZIONE

OLIVETTI PERSONAL COMPUTER M24  
MEMORY EXPANSION BOARD



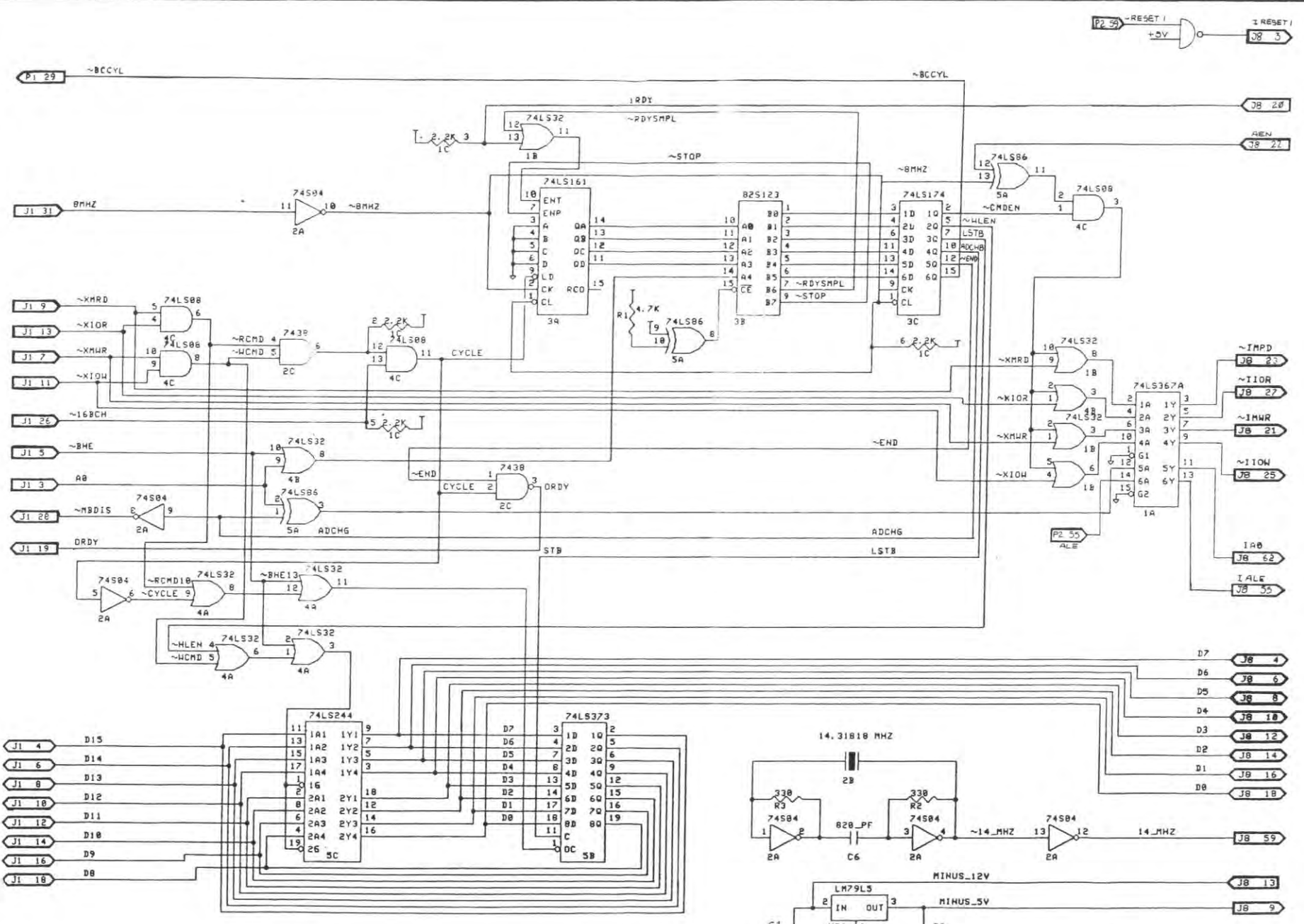
NOTE: J2 through J7 same as shown for J1



NOTE: J9 through J14 same as shown for J8

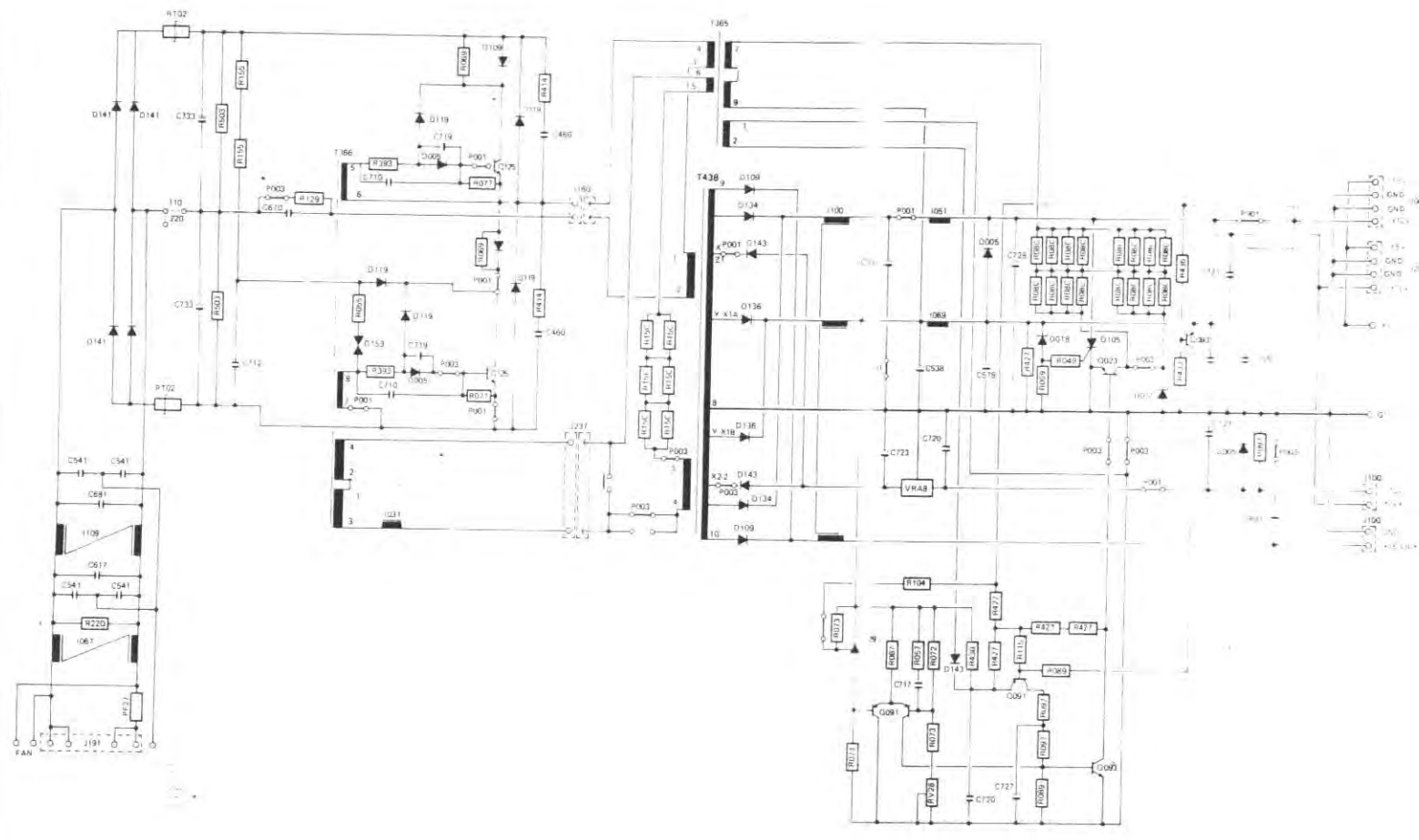
SOLO PER INFORMAZIONE

OLIVETTI PERSONAL COMPUTER M24  
BUS CONVERTER BOARD

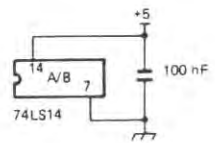
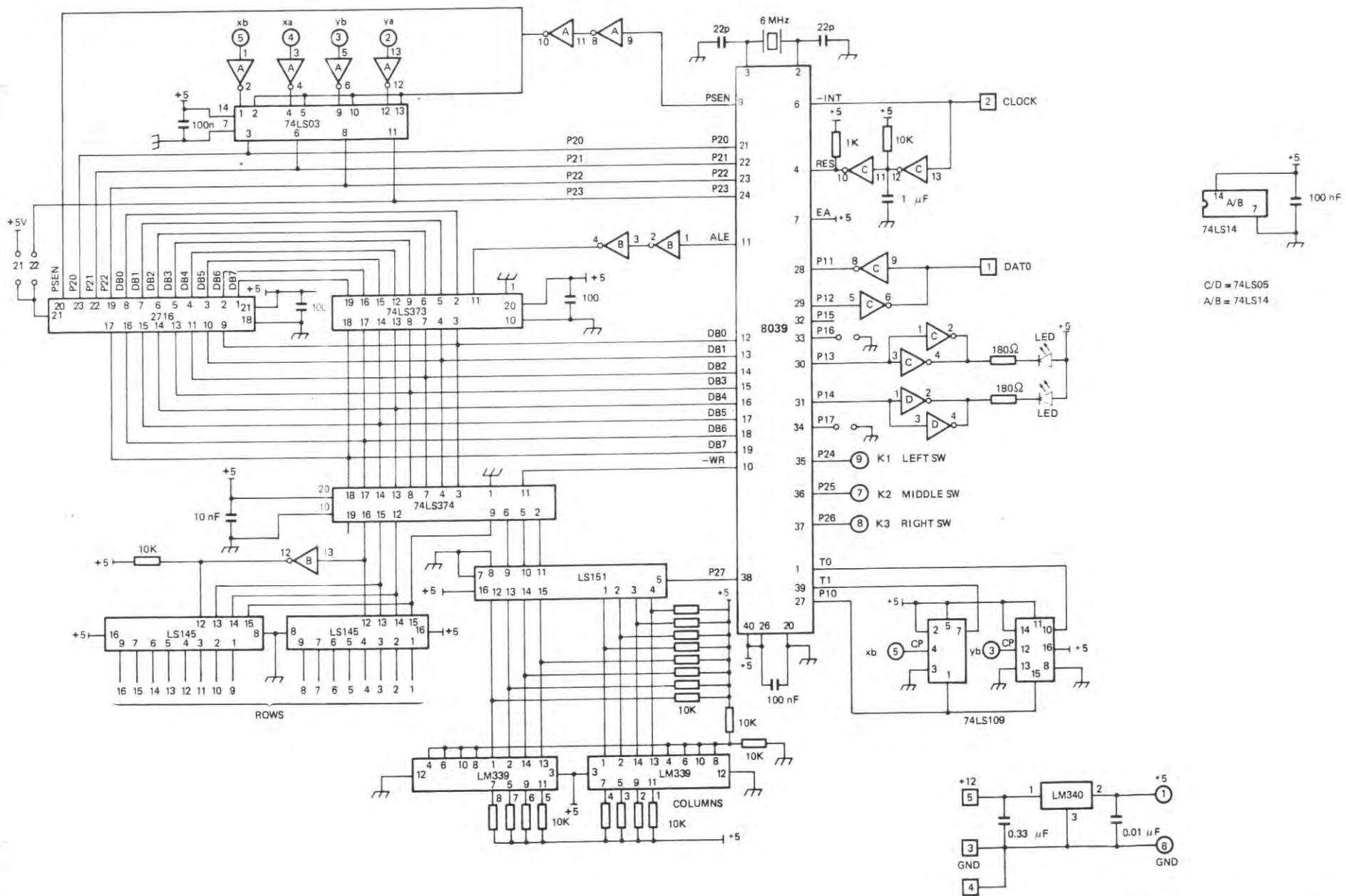


SOLO PER INFORMAZIONE

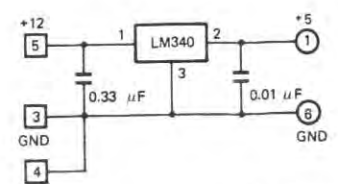
OLIVETTI PERSONAL COMPUTER M24  
BUS CONVERTER BOARD



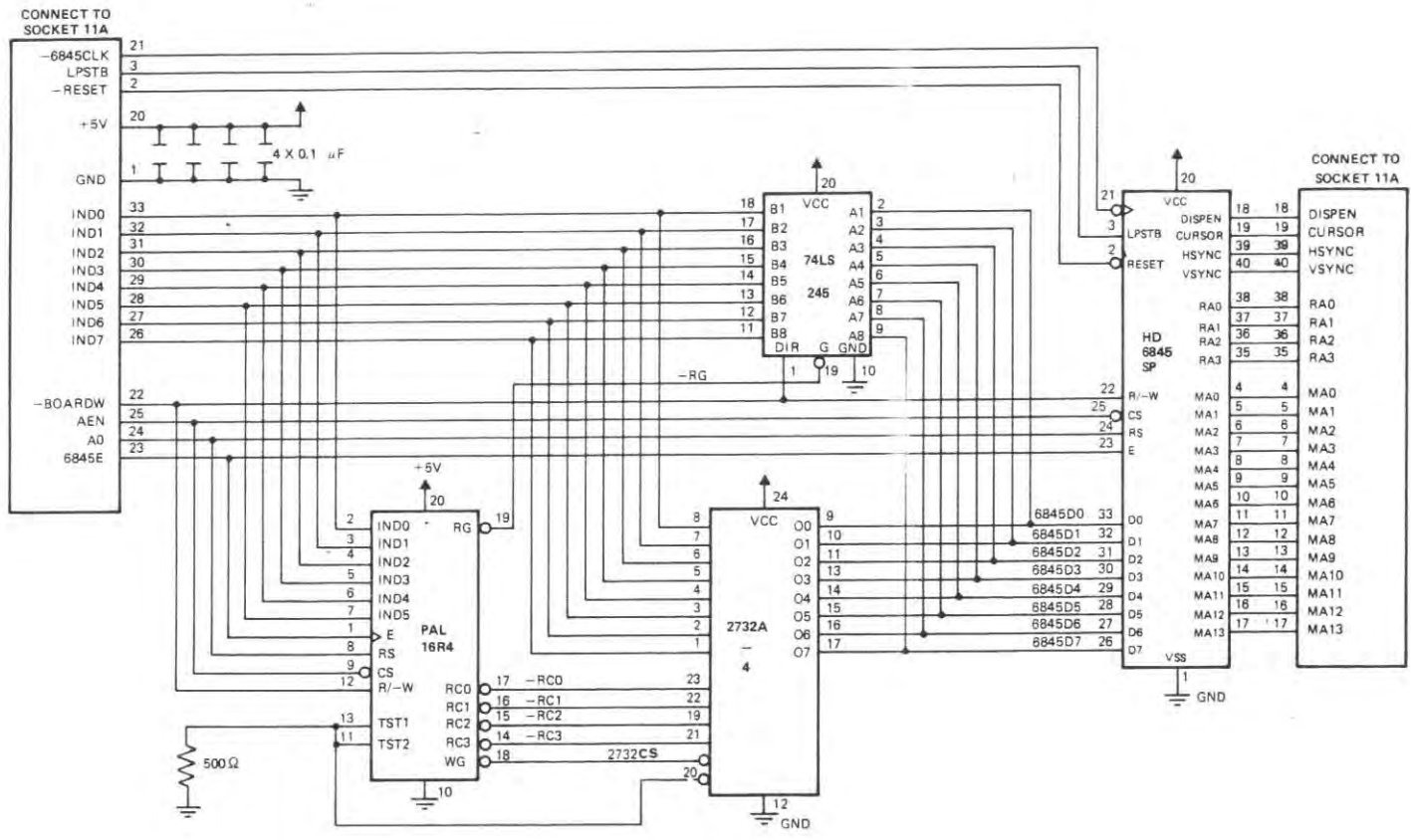




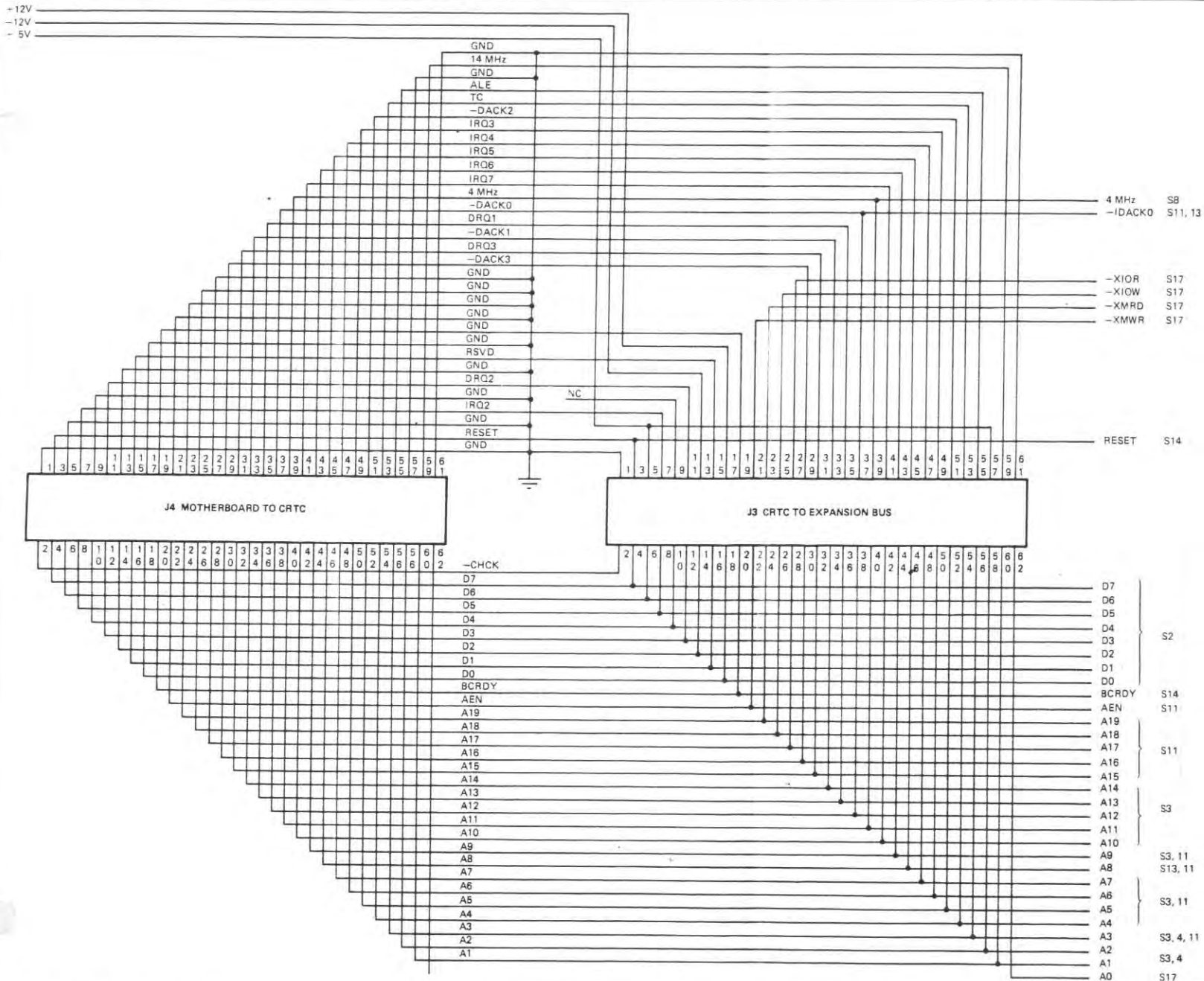
C/D = 74LS05  
A/B = 74LS14



SOLO PER INFORMAZIONE



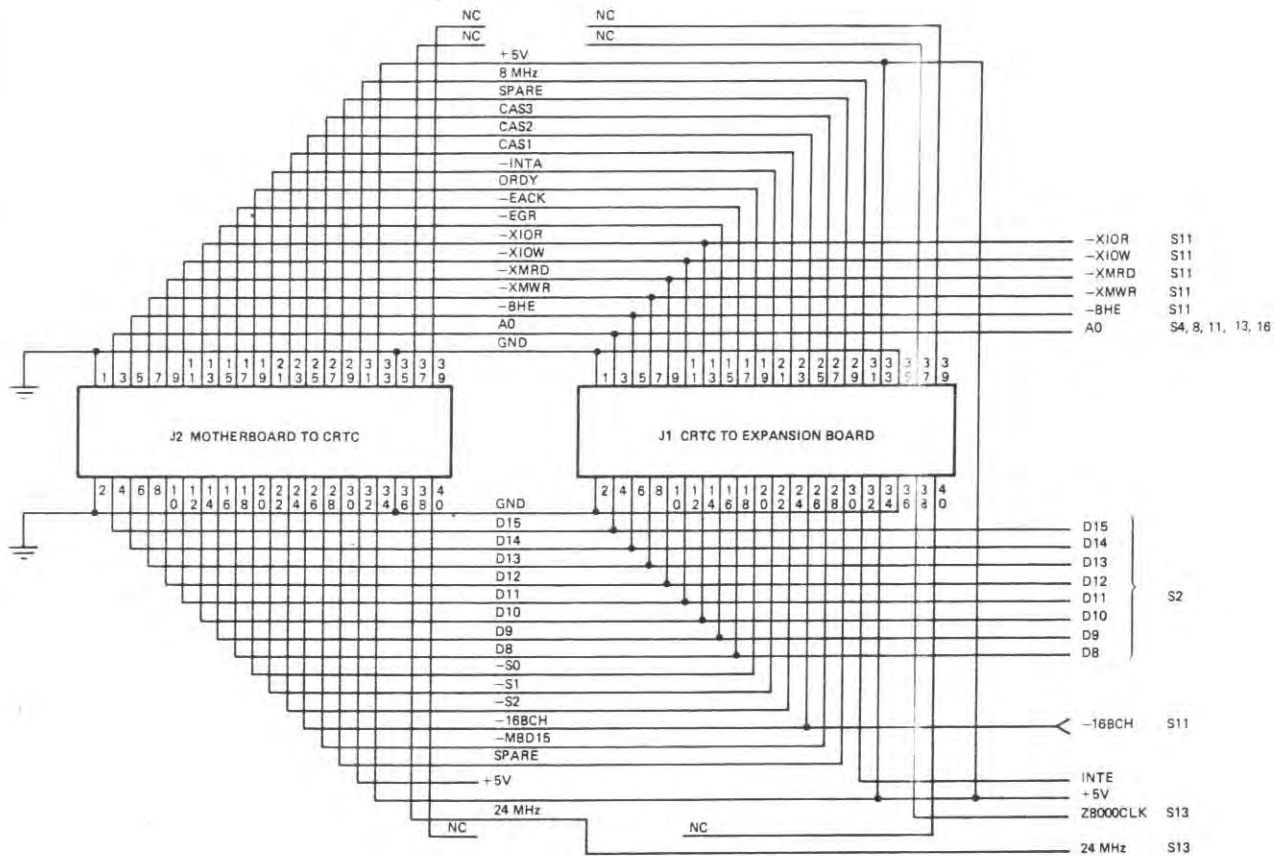
PIASTRA PIGGY BACK



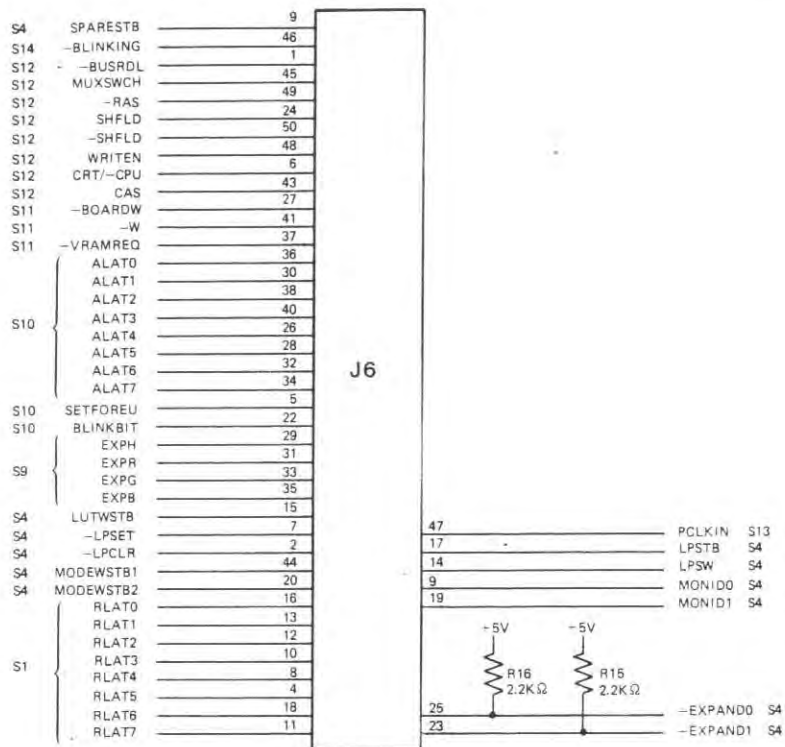
SOLO PER INFORMAZIONE

CONNETTORI DEL SISTEMA

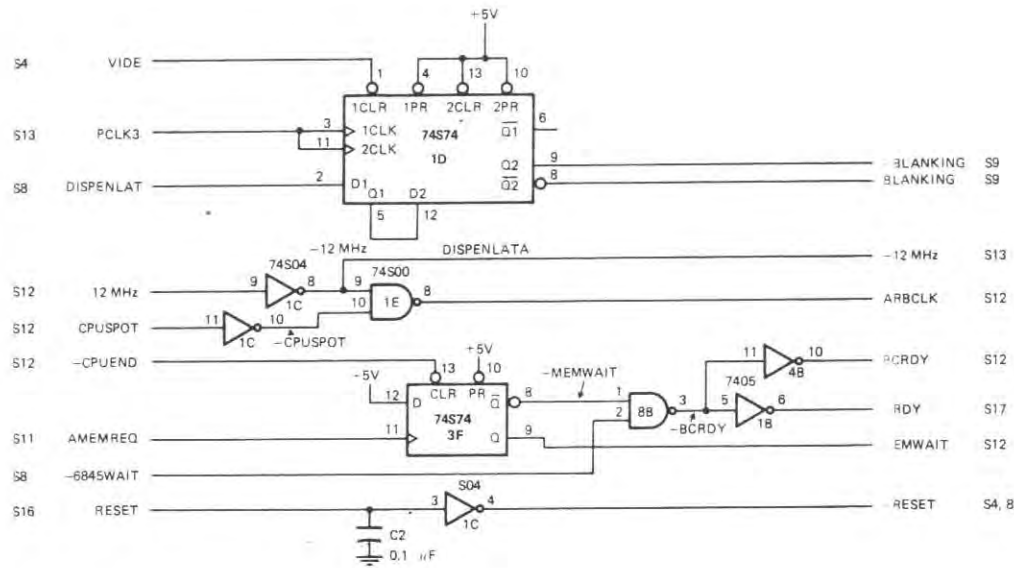
OLIVETTI PERSONAL COMPUTER M24  
 DISPLAY CONTROLLER  
 REV. P2



CONNETTORI DEL SISTEMA

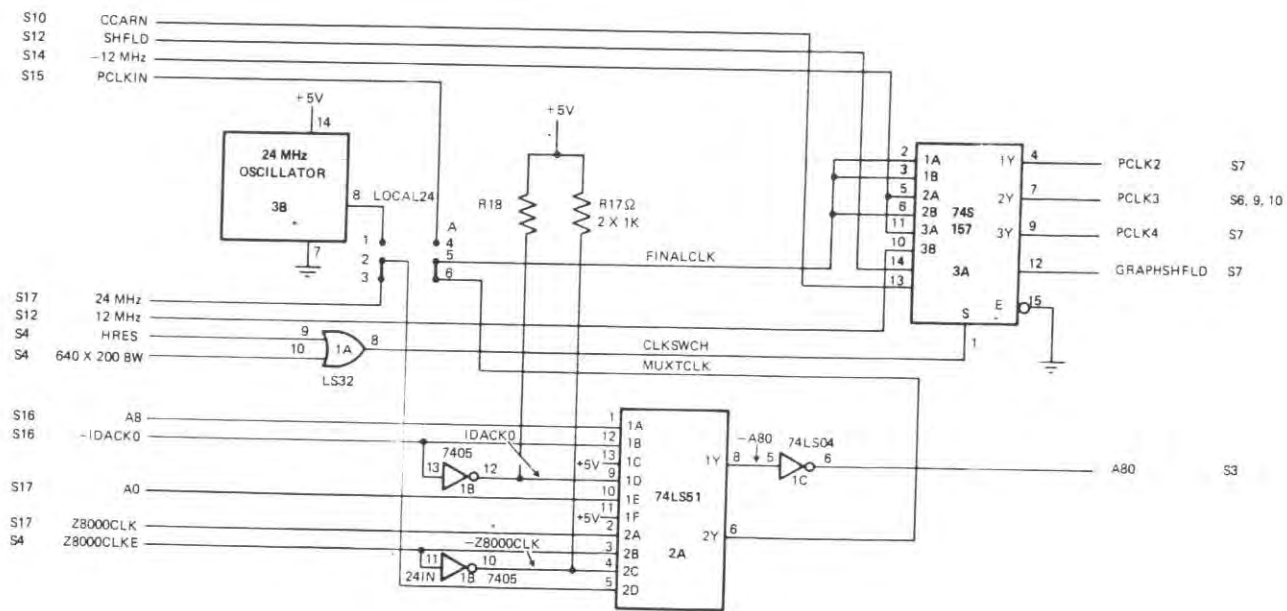


CONNETTORE ENHANCEMENT

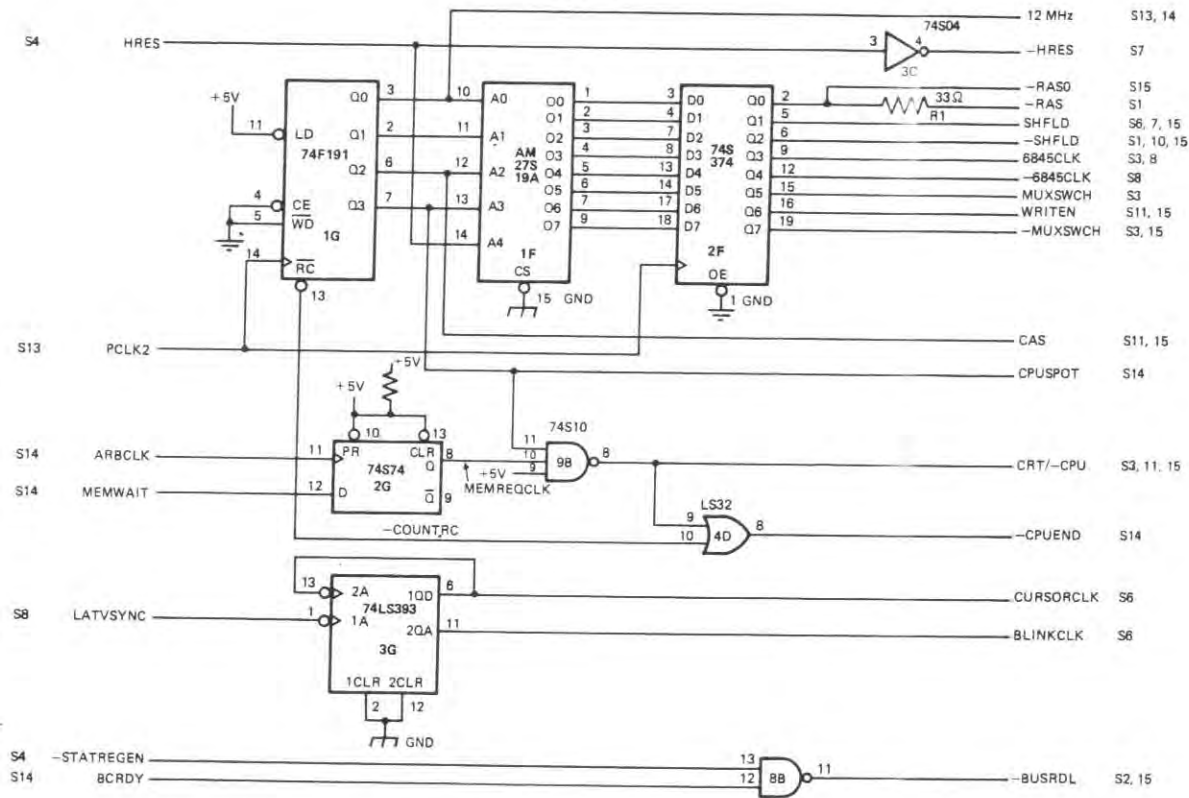


ELABORAZIONE DI BLANKING, ARBITRAGGIO E READY

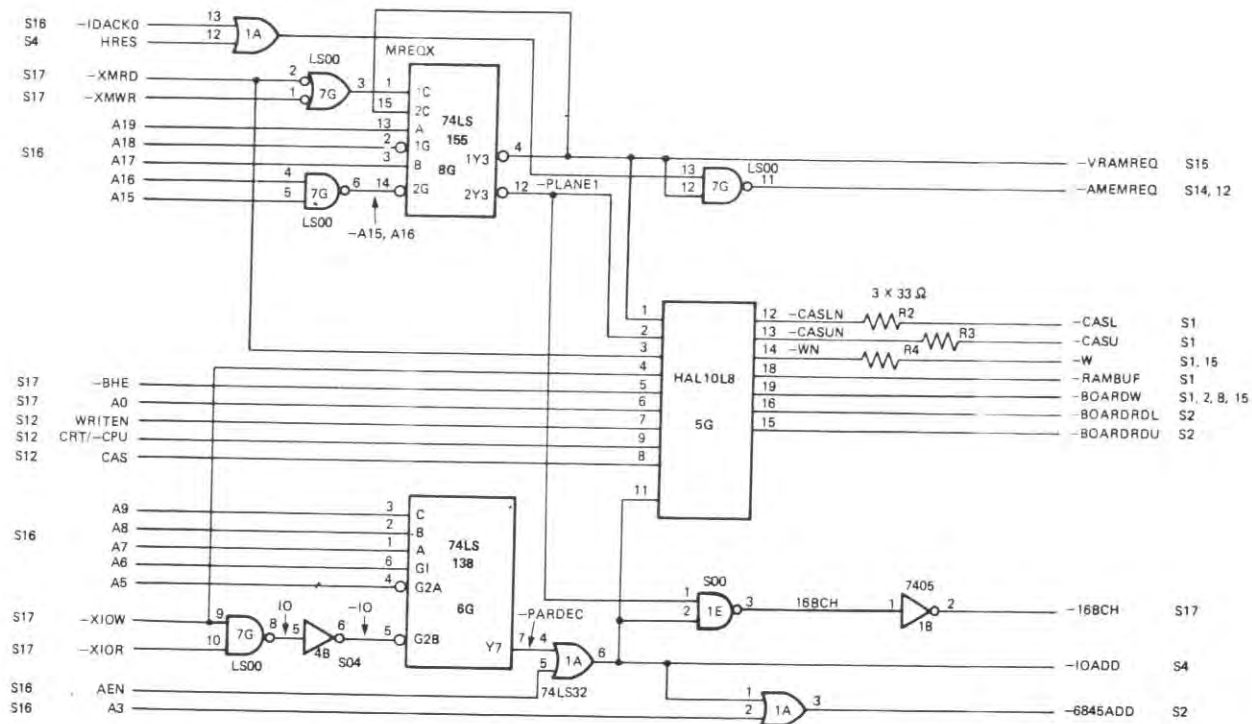




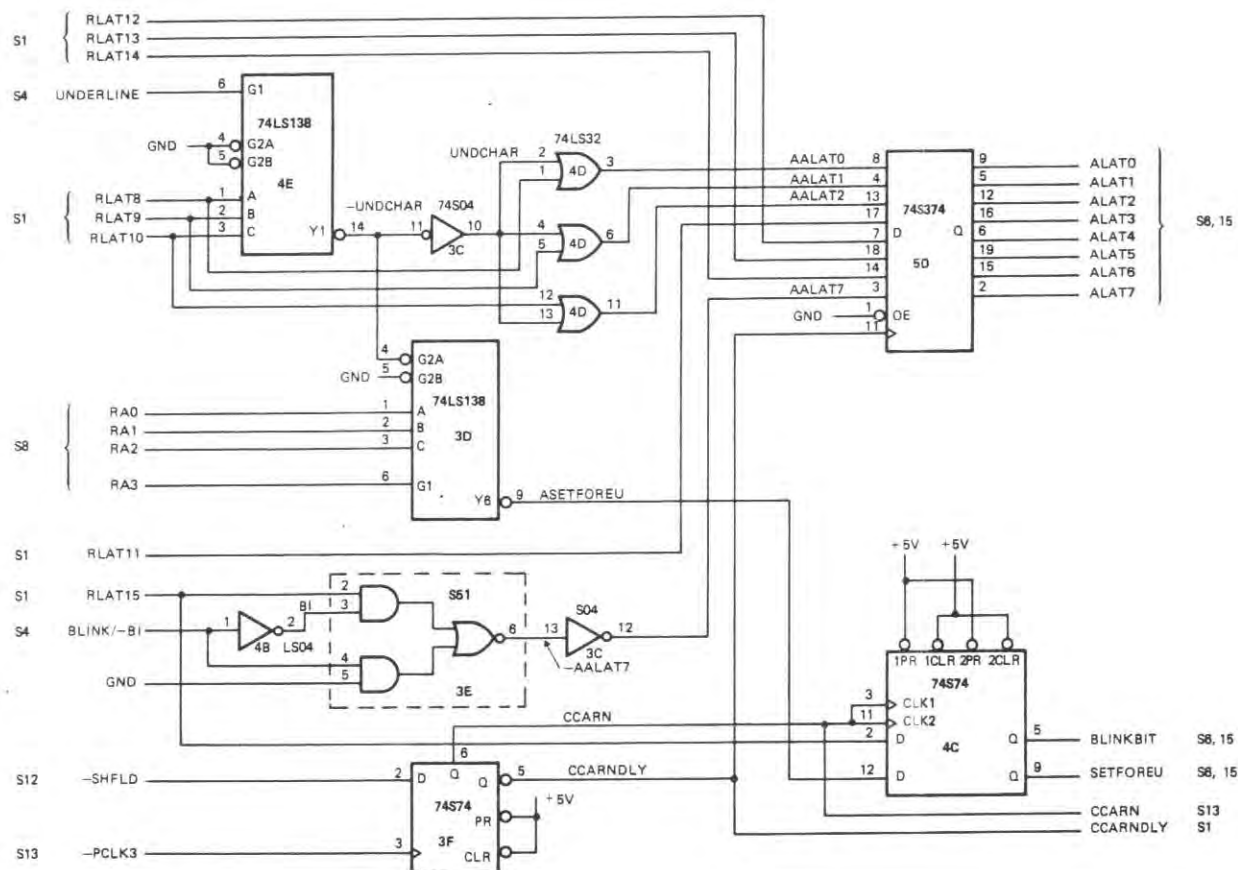
CIRCUITO DEL MODO



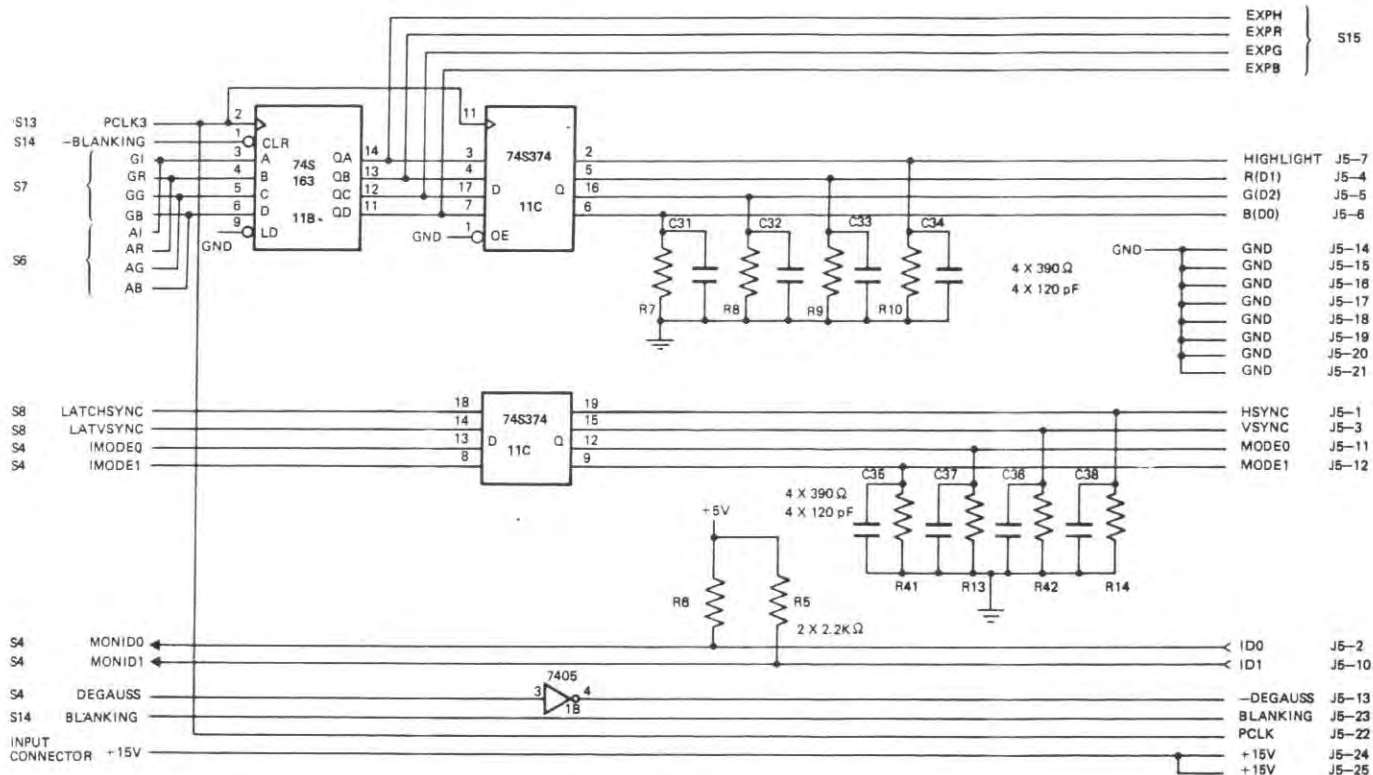
LOGICA DI TEMPORIZZAZIONE



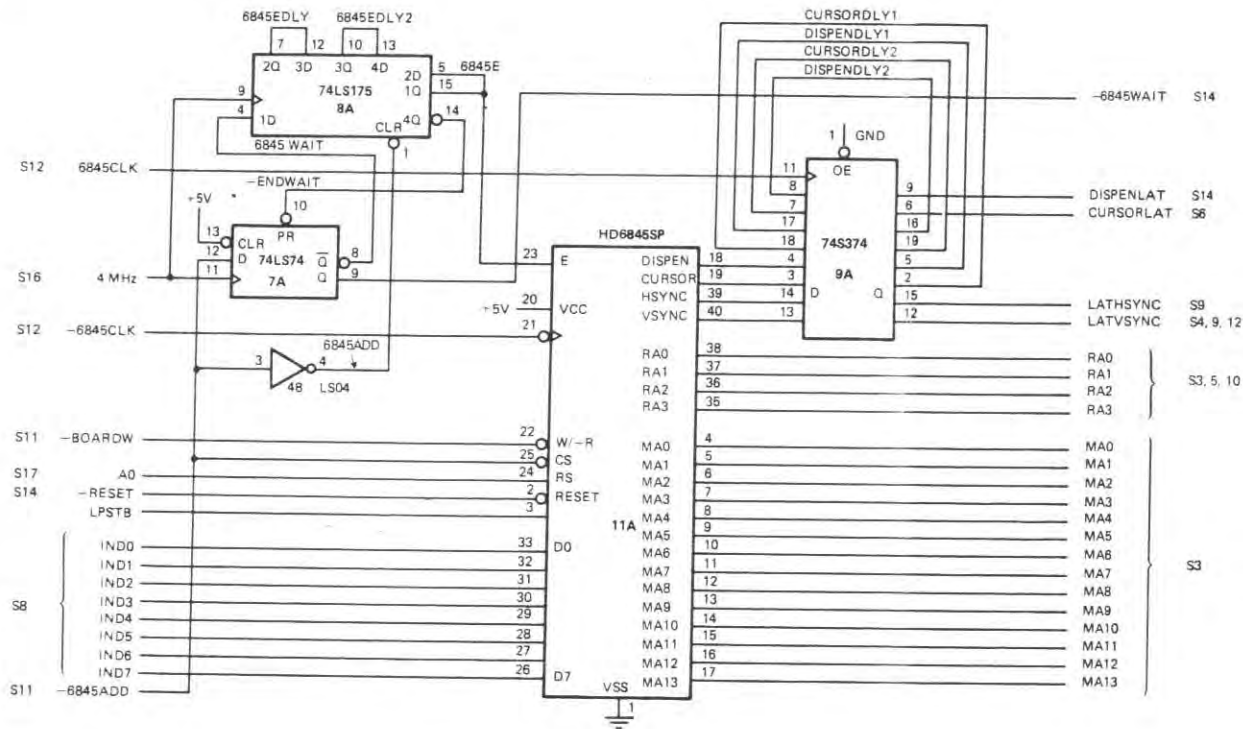
DECODIFICATORI INDIRIZZO



LOGICA SOTTOLINEATURA

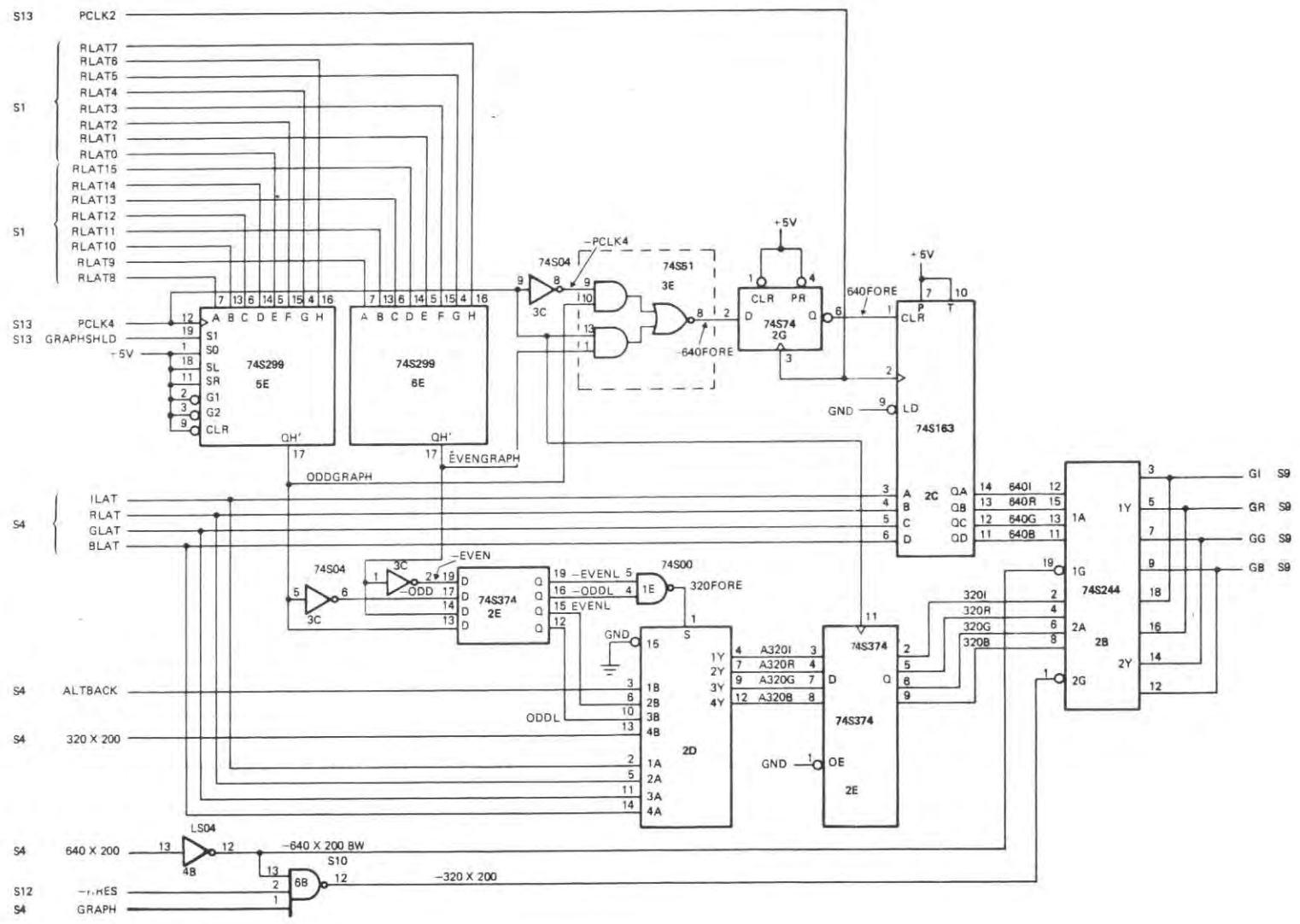


DRIVER BLANKING E OUTPUT



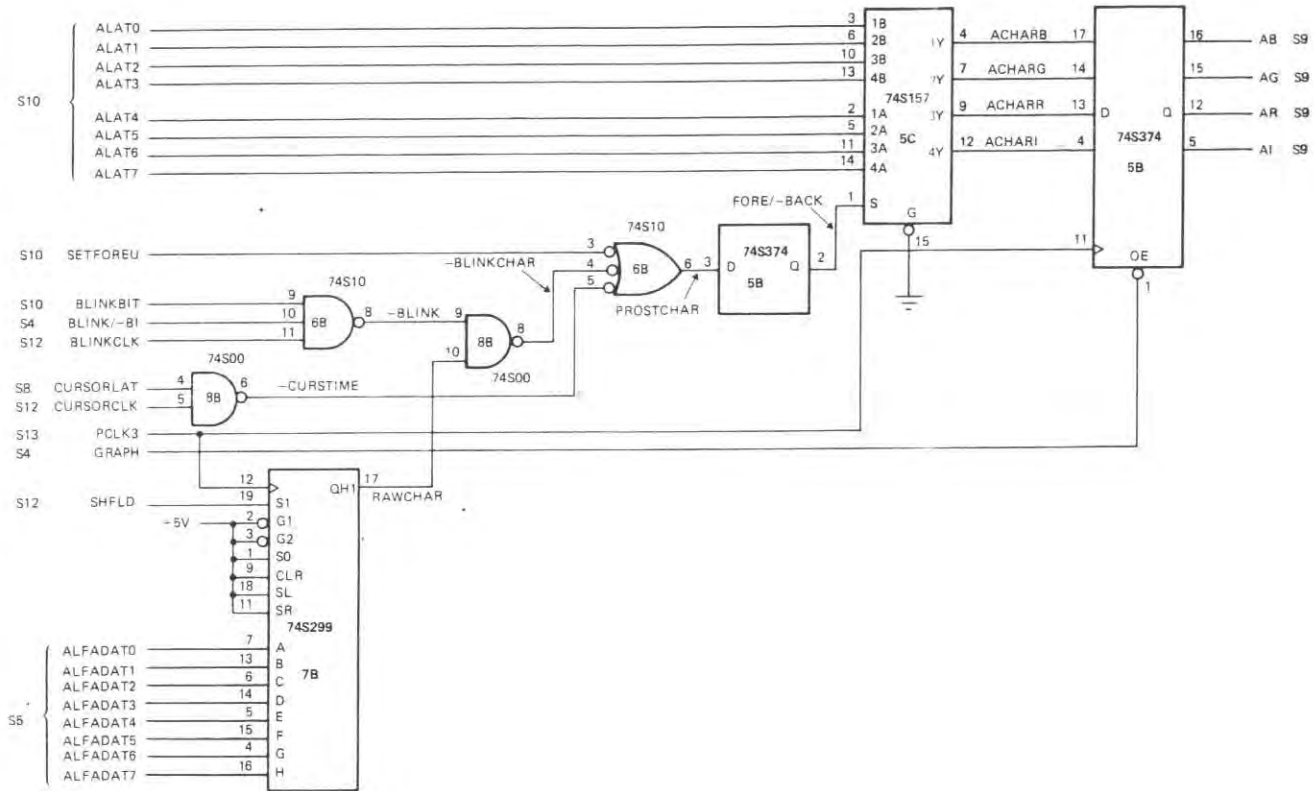
GOVERNO CRT 6845



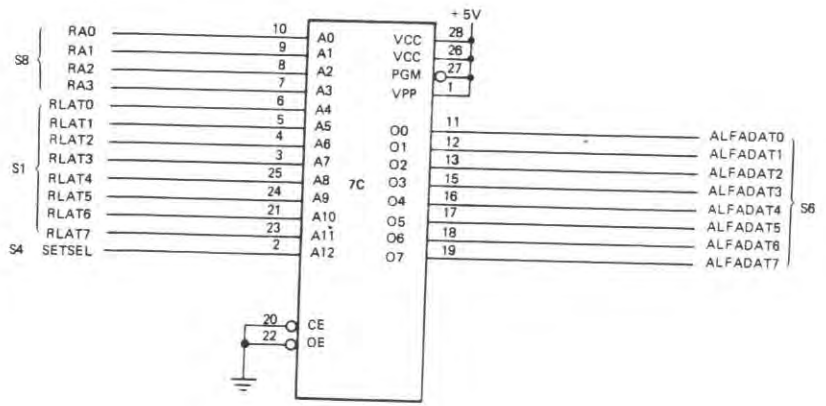


STADIO DI OUTPUT GRAFICA

SOLO PER INFORMAZIONE

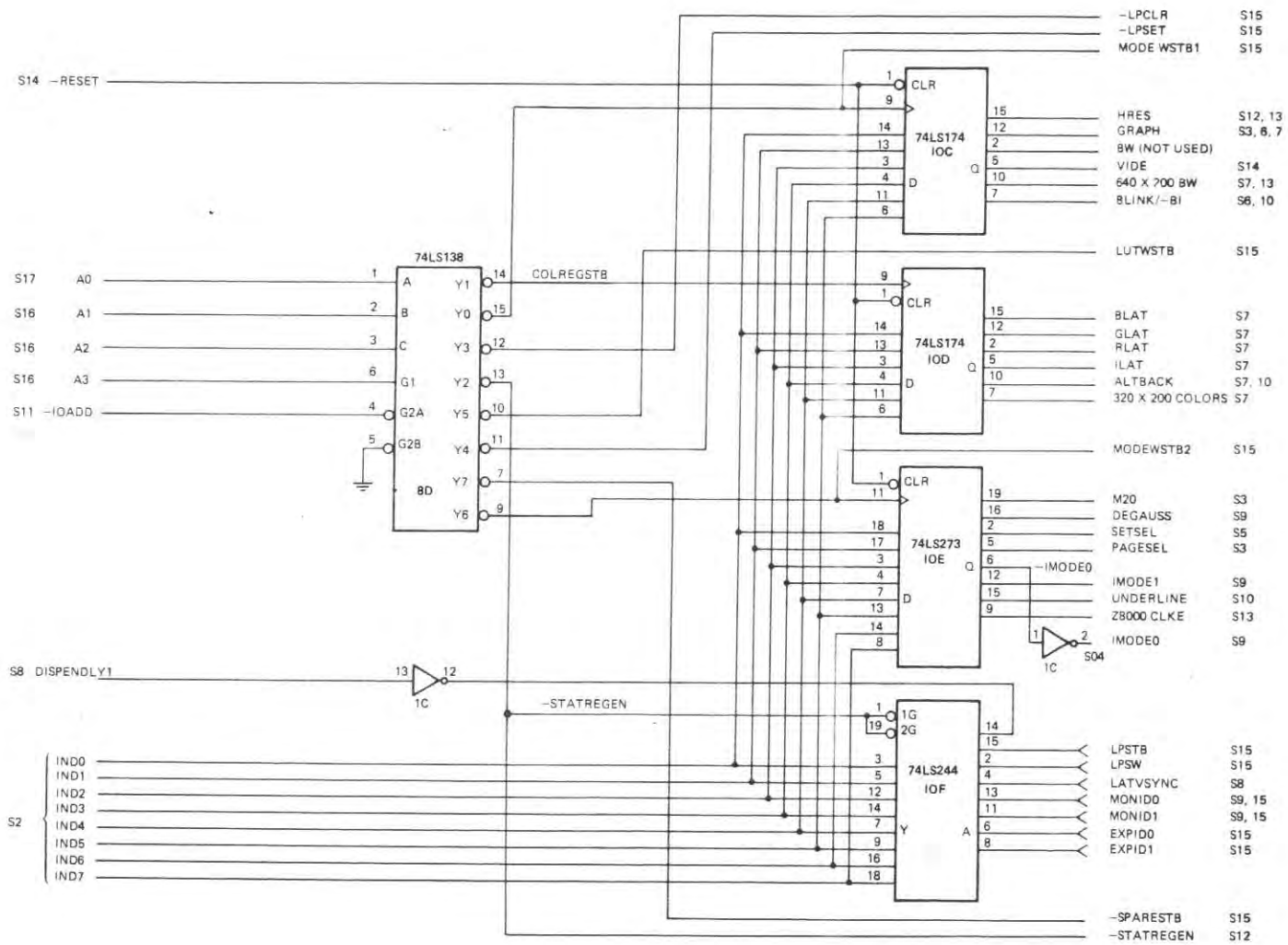


STADIO DI OUTPUT DEL CARATTERE

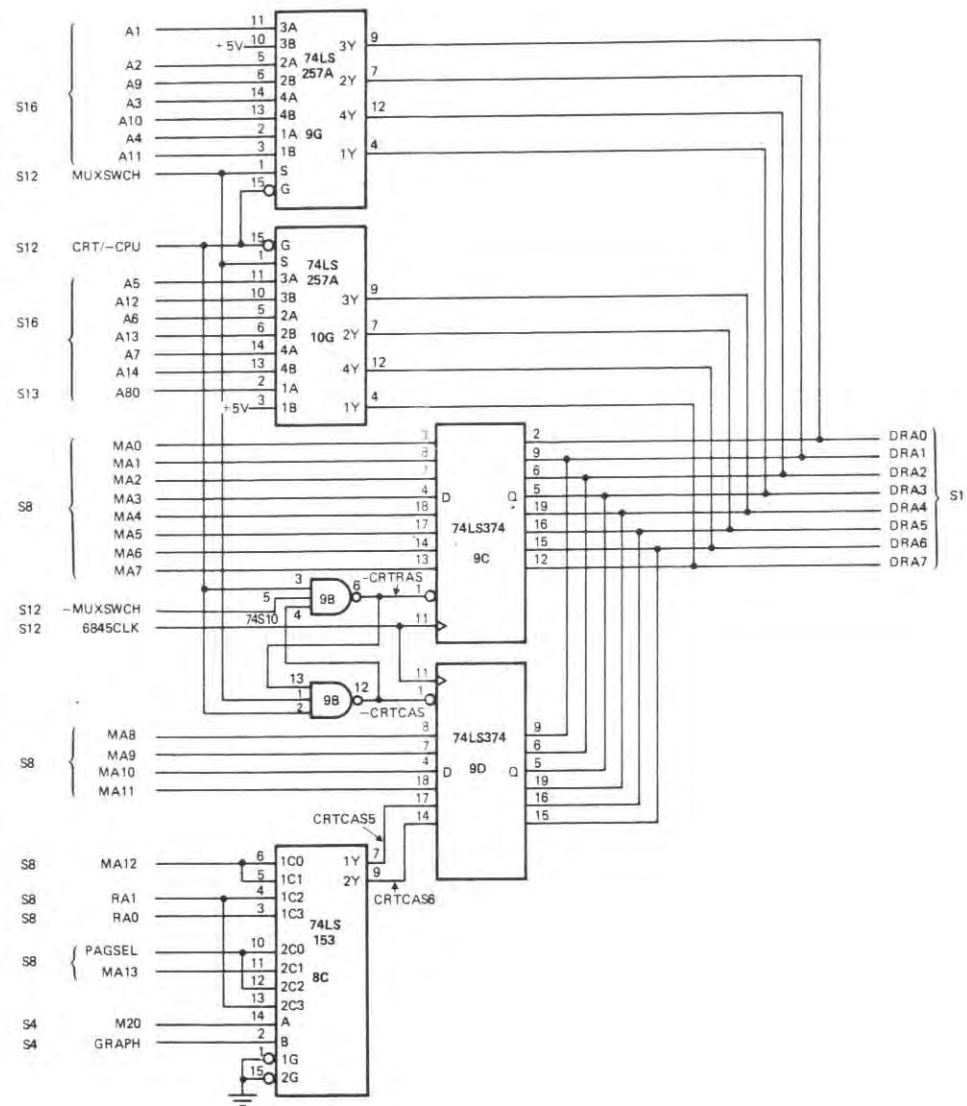


- 2732A EPROM (4K.)
- OR
- 2732A-25 EPROM (4K.)
- OR
- 2764 EPROM (8K.)
- OR
- 2764-25 EPROM (8K.)
- OR
- SY2333-2 ROM (4K.)
- OR
- SY2365-2 ROM (8K.)
- OR
- SY2365A-2 ROM (8K.)
- OR
- S2364B ROM (8K.)

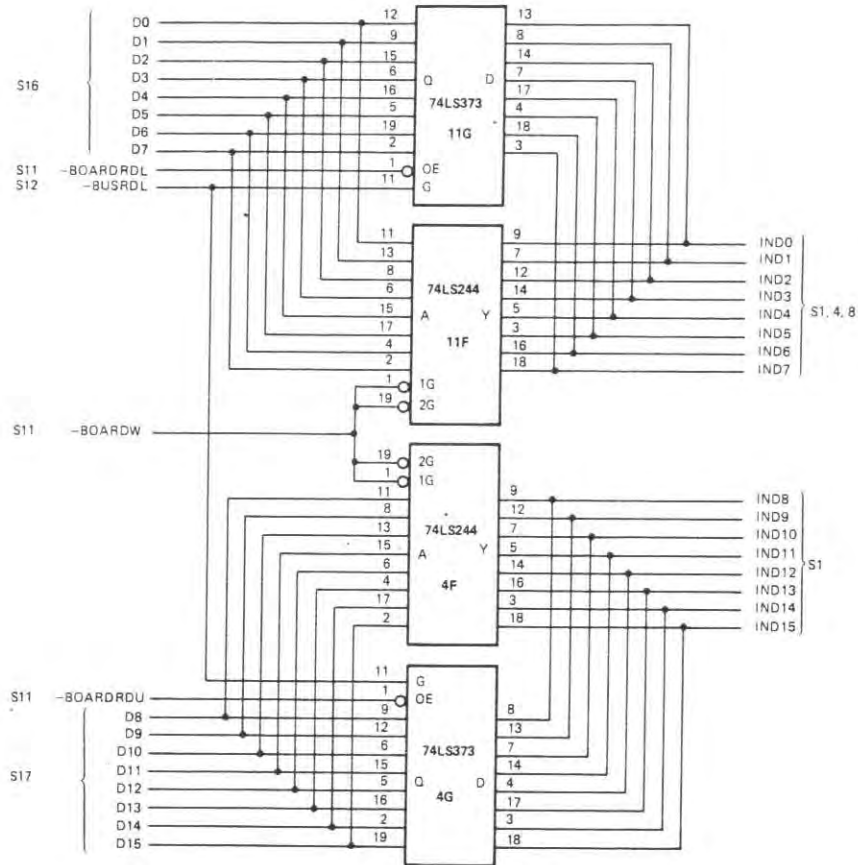
ROM GEN. CARATTERI



REGISTRI DI I/O

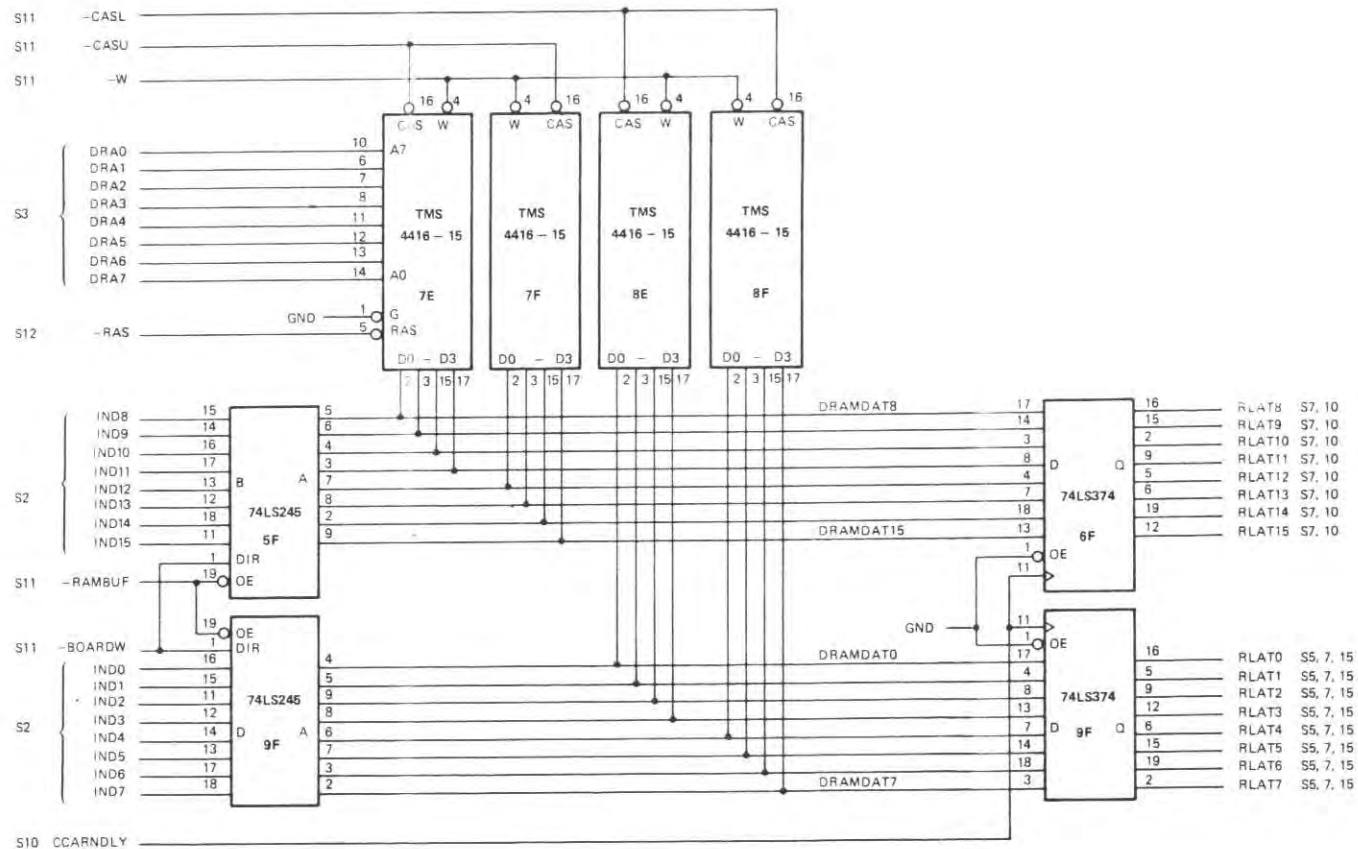


MULTIPLEXER DI INDIRIZZAMENTO DRAM

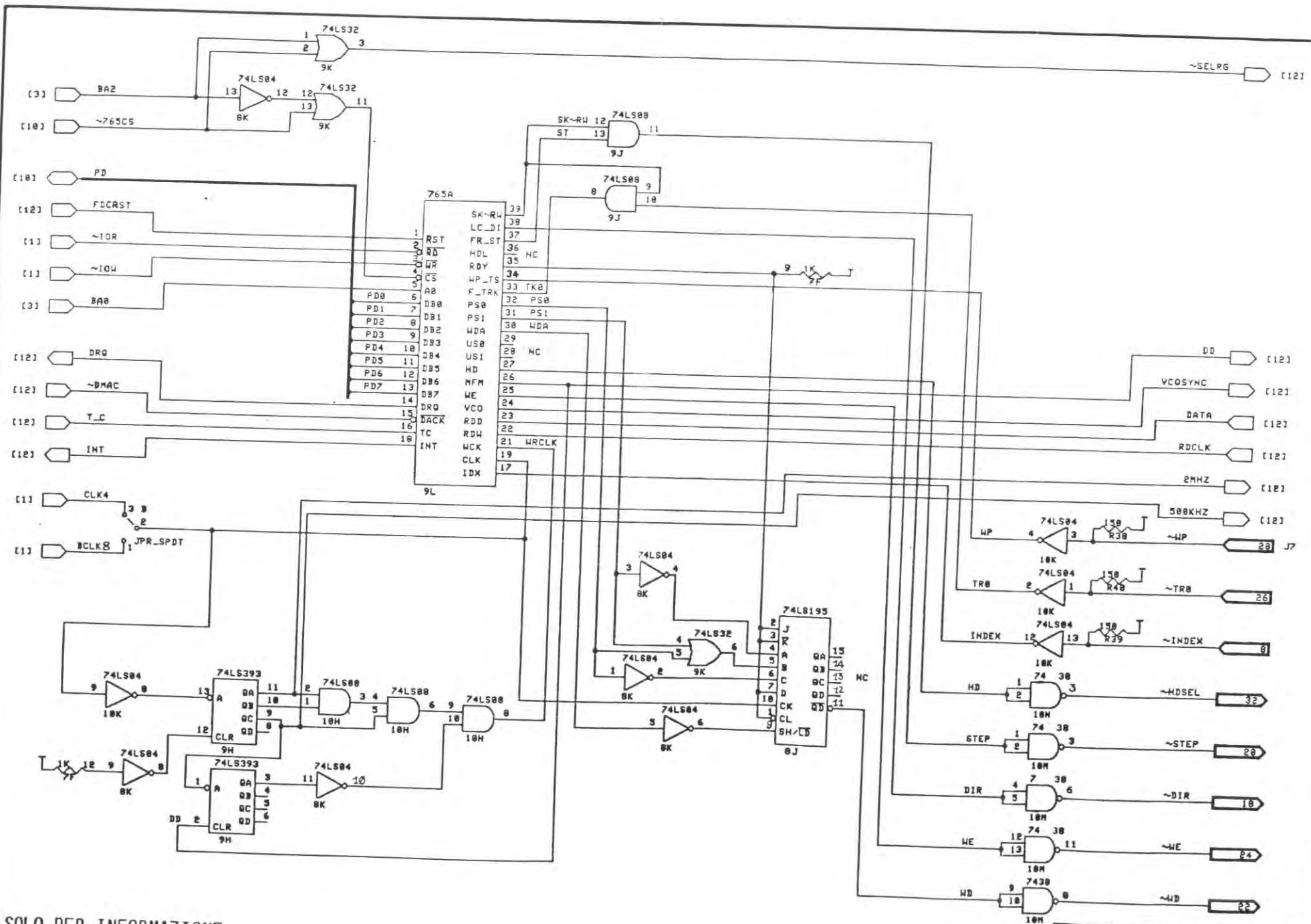


BUFFER BUS DATI



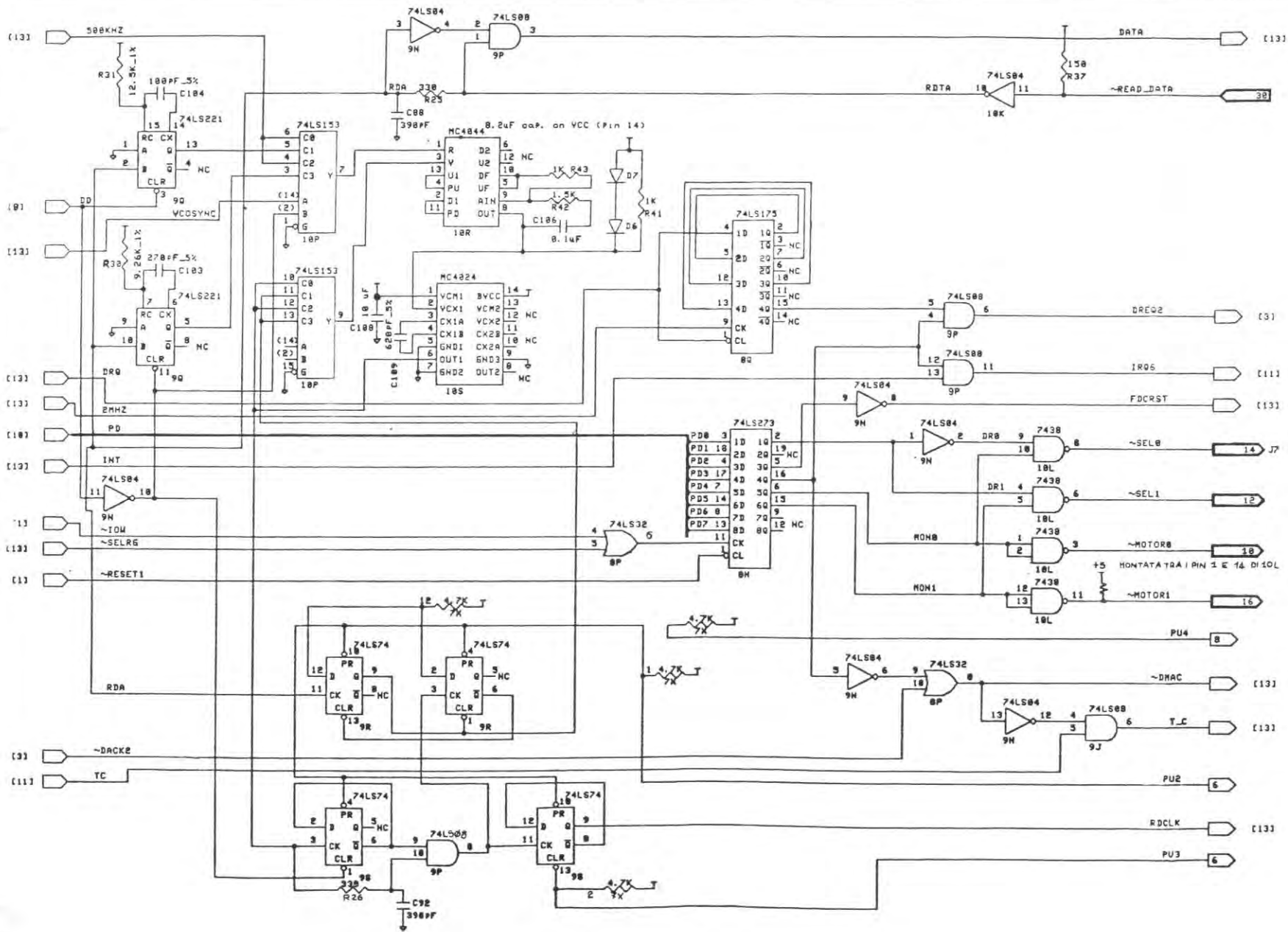


RAM DEL VIDEO

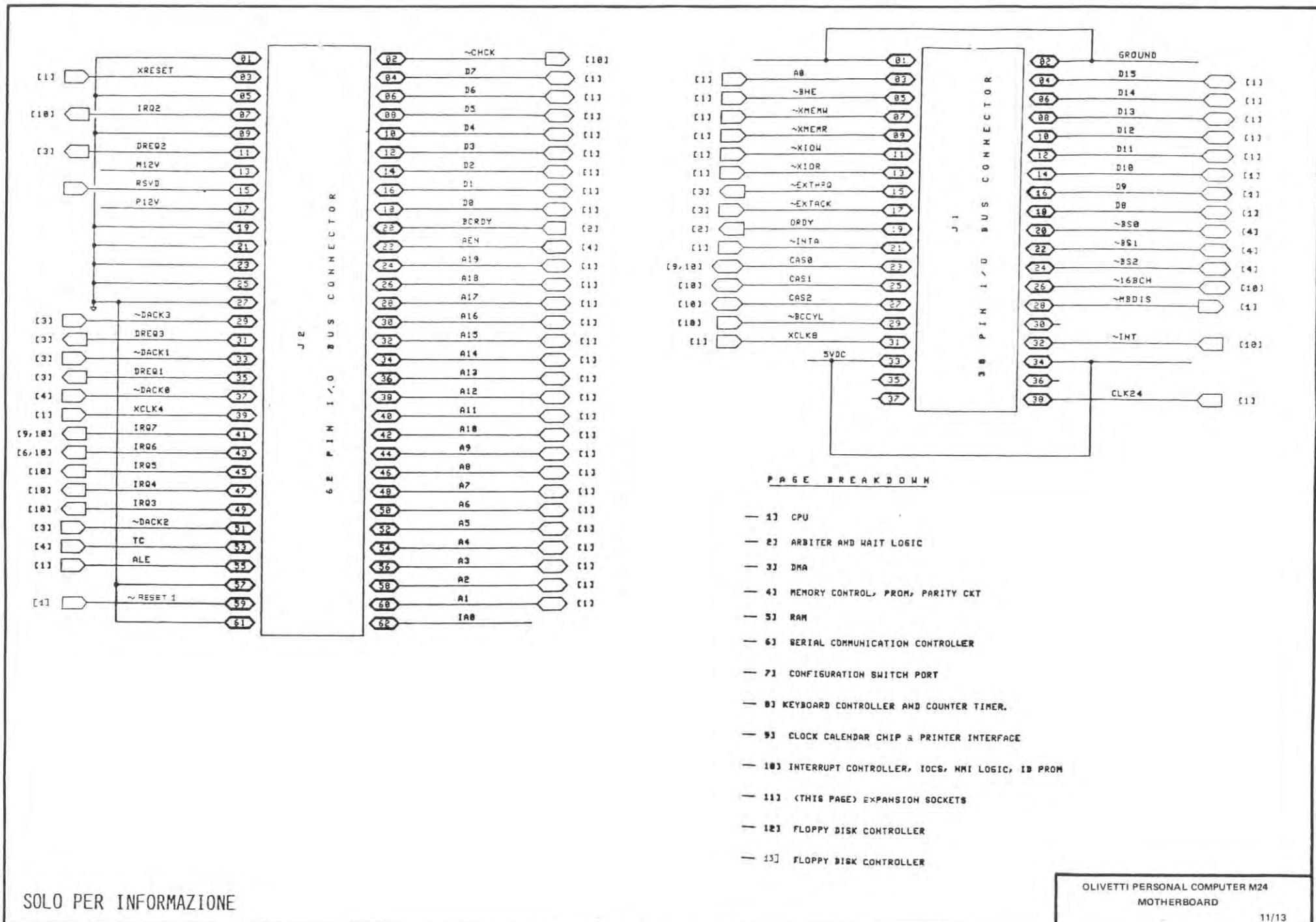


SOLO PER INFORMAZIONE

OLIVETTI PERSONAL COMPUTER M24  
MOTHERBOARD



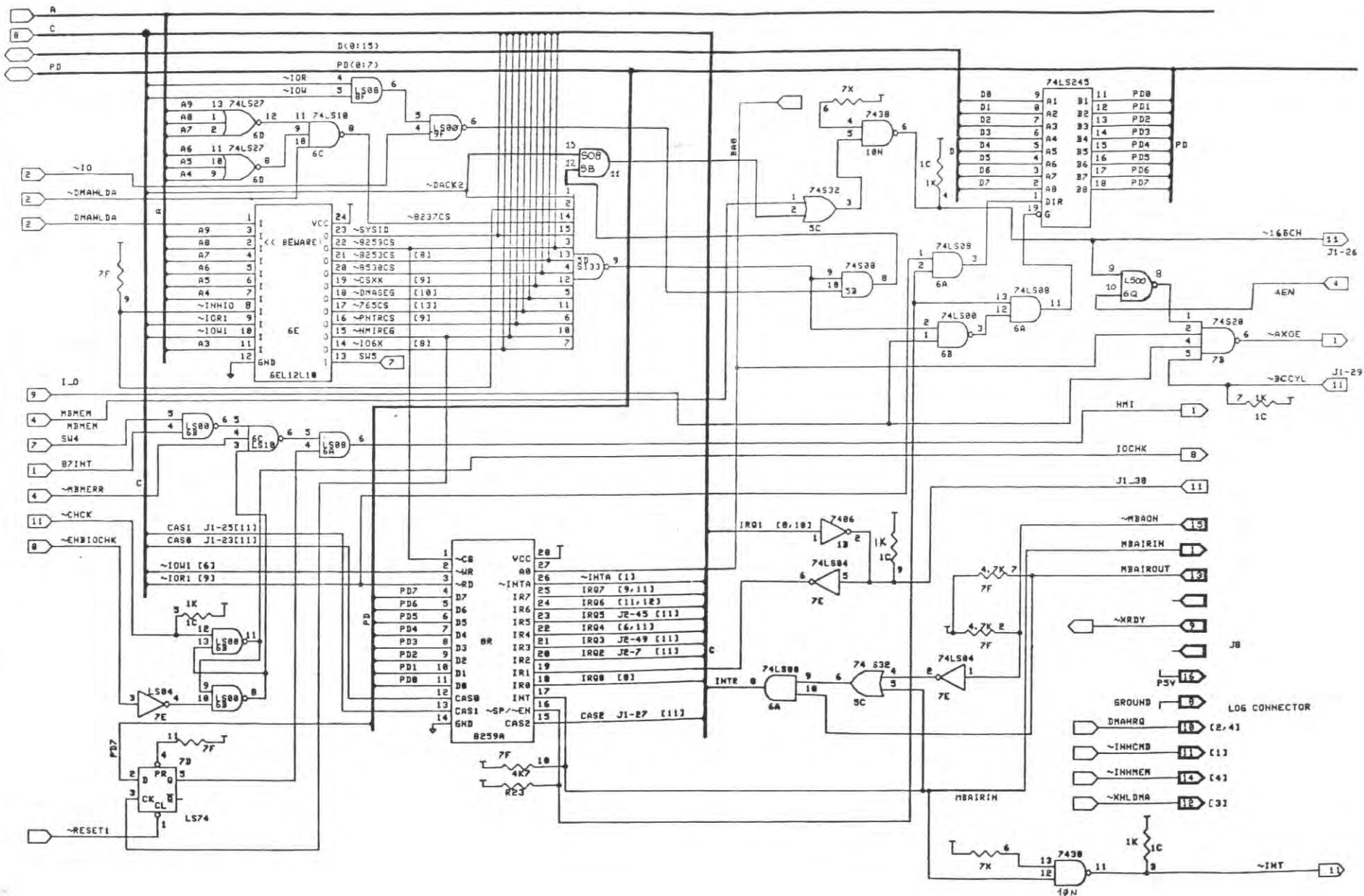
SOLO PER INFORMAZIONE

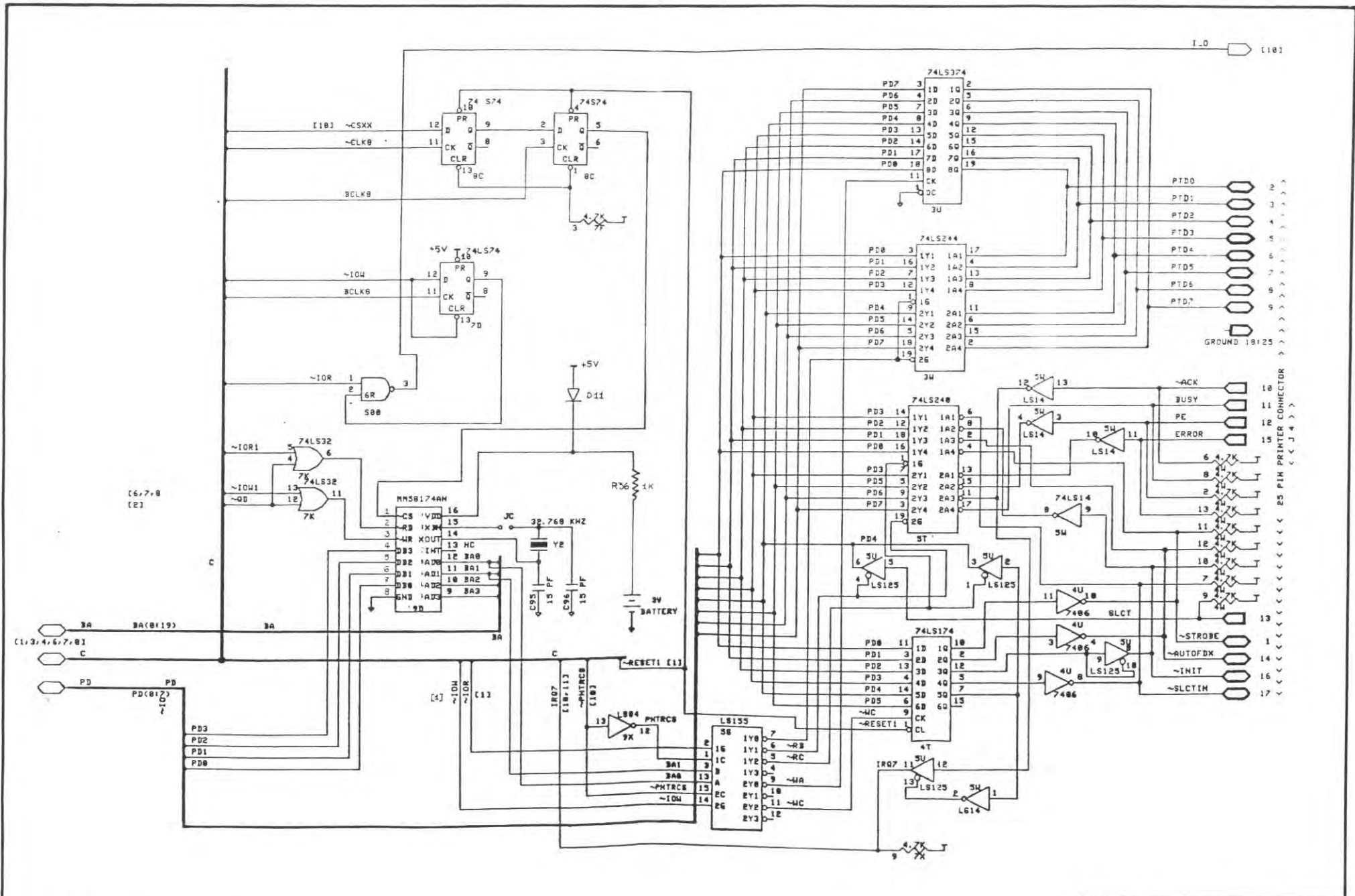


PAGE BREAKDOWN

- 1] CPU
- 2] ARBITER AND WAIT LOGIC
- 3] DMA
- 4] MEMORY CONTROL, PROM, PARITY CKT
- 5] RAM
- 6] SERIAL COMMUNICATION CONTROLLER
- 7] CONFIGURATION SWITCH PORT
- 8] KEYBOARD CONTROLLER AND COUNTER TIMER.
- 9] CLOCK CALENDAR CHIP & PRINTER INTERFACE
- 10] INTERRUPT CONTROLLER, IOCS, NMI LOGIC, IS PROM
- 11] (THIS PAGE) EXPANSION SOCKETS
- 12] FLOPPY DISK CONTROLLER
- 13] FLOPPY DISK CONTROLLER

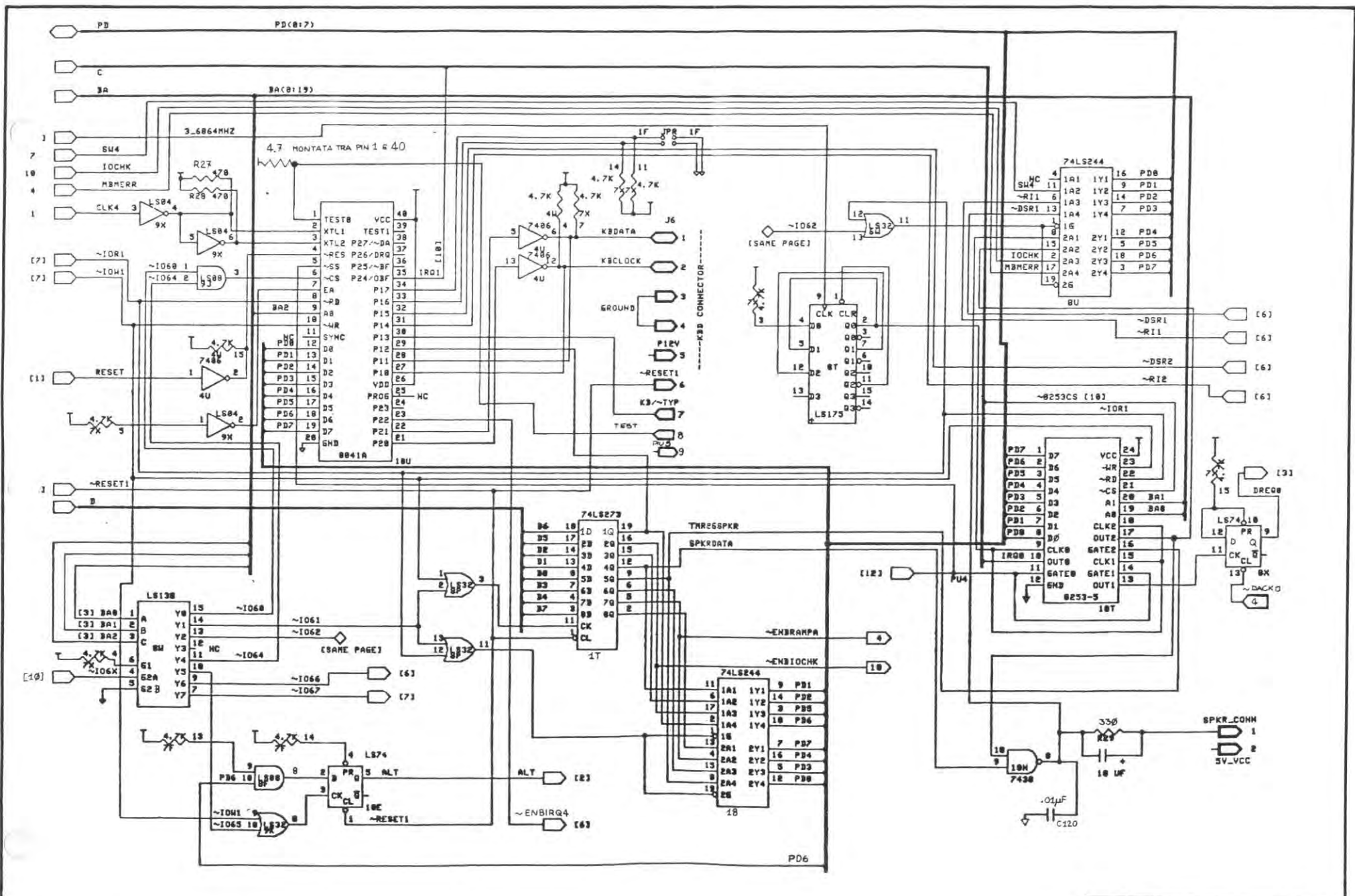
SOLO PER INFORMAZIONE





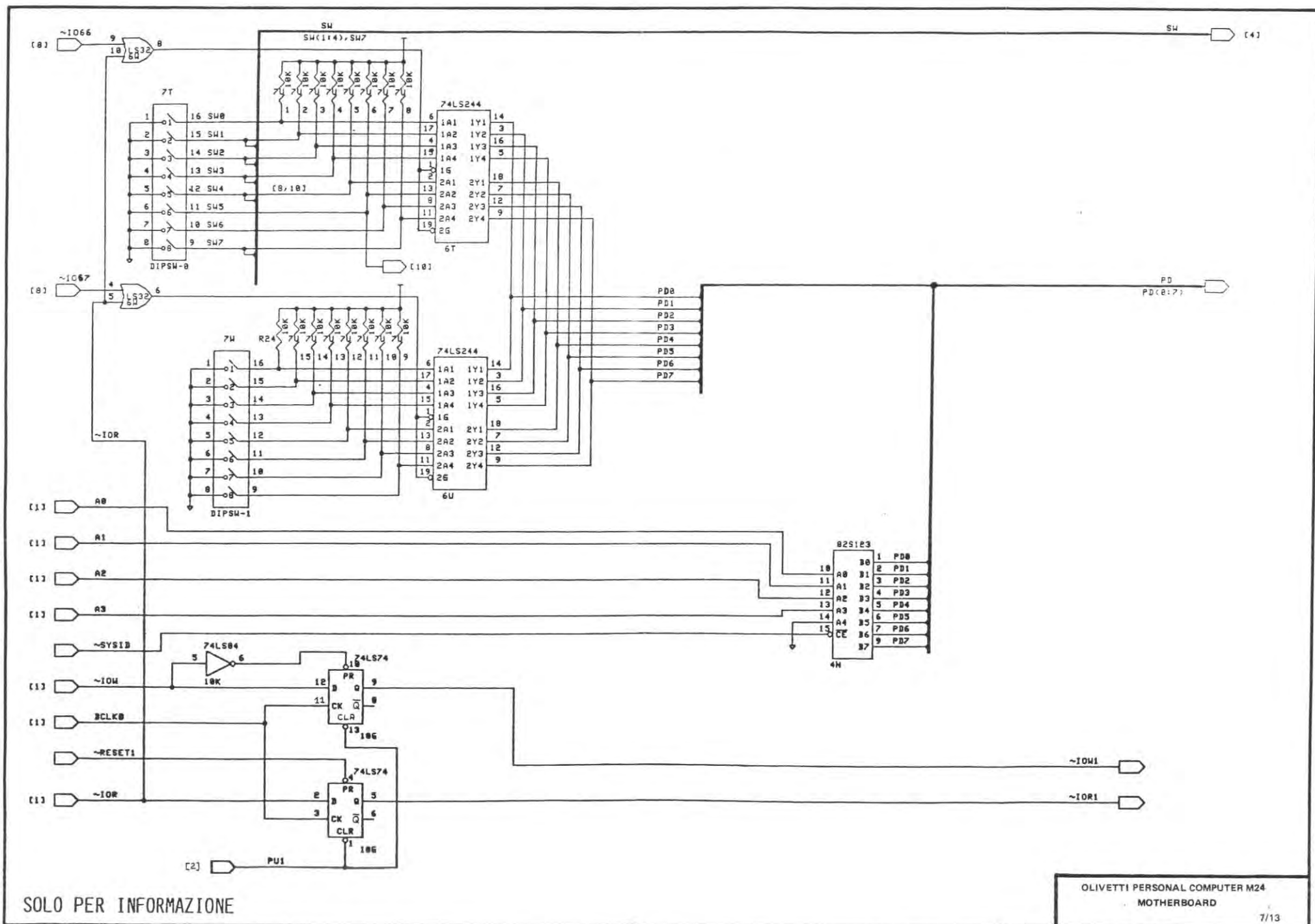
SOLO PER INFORMAZIONE



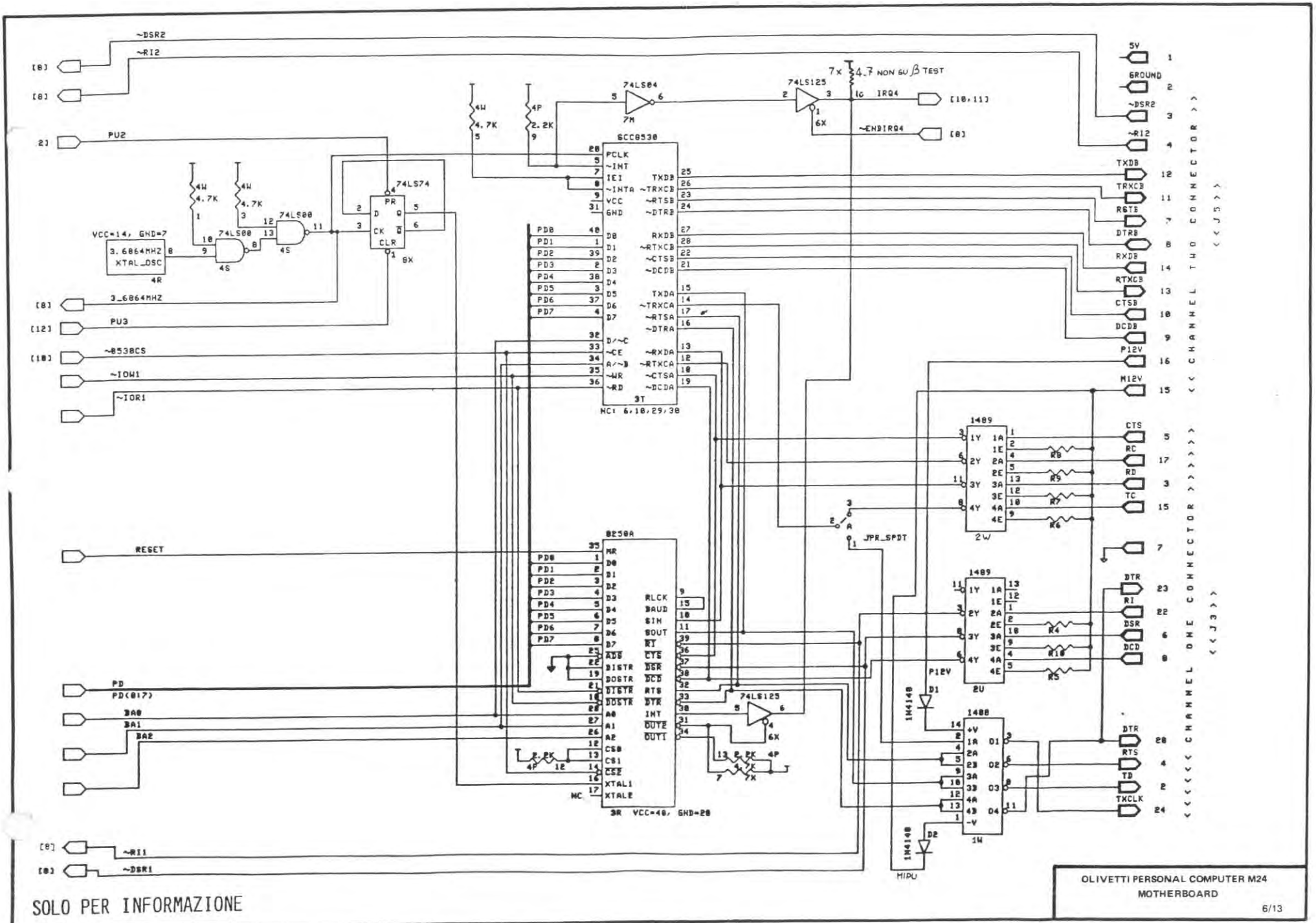


SOLO PER INFORMAZIONE

OLIVETTI PERSONAL COMPUTER M24  
MOTHERBOARD  
8/13

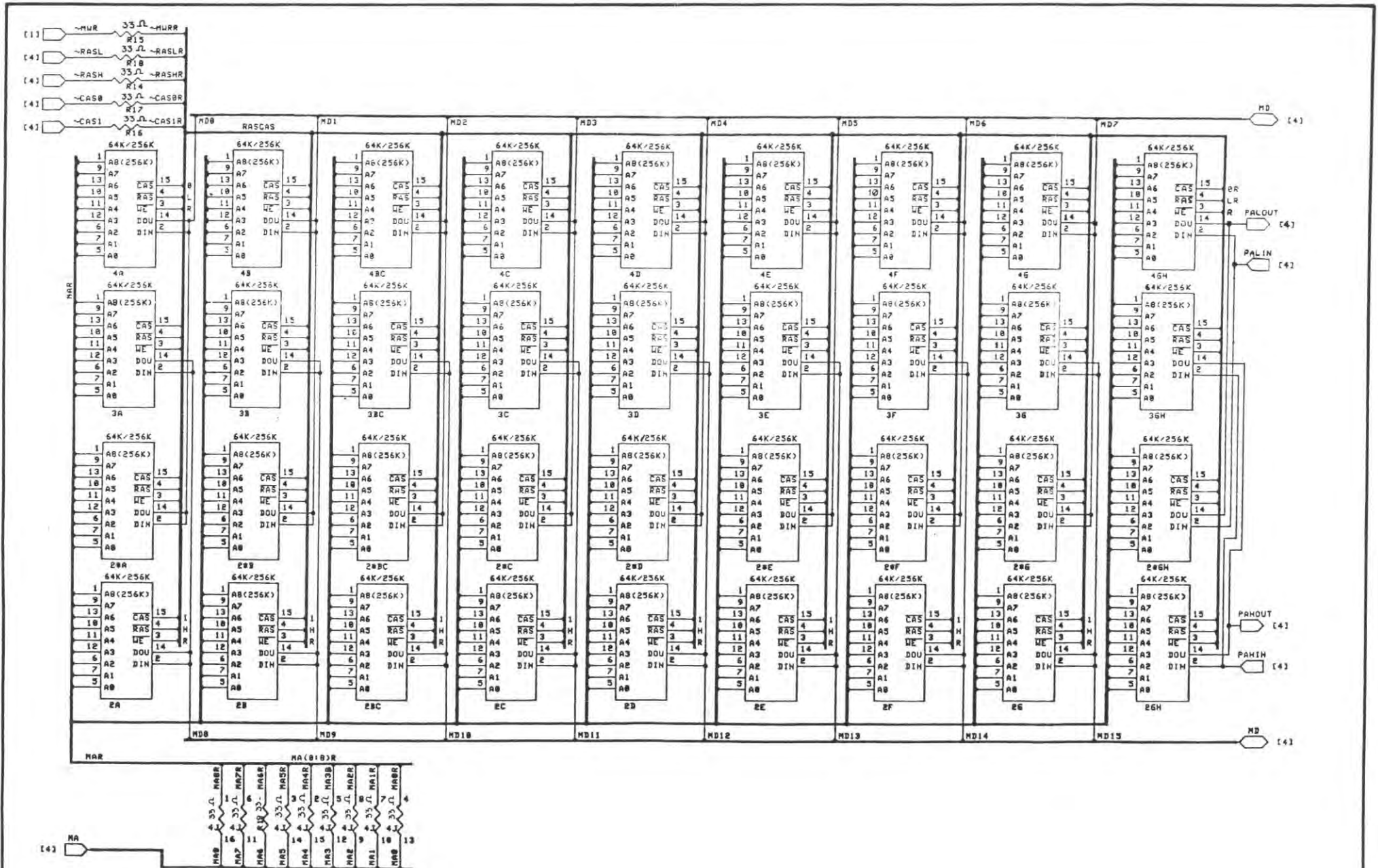


SOLO PER INFORMAZIONE

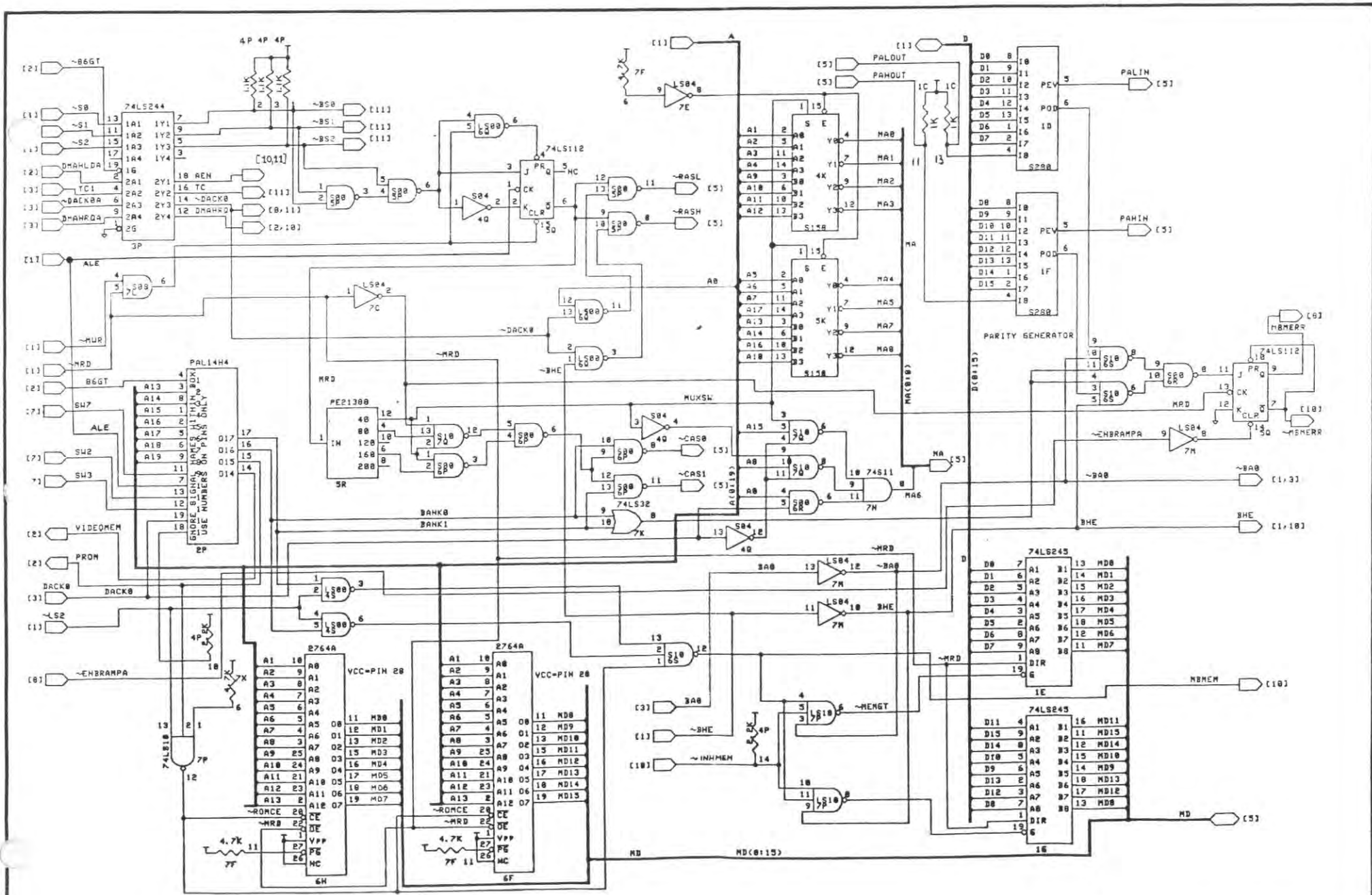


SOLO PER INFORMAZIONE

OLIVETTI PERSONAL COMPUTER M24  
MOTHERBOARD  
6/13



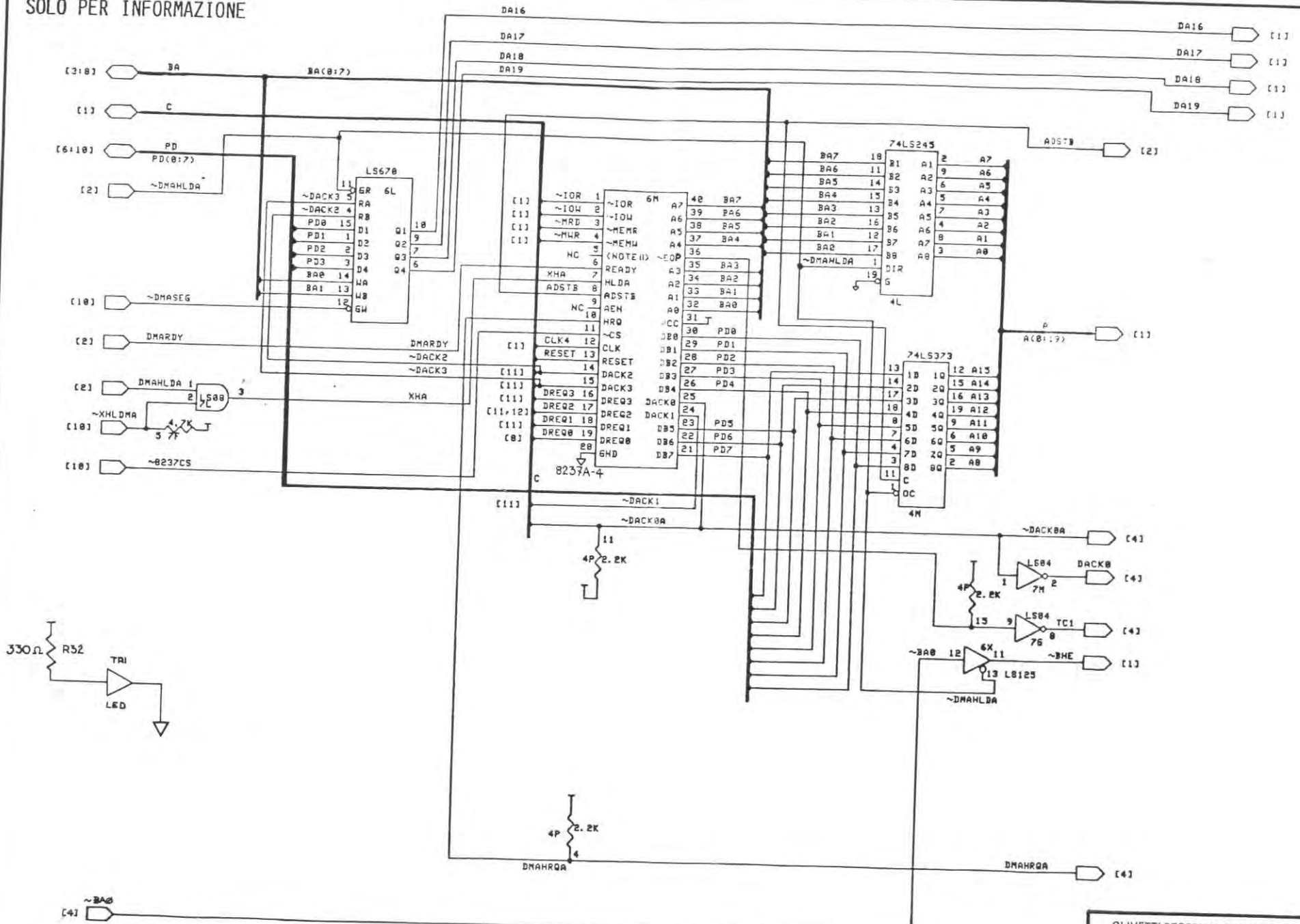
SOLO PER INFORMAZIONE



SOLO PER INFORMAZIONE



SOLO PER INFORMAZIONE



OLIVETTI PERSONAL COMPUTER M24  
MOTHERBOARD





