

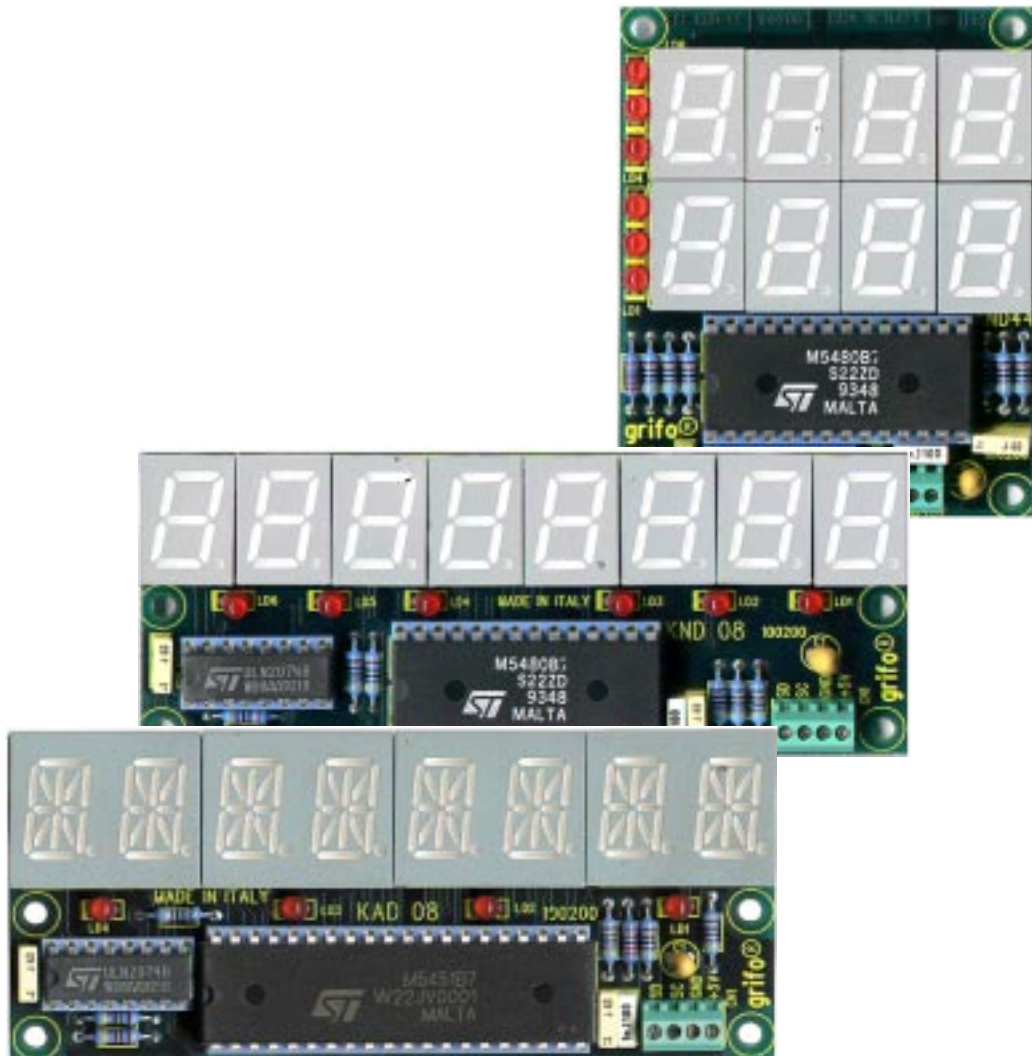
# KND 44 KND 08

Kit Numerical Display 4+4 and 8 digit

# KAD 08

Kit Alphanumeric Display 8 digit

## TECHNICAL MANUAL



**grifo**<sup>®</sup>

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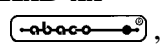
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KxD xx

Edition 5.00

Rel. 26 June 2000

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# KND 44 KND 08

Kit Numerical Display 4+4 and 8 digit

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## TECHNICAL MANUAL

**KND 44** and **KND 08** are simple and practical board to drive LED-based **7 segments** displays featuring respectively **four plus four** and **eight** 13 mm **digits** and **six** 3 mm signalation **LEDs**. The **M5480** and the minimum essential circuitry installed on the board can warrant the proper driving for each segment making this design solution suitable for being used efficiently in all the applications which require signalations through LED displays.

**KAD 08** is a simple and practical board to drive 14 mm **8 digits 14 segments** LED-based displays and four 3 mm signalation LEDs. The **M5451** installed on the board can warrant the proper driving for each segment making this design solution suitable for being used efficiently in all the applications which require signalations through alphanumeric LED displays.

Main features of these two boards are:

- capability of being driven through only **2 digital output lines** (one for the clock, one for the data).
- one **Timed Interrupt** routine for being software driven.

A wide range of examples made with the inexpensive **BASCOM Compiler (LT; 8051; AVR)** is freely available; this doesn't prevent from making programs with any other language and for any other type of CPU.

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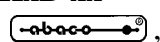
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For specific informations on the components mounted on the card, please refer to the Data Book of the builder or second sources.

### SYMBOLS DESCRIPTION

In the manual could appear the following symbols:




Attention: Generic danger



Attention: High voltage

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## 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.

The reported data are destined- IN EXCLUSIVE WAY- to specialized users, that can interact with the devices in safety conditions for the persons, for the machine and for the environment, impersonating an elementary diagnostic of breakdowns and of malfunction conditions by performing simple functional verify operations , in the height respect of the actual safety and health norms.

The informations for the installation, the assemblage, the dismantlement, the handling, the adjustment, the reparation and the contingent accessories, devices etc. installation are destined - and then executable - always and in exclusive way from specialized warned and educated personnel, or directly from the TECHNICAL AUTHORIZED ASSISTANCE, in the height respect of the manufacturer recommendations and the actual safety and health norms.

The devices can't be used outside a box. The user must always insert the cards in a container that respect the actual safety normative. The protection of this container is not threshold to the only atmospheric agents, but specially to mechanic, electric, magnetic, etc. ones.

To be on good terms with the products, is necessary guarantee legibility and conservation of the manual, also for future references. In case of deterioration or more easily for technical updates, consult the AUTHORIZED TECHNICAL ASSISTANCE directly.

To prevent problems during card utilization, it is a good practice to read carefully all the informations of this manual. After this reading, the user can use the general index and the alphabetical index, respectly at the begining and at the end of the manual, to find information in a faster and more easy way.

## CARD VERSION

The present handbook is reported to the **KND 44** version **270300**, **KND 08** version **270300**, **KAD 08** version **100200** and later. The validity of the bring informations is subordinate to the number of the card release. The user must always verify the correct correspondence among the two denotations. On the card the release number is present in more points both board printed diagram (serigraph) and printed circuit (for example on the external edge of the board near the name of the board itself on the component side).

## KND 44 AND KND 08 TECHNICAL FEATURES

### GENERAL FEATURES

**On board resources:** eight 7 segments displays, height 13 mm  
six 3 mm LEDs

### PHYSICAL FEATURES

**Size (W x H):** 155 x 71 mm KND 44  
101 x 45 mm KND 08

**Weight:** 40 g KND 44  
42 g KND 08

**Connectors:** CN1: 4 pins vertical screw terminal connector with  
2.54 mm pitch

**Temperature range:** from 0 to 70 Centigrad degrees

**Relative humidity:** 20% up to 90% (without condense)

### ELECTRIC FEATURES

**Power supply:** +5 Vdc

**Current consumption on 5 Vdc:** 6 mA with all LEDs and displays off  
350 mA with all LEDs and displays on



FIGURE 1: KND 44 AND KND 08 CARDS PHOTO

## KAD 08 TECHNICAL FEATURES

### GENERAL FEATURES

**On board resources:** eight 14 segments displays, height 14 mm  
four 3 mm LEDs

### PHYSICAL FEATURES

**Size (W x H):** 101 x 45 mm

**Weight:** 40 g

**Connectors:** CN1: 4 pins vertical screw terminal connector with  
2.54 mm pitch

**Temperature range:** from 0 to 70 Centigrad degrees

**Relative humidity:** 20% up to 90% (without condense)

### ELECTRIC FEATURES

**Power supply:** +5 Vdc

**Current consumption on 5 Vdc:** 6 mA with all LEDs and displays off  
550 mA with all LEDs and displays on



FIGURE 1: KAD 08 CARD PHOTO



## 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, LED, etc. installed on the **KND 44**, **KND 08** and **KAD 08** board.

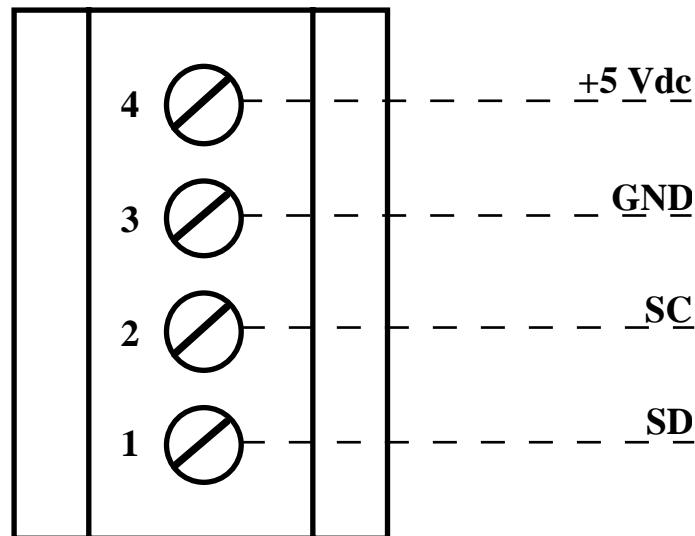
### CONNECTIONS

Each board is provided with one connectors that can be linked to other devices or directly to the field, according to system requirements. In this paragraph there are connectors pin out, a short signals description and connectors location (see figure 4).

#### **CN1 - POWER SUPPLY AND BOARD MANAGEMENT CONNECTOR**

CN1 is a 4 pins vertical screw terminal connector with 2.54 mm pitch.

Through CN1 the board is supplied and the management signals of M5480 and M5451 are connected. The whole software management documentation about these components (clock and data sequence) is available at our web site with their description in pdf format and several example of use. The two input signals, SC and SD, feature TTL levels and are directly connected to the component.



**FIGURE 3: CN1 - POWER SUPPLY AND BOARD MANAGEMENT CONNECTOR**

Signals description:

**SD** = I - TTL digital line of Data signal.  
**SC** = I - TTL digital line of Clock signal.  
**GND** = - Ground signal.  
**+5 Vdc** = I - Power supply +5 Vdc

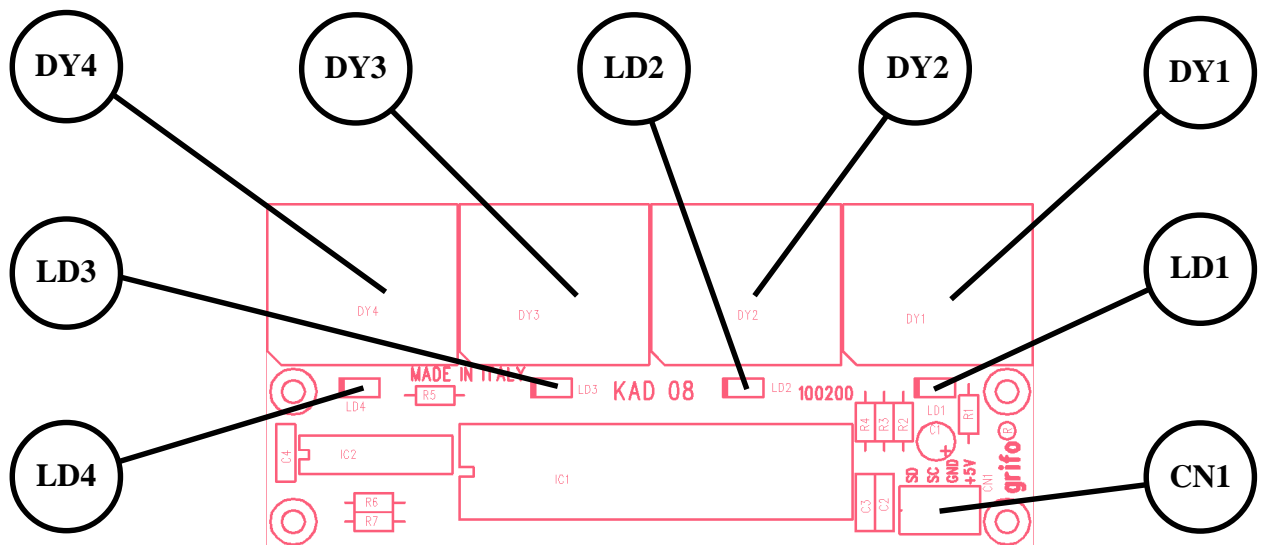
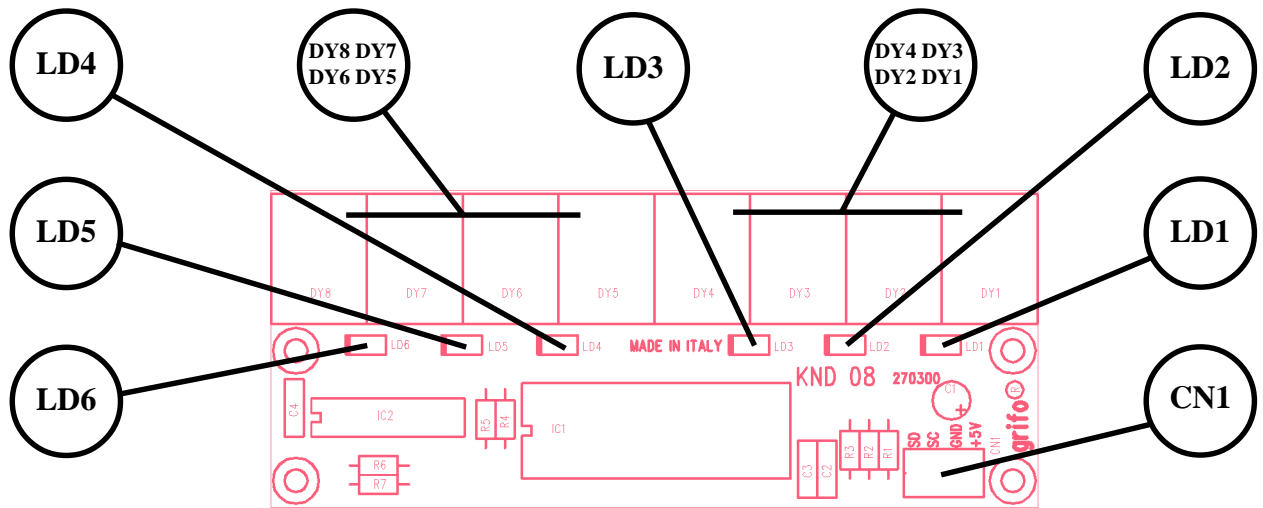
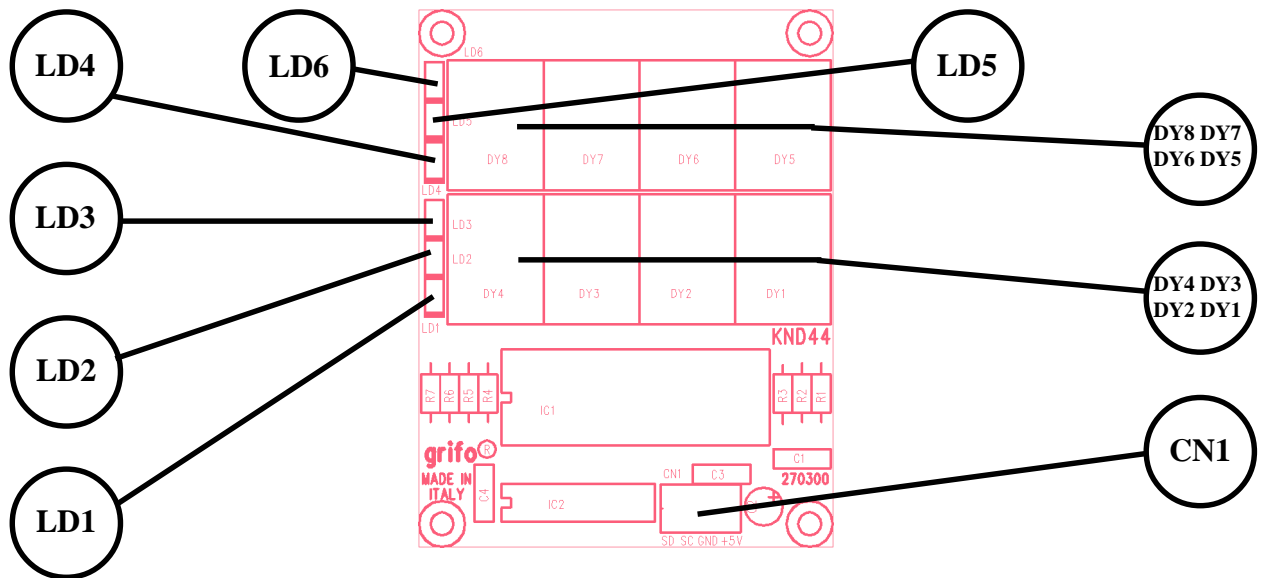
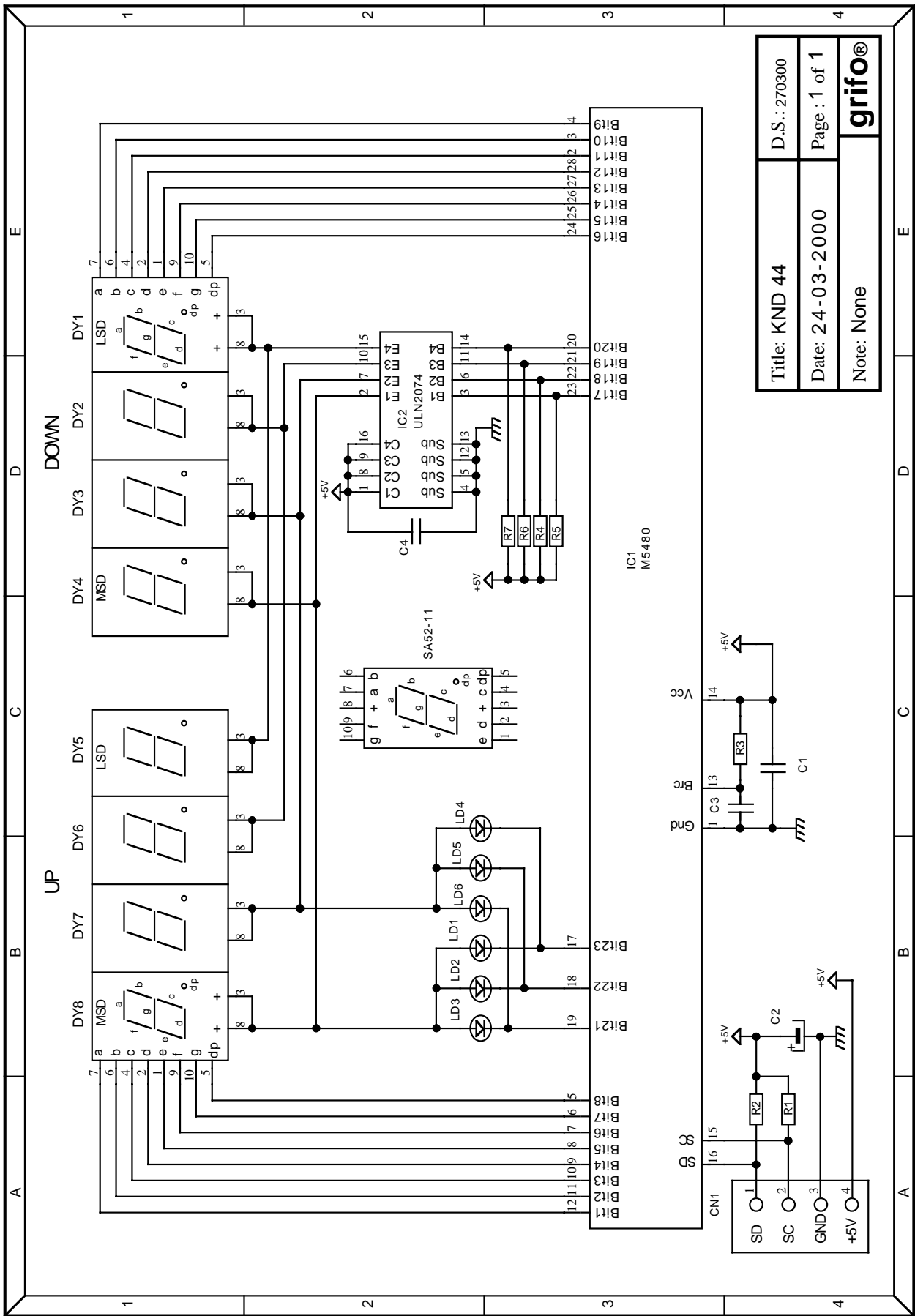


FIGURE 4: CONNECTORS, DISPLAYS AND LEDs LOCATION



Title: KND 44	D.S.: 270300
Date: 24-03-2000	Page: 1 of 1
Note: None	<b>grifo®</b>

FIGURE 5: KND 44 ELECTRIC DIAGRAM



**KND 44 COMPONENTS LIST**

- RESISTORS -

R1, R2, R4, R5, R6, R7 = 4k7Ω 1/4W  
 R3 = 2k2Ω 1/4W

- SEMI CONDUCTORS -

LD1, LD2, LD3, LD4, LD5, LD6 = LED 3mm red  
 DY1, DY2, DY3, DY4 = SA52-11 7 segments display red  
 DY5, DY6, DY7, DY8 = SA52-11 7 segments display green

- CAPACITORS -

C1, C4 = 100nF multilayer  
 C2 = 22µF 6v Tantalium  
 C3 = 1nF 50v polyester

- CONNECTORS -

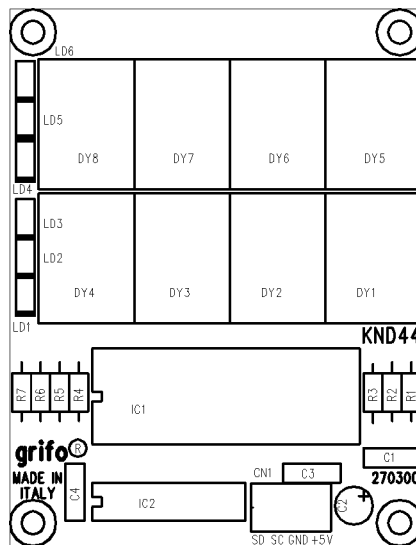
CN1 = 4 pins screw terminal connector 2.54 mm pitch

- SOCKETS-

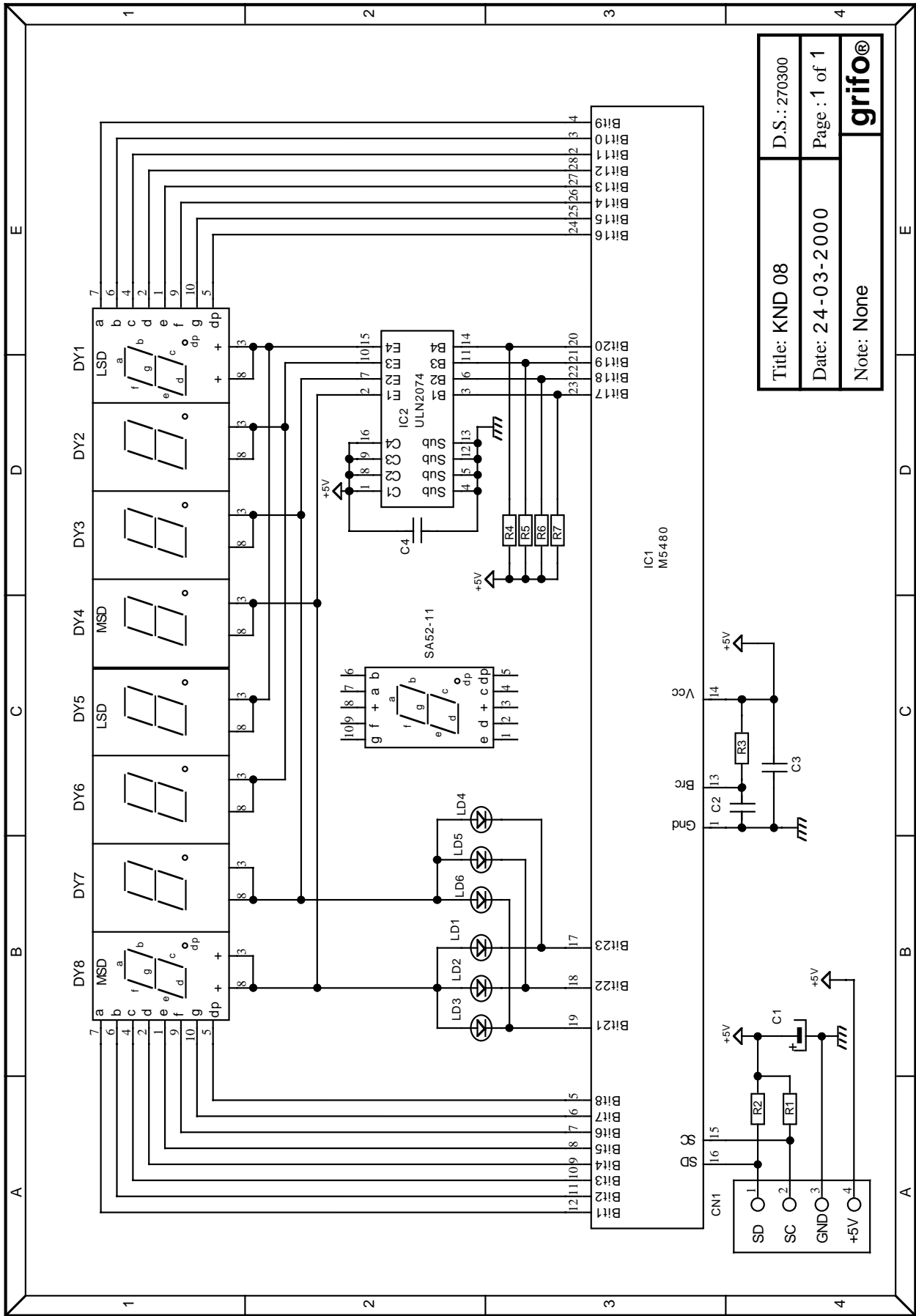
IC1 = 28 pins  
 IC2 = 16 pins

- ICs INSTALLED ON SOCKETS -

IC1 = M5480  
 IC2 = ULN2074



**FIGURE 6: KND 44 COMPONENTS MAP**



Title: KND 08	D.S.: 270300
Date: 24-03-2000	Page: 1 of 1
Note: None	<b>grifo®</b>

FIGURE 7: KND 08 ELECTRIC DIAGRAM



**KND 08 COMPONENTS LIST**

- RESISTORS -

R1, R2, R4, R5, R6, R7 = 4k7Ω 1/4W  
 R3 = 2k2Ω 1/4W

- SEMI CONDUCTORS -

LD1, LD2, LD3, LD4, LD5, LD6 = LED 3mm red  
 DY1, DY2, DY3, DY4 = SA52-11 7 segments display  
 DY5, DY6, DY7, DY8 = SA52-11 7 segments display

- CAPACITORS -

C1 = 22μF 6v Tantalium  
 C2 = 1nF 50v polyester  
 C3, C4 = 100nF multilayer

- CONNECTORS -

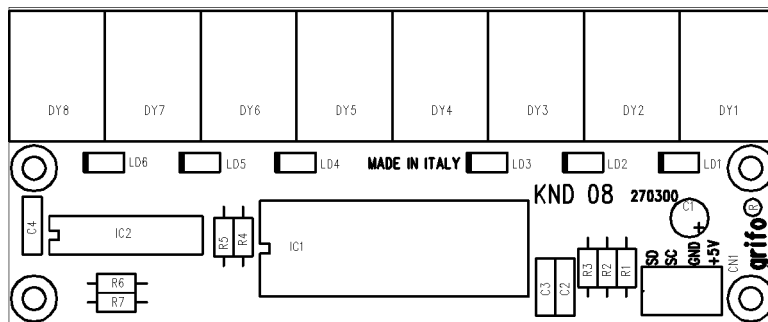
CN1 = 4 pins screw terminal connector 2.54 mm pitch

- SOCKETS-

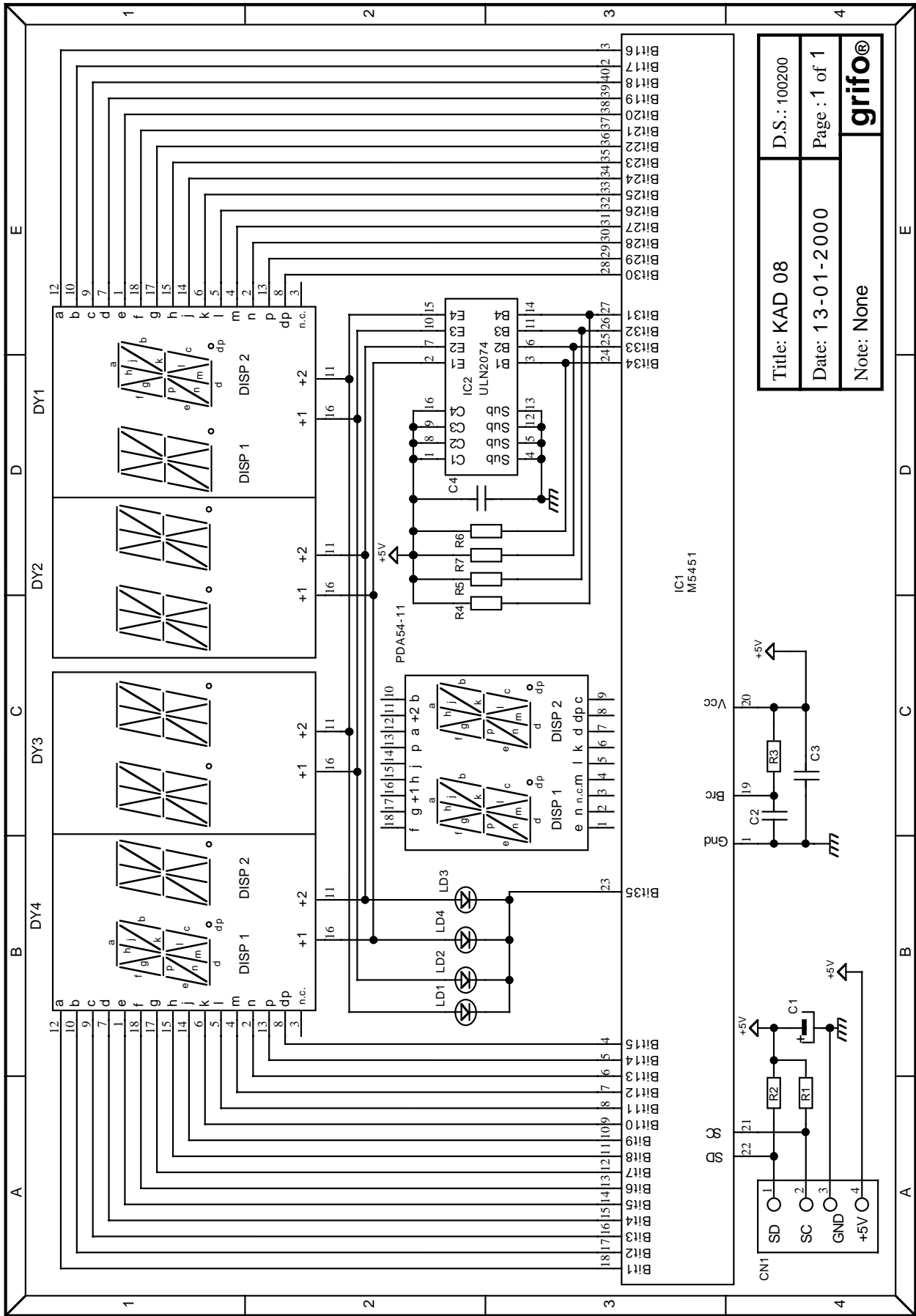
IC1 = 28 pins  
 IC2 = 16 pins

- ICs INSTALLED ON SOCKETS -

IC1 = M5480  
 IC2 = ULN2074



**FIGURE 8: KND 08 COMPONENTS MAP**



Title: KAD 08	D.S.: 100200
Date: 13-01-2000	Page: 1 of 1
Note: None	<b>grifo®</b>

FIGURE 9: KAD 08 ELECTRIC DIAGRAM



**KAD 08 COMPONENTS LIST**

- RESISTORS -

R1, R2, R4, R5, R6, R7 = 4k7Ω 1/4W  
 R3 = 2k2Ω 1/4W

- SEMI CONDUCTORS -

LD1, LD2, LD3, LD4 = LED 3mm red  
 DY1, DY2, DY3, DY4 = PDA54-11 double16 segments display

- CAPACITORS -

C1 = 22μF 6V Tantalium  
 C2 = 1nF 50V polyester  
 C3, C4 = 100nF multilayer

- CONNECTORS -

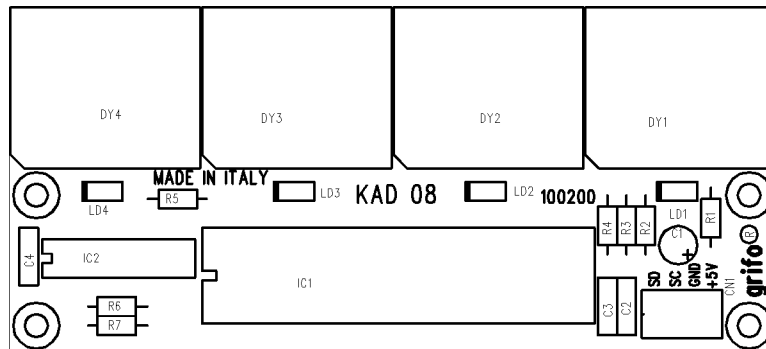
CN1 = 4 pins screw terminal connector 2.54 mm pitch

- SOCKETS-

IC1 = 40 pins  
 IC2 = 16 pins

- ICs INSTALLED ON SOCKETS -

IC1 = M5451  
 IC2 = ULN2074



**FIGURE 10: KAD 08 COMPONENTS MAP**



## DESCRIPTION

Here follows a short description about how the boards work .

### DESCRIPTION OF M5480 AND M5451 INTEGRATED CIRCUITS

The most important device on the **KND 44**, **KND 08** and **KAD 08** boards is the integrated circuit M5480 or M5451. These two components are managed through two TTL output signals, one for the clock and one for the data. Sending data to these devices is very easy; after the start sequence, for each of the following 36 clock impulses, the status of the data signal is copied to each one of the IC's outputs. As figure 11 shows, M5480 has less pins than M5451, for each of the missing bits the status of data signal has no influence. M5451 can match every clock impulse to an output, while for M5480 the bits indicated with an "x" have no physical correspondance with the pins.

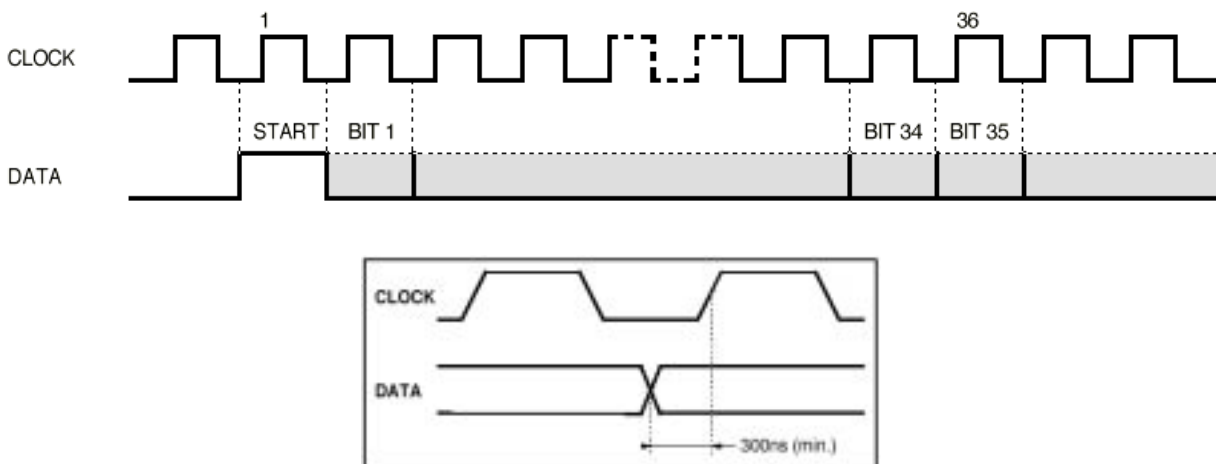
<b>5451</b>	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	START
<b>5480</b>	X	X	X	11	10	9	8	X	X	X	7	6	5	4	3	2	1	X	START

<b>5451</b>	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
<b>5480</b>	X	23	22	21	20	19	X	X	18	X	17	16	15	14	13	12	X

**FIGURE 11 : CORRESPONDANCE BETWEEN CLOCK AND BITS**

The following figure shows a graphic representation of clock and data signals bit sequences, where start bit is enhanced to separate it from User data bits. In particular it is evident that, after 36 clock impulses, the next sequence will be recognized only if it starts with the start bit and if the data signal changes its status at least 300 ns before the clock signal's front raises.



**FIGURE 12: GRAPHIC RAPRESENTATION OF CLOCK AND DATA SIGNALS**

It is essential to send 37 clock impulses keeping the data signal low before sending the User data bits sequence. This assures that, at the starting of the next sequence, clock and data output bits will be synchronized. Synchronicity can be lost because there is no stop sequence, so if a User data bits sequence is interrupted before its completion, this action allows to go round the problem. For further informations please refer to **grifo**® website where data sheets of the ICs are available in PDF format with several software examples to explain their management.

## **HOW TO USE KND 44 AND KND 08 BOARDS**

The boards are identical except for the positioning of the displays.

Their main feature is the way the displays are connected, in fact the 7 segments and the decimal dot are connected four by four (DY8 DFY7 DY6 DY5 and DY4 DY3 DY2 DY1), while their supply common terminals are connected two by two (DY8 DY4, DY7 DY3, DY6 DY2, DY5 DY1).

This connection allows to manage eight 7 segments displays with a very reduced number of signals. The management of all the display must be made through a refresh with a maximum latency time of 20 ms, otherwise the human eye experiences a troublesome flickering.

Such refresh is very easy to implement; it is enough to program a timed event to trigger every 5 ms, this event must activate two displays at a time, setting to zero one of the four bits (bit 17, bit 18, bit 19, bit 20) that drive the supply of the displays through ULN2074, while bits 9-16 allow to manage the segments of the displays on the right side and bits 1-8 allow to manage the segments of the displays on the left side (bit x = 1 the segment is on).

The 6 LEDs are treated like a segment of the display to which they are connected. When the display is supplied (one of bits 17-20 =0) it is enough set bit 22-23 to one.

## **HOW TO USE KAD 08 BOARD**

The working modality of this board is identical to the one of the two previous boards, the only difference is the number of segments managed per display: 14 instead of 7.

The displays are supplied setting to zero one of the four bits (bit 31, bit 32, bit 33, bit 34) that drive the current amplifier ULN2074.

Bits 16-30 manage the displays on the right side while bits 1-15 manage the displays on the left side.

The 6 LEDs are treated like a segment of the display to which they are connected. When the display is supplied (one of bits 31-34 =0) it is enough set bit 35 to one.

## BIBLIOGRAPHY

Here follows a list of manuals that can be a source of further information about the devices installed on **KND 44**, **KND 08** e **KAD 08**.

Manual SGS-THOMSON: *INDUSTRIAL and COMPUTER PERIPHERAL ICs*

Manual SGS-THOMSON: *INDUSTRY STANDARD LINEAR ICs*

Please contact the manufacturers and their local distributors to find these manuals. Alternatively, the same information or upgraded documentation can be found at the Web site of the manufacturers.

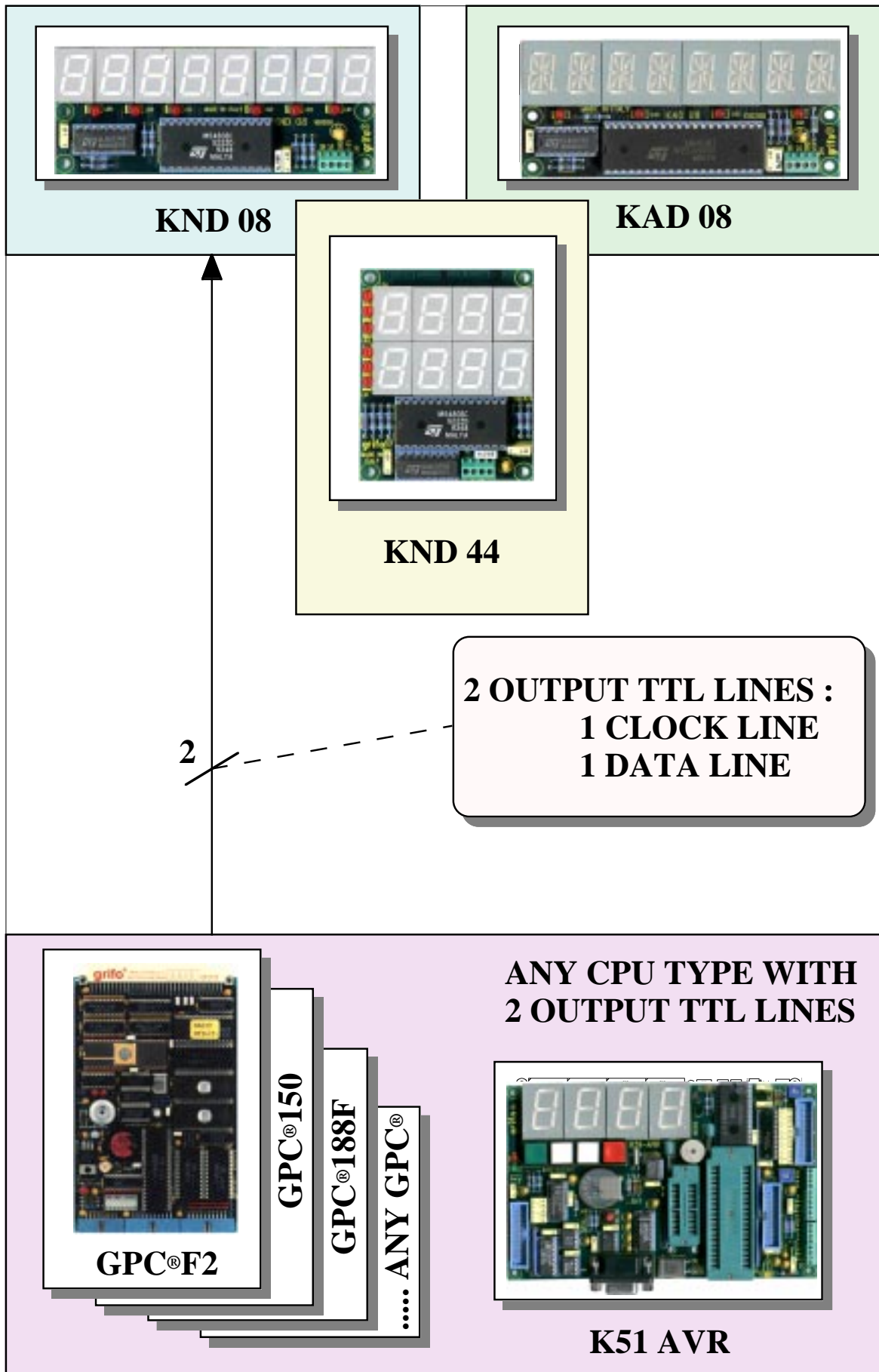


FIGURE 13: EXAMPLE OF CONNECTION

## EXTERNAL CARDS

The typical application for these cards is to display numerical (**KND 44** and **KND 08**) and alphabetical (**KAD 08**) characters with an high grade of visibility and brightness.

These cards can interface with almost all other the **grifo**<sup>®</sup> boards, two TTL output signals are enough for management. Here is reported a very short list of our boards with a brief explanation as an example of our listings; for further informations please require specific documentation:

### **GPC<sup>®</sup> F2**

General Purpose Controller family 51

11MHz 51 INTEL also with masked MCS BASIC. RTC; 32 K SRAM Back-Up through Lithium battery; EPROM programmer; EEPROM; 1 or 2 RS 232 lines ; 16/24 I/O TTL; 9 timer/counter featurong 16 bits; dip switch; .

### **GPC<sup>®</sup> 150**

General Purpose Controller 84C15

Microprocessor Z80 with quartz at 16 MHz; CMOS complete implementation; 512K EPROM or FLASH; 512K SRAM; RTC; Back-Up through external Lithium battery; 4M serial FALSH; 1 RS 232 line + 1 RS 232 or RS 422-485 or Current Loop line; 40 I/O TTL; 2 timer/counter; 2 watch dog; dip switch; EEPROM; 8 A/D lines featuring 12 bit; activity LED.

### **GPC<sup>®</sup> 188F**

General Purpose Controller 80C188

Microprocessor 80C188 INTEL. 1 RS 232 line and 1 RS 232 or 422-485 ro Current Loop line; 24 I/O TTL lines; 256K EPROM or FLASH and 256K SRAM backed through Lithium battery; RTC; 3 Timer Counter; 8 A/D lines featuring 12 bit; Watch Dog; Write Protect; EEPROM; 2 activity LEDs; dip switch.

### **GPC<sup>®</sup> 553**

General Purpose Controller 80C552

Microprocessor 80C552 with quartz at 22 or 30 MHz. CMOS complete implementation; 32K EPROM; 32 K SRAM; 32 K EEPROM or SRAM; RTC; EEPROM; 1 RS 232 line + 1 RS 232 or RS 422-485 or Current Loop line; 16 I/O TTL; 2 PWM lines; 16 bits timer/counter; watch dog; dip switch; 8 A/D lines featuring 12 bit; DC or AC power supply; container for DIN 46277-1 and 3 rails.

### **GPC<sup>®</sup> 114**

General Purpose Controller 68HC11

Microprocessor 68HC11A1 with quartz at 8M Hz. CMOS complete implementation; serie 4 size; 32K EPROM; 32K SRAM backed through Lithium battery; 32K EPROM, SRAM, EEPROM; RTC; 1 RS 232 or RS 422-485 line; 10 I/O TTL; 3 timer counter; watch dog; 8 A/D lines featuring 8 bit; 1 synchronous serial line; very low current consumption; container for DIN 46277-1 and 3 rails.