DT-102NR, DT-102NX

and DT-102Nxsi DISPLAYS

OPERATION MANUAL

1017K03A

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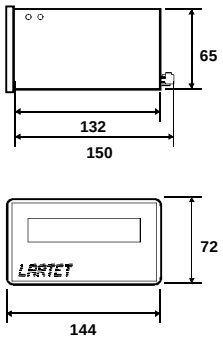
1.GENERAL SPECIFICATIONS

DT-102NR are RS-232 series control displays.
DT-102NX are RS-485 series control displays.

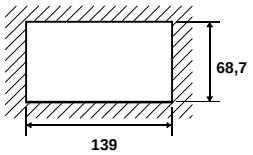
Screen
green colour VFD fluorescent. Two characters lines of points matrix of 5 mm height.
Approximated reading distance
2.5 metres.
Maximum environmental lighting
2000 lux.
Protection
IP 41, at the front.
IP 20, on the rest.
Nominal supply tension
24 VCC. From 18 V to 32 VCC.
Maximum ripple 1V.
Intensity **,** 220 mA a 24 VCC
EEPROM memory of 32k bytes.
Environmental conditions
Temperature: work 0° a 50°C.
Storing -10° a 60°C
Humidity: 5-95% without condensation.
RS-232 series line.
Connector of 9 pins, type D.
Advisable maximum distance: 15m.
RS-485 series line.
Connector of 9 pins, type D.
Advisable maximum reading: 1000m.
Maximum num. of messages
512
Maximum num. of characters per line
In fix, static mode, 20. Characters. In rotation, 160 characters.

Individual character by character, programmable.

DIMENSIONS



PANEL



2. INSTALLATION

It must not be installed on places fastened to vibration or where the specified levels of temperature or humidity are overcome.

Neither displays nor supply or control conductors must be installed close to high tension lines, high intensity lines or high frequency equipments, which are habitual in ovens or soldering equipments.

In general it must be far from lines of high level of electric noises.

2.1. POWER SUPPLY

From 18 to 32 VCC.

Intensity, 250 mA at 24 VCC., as common consumption.
Every activated parallel input consumes approximately an extra of 10mA.

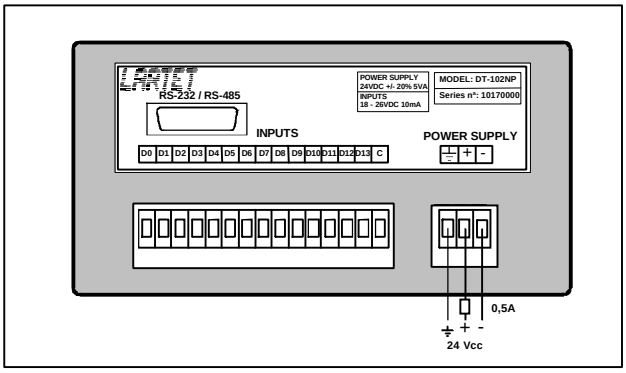
Maximum undulation: 1V

Section of supply conductor, 1 mm^2

Land connection can be just done when an excellent installation land is guaranteed. Otherwise, it is better not to connect it, because it can damage the display good working order.

Although displays count on their own internal protection, it is necessary to install an external protection fusible of 0.5ª on supply line.

POWER SUPPLY



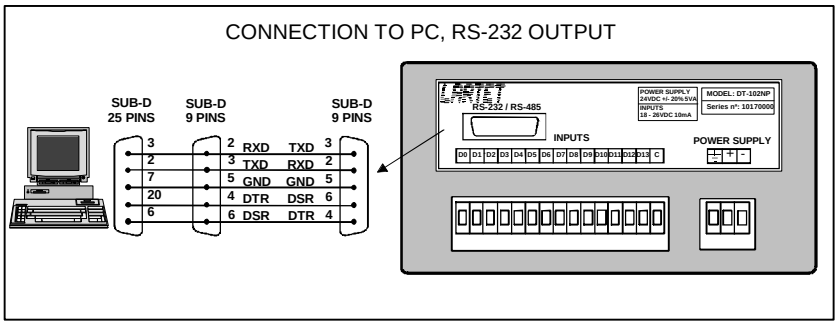
2.2. RS-232 INSTALLATION LINE, DT-102NR

RS-232 series line has a double function :

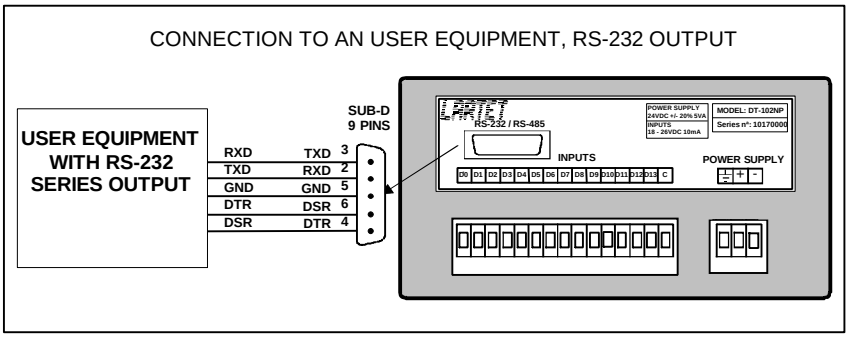
1) **Recording messages in EEPROM memory** of displays, or direct sending of direct messages to displays from **TED** program. To adjust TED program is necessary a PC, XT model, AT, 386, 486 or Pentium.

In this case TED program starts RS-232 series port by itself , at fixed parameters:

9600 baud, even parity, 8 bits, 1 bit stop.



2) **Display control by way of RS-232 series**, by user own Software, by way of a PC or a mechanism with RS-232 series output, according to rules explained on chapter 5.



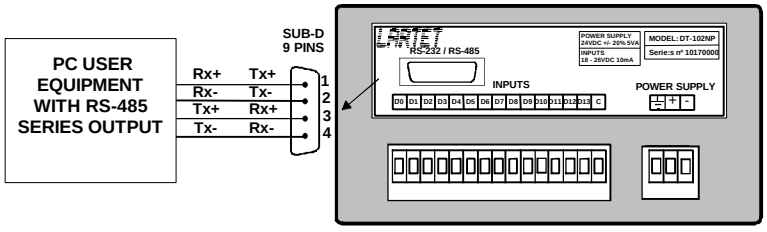
2.3. RS-485 INSTALLATION LINE, DT-102NX and DT-102NXsi

RS-485 series line has the same functions as RS-232 line. However, it can also control multiple displays on net, up to 255, and it does it from a much greater distance than RS-232 line does. It is advisable when displays are placed more than 15 meters far from series mechanism, even thought there is just one display to be controlled.

In general computers do not have incorporated this type of series line, but it is easy to acquire from computer science suppliers a RS-485 converter in order to set it inside the PC.

A more versatile possibility is to set a RS-232 / RS-485 converter outside the PC or the user series mechanism.

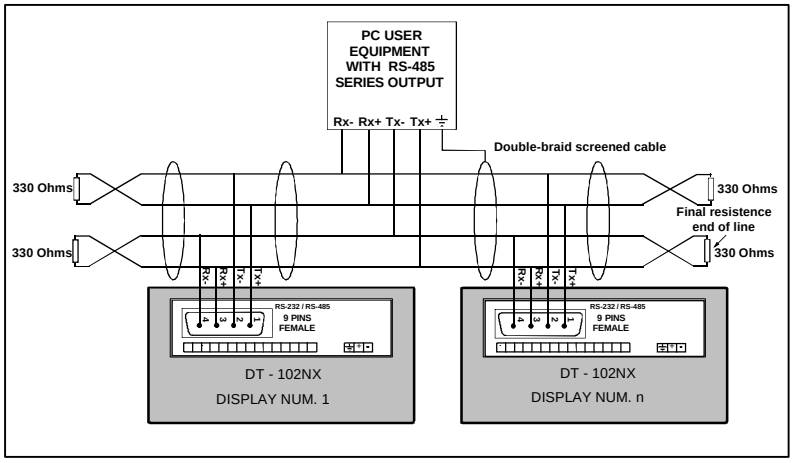
RS-485
DISPLAY CONNECTION TO PC OR USER EQUIPMENT



To install it on red it is necessary to use double-braid screened cables of 0.25 mm^2. minimum section. The screen of the cable must be connected just to the corresponding end of the control equipment, PC, PLC or another. Both ends of the screen must not ever be connected.

A resistance of 330 Ω 0.25W must be connected to the ends of the line for a proper working order.

It is necessary to set a net amplifier for each group of 32 displays from the 255 able to be controlled. The first 32 displays do not need an amplifier.



A direction must de allocated to every display to have its independence. The direction is allocated by a binary codification of 8 bits, which is connected by way of 8 inputs from the posterior terminal, see chapter 4.

3. RESET

When the display is supplied, there is an automatic initial reset and sequential lighting of both lines, in order to be able to check its proper working order and detect any anomaly.

After connecting to net, all the messages previously stored in EEPROM memory in **PRESENTATION** mode are displayed. If the user does not recorder any text in EEPROM memory, the messages displayed are the ones from factory.

PRESENTATION mode is called to the automatic sequential displaying of all the messages stored in EEPROM memory. When a new message or messages are recorded, the previously recorded messages will be substituted, see 5.1.8.

Initial messages recording in EEPROM memory is done by PC, by the same series line, by which the display will be later controlled. **TED** program makes it able to record the initial messages. TED program is optional and it is specifically designed for DT-102P displays programming, of parallel de control.

Series control of DT-102NR and DT-102NX models is exactly the same one. Any direction can be connected to both models, although DT-102NR model consist on just one display.

4. DISPLAYING DIRECTION

D8 to D13 inputs must be connected in order to follow a logic order "1" fixed. The other inputs, from D0 to D7, determine the display direction.

INPUTS	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
DIRECTION	1	1	1	1	1	1	d7	d6	d5	d4	d3	d2	d1	d0

D0 to D7 Display direction on Net.

D8 to D13 inputs, at logic level **"1"**, inform the display that its control mode is **series** mode, otherwise the display by itself would use parallel mode, which is completely different from series one. In case parallel mode is required to control the display, ask for the corresponding manual of DT-102-P model.

Direction "0", which means from d0 to d7 = 0, must not be used as display direction in DT-102NR and DT-102NX series displays.

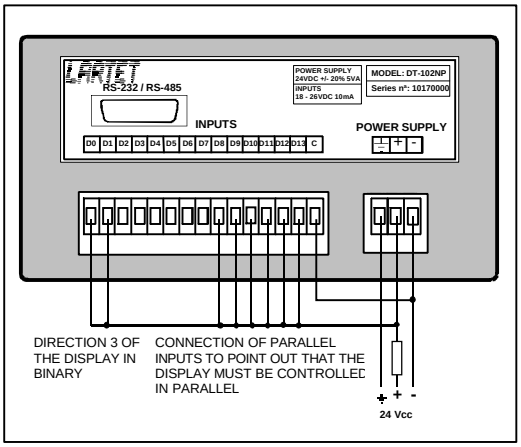
Direction "0" of displays is reserved to parallel control models, which show the corresponding message to message num. 0, which is stored in EEPROM memory.

A really useful characteristic of direction “0” on these series displays is that when a message is sent to a fictitious display, what happens in reality is that **this message is sent at the same time to all displays on NET,** independently from the own display direction.

4.1. CONEXIONADO DIRECCIONAMIENTO

Conectar el borne **"C"** al polo negativo de la fuente de 24 VCC de alimentación del visualizador y el polo positivo a la entrada que deseemos poner en nivel lógico "1".

Conectar los bornes D8 a D13 al polo positivo de la fuente de alimentación. Conectar a los bornes D0 a D7, la dirección del visualizador.



5. DT-102NR and DT-102Nxsi SERIES PROTOCOL.

The communication of any mechanism of RS-232 or RS-485 series output to DT-102NR or DT-102NX displays is done by Full Duplex, in such way that for every transmission block sent by series mechanism, there is the corresponding answering block from the display.

The only exception is that there will be no answering block when a message is sent to direction “0”, because, as it has been pointed out before, there must be no displays in direction "0".

Transmission block	00 02	nn	xx	dd..dd	00 0D	zz zz	00 03

Answering block	00 02	nn	xx	rr..rr	00 0D	zz zz	00 03

5.1. TRANSMISSION BLOCK.

Transmission block protocol of the display series mechanism.

00 02	**nn**	**xx**	**dd..dd**	**00 0D**	**zz zz**	**00 03**
heading	Num. of terminal	Num. of bytes	Information	End of information	CRC	End of block

5.1.1. Heading

2 bytes 00 02

It is the fixed value in hexadecimal, **"00 02"**

5.1.2. Num. of terminal

1 byte

It is the number of terminal on NET. Although a single display is being used, it has to have a direction, whether it is a RS-232 or RS-485 display.
The num. of terminal "0" states that it is a message directed to all displays on NET, independently from the display own direction. In such case, there will be no answering block from the display.

5.1.3. Num. of bytes

1 byte

It is the number of bytes that form the information block. They start to be counted from the byte of the terminal number up to the second byte of CRC, both inclusive. The value of the amount of bytes is between 6 and 250.

5.1.4 Information

It consist of the messages texts, which include control characters and error codes. The data zone must begin with control characters, which define the posterior information, which is then sent. The structure of data zone is :

00 1B	**06**	**Text**	**00 14**	**02**	**Text**
Beginning of message sending	It indicates 1st line	Text in ASCII, 1st line	Num. of lines	Line 2	Text in ASCII 2nd line

Beginning of message sending

2 bytes 00 1B

It is the fixed value in hexadecimal, "00 1B". Control character indicates that the following information is the messages text.
Then it is possible to send the 1st or 2nd line or both at the same time, as it will be pointed out later on.

1st line indicator

1 byte 06

It is the fixed value in hexadecimal, "06". It indicates that the following text must be the 1st line of the display.

Text in ASCII, 1st line

The text to be displayed must be in ASCII code.
Flicking control character of the sequence of ASCII characters can be used within the text.:

Beginning of flicking: 2 bytes. Fixed value **"00 08"**

End of flicking: 2 bytes. Fixed value **"00 09"**

Num. of line

2 bytes 00 14

Fixed control character which indicates the display that the following character it will receive is the num. of line.

Line 2

1 bytes 02

The only possible number of line is line 2 for DT-102 displays, because it has just two lines. This field can adopt different values when they are multimedia displays models.

Text in ASCII, 2nd line

The text to be displayed must be in ASCII code. The process to follow is the same as for ASCII text, 1st line.

The data can be sent to an specific line. It is not necessary to send both lines at the same time. It means that it can just be sent the 1st line: 00 1B 06 "Text"... , or just the 2nd line: 00 1B 00 14 02 "Text"... .
When both lines are sent at the same time, it is necessary two follow, firstly the 1st line and then the 2nd line, never the other way round.

5.1.5. End of information

2 bytes 00 0D

It is fixed value in hexadecimal, **"00 0D"**

5.1.6. CRC

2 bytes

It is a control code to verify the proper transportation of information.
First byte is the result of calculating the operation OR EXCLUSIVE of odd bytes. It begins with the **"Num. of terminal"** up to **"End of information"**, both inclusive.
Second byte is the result of calculating the operation OR EXCLUSIVE of even bytes. It begins with the **"Num. of bytes"** up to **"End of information"**, both inclusive.

EXAMPLE OF CRC CALCULATIONS

Using the example of transmission of the following pages, CRC calculation is :

1º byte. Function OR exclusive of the following bytes (odd num.)

02, 00, 06, 41, 54, 54, 14, 31, 33, 35 y 00

Result = 66

2º byte. Function OR exclusive of the following bytes (even num.)

18, 1B, 4C, 52, 45, 00, 02, 32, 34, 36, y 0D

Result = 67

CRC code for this example = 66 67

5.1.7 End of Block

2 bytes 00 03

It is a fixed value in hexadecimal, **"00 03"**

EXAMPLE OF TRANSMISSION

Display num. 2, from the NET.

Text to be sent to 1st line : "LARTET"

Text to be sent to 2nd line : "123456"

Transmission block will be :

00 02 02 18 00 1B 06 4C 41 52 54 45 54 00 14 02 31 32 33 3434 36 00 0D 66 67 00 03

00 02	Heading
02	Display num. 2
18	Num. of bytes in Hexadecimal (24 in decimal).
00 1B	Beginning of message sending.
06	Indicator that indicates that the following ASCII characters must be displayed in the 1st line.
4C	"L" in ASCII.
41	"A" in ASCII.
52	"R" in ASCII.
54	"T" in ASCII.
45	"E" in ASCII.
54	"T" in ASCII.
00 14	Fixed control character, which indicates the display that the following character it will receive is the num. of line.
02	Indicator that the following ASCII characters must be displayed in the 2nd line.
31	"1" in ASCII.
32	"2" in ASCII.
33	"3" in ASCII.
34	"4" in ASCII.
35	"5" in ASCII.
36	"6" in ASCII.
00 0D	It indicates end of information.
66 67	CRC. OR EXCLUSIVE of even and odd numbers.
00 03	End of transmission block.

5.1.8. PRESENTATION MODE.

In mode it displays the messages previously recorded in EEPROM memory. Messages are recorded by TED program, which is optional, it is not provided with the display) See chapter 6, for TED program.

TED program is executed from a PC and it communicates with the display through the same series port, by way of a series cable (optional).

PRESENTATION MODE is useful to send fixed stored messages in the displayed itself. When messages are just once recorded or just from time to time, the computer can be disconnected from the display in order to make it work automatically. The storing time without tension of EEPROM memory is undefined.

This is the mode the display is automatically set to connection and it remains this way until it receives the first message of **SERIES MODE.**

Protocol of the transmission block of the series mechanism to the display, for PRESENTATION MODE. It is the same series protocol, but in the data zone. Send the code of fixed control "00 0D".

00 02	**nn**	**xx**	**00 1D**	**00 0D**	**zz zz**	**00 03**
Heading	Num. of terminal	Num. of bytes	**Presentation mode**	End of data	CRC	End of block

2 bytes 00 0D

It is a fixed value in hexadecimal, **"00 0D"**

It is really easy to pass from PRESENTATION MODE to SERIES MODE, and vice versa.

EXAMPLE OF DEMONSTRATION MODE

Sent to **all** displays on NET the order to pass to DEMONSTRATION MODE, which means sending the order to the virtual display "0".

Transmission block will be:

00 02 00 08 00 1D 00 0D 00 18 00 03

00 02	heading
00	Display num.0. Inexistent, which means sending it to all of them.
08	Num. of bytes in Hexadecimal (8 in decimal).
00 1D	Order of DEMONSTRATION MODE.
00 0D	End of information.
00 18	CRC.
00 03	End of block.

5.2. ANSWERING BLOCK.

After receiving the transmission block from the series mechanism with the information, the display answers with the answering block, which is of conformity or error.

00 02	**nn**	**xx**	**05..ee**	**00 0D**	**zz zz**	**00 03**
heading	Num. of terminal	Num. of bytes	Data	End of Data	CRC	End of block

The information block for the different answers is 2 bytes :

05 00 **Correct answer**

05 01 **Error of communication**

05 02 **Error of CRC**

05 03 **Error in the data block**

05 04 **Error. It does not find end of data**

05 05 **Error. Incorrect num. of bytes**

EXAMPLE OF ANSWER BLOCK

Display num.1 of the NET.

The correct answer block is:

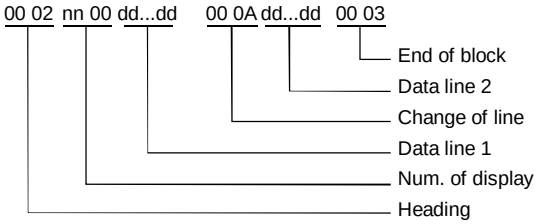
00 02 01 08 05 00 00 0D 04 05 00 03

00 02 Heading
01 Display num. 1
08 Number of bytes in Hexadecimal (8 in decimal).
05 00 Code of correct answer.
00 0D End of information.
04 05 CRC.
00 03 End of block.

6. DT-102Nxsi SERIES PROTOCOL

6.1 Information

Communication with DT-102Nxsi display is done by RS-485 connection in reception mode and with a data block, as it follows.



6.1.1 Heading

Name 00 02 in hexadecimal.

6.1.2 Num. of display. (2 Bytes).

It is the number that identifies the display on NET.
Its value has to be between 1and 255. (1-FF)
Messages number 0 are sent to all displays.
The display number is set on the high byte. The second byte must be set on 0.

6.1.3 Data line 1.

It is the message text of line 1.

6.1.4 Change of line.

Code 00-0A in hexadecimal.

6.1.5 Data line 2.

It is the message text of line 2.

6.1.6 End of block

Code 00-03 in hexadecimal.

6.1.7 Control code.

Beginning of flicking 00-08

End of flicking 00-09

Codes of beginning and end of flicking are used on data lines. Starting from beginning of flicking code, line characters are displayed in flicking until end of flicking code.

6.2 RS-485 series line.

Characteristics:

- Velocity: 9600
- Parity: without parity
- Num. of Bits: 8
- Stop Bits: 2

6.3. Differences between DT-102NXsi and DT-102NX displays.

Apart from protocol differences, this version do not send an answer on communication.

It does not have EEPROM memory for message retention.
Message retention is done by RAM, and it is supplied by a battery. Last message sent is kept, even after disconnecting the equipment supply.