

DIGITAL INPUTS
DISPLAYS OPERATION
MANUAL

DT-105P, DT-106P, DT-110P,
DT-111P and DT-203P

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DECLARATION OF CONFORMITY CE	

1. Introduction.

The message displays of **DT-105P, DT-106P, DT-110P, DT-111P and DT-203P** series are industrial displays of parallel control.

The displays working order is basically based on a microprocessor and on technically advanced circuits of control.

Its main characteristic is the great size of the characters.

30mm. height for **DT-203**, which allows a reading up to 15 meters

50mm. height for **DT-105 and DT-106**, which allows a reading up to 25 meters.

100mm. height for **DT-110 and DT-111**, which allows a reading up to 50 meters.

They are manufactured in one or two sides of displaying, which provides several possibilities and solutions when it has to be installed.

They can be set up on a surface, whether they are fixed to a wall or a partition, or they can be left hanging from the lateral supports.

There is a wide range of applications of these displays, which goes from industrial applications, such as warning breakdowns or displaying production information, to common advertisements.

* **Internal communication notices aimed at staff.**

"Mr ... phone to switchboard", "Meeting at 11:00", "Welcome Mr Smith from ACME", etc.

* **Production control of machines or installation, etc.**

"Production=1200 P/H", "Amount of manufactured pieces 14.327"

* **Breakdowns**

"Error STATION 5", "Machine 2, out of order", etc.

* **Security alarm**

"Fire in zone 3", "Lights of at 18:30", etc.

* **Advertisement**

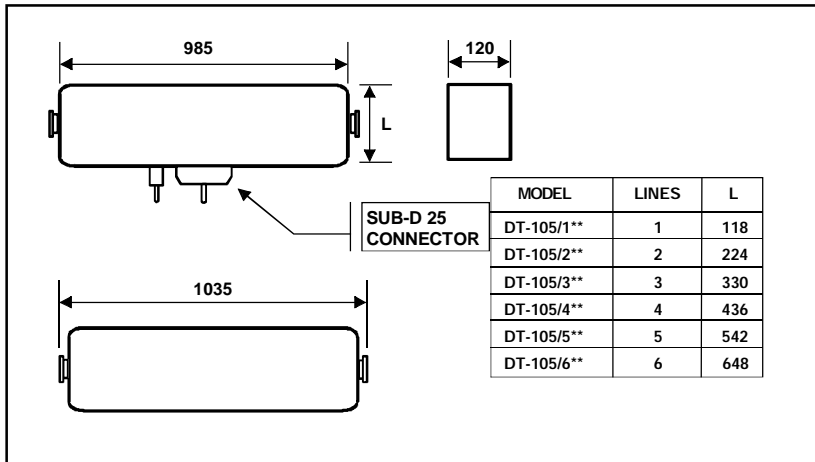
"Washing powder JIK 2\$", "Women clothes first floor, 1st", etc.

For programming initial texts and in one kind of messages it is available TED program, which works in PC and MS-DOS.

2. General specifications.

2.1 Electrical specifications of DT-105P displays.

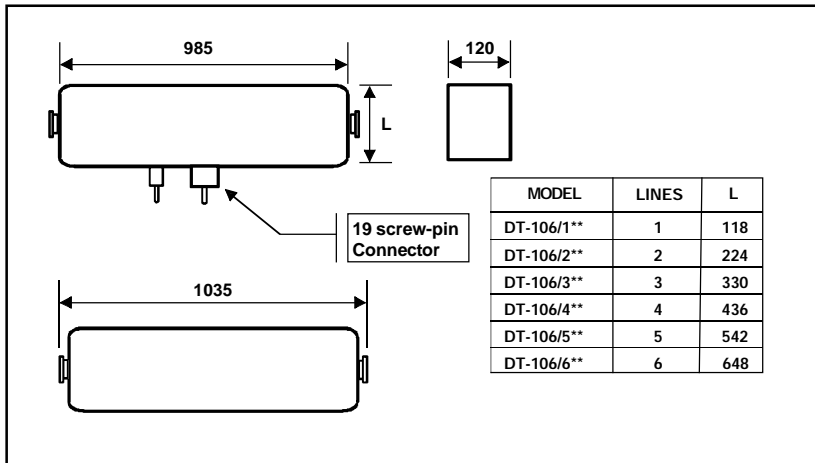
Power supply	230VAC ±10% 50/60Hz.
Consumption	1 Side = (5 + (Nx20)) VA.
.....	2 Side = (5 + (Nx20x2)) VA.
.....	N=N° of lines.
Display	LED. Matrix points by 7x5 of 50mm. de height.
.....	Readable up to 25 meters.
Initial message memory	EEPROM.
Watch calendar	Second / Minute / Hour / Day / Month / Year.
Environmental conditions	Operating temperature: 0 to 50°C.
.....	Storage temperature: -10°C to 60°C.
.....	Humidity: 5-95% without condensation.
.....	Maximum environmental lighting: 1000 lux.
.....	Protection IP 41.
RS-232 port series	For recording the initial messages in EEPROM
.....	and activating messages from control series
.....	device.
Inputs power supply	18 to 26 VCC. 10 mA for input.



2.1 DT-105 display dimensions

2.2 Electrical specifications of DT-106P displays.

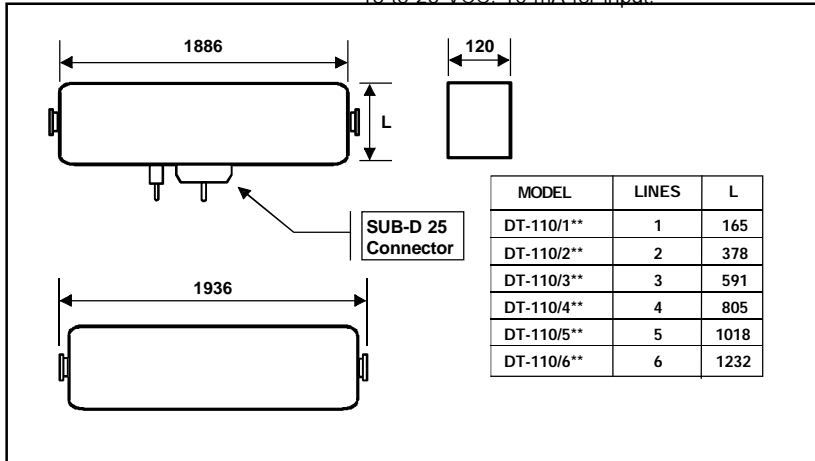
Power supply	230VAC \pm 10% 50/60Hz.
Consumption	1 Side = (5 + (Nx20)) VA.
.....	2 Side = (5 + (Nx20x2)) VA.
.....	N=N° of lines.
Display	LED. Matrix points by 7x5 of 50mm. de height. Readable up to 25 meters.
Initial message memory	EEPROM.
Watch calendar	Second / Minute / Hour / Day / Month / Year.
Environmental conditions	Operating temperature: 0 to 50°C. Storage temperature: -10°C to 60°C. Humidity: 5-95% without condensation. Protection IP 54. External display
RS-232 port series	For recording the initial messages in EEPROM and activating messages from control series device.
Inputs power supply	18 to 26 VCC. 10 mA for input.



2.2 DT-106 display dimension

2.2 Electrical specifications of DT-110P displays.

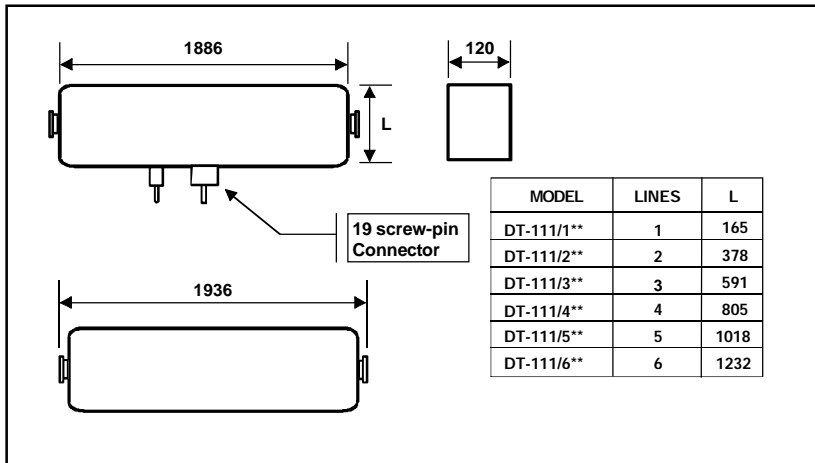
Power supply	230VAC \pm 10% 50/60Hz.
Consumption	1 Side = (5 + (Nx20)) VA.
.....	2 Side = (5 + (Nx20x2)) VA.
.....	N=N° of lines.
Display	LED. Matrix points by 7x5 of 100mm. de height.
Initial message memory	Readable up to 50 meters.
Watch calendar	EEPROM.
Environmental conditions	Second / Minute / Hour / Day / Month / Year.
.....	Operating temperature: 0 to 50°C.
.....	Storage temperature: -10°C to 60°C.
.....	Humidity: 5-95% without condensation.
.....	Maximum environmental lighting: 1000 lux.
RS-232 port series	Protection IP 41.
.....	For recording the initial messages in EEPROM
.....	and activating messages from control series
Inputs power supply	device.
.....	18 to 26 VCC. 10 mA for input.



2.3 DT-110 display dimensions

2.2 Electrical specifications of DT-111P displays.

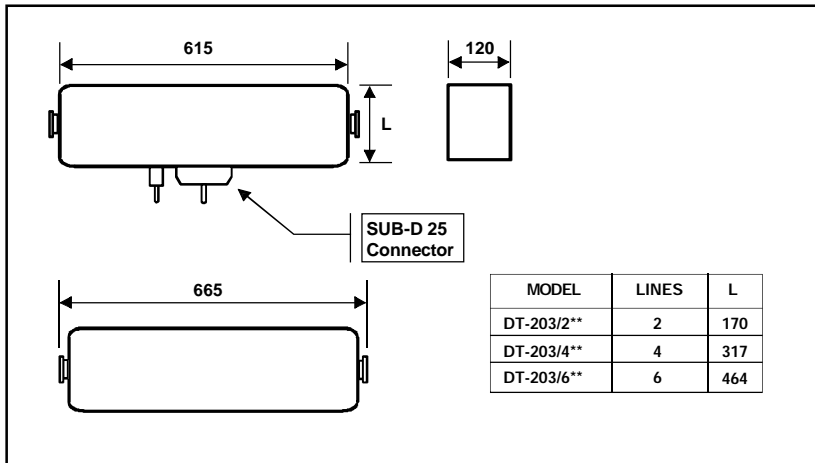
Power supply	230VAC \pm 10% 50/60Hz.
Consumption	1 Side = (5 + (Nx20)) VA.
.....	2 Side = (5 + (Nx20x2)) VA.
.....	N=N° of lines.
Display	LED. Matrix points by 7x5 of 100mm. de height.
Initial message memory	Readable up to 50 meters.
Watch calendar	EEPROM.
Environmental conditions	Second / Minute / Hour / Day / Month / Year.
.....	Operating temperature: 0 to 50°C.
.....	Storage temperature: -10°C to 60°C.
.....	Humidity: 5-95% without condensation.
RS-232 port series	Protection IP 54. External display
.....	For recording the initial messages in EEPROM
.....	and activating messages from control series
Inputs power supply	device.
.....	18 to 26 VCC. 10 mA for input.



2.4 DT-111 display dimensions

2.2 Electrical specifications of DT-203P displays.

Power supply	230VAC \pm 10% 50/60Hz.
Consumption	1 Side = (5 + (Nx20)) VA.
.....	2 Side = (5 + (Nx20x2)) VA.
.....	N=N° of lines.
Display	LED. Matrix points by 7x5 of 30mm. de height.
.....	Readable up to 15 meters.
Initial message memory	EEPROM.
Watch calendar	Second / Minute / Hour / Day / Month / Year.
Environmental conditions	Operating temperature: 0 to 50°C.
.....	Storage temperature: -10°C to 60°C.
.....	Humidity: 5-95% without condensation.
.....	Maximum environmental lighting: 1000 lux.
.....	Protection IP 41.
RS-232 port series	For recording the initial messages in EEPROM
.....	and activating messages from control series
.....	device.
Inputs power supply	18 to 26 VCC. 10 mA for input.



2.5 DT-203 display dimensions

3. Installation.

DT-105, DT-106, DT-110, DT-111 and DT-203 displays installation is not really complicated, but there are some consideration to take into account.

They must neither be fixed in places close to vibration nor in places where the limits described in general specifications about temperature and humidity are overcome.

DT-105, DT-110 and DT-203 displays have a protection degree of IP-41, which means that it is protected from the penetration of weird solid items of more than 1mm diameter and from rain drops which fall vertically.

DT-106 and DT-111 displays have a protection degree of IP-54, which means that it is protected against dirtiness without carrying to deposit harmful and from rain drops which fall from anywhere.

DT-105, DT-110 and DT-203 displays must not be installed in places where the lighting level is higher than 1000 lux. It must be protected from direct sunlight rays, which is detrimental to its visibility.

DT-106 and DT-111 displays can be installed outside without carrying problems of visibility.

They must neither be installed close to electric conduction cables of high intensity nor to high voltage lines.

They must stay away from:

High frequency generators, which are frequent in soldering equipment.
U/F converters for motors.

Although the display stays away from noises supply, try not to have neither the conductors close to them nor the power supply font.

Applying this rules do not requires any additional effort for users. It is necessary just to take into consideration this few precautions before installing the display.

3.1 Power supply.

Power supply must be **230VAC ± 10%, 50/60Hz**.

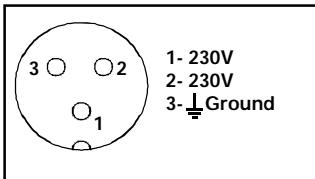
Intensity consumed by the different types:

DT-105 and DT-106		
	1 Side	2 Side
1 line	0,1A	0,2A
2 lines	0,2A	0,4A
3 lines	0,3A	0,6A
4 lines	0,4A	0,8A
5 lines	0,5A	1A
6 lines	0,6A	1,2A

DT-110 and DT-111		
	1 Side	2 Side
1 line	0,5A	0,9A
2 lines	0,9A	1,7A
3 lines	1,3A	2,5A
4 lines	1,7A	3,3A
5 lines	2,1A	4,1A
6 lines	2,5A	4,9A

DT-203		
	1 Side	2 Sides
2 lines	0,15A	0,25A
4 lines	0,25A	0,45A
6 lines	0,35A	0,65A

Although the display has its own internal protection system, the user should install a fusible or an external automatic switch for protection on the power supply cable, which must be of appropriate intensity.



3.1 Power supply 230VAC

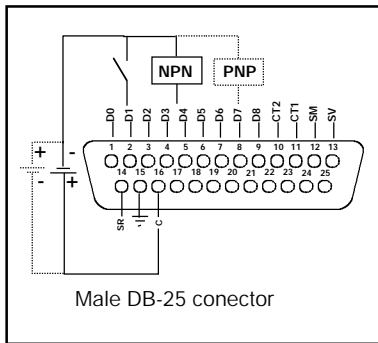
The conductors section must be selected according to consumption. The ground conductor must be at least 1,5mm². section. Although displays are specially prepared for places where the level of electric noises is high, if the power supply cable seems really noise, it is better to interpose between the power supply cable and the display a screened divider transformer with the screen connected to ground and/or the interposition of a filter in the exterior Net.

The supply connector is a three contacts type and it is located at the bottom of the equipment. The connection must be done according to figure 3.1

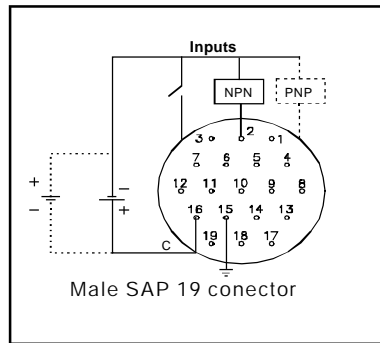
3.2 Inputs connections.

The displays described in this handbook have been designed to be controlled by control equipment's with common digital outputs. Although any kind of control equipment can be used, here it is described the using of a PLC. It does not matter the model or brand of the PLC.

In 3.2 a and 3.2b figures the inputs connections are shown depending on the model. These connections are placed at the bottom of the display



3.2a DT-105P, DT-110P and DT-203P



3.2b DT-106P and DT-111P

A male DB25 conecotr and a male SAP12 conector

The inputs of displays DT-105P, DT-106P, DT-110P, DT-111P and DT-203P accept any type of outputs from the control equipment: NPN, PNP and CONTACT.

When the PLC outputs are of CONTACT type, the connection polarity does not matter because the display accepts any polarity. It is to say that the display common can be positive or negative, and consequently the polarity of the common of the control equipment will be the opposite.

When the PLC output is NPN, the positive of the power supply must be connected to the display common and the negative as the common of the PLC outputs.

When the PLC output is PNP, the negative of the power supply must be connected to the display common and the positive as the common of the PLC outputs.

The inputs power supply are external from the display.

Takin into account that every display inputs uses up approximately 10 mA at 24Vcc, the maximum energy required by the power supply is 150mA. It is useful to use the same power supply to supply the display inputs and the general power supply used for the PLC inputs.

The tension of the power supply inputs must be from 12V to 26V continuous current, with to maximum undulation of 500mV. Surpassing those values could damage irrevocably the display.

3.3. Series line connections.

In DT-105P, DT-106P, DT-110P, DT-111P and DT-203P displays, series line is used to transfer messages from PC to display.

The TED program lets you to edit, save and transfer the messages. TED program sets the computer serial port to these parameters:

Baud rate: 9600 Parity: Even N° of bits: 8 Stop bits: 2

The computer must be PC with Windows operating system

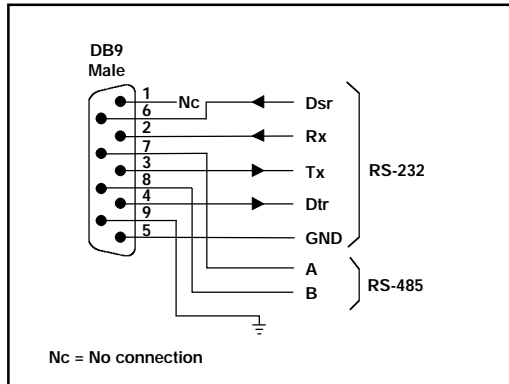
The DT-105P, DT-106P, DT-110P, DT-111P and DT-203P displays series may be programmed using two serial line types: RS-232C and RS-485. Both serial lines use the same connector placed at display's bottom.

The models DT-105P, DT-110P and DT-203P use a DB9 connector. See Fig. 3.3a

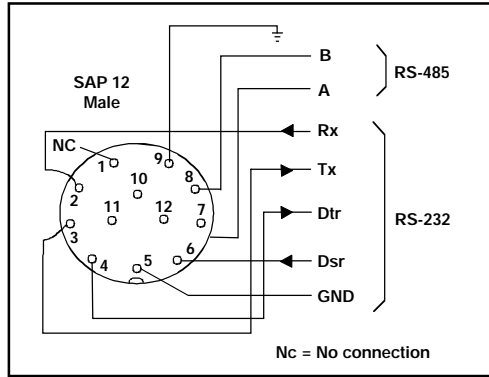
The models DT-106P, DT-111P use a SAP12 connector. See fig 3.3b

The cable used for the connection between the computer and the display is an option. Ask for it at your supplier.

The wiring diagram are shown below:



3.3a Series line connections for DT-105P, DT-110P and DT-203P



3.3b Series line connections for DT-106X and DT-111X.

4.- Working.

4.1 First time in service.

The displays series DT105/106/110/111/203/X are industrial displays controlled by digital inputs. There are available models from 1 to 6 rows and 1 o 2 display sides.

Before connecting the display to the power supply, it must be checked that all connections have been set properly and that the display have been firmly placed.

Every time the display is connected to the power supply, there is an initial reset, which check all the points of the display

Following the reset, the displays reads the message memory and initialise the messages table. The world «INICI» is shown until the display is prepared to receive messages.

4.2 Message programming

In order to program the messages into the memory Eeprom, a PC computer and the TED software are necessities. TED is software specifically designed to program the messages into display. See the TDL Manual to know how the TDL works.

To program the messages, the display must be configured with the following parameters: (See Set Parameters)

- 1- Display Address = 000
- 2- Protocol = Lartet
- 3- BaudRate = 9600
- 4- Data length = 8
- 5- Parity = Par
- 6- Stop Bits = 2
- 7- Serial input = Depends on serial line (RS-232 o RS-485).

The program time could be of some minutes.

4.3 Set parameters.

Before to use the display you must set the parameters.

The parameters are:

- 1- Language.
- 2- Display address.
- 3- Protocol.
- 4- Baud rate.
- 5- Bits length.:
- 6- Parity.
- 7- Stop bits.
- 8- Serial input.
- 9- Date
- 10- Time
- 11- End

To set the parameters, the display has a pair of pushbuttons located at the bottom of the case. The menu is in four languages.

4.3.1 Modify parameters

To go into modify parameters menu, you should push for more than three seconds the advance pushbutton, labelled with «7->5». After the 3 seconds, the display shows the first parameter in flashing mode.

From this point, there are two options:

1- Display the parameters value.

Pushing advance ("7->5") you may see the parameters value. The pushbutton increment, labelled «+», lets you to modify the parameter.

To select the parameters name push the advance pushbutton («7->5»).

2- Select another parameter.

While the parameters name is flashing, every time you push the increment pushbutton («+») select a new parameter.

4.3.2 Exit modify parameters

To exit modify parameters menu, select the parameter «END» and then push advance «7->5».

4.3.3 Meaning of each parameter.

- 1- **Language:** The language menu. There are four languages available: **Catalá**, **Español**, **Français** and **English**.
- 2- **Address:** The network display address. Selectable between 0 and 299. Depends of each protocol.
- 3- **Protocol:** The selected protocol. The protocols available are: **Lartet**.
- 4- **Baud Rate:** Selects the transmission baud rate. There are three baud rates available: **4800**, **9600** and **19200**.
- 5- **Data length:** Selects the transmission data length. Select **7** or **8** bits.
- 6- **Parity:** Selects the parity transmission parity. Select **Even**, **Odd** or **None**.
- 7- **Stop Bits:** Selects the transmission number of stop bits. Select **1** or **2**.
- 8- **Serial input:** Selects the transmission type of serial line: **RS-232** or **RS-485**
- 9- **Date:** Let's you to modify the displays date.
- 10- **Time:** Let's you to modify the displays time.
- 11- **End:** To exit modify parameters menu, push advance ("7->5").

4.4 Internal working order.

Although it is not necessary to know how the internal working order operates, it is interesting to know its composition and structure in order to know better how to work with it.

DT-105P, DT-106P, DT-110P, DT-111P and DT-203P displays can store up to 512 messages, with a maximum length of 160 characters per message. The sum of all the characters of all messages can not be more than 32000 characters.

Every message is composed by two blocks:

***Message number** -It takes two characters.

It is the number to be used to call the message from PLC

***Printing message code**- It takes one character.

Not used now.

***Message characters**- It takes one character.

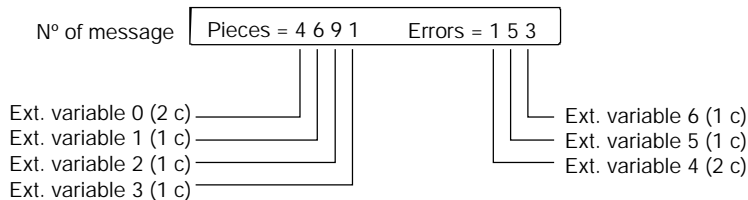
***Control orders** - It takes two or more characters.

They indicate the special functions which the message must do when they are displayed. The orders used are:

- **Number of line**- It takes three characters.
- **Start of characters in flashing** - From this code on all the characters are displayed in flashing mode to the end of the message or until ending of flashing code is used (It takes two characters).
- **End of characters in flashing**- From this code on the characters are not in flashing method anymore.

- **External variable.** It saves one character from the text to enter an external variable (It takes two characters). In message memory one external variable takes two characters. However, the following variables of this message, if they are correlative, take only one variable.

Example: Message N° 15, Pieces: xxxx Errors: xxx



- **Internal variable.** Hour: Minutes. It saves 5 characters from the text. When the displays faces this variable, it sets automatically the present time in Hour: Minutes format (It takes two characters).
- **Internal variable.** Hour: Minutes: Seconds. It saves 8 characters from the text. When the displays faces this variable, it sets automatically the present time in Hour: Minutes: Seconds format (It takes two characters).
- **N° of message internal variable.** It adds the message number to the text. It saves three characters (It takes two characters).
- **Message lasting time.** It does not save any characters from the text. It is the time of period that the message last. Once the lasting time of the message is programmed, this value is not changed until another message, which is programmed with message lasting time order, is operated (It takes 4 characters).

4.5 Inputs characteristics.

- D0 Data inputs. Bit 1
- D1 Data inputs. Bit 2
- D2 Data inputs. Bit 4
- D3 Data inputs. Bit 8
- D4 Data inputs. Bit 16
- D5 Data inputs. Bit 32
- D6 Data inputs. Bit 64
- D7 Data inputs. Bit 128
- D8 Data inputs. Bit 256
- CT1-CT2 Select specific functions.
- SM Strobe Messages. Impulse (10ms), activated or deactivated a message.
- SV Strobe Variables. Impulse (10ms), variable validate.
- SR Set/Reset. Auxilliary signal for activated or deactivated.

4.6 How to send messages to the display.

There are three ways to send a message once the displayed is programmed:

- **Displaying only one message**
- **Displaying all messages in EEPROM**

The number of lines of a message has nothing to do with the way a message is sent because the corresponding lines and texts are defined by the message edited in TED program.

All the following specifications have nothing to do with the number of lines of the display.

4.6.1 Displaying only one message.

It is the easiest way to send an only message to the display. The direction of the message must be sent to the display inputs in binary code.

The message number must be codified to D0-D8 inputs and keep it activated for the period of time it is wished to be displayed. The display always shows the message whose direction is applied.

This method neither memorise the messages nor allows to codify the variables. CT1, CT2, SM, SV and SR control signs are not used in this method, which means that they must be deactivated.

Inputs:

CT1, CT2, SM, SV and SR = 0 (deactivated)

D0-D8 = binary code

The maximum number of messages to be sent are 512 messages by using 9 PLC outputs.

The number of PLC outputs required depends on the number of messages wished to be sent. For example, to send 52 messages it is required to use 6 PLC outputs, which allows to send 64 messages, from the message n° 0 to message n° 63.

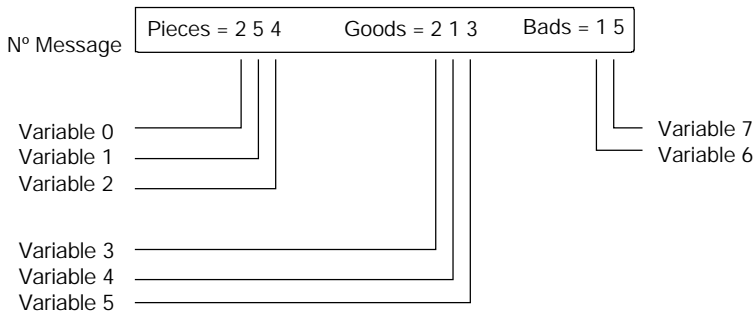
When the display is used to display only one message, PLC outputs can be static or relay outputs.

4.6.3 Displaying all messages in EEPROM.

DT-105P, DT-106P, DT-110P, DT-111P and DT-203P displays allow the entry of variables to insert in permanent texts of the programmed messages. This value must be sent externally by way of the parallel inputs of the display.

The external variables are useful tools, which allow to introduce numeric and ASCII values in the messages or modify them depending on the situation. For example, it can be displayed a counter of pieces, the temperature degree, a variable of a process, etc.

A total of 16 variable characters can be associated for every line, which can be in groups or isolated the message and which are ordered by a position counter (see 4.4)



In this example, there are 8 variables in groups of (0,1, 2) , (3, 4, 5) , (6, 7) from the first line. The other 8 variables available in the line are not used.

Every line has a direction of variable associated, which must be used to send various variables to the lines.

Line 1	Variable 0-15
Line 2	Variable 16-31
Line 3	Variable 32-47
Line 4	Variable 48-63
Line 5	Variable 64-79
Line 6	Variable 80-95

Up to 10 messages can be displayed simultaneously in displaying messages in EEPROM mode, which are loaded in an internal buffer of RAM memory. If there are more than ten messages, no more messages will be accepted until some messages from the buffer are eliminated.

There are three displaying methods:

a) Displaying the first activated message.

Set **CT2=1** (Activated)
CT1, SV, SR=0 (Desactivated)
D0-D8= N° Mensaje
SM=1 Impuls activated ≥ 10 mseg.

b) Displaying the last activated message.

Set **CT1=1** (Activated)
CT2, SV, SR=0 (Desactivated)
D0-D8= N° Mensaje
SM=1 Impuls activated ≥ 10 mseg.

c) Displaying all the activated messages.

Set **CT1, CT2=1** (Activated)
SV, SR=0 (Desactivated)
D0-D8= N° Mensaje
SM=1 Impuls activated ≥ 10 mseg.

For any of these options (a), (b), (c) it is necessary to have at least one of the inputs CT1, CT2, SV, SR, SM activated, although it is not necessary to be always the same input. In case of desactivating all the inputs for more than 0,5 seconds, the display will change to displaying only one message mode (see 4.3.1) and all the messages activated will disappear.

At any time one kind of displaying mode (a), (b) or (c) can be changed to another without deactivating the messages. It is only necessary to activate again the message with the new selected mode.

Example: If message n°3, n°22 and n°1 are activated in this order in (a) option, message n°3 will be displayed. In order to display all the messages, any of these three messages has to be activated in (c) option.

The activation code of one message can be repeated as many times as wished without affecting the working order of the other messages. This fact allows to change the displaying mode and to select the message to which the variable will be sent.

- **To deactivate a message.**

It can be used in any of three displaying mode (A), (B), o (C).

Set **SR=1** (Activated)

CT1, CT2, SV=0 (Desactivated)

D0-D8= N° Mensaje

SM=1 Impuls activated ≥ 10 mseg.

- **To deactivate all the messages at the same time.**

Set **SR, CT2 y D0 a D7=1** (Activated)

CT1, SV=0 (Desactivated)

D8= Irrelevant

SM=1 Impuls activated ≥ 10 mseg.

When messages with variables are displayed, PLC outputs have to be static.

4.7 General specifications for working with the variables.

To display variables, there are some conditions to consider:

-The variables characters have to be previously programmed from TED program to the message.

- The message has to be activated and it has to be the last activated. When a message is not the last one activated, it has to be activated again. The fact of activating one message which has been previously activated does not display this message two times.
- The internal position counter of the variables has to be loaded with (0-15) value, which says the position of the variable.

This method allows to modify a variable value or group of variables value without changing the other variables. Every time a variable character is sent, the position counter increases automatically to the following position. The variable direction of every character can be sent although it is easier to load the direction value of the first variable and to let the counter increase the directions by itself.

- To load the variable value in the position counter.

Set **CT2=1** (Activated)

CT1, SM, SR=0 (Desactivated)

D4-D8= Irrelevant.

D0-D3= Variable position.

SV=1 Impuls activated ≥ 10 mseg.

The variable position can be from 0 to 15 in hexadecimal (0-F), for the first line and see 4.3.3 for the other lines.

The external variables can be **ASCII or Binary**.

- **ASCII variables:** They are sent in ASCII code to the display. They take one character.

- Set **SR=1** (Activated)

CT1, CT2, SM=0 (Desactivated)

D0-D7= ASCII code.

D8= Irrelevant.

SV=1 Impuls activated ≥ 10 mseg.

- As BCD forms part of ASCII code, variables can be sent in BCD code with D4 and D5, inputs. They have to be activated permanently.

Set **SR=1** (Activated)
CT1, CT2, SM, D6, D7=0 (Desactivated)
D0-D3= Código BCD.
D4-D5= 1 (Activated)
D8= Irrelevant.
SV=1 Impuls activated ≥ 10 mseg.

- **Binary variable:** There are two kinds of binary variables depending on the number of characters: 8 bits plus sign and 16 plus sign.

- **8 bits binary plus sign.** It changes a value from **0 to FF** (Hexadecimal). into a decimal (3 digits plus sign). It takes 4 characters.

Set **SR, CT1, CT2=1** (Activated)
SM=0 (Desactivated)
D0-D7= 8 bits number.
D8= Sign (=0 positive, =1 negative)
SV=1 Impuls activated ≥ 10 mseg.

- **16 bits binary plus sign.** It changes a value from **0 to FFFF** (Hexadecimal) into a decimal (5 digits plus sign) It takes 6 characters. Two consecutive operations are needed to send it. The 8 high bits with the sign must be sent and then the 8 low bits with the sign.

To send the 8 high bits:

Set **SR, CT1=1** (Activated)
CT2, SM=0 (Desactivated)
D0-D7= 8 high bits.
D8= 0 (Positive sign) =1 (Negative sign)
SV=1 Impuls activated ≥ 10 mseg.

To send the 8 low bits:

Set **SR, CT1, CT2=1** (Activated)
SM=0 (Desactivated)
D0-D7= 8 low bits.
D8= 0
SV=1 Impuls activated ≥ 10 mseg.

DECLARATION OF CONFORMITY

Tetralec S.L.
c/ Severo Ochoa, 80
Polígono Industrial Coll de la Manya
08400 Granollers

As the manufacturer of the brand **LARTET** equipment:

Character display with digital interface.
Model: DT-105P, DT-106P, DT-110P, DT-111P and DT-203P in all its versions.

We state under own responsibility that the above mentioned product comply with the following European:

Regulation: 73/23/CEE Regulation of low voltage
Standard EN61010-1 Security in electric equipment

Regulation: 89/336/CEE Regulation of electromagnetic compatibility
Standard UNE-EN 50081-2 Generic emission standard.Industrial environment
Standard UNE-EN 50082-2 Generic immunity standard.Industrial environment

Granollers, 20 of March 2000

Josep M° Bisbe
Technic Manager