COMMUNICATION WITH DM DISPLAYS USING TCP-ASCII PROTOCOL

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1. DESCRIPTION

It is possible to communicate with DM Displays using TCP-ASCII protocol. This protocol allows sending full text to visualize or to execute a message from the memory.

IMPORTANT: Note that for this protocol the use of internal variables is not available (see Modbus Protocol)

2. TCP-ASCII PROTOCOL

2.1. TCP-ASCII Protocol

The frame to be sent contains the block of data (texts + control codes) followed by an end-of-frame character which will be recognized by the display. Table 1 shows the different options available for the end of the frame.

Frame must be send to TCP port 10001(¹)

2.2. End of frame

End of frame options table (Hexadecimal codification).

End of frame	Number of BYTES	BYTES
CR	1	0x0D (²)
LF	1	0x0A
CR + LF	2	0x0D 0x0A
LF + CR	2	0x0A 0x0D
DLE	1	0x10
ETB	1	0x17
DLE + ETB	2	0x10 0x17
ETB + DLE	2	0x17 0x10

Possible end of frames

(¹) (²) Default configuration.

NOTE: Default configuration can be change by configuration software DYNAMIC3

2.3. DM display response

Table of DM display response options.

Response	Description
No Response	Display send no response
ACK (0x06) + End of Frame	Display send as response the BYTE 0x06 followed by selected end of frame sequence
ACK (0x06) (1)	Display sends as response the BYTE 0x06

Possible display responses

(1) Default configuration.

NOTE: Default configuration can be change by configuration software DYNAMIC3

2.4. Examples

Next examples show how will be the frame that would be sent:

Example 1: Executes a program that shows the text "Hola" selecting immediat mode for line 1.

If end of frame (CR) = 0x0D, the sent frame will be:

0x03 + 0xC7 + "1" + 04 + 00xF0 + "Hola" + 0x04

03	C7	31	04	F0	48	6F	6C	61	0D

Looking in more detail:

03	C7	31	04	F0	48	6F	6C	61	0D
Pre-token	*Line*	*'1'*	*Pre-token*	*Imme-diat Mode*	*'H'*	*'o'*	*'l'*	*'a'*	*End of frame*

If end of frame = 0x0A 0x0D, the sent frame will be:

0x03 + 0xC7 + "1" + 0xF0 + "Hola" + 0x0A + 0x0D

03	C7	31	04	F0	48	6F	6C	61	0A	0D

Looking in more detail:

03	C7	31	04	F0	48	6F	6C	61	0A	0D
Pre-token	*Line*	*'1'*	*Pretoken*	*Immediat Mode*	*'H'*	*'o'*	*'l'*	*'a'*	*End of frame*	

Example 2: Executes the program called “MPTEST” previoulsy saved on the display memory(1) .

VERY IMPORTANT:the name of programm must have beetwen 3 and 7 characters lenght .

With end of frame = 0x0D, the sent frame will be:

0x03+ 0xC8 + "MPTEST" + 0x04

03	C8	4D	50	54	45	53	54	0D

Looking in more detail:

03	C8	4D	50	54	45	53	54	0D
Pretoken	*Program execution*	*'M'*	*'P'*	*'T'*	*'E'*	*'S'*	*'T'*	*End of frame*

Example 3: Stops execution on display.

With end of frame = 0x0D, the sent frame will be:

0x03 + 0xC8 + “$STOP” + 0x04

03	C8	24	53	54	4F	50	0D

Looking in more detail:

03	C8	24	53	54	4F	50	0D
Pretoken	*Program execution*	*'$'*	*'S'*	*'T'*	*'O'*	*'P'*	*End of frame*

(1) Using configuration software DYNAMIC3

3. Default configuration for DM Displays

Default factory configuration is the following:

Parameter	Default value
Display ID	1
LocalCast Adress	0
RS232 port: Bauds	9600
RS232 port: Data BITS	8
RS232 port: Parity	No Parity
RS232 port: Stop BITS	1
RS485 port: Bauds	9600
RS485 port: Data BITS	8
RS485 port: Parity	No Parity
RS485 port: Stop BITS	1
IP address	192.168.1.100
DHCP client	Disabled
Subnet mask	255.255.255.0
Gateway	192.168.1.1
TCP port for DTPM protocol	53
TCP-ASCII protocol: End of frame	CR (0x0D)
TCP-ASCII protocol: Response	ACK (0x06)
TCP-ASCII protocol: Port	10001

Default factory configuration

NOTE: Default configuration can be change by configuration software DYNAMIC3

4. DTPM Script

4.1. Introduction

DTPM is the proprietary protocol for DM displays. It consists of codes that allow total control of displays.
All these codes plus the text of the message that will be displayed make up the DTPM Script or program.

The codes dedicated to editing allow you to control the display settings, such as font type, character thickness, sof the line where to writeelection , mode and speed text appearing, waiting time, brightness, text color, the flashing of the complete or partial text, the alignment of the text, the synchronization of lines, the insertion of temporary variables (time, date, countdown), the insertion of numerical or alphanumeric variables, the insertion of graphics, etc.

Activation of preloaded programs in display memory which were previously edited with *Dynamic3* is allowed, as well.

If codes are not added to the sent text, it will be displayed according to the default settings on the screen. Some default editing settings are fixed and others, such as the Speed of appearance and the waiting time can be configured through Dynamic3. However, some codes are essential for the execution of the program, such as the appearance mode, and can not be omitted in the sent script.

ATTENTION: to complete the frame of the TCP / ASCII protocol, you must add to the Script (codes + text) the end-of-frame carácter. (see 2.2 End of frame)

FOR MORE INFORMATION ABOUT THE DTPM PROTOCOL SEE THE MANUAL "COMMUNICATION WITH DISPLAYS OF THE SERIES DM VIA PROTOCOL DTPM".

4.2. List and Description of DTPM codes for program edition

The codes are composed of "pretoken"+"token"+ parameters "n" (some codes have no parameters).They are classified by types (Data, Modes and Time).

NAME	PRETO -KEN	TOKEN	DESCRIPTION
DATA			
Blink	0x03	0xA0	Text between 2 BLINK will flash
Text Color < n >	0x03	0xA1+n	Text color n= 0 – No Change 1 – Red 2 – Green 3 – Amber 4 – Blue 5 – Magenta 6 – Cyan 7 – White
Graphic < n >	0x03	0xA4+n+1F	A graphic appears. n= 0 to 49. 50 graphics are availables for each font. To know the nº of graphic see is position in Dynamic3 software. *Example by Graph Nº21 : 0x03 0XA4 0X32 0X31 0X1F*
Flash < n >	0x02	0xB0+n	The displayed text will flash n times (1 to 10)
Erase	0x02	0xB2	The active line will be erased

NAME	PRETO -KEN	TOKEN	DESCRIPTION
DATA			
Thickness < n >	0x03	0xC0+n	Each column is turned into n columns (1 to 4)
Font < n >	0x03	0xC1+n	Changes font type (according to model) (0 to 20)* SEE TABLE AHEAD
Speed of apparition < n >	0x03	0xC4+n	Speed of apparition mode (1 to 99) .Very slow to very fast. Not used for immediate mode.
Waiting time < n >	0x03	0xC5+n	Waits n/4 seconds before executing next line (no synchronism) or page (synchronism)
Line < n >	0x03	0xC7+n	Display location defined by n= n=< x,y > x= Nº Line Y= Number of line height (0x31 default) *Exemple for Line 2 : 0x03 0xC7 0X32 0X2C 0X31*
Run Program < n >	0x03	0xC8+n	Executes the programm. n= the name of programm. Must have beetwen **3 and 7 characters lenght.**
Stop Display< n >	0x03	0xC8+$STOP	Stops the programm that is running. The display stays in black.
Synchronism	0x03	0xC9	Synchronized display of the lines of the page. Without this parameter, the display is by default sequentially.
End of synchronism	0x03	0xCA	End of synchronism
Language < n >	0x03	0xCB+n	Language used for tokens. n= 0(Spanish) 1(Catalan) 2(Basque) 3(Galician) 4(French) 5(English) 6(Portuguese)
Text alignment	0x03	0xCD+n	0= Centered 1=left alignment 2=right alignement
Brightness < n >	0x03	0xD0+n	Sets display brightness from 1 to 100% or automatic brightness. n=0 for automatic brightness. n=1 to 100 for manual .
Window < n >	0x03	0xD3+n	Defines a window on the screen. n=<ID window,x1,y1,x2,y2> (the intermediate characters must also be sent) ID window: from A to N x1: column number of left side of the window y1: line where window starts x2: column number of right right side of the window y2: line where window ends See 4.4. Examples of Script

< n > → ASCII value parameter of the corresponding code. For example 0x31 for value 1.
0x → Hexadecimal codification.
*According to the model

NAME	PRETO-KEN	TOKEN	DESCRIPTION
MODES			
Appearing Left	0x04	0xD0	Text scrolls from left to right on the selected speed of apparition
Appear Right	0x04	0xE0	Text scrolls from right to left on the selected speed of apparition
Ascend	0x04	0xE5	Text appears from up to down on the selected speed of apparition
Descend	0x04	0xE6	Text appears from down to up on the selected speed of apparition
Immediate	0x04	0xF0	Text appears immediately on the selected speed of apparition

NAME	PRETO-KEN	TOKEN	DESCRIPTION
TIME			
Current Date	0x01	0x95	Shows the date in DD/MM/YY format
Current Year YY	0x01	0x96	Two last numbers of the current year
Current Month number MM	0x01	0x97	Two characters indicating the number of the current month
Current Day number DD	0x01	0x99	Two characters indicating the number of the current day
Current Time	0x01	0x9E	Shows the time in HH:mm:SS format
Hours : Minutes	0x01	0xA7	Shows the time in HH:MM format
Current Hour HH	0x01	0x9B	Two number indicating the current hour
Current Minutes mm	0x01	0x9C	Two numbers indicating the minutes elapsed from each hour
Current Seconds SS	0x01	0x9D	Two numbers indicating the seconds elapsed from each minute

Current Month long name	0x01	0x98	Name of the month
Current Month short name	0x01	0xAA	Shows short name of month using three characters
Current Day long name	0x01	0x9A	Name of the day
Current Day short name	0x01	0xA9	Shows short name of weekday using three characters
Current Temperature ºC	0x01	0xA8	Shows temperature in xxºC (depending on model)*
Current Temperature	0x01	0x9F	Shows the Temperature in xx format*
Event Date	0x03	0xCC +n	Reference date for calculating the Events tokens. n=<DD-MM-YY HH:MM:SS> (respect the space character)
Differ Days	0x01	0xA4	Difference in days between current date and the event date (0xCC). Countdown (futur event) or countup (past event)
Differ Weeks	0x01	0xA5	Difference in days between current date and the event date (0xCC). Countdown (futur event) or countup (past event)
Differ Month	0x01	0xA6	Difference in months between current date and event date (0xCC). Countdown (futur event) or countup (past event)
Differ hours	0x01	0xAB	Difference in hours between current date and event date (0xCC). Countdown (futur event) or countup (past event)
Differ minutes	0x01	0xAC	Difference in minutes between current date and event date (0xCC). Countdown (futur event) or countup (past event)
Differ seconds	0x01	0xAD	Difference in seconds between current date and event date (0xCC). Countdown (futur event) or countup (past event)
Remaing time in Days	0x01	0xAE	Remaining Days til the event date. Countdown (futur event) or countup (past event)
Remaing time in Hours	0x01	0xAF	Remaining Hours til the event date. Countdown (futur event) or countup (past event)
Remaing time in Minutes	0x01	0xB0	Remaining Minutes til the event date. Countdown (futur event) or countup (past event)
Remaing time in Secondes	0x01	0xB1	Remaining Secondes til the event date. Countdown (futur event) or countup (past event)

DTPM codes list for programm edition

< n > → ASCII value parameter of the corresponding code. For example 0x31 for value 1.
0x → Hexadecimal codification.
*According to the model

Number of pixel	Name of the Font type	CODE (Hexadecimal codification)
6 pixels	Pequeña	03 C1 37
7 pixels	LCD	03 C1 31 30
	Normal	03 C1 38
	Ampliada	03 C1 31 32
	Italica	03 C1 39
	West	03 C1 31 31
	Vertical	03 C1 33 32
	Vertical	03 C1 33 33
8 pixels	Normal	03 C1 32 31
12 pixels	Stand 12	03 C1 31 34
14 pixels	Normal	03 C1 30
	Broadway	03 C1 36
	Futura	03 C1 33
	Gótica	03 C1 35
	Popcorn	03 C1 32
	Vacía	03 C1 31
	Western	03 C1 34
16 pixels	Normal	03 C1 31 38
	Big	03 C1 31 39
21 pixels	Stand 21	03 C1 31 33
24 pixels	Stand 24	03 C1 31 37
28 pixels	Stand 28	03 C1 31 35
	Broad	03 C1 31 36
32 pixels	Normal	03 C1 33 34

DTPM codes for availables Font types

4.3. Structure of the frame

The DTPM codes are executed sequentially in a specific order:

The editing codes DATA go first, followed by the mode of appearing codes MODE that are indispensable, then the text that will be displayed and eventually the codes corresponding to the time variables TIME , internal variables and graphics that can be inserted in the text.
At the end, the effect codes that modify the content of the displayed data

If a code is not in its correct position in the frame, the program will not be executed or incompletely.
Windows-1252 encoding (extension of ISO-8859-1) is used for printable character codes starting at 0x20.

Position into the frame	Name	CODE (Hexadecimal codification)
Pos1	Brigthness	03 D0
Pos2	Alignement	03 CD+n
Pos3	Language	03 CB
Pos4	Synchronism	03 C9
Pos5	Window	03 D3+n
Pos6	Line	03 C7+n
Pos7	Font	03 C1+n
Pos8	Ticness	03 C0+n
Pos9	Waiting time line or page	03 C5+n
Pos10	Speed apparition mode	03 C4+n
Pos11	Apparition Mode	04 D0 to F0
Pos12	Text Color	03 A1+n
Pos13	Message to display	Text characters in ASCCI code + TIME codes (date, temperature , events) and graphics.
Pos14	Blink	03 A0 (before and after selected text)
Pos15	Flash	02 B0+n
Pos16	Erase	02 B2
Pos17	End of synchronism	03 CA

Position of the most common DTPM codes in the frame of a program

4.4. Examples of Script

Activate preloaded program (1)**:**

Program < n >: Send hexadecimal frame "03 C8 **54 65 73 74 31** 0D" to execute on display the preloaded program called "Test1".
ATTENTION: The name of programm must have beetwen **3 and 7 characters lenght** (1)**.**

Sending all the frame (text + Editing codes+ end of frame):

Immediat apparition mode: Send hexadecimal Frame" 04 F0 **48 65 6C 6C 6F** 0D " to display "Hello" in immediat mode and centered text.

Scroll apparition mode: Send hexadecimal Frame" 04 E0 **48 65 6C 6C 6F** 0D" to display "Hello" in scroll mode (default scroling speed)

Speed<n>: Send hexadecimal Frame" 03 C4 34 35 04 E0 **48 65 6C 6C 6F** 0D " to display "Hello" in scroll mode with 45% scroling speed

Line<n>: Send hexadecimal Frame" 03 C7 32 2C 31 04 F0 **48 65 6C 6C 6F** 0D " to display "Hello" in Line 2 in immediat mode and centered text .

Color <n>: Send hexadecimal Frame" 04 F0 03 A1 31 **48 65 6C 6C 6F** 0D " to display "Hello" in immediat mode, centered text

Left: Send hexadecimal Frame" 03 CD 31 04 F0 03 A1 31 **48 65 6C 6C 6F** 0D " to display "Hello" in immediat mode, left side and red color.

Brightness<n>: Send hexadecimal Frame" 03 D0 35 30 04 F0 03 A1 31 **48 65 6C 6C 6F** 0D " to display."Hello" in immediat mode, centered text,.red color and 50% brightness

Window < n >: Send hexadecimal Frame" 03 D3 41 2C 37 30 2C 31 2C 31 32 30 2C 32 04 F0 **48 65 6C 6C 6F** 0D " to create in the right side of display a window of 2 lines that shows "Hello". (Note that this example is made for a 120 pixels lenght display)

ATTENTION: The Null 0x00 character should not be used in the frame because the display will interpret it as a frame ending and will not process the codes that follow this character. If necessary, replace the null characters 0x00 with the space character 0x20.

(1) Using configuration software DYNAMIC3

4.5. Edition and test of the DTPM Script with the Dynamic3 software

The editing and configuration software Dynamic3 also has a tool on the ***Edition*** tab of the main menu called ***Advanced Script Manipulation*** that allows editing the script corresponding to each line or page of a program in hexadecimal or ASCII format. This script can be modified, copied, pasted and sent to the screen. ***Therefore, it is a very practical tool to generate and test frames.***

In this way, it is not necessary to know in detail the DTPM codes and their exact position in the frame. One can simply recover all the code of a program to reuse it in its own application.

To use this function, you must unlock the advanced options of the software. To do this, go to the ***Application Settings*** tab of the main menu and enter the password INT8932 in the Advanced Options field and validate by pressing the key.