ALARMS AND TEXT DISPLAY

DISP2 BUS

User's manual

Notes:

- Information in this document may be modified without notice.

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1- INTRODUCTION

The displays of DISP2 family by **DUEMMEGI** are devices allowing to report, in a customized way, messages for controlling purpose in many applications, such as industrial and domestic plants. Thanks to the flexibility of these devices, the displays of DISP2 family make easy to understand any information related to the occurrence of alarms or events. These devices may be employed in several applications as in the following examples:

- Machinery
- Industrial processing
- Plants
- Building automation
- Home automation
- Alarm signaling

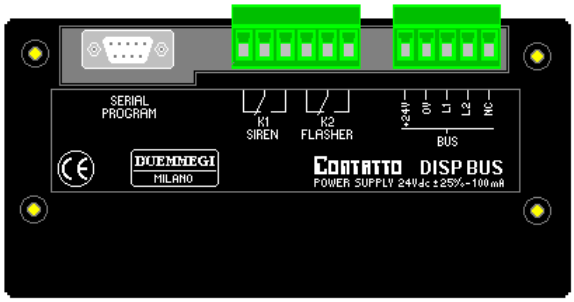
DISP2 BUS replaces the previous version DISP BUS, introducing some innovations as listed in the next paragraph.

2- DISP2 BUS: GENERAL CHARACTERISTICS

- LCD display 2 x 16 characters with back-lighting
- LCD contrast may be adjusted by the button on the front panel
- Message programming by front panel pushbuttons or by PC
- Messages and parameters stored into DISP2 BUS memory may be read by a PC
- Messages are recalled by the bus line **DUEMMEGI** Contatto
- 255 messages made by 2 main lines and 2 auxiliary lines
- 1 base message made by 2 lines (stand-by message)
- 1 alarm pending message made by 2 lines
- 2 operating mode: with memory (MEM) or without memory (NOMEM)
- Events are displayed in chronological order (up to 64); information about the total amount of pending alarms
- Cyclic displaying of more messages; the cycle time may be set by user in the range 1 to 10 seconds
- Internal buzzer for alarm acoustic signaling; the buzzer operation may be disabled
- 2 potential free contacts (internal relays) and buzzer (directly handled by DISP2 BUS in LOCAL mode ore via bus in REMOTE mode) for additional acoustic/visual signaling (siren and flasher)
- The status of the buttons on the front panel can be acquired via bus
- ACK and RESET commands can be forced via bus
- Keyboard lock to avoid unwanted operations by unauthorized personnel

The firmware of DISP2 BUS device may be updated directly by the user through a PC and the RS232 communication port; this feature allows future developments of the product concerning new functions and possible special versions. For more details about this feature, contact **DUEMMEGI** commercial office.

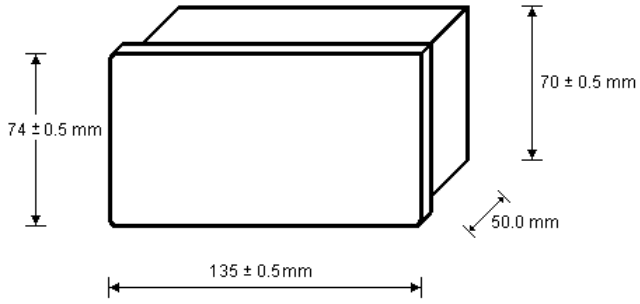
3- CONNECTIONS

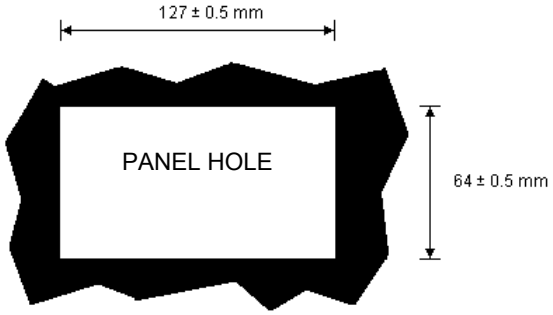


Description of the terminals:

+24V	+24V ⎓ ± 25% SELV
0V	Power supply common
L1	L1 bus line of **DUEMMEGI CONTATTO** system
L2	L2 bus line of **DUEMMEGI CONTATTO** system
SERIAL PROGRAM	Connector for messages programming by PC
K1 (SIREN)	Free-potential contact of internal relay for alarm device (e.g.. siren)
K2 (FLASHER)	Free potential contact of internal relay for alarm device (e.g. flasher)

4- OUTLINE DIMENSIONS





5- TECHNICAL DATA

Power supply	24V ⎓ ± 25%
Current consumption	100mA MAX
Ouput contacts: **MAX switching voltage** **MAX switching current** **MAX operating power**	 60Vdc or 125Vac 1A 30W dc – 60VA ac
PC interface	RS232C full duplex opto-coupled
Display	LCD with back-lighting and contrast adjusting by front panel
Characters (each line)	16
Lines	2
Characters height	8 mm
Number of messages	255 (4 lines each one) + 1 of 2 lines (stand-by message) + 1 of 2 lines (pending messages)
Connections	By removable terminal blocks
Protection degree	Front: IP 53 – Back: IP20
Operating temperature	0 ÷ +50°C
Storage Temperature	-10 ÷ +70°C

6- INPUT AND OUTPUT POINTS

DISP2 BUS behaves as an assemblage made by an input module and two output modules of DUEMMEGI CONTATTO family. Said "x" the base address chosen for DISP2 BUS, the following ***input points*** are available:

Input points:

Address/point	Function	Address/point	Function
x.1	Status of button 	x.5	Status of button 
x.2	Status of button 	x.6	Status of button 
x.3	Status of button 	x.7	Status of relay K1 (siren)
x.4	Status of button 	x.8	Status of relay K2 (flasher)

Output points:

Address/point	Function	Address/point	Function
(x+1).1	Remote command button 	(x+1).5	Not available
(x+1).2	Remote command button 	(x+1).6	Command for internal buzzer
(x+1).3	Keyboard Lock/Unlock	(x+1).7	Command for relay K1 (siren)
(x+1).4	Not available	(x+1).8	Command for relay K2 (flasher)

The output address x is reserved to the binary code for the recalling of the message stored in DISP2 BUS.

Notes:

1. Remote commands for ACK and RESET pushbuttons allow the implementation of remote acknowledge and reset functions; in other words, pushing the related button on the front panel or send through the bus a command of the same function are equivalent actions

2. The commands of relays K1 and K2 and of the buzzer by the bus are allowed when DISP2 BUS is set in REMOTE mode

7- FUNCTIONAL DESCRIPTION

DISP2 BUS shows, at power-on and during 2 second about, some information:

- on the first line: the type (DISP2 BUS) and the firmware version (see example in the figure)
- on the second line: memory (MEM) or no memory (NOM) option, buzzer enabled (ON) or disabled (OFF), cycle time in seconds (e.g. T=2s)

Then, if no events are present, the stand-by message will be displayed (line 1 and line 2 of the message zero).

The **base address** of DISP2 BUS can be set by the buttons on the front panel or by a PC (see the paragraph describing the programming).

WARNING: DISP2 BUS base address cannot be programmed by CONTATTO FXPRO programmer.

6.1- Operating options

DISP2 BUS allows the setting of the options here bottom described.

DISPLAY CONTRAST

The contrast of the LCD display may be adjusted according to the user preferences. To execute this adjustment, enter in the DISP2 BUS setting menu pushing down at the same time the buttons + + and move in the menu until the DISPLAY CONTRAST parameter is reached using the buttons and . To modify the displayed parameter refer to paragraph 9.1. The setting of this parameter can be done through the keyboard on DISP2 BUS front panel or by the configuration program DISPTools running on the PC.

BUS ADDRESS

This is the bus base address assigned to DISP2 BUS. To execute this setting, enter in the DISP2 BUS setting menu pushing down at the same time the buttons + + and move in the menu until the BUS ADDRESS parameter is reached using the buttons and . To modify the displayed parameter refer to paragraph 9.1. The setting of this parameter can be done through the keyboard on DISP2 BUS front panel or by the configuration program DISPTools running on the PC.

MEMORY OPTION

MEM (memory): the input activation occurrence will be stored; in other words, the related message remains in the queue even if the input has been de-activated.
NOMEM (no memory): the displaying cycle shows the message related to the current binary code received via the bus.

To modify this option, enter in the DISP2 setting menu pushing down at the same time the buttons + + and move in the menu until the MEMORY OPTION is reached using the buttons and . To modify the displayed option refer to paragraph 9.1.
The setting of this option can be done through the keyboard on DISP2 front panel or by the configuration program DISPTools running on the PC.

BUZZER OPTION
BUZZER ON: this option enables the buzzer inside DISP2 BUS. This is a global option, because it applies to all messages. In LOCAL mode the buzzer, if enabled, follows the status of the siren relay.
Note: the buzzer, as for the siren and flasher outputs, will be activated only for the messages that were configured for this function.
BUZZER OFF: this option disables the buzzer inside DISP2 BUS (but siren will be however enabled).

To modify this option, enter in the DISP2 setting menu pushing down at the same time the buttons  +  +  and move in the menu until the BUZZER OPTION is reached using the buttons  and  . To modify the displayed option refer to paragraph 9.1.
The setting of this option can be done through the keyboard on DISP2 front panel or by the configuration program DISPTools running on the PC.

CYCLE TIME
This parameter set the time between the displaying of a message and another one. Allowed values are in the range 1 to 10 seconds, with 1 second step.

To modify this parameter, enter in the DISP2 BUS setting menu pushing down at the same time the buttons  +  +  and move in the menu until the CYCLE TIME is reached using the buttons  and  . To modify the displayed parameter refer to paragraph 9.1.
The setting of this parameter can be done through the keyboard on DISP2 front panel or by the configuration program DISPTools running on the PC.

ALARM OUTPUTS
Each message of DISP2 BUS (in LOCAL mode) may be set to cause or less the activation of the 2 centralized alarm outputs (siren and flasher) and of the buzzer (if enabled). In other words, the difference between the two settings only concerns the handling of the two centralized alarm outputs (siren and flasher) and the buzzer (if enabled): a message having the alarm outputs enabled will cause the activation of siren, flasher and buzzer, while a message having the alarm outputs disabled will not cause any action on these devices.
The setting of the ALARM OUTPUTS for each message can be done *only* by the configuration program DISPTools running on the PC and it is valid for LOCAL mode only.

7.2- Operating modes

DISP2 BUS allows several operating modes:

MEM (memory): each message, when recalled, remains in the displaying queue even if the binary code sent by bus changes; if several messages had recalled, these ones will be cyclically displayed with a period in the range 1 to 10 seconds (as set in CYCLE TIME option)

NOMEM (no memory): displayed message is always that related to the last binary code received by bus

LOCAL: two output relays are locally handled by DISP2 BUS, in a way similar to the standard ISA-M alarm sequence

REMOTE: two output relays are exclusively driven by the bus; in other words, handling of the relays will be left to the CONTATTO system controller (MCP)

Setting of operating mode may be done by front panel pushbuttons or by PC (see paragraph describing programming feature).

Note: in the following paragraphs it is assumed that the buzzer follows, in LOCAL mode and if enabled, the status of K1 relay (siren).

7.3- Relay operation in LOCAL mode

In LOCAL mode and without alarm pending, K1 relay (siren) is de-energized and K2 relay (flasher) is energized; the siren must be then connected to the normally open contact and the flasher must be connected to the normally closed contact. This last connection ensures at least a visual warning when the power supply of DISP2 BUS fails (intrinsic safety). **The just described connections will be assumed in the following two paragraphs**.

7.4- LOCAL – MEM operation

When DISP2 BUS is set as LOCAL and MEM, the operating sequence is the following:

- when DISP2 BUS receive, by the bus, a non-zero binary code, the siren and flasher will be activated; the related message will be shown on the display, alternated to the alarm pending message (message 000,3-000,4 – see paragraph describing the programming feature)
- if another non-zero binary code is received by the bus, the related message will be added to the queue and the display will cyclically show all recalled message and the alarm pending message
- pushing  button (ACK), the siren will be switched off, the flasher will remain in its active state and the display will show, during some seconds, the first recalled message (first out feature), then the cyclic displaying restarts
- after removing of the alarm causes, DISP2 BUS may be restored by a RESET sequence (pushing, in sequence, of pushbuttons 

and ): the siren will be switched off, the displaying queue will be reset and the stand-by message will be displayed (message 000,1-000,2, see paragraph describing the programming feature)

Notes:

1. if a new alarm occurs after ACK, the siren will restart
2. if some alarms are still active after a RESET sequence, the described sequence restarts as soon as a non-zero binary code will be received by the bus
3. if the 16th character of line 1 of a message is the symbol #, then the receiving of the related binary code from will not influence the internal relays
4. DISP2 BUS stores, in chronological order, up to 32 events; any other event exceeding 32 will be ignored; the message shown after the alarm pending message is the first occurred, the second one is the second occurred and so on
5. pushing  button, it is possible to change from automatic (cyclic) to manual displaying; in manual mode, the message related to the pending alarms can be displayed by pressing 

(backward) and 

(forward) buttons

7.5- LOCAL – NOMEM operation

When DISP2 BUS is set as LOCAL and NOMEM, the operating sequence is the following:

- when DISP2 BUS receives, by bus, a non-zero binary code, the siren and flasher will be activated; the related message will be shown on the display
- pushing  button (ACK), the siren will be switched off, the flasher will remain in its active state and the display will show the message recalled at the previous point
- when a zero binary code will be received by the bus, the siren and flasher will be switched off and the stand-by message will be displayed

Notes:

1. if more alarms are pending, the bus controller (MCP) cyclically sends to DISP2 BUS the related binary codes; this means that the siren restarts (if silenced before by the ACK pushbutton) at every binary code. This strange operation is an implicit operation because DISP2 BUS has not in the queue the alarm already acknowledged (remember that we are in NOMEM mode). It is better to use the REMOTE-NOMEM mode and handle the internal relays by the program downloaded in MCP controller
2. the RESET sequence in LOCAL-NOMEM mode has no relevance

7.6- REMOTE – MEM operation

When DISP2 BUS is set as REMOTE and MEM, the operating sequence is as before described for LOCAL-MEM mode, with the exception that two internal relays will be always de-energized; the handling of these relays, when required, must be implemented in the program downloaded in the system controller (MCP).

7.7- REMOTE – NOMEM operation

When DISP2 BUS is set as REMOTE and NOMEM, the operating sequence is as before described for LOCAL-NOMEM mode, with the exception that two internal relays will be always de-energized; the handling of these relays, when required, must be implemented in the program downloaded in the system controller (MCP).

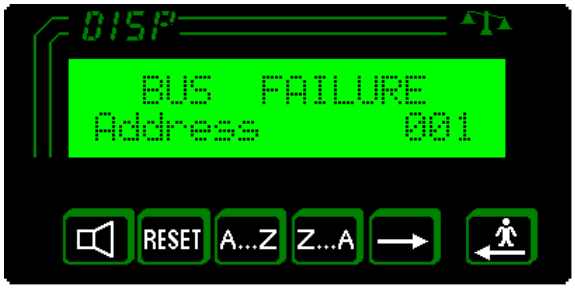
7.8- RESET of alarms

If the chosen operating mode is without storing (NOMEM), the RESET sequence has no relevance.
On the contrary (MEM mode), the RESET sequence allows to restore the situation; this means that all alarms in the queue will be removed. The RESET sequence is the following:

- silence the siren by pushing  button
- push  button; DISP2 BUS will displays the text shown in the left-side figure
- push  button to confirm the RESET of the message queue

If the confirmation does not occur in 3 seconds, the RESET request will be automatically rejected.

7.9- Bus failure warning (BUS FAILURE)



When the signal on the L1 and L2 bus lines is not detected by DISP2 BUS (e.g. when the MCP controller is disconnected, or when the bus is broken), DISP2 BUS warns about this condition displaying the text shown in the left-side figure. Note that in this condition the base address is displayed too.

8- PUSHBUTTONS FUNCTION AND KEYBOARD LOCK

The 6 pushbuttons on the front panel, during normal operation, perform the following functions:

	ACK: acknowledge, siren silencing
	Request of queue reset; the confirmation must occur within 3 seconds by pressing the ACK button
	Show next message when the manual scrolling of messages is enabled
	Show previous message when the manual scrolling of messages is enabled
	Switch from the automatic to manual scrolling of messages and vice-versa. DISP2 returns to automatic scrolling at the activation of a new message
	Show the auxiliary lines of the current message (lines 3 e 4 of each message). The displaying of auxiliary lines, in automatic cyclic mode, remains until the cycle time T (set by the user) elapses. During the manual displaying mode, lines 3 and 4 remain on the display until the pressing of button  or 

The keyboard of DISP2 BUS can be locked activating the point (x+1).3 (x is the base address). To unlock, deactivate the same point. During the programming mode, these pushbuttons performs other functions; refer to the related paragraph for details.

9- PROGRAMMING

9.1- Manual programming by the panel pushbuttons

The message programming may be performed by the front panel keyboard of DISP2 BUS.

To enter the programming mode of DISP2 BUS, press down at the same time the buttons 

.
The parameters and options that can be modified are:

- LCD display contrast
- Base address
- MEM/NOMEM option
- LOCAL/REMOTE option
- BUZZER ON/OFF option
- Cycle time for messages scrolling
- Messages text (0 to 255)

The programming procedure counts two operating modes:

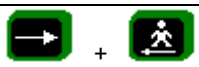
- Search of the parameter or option or message to be modified
- Parameter or option or message edit

These modes can be easily identified because in the edit mode a cursor under the current character to be edited is shown (the cursor is a small line under the character); the cursor is not displayed during searching mode.

In the searching mode the pushbuttons perform the following functions:

	Next message or parameter. Hold down this button to quickly scroll forward the searching.
	Previous message or parameter. Hold down this button to quickly scroll backward the searching.
 o	Enter the edit mode.
 +	Quit programming.

In the parameter edit mode the pushbuttons perform the following functions:

	Increase the parameter. Hold down this button to quickly scroll forward.
	Decrease the parameter. Hold down this button to quickly scroll backward.
 +	Save the current parameter and go to searching mode.
 +	Quit programming without saving.

In the message edit mode the pushbuttons perform the following functions:

	Next character. Hold down this button to quickly scroll forward.
	Previous character. Hold down this button to quickly scroll backward.
	Move cursor to right.
	Move cursor to left.
 +	Save the current parameter and go to searching mode.
 +	Quit programming without saving.

9.2- Programming by Personal Computer

DISP2 BUS features a DB9 connector to allow the connection to a PC through the RS232 serial port.

The connection cable to be used is of standard type with a 9-way male connector on a side and a 9-way female connector on the other one. The connections between this two connectors are pin to pin (pin 1 to pin 1, pin 2 to pin 2 and so on); all pins must be connected.

The operating parameters, options and messages of DISP2 BUS can be fully programmed by the PC; in addition, the reverse operation can be also performed, so it is possible to read all parameters, options and message stored in the DISP2 BUS.

The PC must be equipped with a program named DISPTools and free distributed by **DUEMMEGI**. This program runs in Windows 98, 2000, XP.

For detail on using DISPTools refer to the on line help of the program itself.

10- PROGRAMMING MCP IN DISP2 BUS APPLICATION

This paragraph describes, by an example, the implementation of an alarm sequence totally handled by MCP controller of **CONTATTO** system.

The DISP2 BUS in the following example **must** be set as NOMEM and REMOTE; the base address is chosen as 003.

Description of the system to be implemented:

given 8 inputs (`I1.1 + I1.8`), we want that at the activation of each input the following events occur:

- The message related to the occurred event will be displayed
- The event must be stored, then, even if the input returns to its non-active state, the alarm condition remains active
- Siren and flasher output will be activated

We want to silence the siren pushing ACK button on DISP2 BUS front panel; we want that this button does not influence the flasher output and the displaying of DISP2 BUS. Moreover, we want that RESET button on DISP2 BUS front panel restore the “system”, this means to remove the pending alarm from memory, but only if the related input has returned to its non-active state, and, if no more alarms are pending, the flasher output must be switched off.

After each acknowledge, any new alarms (that means not still stored) must activate the siren again.

In addition, the RESET button must not have any effect if the siren was not silenced before by ACK button.

The program for **CONTATTO MCP** controller that implements the just described specification is the following:

```
////////////////////////////////////////////////
// MCP PROGRAM FOR ALARM HANDLING WITH DISP2 BUS //
////////////////////////////////////////////////
// ALARM MEMORY DEFINITION: EACH MEMORY CELL IS SET BY RELATED INPUT
// (FROM I1.1 TO I1.8) AND RESET BY RESET BUTTON ON DISP2 BUS (I3.2),
// BUT ONLY IF THE SIRENA (O4.7=V202) WAS SILENCED AND RELATED INPUT HAS
// RETUORNED TO ITS NON-ACTIVE STATE
V1 = SI1.1 & (RV203 | I1.1)
V2 = SI1.2 & (RV203 | I1.2)
V3 = SI1.3 & (RV203 | I1.3)
V4 = SI1.4 & (RV203 | I1.4)
V5 = SI1.5 & (RV203 | I1.5)
V6 = SI1.6 & (RV203 | I1.6)
V7 = SI1.7 & (RV203 | I1.7)
V8 = SI1.8 & (RV203 | I1.8)
```

```
// SIREN OUTPUT (O4.7): EACH NE ALARM SWITCH ON THE SIRENA; THE SWITCH OFF OF
// THE SIREN OCCURS BY ACK BUTTON ON DISP2 BUS (I3.1)
V201 = TV1 | TV2 | TV3 | TV4 | \
       TV5 | TV6 | TV7 | TV8 | \
       RI3.1
V202 = SV201 & RI3.1 & R!V998
O4.7 = V202

// VIRTUAL POINT TO RESET THE ALARM MEMORY CELLS: V203 WILL BE ACTIVATED
// PUSHING RESET BUTTON (I3.2), BUT ONLY IF THE SIREN (O4.7=V202) IS OFF
V203 = !V202 & I3.2

// FLASHER OUTPUT (O4.8), DEFINED AS OR OF ALARM MEMORY CELLS; THE FLASHER
// WILL BE ACTIVATED UNTIL ALL ALARMS WILL BE REMOVED AND THE SYSTEM WILL
// BE RESET
V204 = V1 | V2 | V3 | V4 | \
       V5 | V6 | V7 | V8
O4.8 = V204

// BINARY OUTPUT BLOCK DEFINITION
BINARY 3 ( \
        B001 = V1    \
        B002 = V2    \
        B003 = V3    \
        B004 = V4    \
        B004 = V5    \
        B004 = V6    \
        B004 = V7    \
        B004 = V8    \
)
```

This program may be easily modified to be adapted to the various real applications.

Example for keyboard lock

Supposing to have assigned the base address 3 to DISP2 BUS, the simple following program allows to lock/unlock the keyboard every time the buttons 

are pressed at the same time for more than 3 seconds.

```
V901 = I3.3 & I3.4 & I3.5
V902 = TIMER(V901, 30, 0)
O4.3 = TV902
```

The keyboard lock/unlock can be implemented in several modes thanks to the possibility offered by MCP programming.