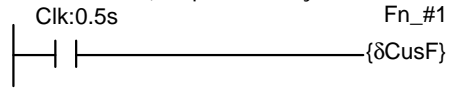


**IMPORTANT**

- When powered up, MDS100 is in non-networked mode and will display any data it receives. But the moment it receives a network message with the header "@nn" where nn corresponds to its ID it immediately enters into network mode and will only accept messages that are sent as correctly formatted string with "@nn" header and good FCS. It will no longer accept just any strings sent using the PRINT #3. Only power-on reset can change it back to non-network mode. MDS can be forced into network mode by the command "?ne" which offers a quick way of putting multiple MDS100s into network mode simultaneously.
- NEVER** use the non-differentiated form {CusFn} to send out string to MDS100. {CusFn} will be executed at every scan of the ladder logic as long as its execution condition is TRUE. This quickly fills up the FIFO serial buffer and causes loss of characters. Only use the differentiated up version {δCusF} so that the message is sent only once when condition =TRUE. To display a changing data you can use a clock pulse (not faster than 0.2s) to periodically refresh the display as follow:

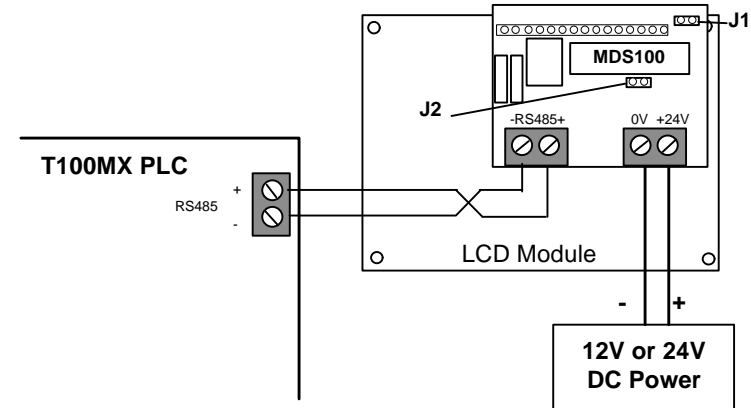


**Using MDS100 In a Network:**

More than one MDS100 can be multi-dropped on the RS485 network as long as each MDS100 is programmed with a different ID address. This opens up great possibility for sophisticated controls where remote LCDs can be sprinkled over a distributed network of control elements. You can use the TRILOGI program: "CFG-MDS.PC4" supplied on the latest version of TRILOGI (or download it from: <http://www.tri-plc.com/trilogi/cfg-mds.zip>) to change the default ID of the Network MDS100. Simply assign the desired ID to variable A in Fn#10 and then transfer the "CFG-MDS.PC4" file into a T100MX+ or MD+ PLC which is connected to the MDS100. Then toggle the "SetID" input momentarily using on-line monitoring mode to write the new ID into the MDS100. If successful the MDS100 will display the new ID address, otherwise you will be asked to retry.

Header File	0000	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011
TTTT1111	0000	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011
xxxx1110	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
TTTT101	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx100	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
TTTT1011	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx1010	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx1001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx1000	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
TTTT0111	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx0110	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx0101	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx0100	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx0011	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx0010	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000
xxxx0000	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000	0001	0010	0011	0000

**Installation Guide for Network MDS100 - Serial LCD Display**



MDS-100 comprises a daughter board (the "control board") that is plugged onto the back ("piggy-backed") of an industry standard 4x20 LCD module. The control board may be removed during installation of the LCD module but care must be taken to plug it back with all the pins correctly aligned before turning on the power, otherwise the LCD panel and/or the control board may be damaged.

Messages to be displayed on the LCD are sent from the PLC to the MDS-100 via their respective RS485 ports at either 38,400 or 9,600 bits per second. If Jumper J1 is open when power-on, the MDS100 is set to 38,400 bps. If J1 is shorted when power-on then the baud rate is set to 9600. Always use the maximum baud rate (38,400bps for T100MX) for best performance. For short distances of less than 2m, any ordinary pair of cables can be used to connect the RS485. Make sure that the "+" and "-" terminals of both RS485 terminals are correctly connected to each other. For longer distances (of up to 1200m) you should use network-grade shielded twisted-pair cables.

MDS100 can also be connected to **COMM2** by connecting the '+' terminal of MDS100's RS485 port to pin 5 and the '-' terminal to pin 3 of the COMM2 port. In this case you should set MDS100 to communicate at 9600 bps.

**Power Supply and Backlighting of MDS100**

MDS100 may be powered by the same 12 to 24V DC power supply of the PLC.. It employs the PWM technique to control the amount of backlight current. When Jumper J2 is open during power-on, the PWM duty cycle is set to 10%. When jumper J2 is shorted, the PWM duty cycle is set to 25%. It is recommended that you leave J2 open for DC24V power supply and short it for DC12V. If J2 is shorted for 24V the display is much brighter but more heat is also being generated at the control board. One remarkable feature of MDS100 is that you can adjust the brightness of the backlight by software, using special instruction "?Bnn" described later.

When the MDS100 is first powered ON a 4 lines sign-on message will be displayed for 1 second. On the 4<sup>th</sup> line of the display it indicates **the network ID address** of the MDS. This ID address is needed when using it with the NETCMD\$ command and can be changed using the supplied TRILOGI program file: "CFG-MDS.PC4".

## Displaying Messages

About 1 second after displaying the sign-on message the LCD screen will be cleared and it is ready to display messages. A blinking cursor will appear at the top left corner of the screen and the cursor marks the starting position where messages will be displayed.

It is easy to display any character on the LCD. Since the MDS100 is connected to the T100MX PLC's RS485 port, simply use the "PRINT #3" statement to display a string of alphanumeric or special characters on the LCD screen at a specified row and column address as follow:

```
PRINT #3  "?Pxyy[text to be printed]"
xx = Column number (01 to 20), yy = Row number (01 to 04)
```

For example, if you execute: PRINT #3 "?P0203Good Morning!!" the text "Good Morning!!" will be displayed at 3<sup>rd</sup> row of the display starting from the 2<sup>nd</sup> character position.

## Displaying Messages Using NETCMD\$ command

Since MDS100 is a stand alone electronics device connected to the T100MX PLC via RS485 communication interface, communication errors can occur due to a number of factors and this can result in lost characters or characters being displayed at wrong location. The Network MDS can accept messages embedded within a "host link command" sent to it in a form similar to the PLC's host link command protocols. Such message format contains error checking "Frame Check Sequence" (FCS) characters which allow the display controller to check whether every character has been properly received. T100MX and T100MD have built-in networking command "NETCMD\$" which can facilitates such communication. Use of the NETCMD\$ can also avoid over-run of the MDS100 serial buffer which can lead to garbled display.

To use the NETCMD\$, first note down the ID address of the MDS100 in use. The ID is displayed in hexadecimal notation (00 to FF) on the 4th line of the sign on message when the MDS100 is first powered ON. Simply append the string "@nn" (where nn is the ID) in front of the coordinates and message string to be displayed. Then create a custom function (e.g. function #99, assuming ID = F0) which can be called by other functions, as follow:

```
Custom Function #99
A$ = NETCMD$(3, "@F0"+X$) `ID = F0
IF LEN (A$) = 0 ` command failure.
  A$ = NETCMD$(3, "@F0"+X$) ` Try a 2nd time
ENDIF
```

The string to be displayed, including the coordinates "?Pxyy" are constructed within the caller function as X\$ and then passed to function #99 by executing a "CALL 99" command. Function #99 will then add the network header "@F0" (where ID = F0 in this example) to the string and invoke the NETCMD\$ to send out the complete network message string (with FCS appended) to the MDS100. When a good message has been received by MDS100 controller the actual content of the message will be extracted and displayed on the LCD. A response string which includes the '@' symbol, the ID and the FCS will be returned to the PLC as acknowledgment via A\$. If there are any missing characters then the message will be aborted and NETCMD\$ will receive an empty string (hence its length = 0). If an error occur the message will be re-sent a second time by function #99.

E.g. To display a message such as the current room temperature, do the following:

```
X$= "?P0103Room Temp=" + STR$(ADC(1)/100)+CHR$(&HDF)+"C"
CALL 99
```

If Analog Digital Converter #1 returns a value of 1200, then the LCD will display the message at column #1, row #3: **Room Temp=12 °C**

Special "degree" ( ° ) character can be found on the LCD ASCII table on page 4 with ASCII code = DF<sub>16</sub> or 223<sub>10</sub>. You will need to use CHR\$(&HDF) or CHR\$(223) to represent this character.

Only as many characters which can be fitted on a single line will be displayed. Excess characters will simply be ignored. MDS-100 can accept no more than 20 display characters from the PLC at any one time. After displaying the string, the cursor is placed back to the position specified by the last "?Pxyy".

**TIPS :** If you need to display a number that may vary within a range of digits (e.g. it could range from 1 to 1000), you can use the STR\$(n, d) function which can generate fixed number of digits. Otherwise, you could insert some blank-spaces at the end of the message strings which will erase the characters occupied by the previous message.

```
X$ = "A = " + STR$(A) + " "
```

## Special Instructions for MDS100

A string sent to MDS100 which begins with the question mark "?" will be treated as special instruction for the MDS100 and will not be printed. The following table describe the various instructions for manipulating the MDS100 display:

Instruction String	Action
?C	Clear screen (Execution time: 2 milliseconds)
?Pxyy	Change cursor position: xx = 01 to 20 (Column #) yy = 01 to 04 (row #) E.g. "?P1403" puts the cursor at 14th position on the 3rd line.
?0	Turn OFF cursor
?1	Turn ON an underline cursor
?2	Turn ON a blinking block cursor ( <i>Default</i> )
?3	Turn ON both underline and blinking block cursors
?Ixx	Send an 8-bit data represented by the hexadecimal number "xx" to the "IR" register of the LCD module*
?Dxx	Send an 8-bit data represented by the hexadecimal number "xx" to the "DR" register of the LCD module*
?Bnn	Adjust %duty cycle of backlight current. nn = 00 to 25 00 = no backlight. 25 = brightest.
?ir	ID-Read: returns the current network ID of the MDS100 as a 2-digit hexadecimal string.
?iwx	ID Write: You can use this command to change the network ID of the MDS100 to hex value "xx".