QUICK START MANUAL for NT2S-SF123B-E

While writing this document, It is assumed that the user is well acquainted with the PLC being used and with Windows based software usage, in general.

[Hereafter, in the manual, NT2S-SF123B-E will be referred to as NT2S C.]

General:

The *NT2S C* is intended to be used as a low cost Operator interface for PLCs which are rich in program memory or data memory areas such as the Omron C Series PLCs.

The *NT2S C* has the following features:

Feature	*NT2S C*
Display	Backlit 2X16 LCD
LEDs	2
Keys	6
ASCII screens	32 characters
Embedded variables	16

Key definitions:

Each key is mapped from work bits I0201.00 to I0201.05. Every time a key is pressed, the corresponding bit as shown in the table below is held on while the key is pressed. The keys also have alternate functions.

Key	Work Bit	Register mode function
F1/REG	I0201.00	Changes register prefix
F2/DATA	I0201.01	Enters data entry mode
F3/DOWN	I0201.02	Increments register number or data depending on mode
F4/UP	I0201.03	Decrements register number or data depending on mode
F5/CLR	I0201.04	Clears data field to 0 / Register field to first register value
F6/ENT	I0201.05	Accepts new data and sends to the PLC

Unit Operations:

The work bits I0200.00 to I0200.15 control the mode of operation of the unit as follows:

Work Bit	Function
I0200.00	Controls LED0
I0200.01	Controls LED1
I0200.02 &	
I0200.03	Not used
I0200.04 to	
I0200.07	Reserved for future use
I0200.08 &	00 : Screen mode 01 : Register mode
I0200.09	10 : Operator mode 11 : Invalid
I0200.10 &	Timeout to screen mode from Operator mode
I0200.11	00 : 10 seconds 01 : 20 seconds
	10 : 30 seconds 11 : 40 seconds
I0200.12 to	
I0200.14	Reserved for future use
I0200.15	To disable data entry in Screen mode (ON : Disable)

From the above table, it is clear that the unit will display ASCII text (see section on **Screens** for more details on this) if I0200.08 and I0200.09 are OFF. To allow operators to view and edit the registers, I0200.09 is to be kept ON. If I0200.09 is OFF, the unit will not display any registers and the function keys will only act as push buttons mapped to the corresponding bits from I0201.00. Refer to "Register Mode" for details. If I0200.09 is ON, REG key press will allow an operator to view the registers. The REG key will scroll through the available register types whereas the UP and DOWN arrow keys will scroll through the register/bit numbers. After timeout specified by bits 10 and 11 and if no key is pressed, the unit will switch back to the Screen mode and display screens. Thus Operator mode is a combination of Register as well as Screen modes.

Screens :

The unit displays 32 characters from the PLC memory.
These characters are taken from the PLC data registers.

The unit tracks register DM0020 (the Offset register) in the PLC. The number in DM0020 gives the start address of the data register block which contains the characters to be displayed. For example, if DM0020 has number 124 in it, the unit will read 16 registers from DM0124, i.e. from DM0124 to DM0139 and display the corresponding characters.

Each register contains two bytes. Each ASCII character to be displayed is one byte. So, each word contains two characters that can be displayed. All the PLC ladder logic has to do is to put the correct words in the registers being read by the unit so that a proper screen can be displayed.

As mentioned above, the starting address of the screen data block is controlled by the Offset register, i.e. DM0020. Hence, there can be two methods of changing the screen to be displayed. One is to keep the value in DM0020 constant and change the data in the screen registers in the ladder logic. Second is to keep the screen text in the data memory (by editing DM registers) and change the value in DM0020 so as to point to the correct memory address to display the desired screen.

It is possible to embed registers in the screens. The unit reads 16 registers from DM0000 to DM0015 (in which DM0012 to DM0015 are used for Bar Graph) in every scan. The data in these registers can be embedded in the screens. To do so, use hex bytes 0 to B (C to F used for Bar Graph) corresponding to register DM0000 to DM0011 respectively in the screen. Refer to the example given which explains the embedding of registers.
It is possible to embed one data entry field in screens. It is similar to embedding register, only instead of 0 to F use 10 to 1F hex bytes to address DM0000 to DM0015. The registers DM0000 to DM0015 can be edited with this feature one at a time in a screen.

Example 1: To display a static screen

Suppose the following screen needs to be displayed on the *NT2S C* :

```
Last Rinse Cycle
Water pump is on
```

To display this screen, do the following:

a.   Move number 200 in DM0020 since the screen text will be stored in DM0200 onwards.

b.   Move character string "Last Rinse Cycle" into 8 words from DM0200.

c.   In a similar manner, the characters "Water pump is on" can be embedded into 8 words from DM0208. (i.e. from DM0208 to DM0215)

This will put the following data in the data words below:

Word	ASCII	Hex	Word	ASCII	Hex
DM0200	La	4C61H	DM0208	Wa	5761H
DM0201	st	7374H	DM0209	te	7465H
DM0202	R	2052H	DM0210	r	7220H
DM0203	in	696EH	DM0211	pu	7075H
DM0204	se	7365H	DM0212	mp	6D70H
DM0205	C	2043H	DM0213	i	2069H
DM0206	yc	7963H	DM0214	s	7320H
DM0207	le	6C65H	DM0215	on	6F6EH

Example 2: Embedding a variable in the screen

Suppose the following screen needs to be displayed :

```
Door: CLOSED
BAKETIME: 13.6s
```

Suppose the bake time is available in data word DM0100 and the oven status is given by bit I001.00.

To display the above screen, do the following:
a.   Move number 200 in DM0020 since the screen will be stored in DM0200 onwards.

b.   Move character string "Door:" into 2 words, i.e. DM0200 and DM0201.
c.   Move characters "OPEN" if bit I001.00 is ON or characters "CLOSED" if I001.00 is OFF.

d. In a similar manner, embed the characters "BAKETIME: " into 5 words   from DM0208.
e. *NT2S C* uses DM0000 to DM0011 registers for embedding data. Here we select DM0003 to be used for embedding. So, move the data of DM0100 into DM0003 so that embedding can be done.

f. Put 03032E03H in words DM0213 and DM0214. The *NT2S C* will read data in DM0003 and embed in xx.x format.
g. Move "s " into DM0215. This command completes the screen by appending the "s " to the bake time.

This will put the following data in the data words below:

Word	ASCII	Hex	Word	ASCII	Hex
DM0200	Do	446FH	DM0208	BA	4241H
DM0201	or	6F72H	DM0209	KE	4B45H
DM0202	:	3A20H	DM0210	TI	5449H
DM0203	CL	434CH	DM0211	ME	4D45H
DM0204	OS	4F53H	DM0212	:	3A20H
DM0205	ED	4544H	DM0213		0303H
DM0206		2020H	DM0214		2E03H
DM0207		2020H	DM0215	s	7320H

Register mode:

In the register mode, the operator can access all the registers and bits in the PLC.
By pressing the REG key, the operator can scroll through the register prefixes. By using the UP
or DOWN keys, the register numbers can be accessed. Data can be changed in the registers by
pressing the DATA key. The data field will blink to indicate that the unit is ready to accept new
data. At this time, the UP or DOWN keys can be used to edit data followed by the ENT key.
It is advisable to create a "password" screen which can block the usage of the register mode.

Bar Graph:

NT2S C uses DM0012 to DM0015 registers to hold bar graph values to be displayed. If Offset
register points to DM0200 then put Hex value 0C0C into DM0200 onwards to display bar graph
with the value in DM0012.
Example:
Put 0C0C into DM0200, DM0201, DM0202, DM0203 and 200 into DM0020. This will display bar
graph 8 characters wide. Maximum length is 16 characters. Each character on display can
display 5 vertical lines. To display full bar graph put # 80 into DM0012 and 0C0C from DM0200
to DM0207.
To display Bar Graph with value in DM0013, put 0D0D in DM0200 onwards.

Triggering screens :

As it can be seen from the above examples, there are two ways to display screens with *NT2S C* :
1. Keep all the message characters in the data memory (the Omron PLCs have lot of data registers which in most applications involving simple digital controls are not used anyway) and simply change the offset register to display different screens.

The user can fill the data memory using the "data display editor" menu of the PLC programming software.

2. Note that the data memory as well as the program memory can be used for embedding of data.

Of course, a combination of the two methods can be used to optimise the memory usage.