

METAL EMBOSSESSER MODELS C360 – C400 – C450



SETUP and PROTOCOL MANUAL

Version 2.7



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1. MACHINE SETUP

1.1. General Information

As setup we mean the whole information required by the embosser to know the devices fitted on machine and to use a particular working mode when switching the machine on.

It is therefore necessary to modify the setup, only if you change the originally setup, or if you require special machine functions (described here-below).

Please note that the setup values are stored in a non permanent way (RAM with battery). In case of need is possible to restore the factory setup.

1.2. System Programming via SetC400 win95 program

Starting from eeprom Ver 2.00 is it possible to completely setup the machine via PC using a windows 95 program called **SetC400.exe**

1. You need to plug the rs232 cable to COM1 or COM2 of the PC
2. Power On the machine with the ONLINE key pressed to enter the PC Setup facility.
3. On the LCD it appears the message : “ **PC SETUP** ”
4. Under win95 run the program **SetC400**

Goes to chapter “SetC400 Setup Procedure “ for details

1.3. System Programming via LCD

NOTE: It is possible to modify the setup **ONLY** with the LCD display console type.
To enable the LCD is necessary to put in the connector P7 a jumper 2-3.

Power On the machine with the ENTER (↵) key pressed, you enter the system setup menu.
On the LCD it appears the message:

SYSTEM PROGRAMMING Ver X.xx

you can release the ENTER key

- Ver X.xx indicate the eeprom version install in the machine.

1.4. System Configuration

Turn the knob until is displayed the message:

1 SYSTEM CONFIGURATION
CCW = previous CW = next ONL = confirm ENT = exit

with these meaning:

CCW = previous: turn the knob Contrary Clock Ways to go back to the previous menu
CW = next: turn the knob Clock Ways to go to the next menu
ONL = confirm: to enter in the menu displayed
ENT = exit: to go back to the SYSTEM PROGRAMMING menu

when in the menu of personalization, is displayed:

PERSO n 0 0 0 0 0 0 0 (00)
ONL = modify WAIT = next ENT = exit

with these meaning:

ONL = modify: to modify the bit flashing
WAIT = to go to the next cell
ENT = to go back to the previous menu

To move from one bit to the next bit you have to turn the knob.
The meaning of the PERSO cells is:

1.4.1. PERSO Values

PERSO 0	7	6	5	4	3	2	1	0	Input Protocols
---------	---	---	---	---	---	---	---	---	-----------------

- Bit 0 **1** = select Multi Embosser protocol
 Bit 1 **1** = select XON/XOFF protocol
 Bit 2 available
 Bit 3 available
 Bit 4 available
 Bit 5 **1** = if together with Bit 1=1 select the XON/XOFF ## protocol compatible
 Bit 6 **1** = if together with Bit 0=1 select the SELECTING protocol FZ99 compatible.
 Bit 7 **1** = if together with Bit 1=1 select the XON/XOFF protocol 1700 compatible

PERSO 1	7	6	5	4	3	2	1	0	Serial Channel Setup
---------	---	---	---	---	---	---	---	---	----------------------

- Bit 0 available
 Bit 1 available
 Bit 2 available
 Bit 3 available
 Bit 4 **0** = NO PARITY **1** = PARITY
 Bit 5 **0** = Parity EVEN **1** = Parity ODD (OK 13/04/2000)
 Bit 6 **0** = 8 bit/byte **1** = 7 bit/byte
 Bit 7 **0** = 1 Stop Bit **1** = 2 Stop Bit

PERSO 2	7	6	5	4	3	2	1	0	
----------------	----------	----------	----------	----------	----------	----------	----------	----------	--

- Bit 0 available
- Bit 1 available
- Bit 2 **1** = the DTR signal will use the logic negate
- Bit 3 **1** = the protocol XON/XOFF run without STX
- Bit 4 **0** = CR → next line **1** = CR + LF → next line
if set to 1 the CR will only move the position pointer to the beginning of the line, then the LF will move to next line.
- Bit 5 **0** = 3 Buffer mode **1** = Single Buffer mode
- Bit 6 **1** = enable the BCC control in the Multi embosser protocol
- Bit 7 At power you can set the status:
0 = OFF LINE Status **1** = ON LINE Status

PERSO 3	7	6	5	4	3	2	1	0	
----------------	----------	----------	----------	----------	----------	----------	----------	----------	--

- Bit 0 **1** = in the Multi embosser protocol enable to reset the error pressing the ENTER key ONLY if the Host has been already select the machine. This function assure to inform the host about the machine status because the operator cannot clear the error before is been Select/read from the host.
- Bit 1 **1** = in the Multi embosser protocol will be sent the Status Answer "CARD_OK" at the end of the card.
- Bit 2 available
- Bit 3 **1** = Fields name (the fix text in the format is not emboss)
- Bit 4 **1** = The plate is inserted in the drum position always at the left edge, this to allow to create a small ramp to remove the jam in case the plates are bend looking down
- Bit 5 **1** = REVERSE Type embossing machine
- Bit 6 set to **0**
- Bit 7 In case of error pressing ENTER the recovery will be:
0 = REPEAT the card **1** = DO NOT REPEAT the card

PERSO 4	7	6	5	4	3	2	1	0	
---------	---	---	---	---	---	---	---	---	--

- Bit 0 **0** = C400 automatic feed machine
 1 = C360 manual feed machine
- Bit 1 **1** = enable the Digitran Format Selector (special Option)
- Bit 2 **1** = Pre-Load plate function mode. The next plate will be load automatically and positioned ready for embossing.
- Bit 3 **1** = The pusher move back of 5mm after loading the plate. This help very much to correct load the plate in the clamp.
- Bit 4 available
- Bit 5 **1** = If the host sent too may chars in the line or too many line to emboss will be NOT generate the errors “FRM FRAME” and “FRM LINE”
- Bit 6 **1** = If the host sent a char which cannot be emboss will be NOT generate the error “ILL CHAR”
- Bit 7 In Bit 6 is **1** the is it possible to select what to do with the not embossable char:
 0 = REMOVE the char **1** = put the SPACE

PERSO 5	7	6	5	4	3	2	1	0	
---------	---	---	---	---	---	---	---	---	--

- Bit 0 **1** = The C400 is equipped with the *Cassette Unloader* device
- Bit 1 **1** = In case of plate error the machine will automatically retry to produce the wrong plate up to 4 times before call the operator.
- Bit 2 **1** = Card Lost / Card Jam sensor (connector P9 – adj via PT3).
 Is possible to add a sensor in the Side Eject unloader to control these errors.
- Bit 3 **1** = FIFO Unloader Full sensor (connector P9 – adj via PT3).
- Bit 4 available
- Bit 5 available
- Bit 6 available
- Bit 7 available

PERSO 6	7	6	5	4	3	2	1	0	
PERSO 7	7	6	5	4	3	2	1	0	
PERSO 8	7	6	5	4	3	2	1	0	

ALL to **0** (available)

PERSO 9	7	6	5	4	3	2	1	0	Test
----------------	----------	----------	----------	----------	----------	----------	----------	----------	-------------

Bit 0 **1** = WITHOUT card mode

Bit 1 **1** = CONTINUOUS mode

Bit 2 **1** = PAUSE mode

Bit 3 available

Bit 4 available

Bit 5 available

Bit 6 available

Bit 7 available

1.5. Offset Movement

The Offset Movement allow to adjust several position of the carriage and the pusher in order to align the plate respect the physical devices.

Moving the knob left and right you change the offset decreasing or increasing the current value.

Then press ON LINE to confirm.

The values are express in motor steps and are:

- **1 X Step = 0.1814 mm** (1/140 “)
- **1 Y Step = 0.127 mm** (1/200 “)
- **1 Pusher Step = 0.041 mm**

List of offset:

OFFSET HOME X	+ 000
----------------------	--------------

Leave at 000

OFFSET LOAD X	+ 000
----------------------	--------------

Adjust the X position of the clamp to load the plate.

The standard adjustment set to have 15mm from the left edge of the plate and the left edge of the clamp.

If this value is wrong the plate will **not enter the Lifter Unload**.

OFFSET MOV. X	+ 000
----------------------	--------------

Adjust the X position of the clamp to emboss the plate.

Adjust this value in order to get the X coordinate position set in the format.

If this value is wrong you will only have an offset from the X position set in the format and the real X embossing position

OFFSET HOME Y	+ 000
----------------------	--------------

Leave at 000

OFFSET LOAD Y	+ 000
----------------------	--------------

Adjust the Y position of the clamp to pickup the plate.

If this value is wrong the clamp will **not pickup the plate**.

OFFSET MOV. Y	+ 000
----------------------	--------------

Adjust the Y position of the clamp to emboss the plate.

Adjust this value in order to get the Y coordinate position set in the format.

If this value is wrong you will only have an offset from the Y position set in the format and the real Y embossing position

OFFSET UNLOAD Y	+ 000
------------------------	--------------

Adjust the Y position of the clamp to unload the plate.

OFFSET LOAD SENS	+ 000
-------------------------	--------------

Set how many steps the plate exit from the feeder after the *Load Sensor* goes ON (**1 Step = 0.041 mm**)

Adjust this value together with the *Offset Load Y* in order to guaranty that the plate enter the clamp.

If this value is wrong the clamp will **not pickup the plate**.

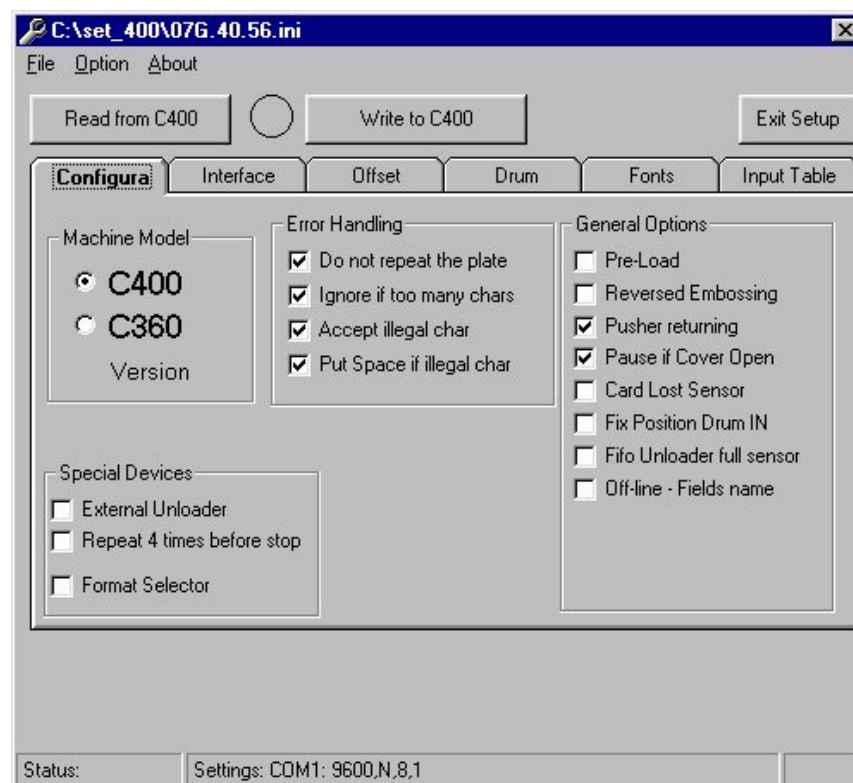
2. SetC400 Setup Procedure

2.1. General Information

Starting from eprom Ver 2.00 is it possible to completely setup the machine via PC using a windows 95 program **SetC400.exe**

1. You need to plug the RS232 cable to the COM port of the PC
2. Power On the machine with the ONLINE key pressed to enter the PC Setup facility.
3. On the LCD it appears the message : “ **PC SETUP** ”
4. Under win95 run the program **SetC400**

If the link is active it will appear the following mask:



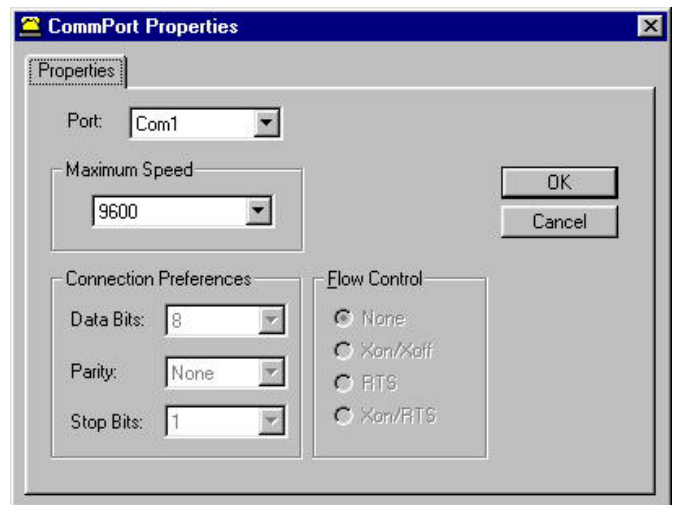
If the link is NOT active will appear the “**Answer Not Receive**” error message:

2.2. Program Setup

If need is possible to change the program setup.

From menu select Option|Setting

- ❑ Select the COM port used on the PC
- ❑ Select the Baud Rate Speed
- ❑ Data Bits is fix to 8
- ❑ Parity is fix to NONE
- ❑ Stop Bits is fix to 1

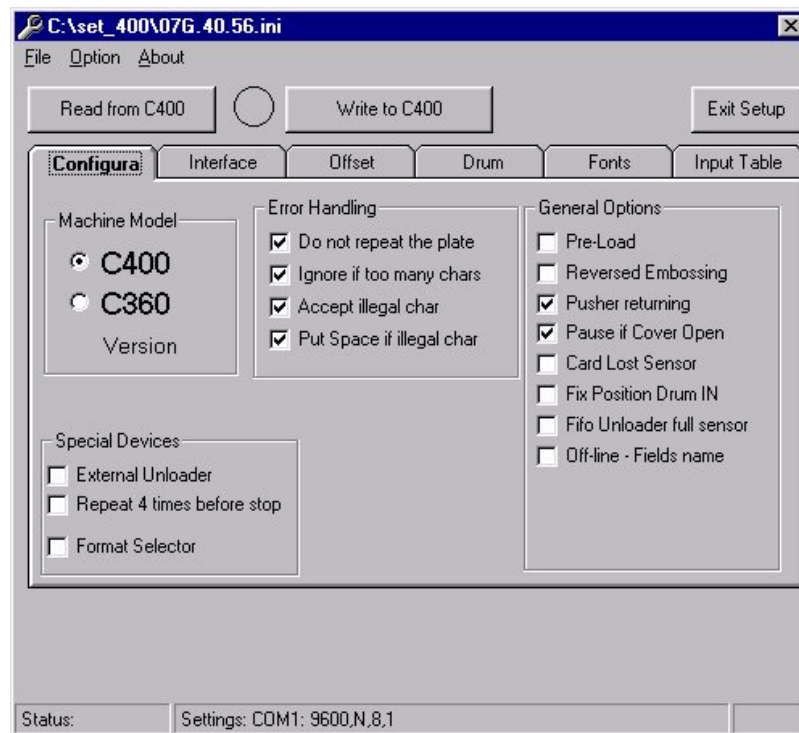


2.3. C400 Setup

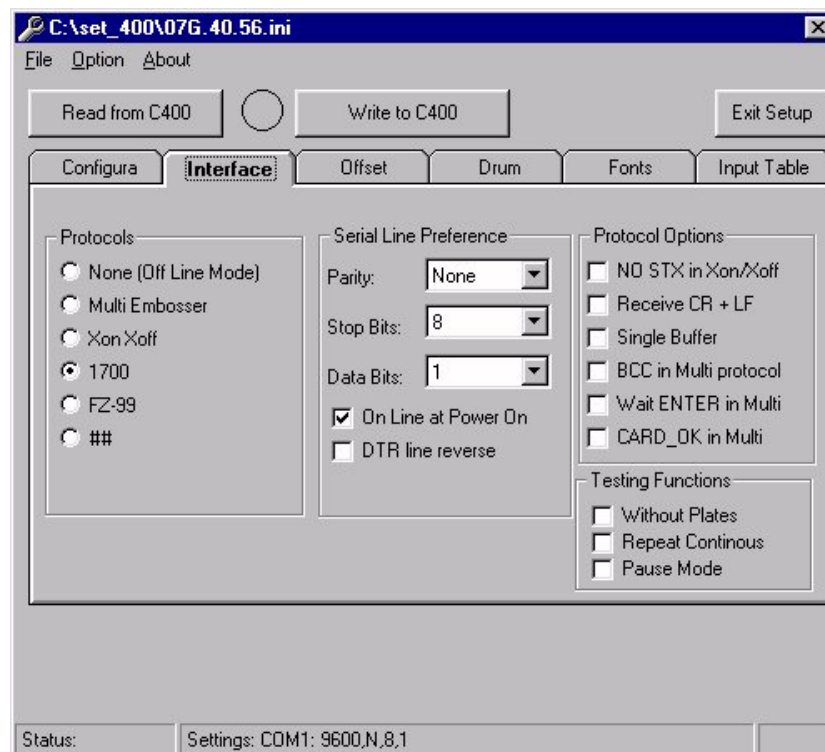
- ❑ Click on *Read_from_C400* you read from the machine memory RAM all the parameters values
- ❑ Click on *Write_from_C400* you write to the machine memory RAM all the parameters values
- ❑ Click on *Exit Setup* to exit the Setup procedure; also for the machine.

Is also possible to save and load the machine parameters to external file.

2.4. Configurations



2.5. Interface



2.6. Mechanical Offset

C:\set_400\07G.40.56.ini

File Option About

Read from C400 ☐ Write to C400 Exit Setup

Configura Interface **Offset** Drum Fonts Input Table

Home X 0 Home Y 0

Load X 0 Load Y 0

Move X 0 Move Y -20

Sensor Load 20 UnLoad Y -20

Plates Counter

Punches Counter

Status: Settings: COM1: 9600,N,8,1

2.7. Drum Layout

C:\set_400\07G.40.56.ini

File Option About

Read from C400 ☐ Write to C400 Exit Setup

Configura Interface Offset **Drum** Fonts Input Table

1	A	B	C	D	E	F	G	H	I	J
11	K	L	M	N	O	P	Q	R	S	T
21	U	V	W	X	Y	Z	0	1	2	3
31	4	5	6	7	8	9	-	/	.	'
41	.	&	*					A	B	C
51	D	E	F	G	H	I	J	K	L	M
61	N	O	P	Q	R	S	T	U	V	W
71	X	Y	Z	0	1	2	3	4	5	6
81	7	8	9	-	/	.	'	.	&	*
91	x	y								

Drum Code

Position: 1

Character: A

Hex Value: 41

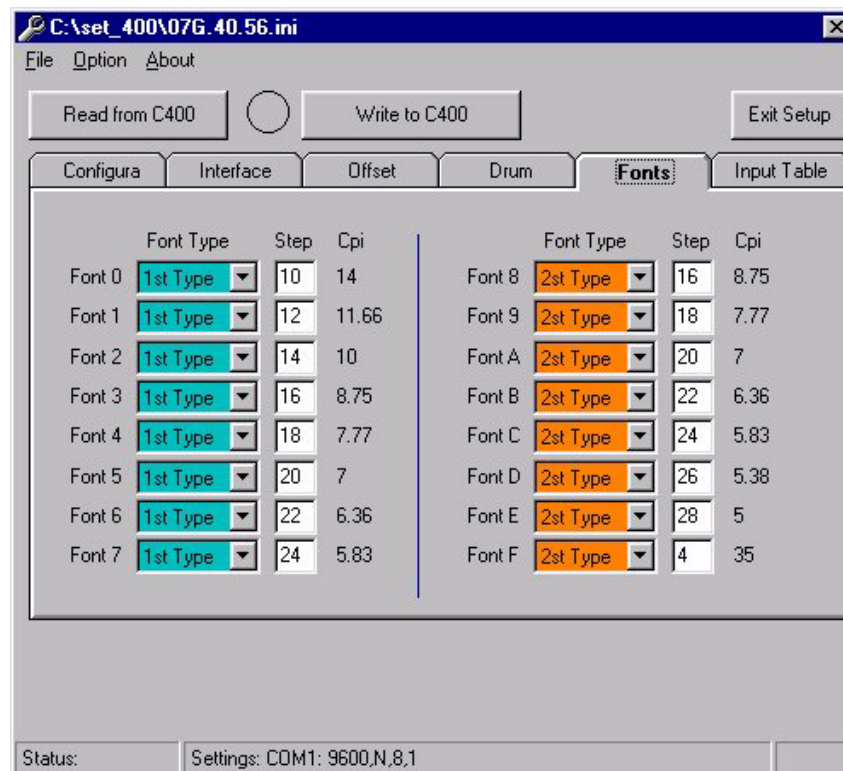
Dec. Value: 65

1st Type

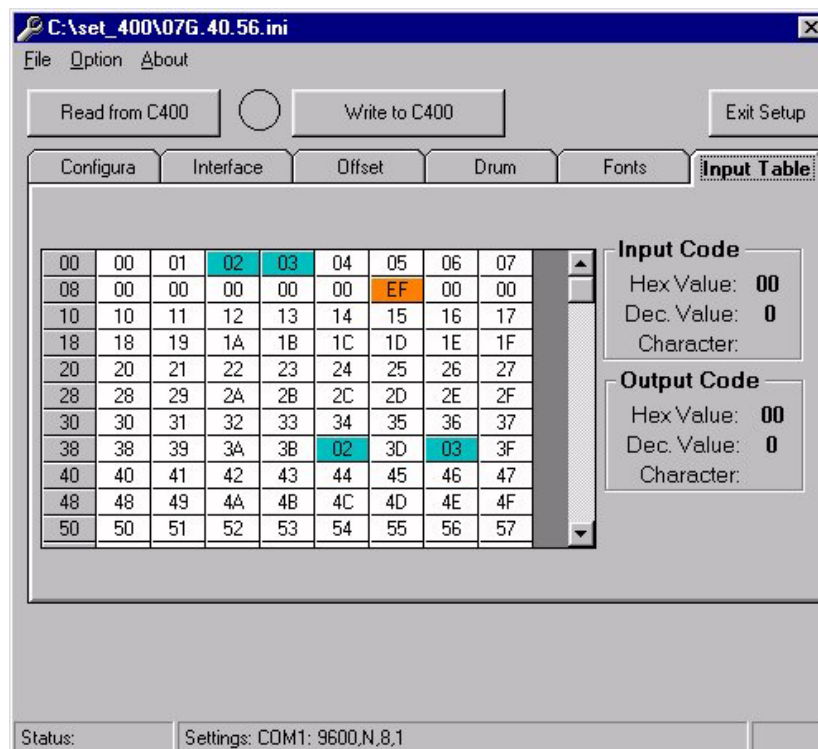
Screen Font

Status: Settings: COM1: 9600,N,8,1

2.8. Fonts Definitions



2.9. Input Conversion Table



3. XON-XOFF STANDARD PROTOCOL

3.1. General Information

The Xon-Xoff protocol is based on the standard XON-XOFF protocol.

When you power on the machine, after the restart procedure, the character **XON** (DC1, 11 hex, 17 dec) is send to the host.

The host can send to the machine a TEXT message or a FORMAT message the character **STX** (02 hex) before and the character **ETX** (03 hex) after.

When the machine receives the message, it stops the communication by sending the **XOFF** character to the host (DC3, 13 hex, 19 dec).

When the message is processed and there is no error the **XON** character is sent again.

- The machine accept either **STX** (02 hex) or “<” (3C hex) as *Start of Message*
- The machine accept either **ETX** (03 hex) or “>” (3E hex) as *End of Message*

3.2. Send a Text

To send a text is easy:

STX Line 1 **CR** Line 2 **CR** Line n **ETX**

Es.

<02>MATICA SYSTEM <0D> BOLLATE – MILANO <0D> TEL. +39 02 33261027 <0D> ITALY <03>

3.3. Send a Format

The format concept is describe in the next chapter.

To send a format is important to send just after the STX the character “]” which indicate → Format String following:

STX Format String ETX

Es.

<02>]01Y472X606 Y79X83F2 Y197X55FA Y276X55FA Y354X165F2 <03>

4. MULTIEMBOSSER PROTOCOL

4.1. General Information

The **MULTIEMBOSSER** protocol is based on a polling protocol:

1. The Host sent to the machine the **SELECT** string
2. The machine must answer the **STATUS** condition

In case of STATUS BUSY or STATUS ERROR is necessary to poll in continue the machine until the Status will becomes READY.

Is suggest to poll the machine every second (1 time a sec.).

Is possible send to the machine 2 types of *Command Data*:

- Format Data which set the physical embossing position
- Emboss Data the TEXT to be emboss

Only when the status answered is **ACK CR** the Host can sent to the machine the *Command Data* using the following basic syntax:

HEADER Command-Data ETX.

The machine must answer to the Host the **ACK CR** string to indicate that the *Command Data* are correct and the machine can start the processing of it.

In case the *Command Data* are wrong the **NACK Error-Message CR** string will be sent.

To start run the machine is necessary to first send the FORMAT, and then send the TEXT be embossed.

The machine save the format in the battery memory. If you are sure that the format is stored in memory you can simply send the text without the format.

4.2. Status Answers

HOST Sending	MACHINE Answers	Meaning
Select	ACK CR	The machine is ready to receive any <i>Command Data</i>
Select	NACK 'NO READY' CR	The machine is not ready (Process are running)
Select	NACK <Err Message> CR	The machine is in error. <i>Err Message</i> is an 8 characters length string which expresses the error (FEEDCARD, X PARITY, NO LOAD see the Alarm Message List)

Agenda:

Select	<04> 2 digit Addr <05>	<04> <33> <31> <05>
Header	<01> 2 digit Addr <02>	<01> <33> <31> <02>
ACK	Acknowledge	<06>
NACK	Not Acknowledge	<15> 21 dec.
CR	Carriage return	<0D> 13 dec.
ETX	End of text	<03>

The values <XX> are express in hexadecimal.

The **2 digit Addr** value in the **Select** and **Header** strings represents the machine address that can be change in case of need; the standard value is **31 (2 digit 33h and 31h)**.

4.3. Command Data

Header	F 01	Format-Data	ETX	To send the format number 01. The machine can store in the memory from '1' to '8' formats.
Header	T 01	Emboss-Data	ETX	To send an embossing text using the format 01.

- Format Data sample:
 <01> 31 <02> F|01Y472X606 Y79X83F2 Y197X55FA Y276X55FA
 Y354X165F2 <03>

The format sample is describe in the next chapter.

- Emboss Data sample:
 <01> 31 <02> T|01MATICA SYSTEM <0D> VIA SILVIO PELLICO <0D>
 TEL. +39 02 33261027 <0D> ITALY <03>

5. FORMAT STRUCTURE

5.1. What is the Format

The format is the group of instructions to be given to the embosser, in order to obtain the embossing according to your own features.

The instructions are the following:

1. Format number to be assigned from 1 to 9.
2. Coordinates (Y and X axis) relative to the positions given to the embossing fields.
3. Type of character (FONT) that has to be embossed
4. Sizes of each embossing field. (optional)

5.2. What is the Font

The font define the spacing and the type of the character, in accordance with the dies assembly on the machine, which must be embossed.

The fonts must be defined, during the format programming, immediately after entering the X coordinate of the field. To define the font it is necessary to specify the number with which it is identified inside the embosser.

Each field of the format may have different fonts. The fonts available are:

Font Number	Character Set	Character Spacing	Char/Inch
0	SIMPLEX	10	14,00
1	SIMPLEX	12	11,67
2	SIMPLEX	14	10,00
3	SIMPLEX	16	8,75
4	SIMPLEX	18	7,78
5	SIMPLEX	20	7,00
6	SIMPLEX	22	6,36
7	SIMPLEX	24	5,83
8	USA BLOCK	16	8,75
9	USA BLOCK	18	7,78
A	USA BLOCK	20	7,00
B	USA BLOCK	22	6,36
C	USA BLOCK	24	5,83
D	USA BLOCK	26	5,38
E	USA BLOCK	28	5,00
F	USA BLOCK	30	4,67

The above table can be modify in Eprom

5.3. A Format as example

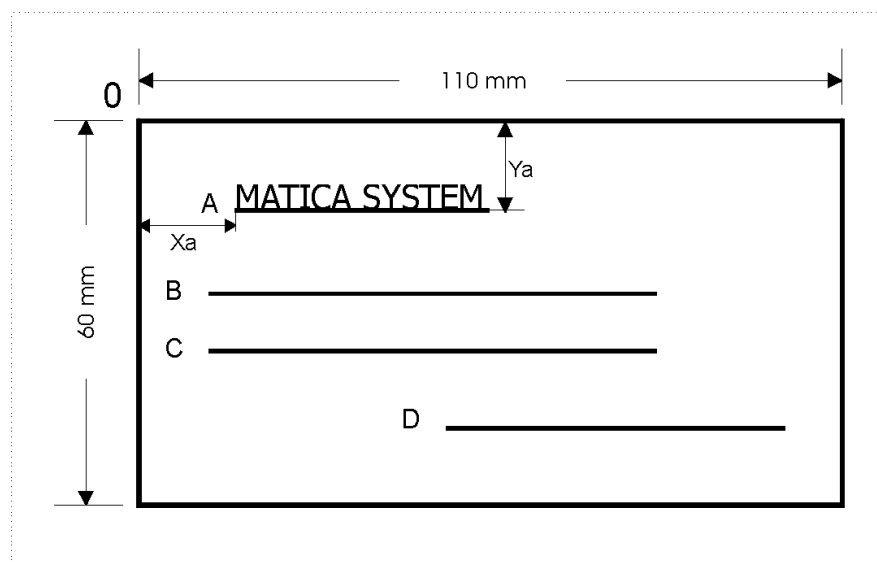
The format start with the Format Number, from 1 to 8. Format 0 and 9 are stored in EPROM.

Then is necessary to specify the plate size Y=xxx and X=xxx.
The values for Y and X coordinates are express in steps.

- The X step ratio is **1 step = 0.1814 mm** (1/140 of inch)
- The Y step ratio is **1 step = 0.127 mm** (1/200 of inch)

At the end of this manual you found a **mm to steps** cross reference table for helping the conversion.

The Y coordinate is measured from the top border of the plate to the bottom of the character
The X coordinate is measured from the left border of the plate to the left side of the character



The sample format is composed of 4 following fields:

Field	Y pos.	X pos.	Chars FONT	Spacing
A	10 mm	15 mm	Simplex 2	10 Chars/inch
B	25 mm	10 mm	Blocco Usa	7 Chars/inch
C	35 mm	10 mm	Blocco Usa	7 Chars/inch
D	45 mm	30 mm	Simplex 2	10 Chars/inch

This format has the following syntax :

For ON LINE with Xon-Xoff protocol sending:

<J01Y472X606 Y79X83F2 Y197X55FA Y276X55FA Y354X165F2 >

For ON LINE with Multi Embosser protocol sending:

Header Tj01Y472X606 Y79X83F2 Y197X55FA Y276X55FA Y354X165F2 Etx

For OFF LINE editing:

F1Y472X606 Y79X83F2 Y197X55FA Y276X55FA Y354X165F2

j01	Format Number 1
Y472X606	Set the plate size 60 mm / 0.127 = 472 (Y dimension) 110 mm / 0.18 = 606 (X dimension)
Y79X83 F2	Coordinate of the first line Select Font 2 (Simplex 2 at 10 Char/”)
Y197X55 FA	Coordinate of the second line Select Font A (USA BLOCK at 7 Char/”)
Y276X55 FA	Coordinate of the third line Select Font A (USA BLOCK at 7 Char/”)
Y354X165 F2	Coordinate of the first line Select Font 2 (Simplex 2 at 10 Char/”)

If you don't add any extra command the line will be automatically set at the maximal number of characters allowed

6. TIP & TRICKS

6.1. Multi protocol - Format Sending

When you send a Format-Data the machine answer ACK CR just to say the format is received.

Then the machine will process the format to control the syntax.

This control will take few seconds (it depends on the number of line).

During this time you can continue to poll the machine every second, and you will received back the answer Status NO READY.

- When the format is been process you will receive the Status OK (ACK CR)
- In case the format is wrong then you will receive the Status Error (NACK Error CR)

6.2. Multi protocol - Polling Timing

Clear the Receive buffer before send the Select or the Command-Data

When you send the Select or a Command-Data wait the answer with a Time-out of 5 sec.

If you send the Select and after 5 sec you have no answer indicate that :

- The machine is POWER OFF
- The machine is in OFF LINE

If you send the Command-Data and after 5 sec you have no answer STOP the program because is not possible now to verify where can be the error:

- The machine is in hang-up
- The machine understand correct but is the Host which don't see the answer.

7. ALARM MESSAGE LIST

7.1. LCD type Console Alarm Message

'ILL REQ '	;04 ILLEGAL REQUEST
'BAD COMM'	;05 WRONG COMMAND
'ILLG FRM'	;06 WRONG FORMAT VALUE
'FRM OPER'	;07 WRONG OPERATING FORMAT DATA
'NO FRM '	;09 FORMAT DONT EXIST
'BUF OVFL'	;10 INPUT BUFFER OVERFLOW
'BCC ERR '	;11 BCC ERROR
'FRM LINE'	;01 TOO LINES TO BE EMBOSSED
'FRM FRAM'	;02 TOO CHARS TO BE EMBOSSED ON THE LINE
'BUF OVRF'	;05 BUFFER OVERFLOW
'ILLG CHR'	;06 ILLEGAL CHAR
'NO TAB '	;11 NO TAB POINT
'ILLG COM'	;12 WRONG COMMAND
'NO F CHR'	;01 MISSING FORMAT CODE
'NO FORM.'	;02 MISSING DATA AFTER FORMAT CODE
'ILLGFORM'	;06 FORMAT EDITING NO ALLOWED (format =/ 0-9)
'NO FORM.'	;07 FORMAT NO FOUND
'TOO M. Y'	;08 TOO MANY Y (over 11)
'Y TOOBIG'	;09 Y VALUE TOO BIG
'WRONG Y '	;10 NEW Y VALUE LESS THAN LAST Y VALUE
'NO X COO'	;12 MISSING X VALUE AFTER Y VALUE
'NO F RAM'	;13 NO ENOUGH RAM SPACE
'WRONKEY2'	;14 WRONG COMMAND AFTER X VALUE
'X TOOBIG'	;15 X VALUE TOO BIG
'WRONG X '	;16 NEW X VALUE LESS THAN LAST X VALUE
'BAD FONT'	;17 WRONG FONT VALUE
'BAD1CNTR'	;18 WRONG COUNTER DEFINE (emboss)
'WRONKEY3'	;19 WRONG DATA AFTER BLANK REQUEST (emboss)
'WRONKEY4'	;20 WRONG COMMAND AFTER BLANK REQUEST (emboss)
'ILLGCHAR'	;21 CHAR NOT EMBOSSABLE
'BIG TFIX'	;22 TOO MANY CHARS IN THE FIXED TEXT (MAX 30)
'WRONKEY5'	;23 HEX COUNTER VALUE DIFFERENT FROM 0-F
'BAD2CNTR'	;24 HEX COUNTER BIGGER THAN 4 DIGIT OR WITHOUT +/-
'BAD3CNTR'	;25 HEX COUNTER INCREASE NO IN THE RANGE 0-F
'ILLGCNTR'	;31 not used
'BAD8CNTR'	;33 not used
'WRONGSRC'	;37 not used
'NO M SEP'	;39 not used
'WRONGDES'	;40 not used
'YTOOSMAL'	;42 Y VALUE TOO SMALL
'XTOOSMAL'	;43 X VALUE TOO SMALL
'PARAMERR'	;44 not used

'NO M LIN'	;45 not used
'NO M COL'	;46 not used
'NO M DAT'	;47 not used
'M OVRFLW'	;50 not used
'NOMOREMV'	;51 not used
'ENDMATRX'	;53 END MATRIX EDITING
'WRONKEY6'	;54 not used
'NO Y COO'	;55 MISSING Y VALUE
'FEEDCARD'	;01
'FEEDZERO'	;02
'FEEDSTOP'	;03
'Z PARITY'	;01 Z END PARITY ERROR
'EMB STRT'	;02 EMBOSS START ERROR
'EMB STOP'	;03 EMBOSS STOP ERROR
'EMB ZERO'	;04 EMBOSS ZERO ERROR
'ZPAR ERR'	;05 Z PARITY ERROR
'DRUM ERR'	;06 Z PARITY ERROR BEFORE EMBOSSING START
'X PARITY'	;07 X END PARITY ERROR
'Y PARITY'	;08 Y END PARITY ERROR
'XY HOME '	;09 X,Y HOME ERROR
'Z+EMB 0 '	;10 SENS EMB AND Z PARITY OUT 0
'EMB OVER'	;11 EMBOSSER SENSOR OUT ZERO DURING THE DRUM MOVEMENT
'CARD ERR'	;12 WRONG PLATE LOADING
'CARD OUT'	;13 NO UNLOADING PLATE
'NO LOAD'	;14 NO LOADING PLATE

7.2. 2 Digit Console Alarm Message

AA	machine in wait condition
01	to load the plates in the hopper device
02	Plexiglas cover open
03	the plate is not in the plate holder
09	the format is not available
10	the embossing data are not appropriate to the format
11	format frame error
12	loading movement error
13	embosser movement error
14	X movement error
15	Y movement error
16	drum movement error

8. MM/STEP CONVERSION TABLE

mm	Y	X
1	8	6
2	16	11
3	24	17
4	31	22
5	39	28
6	47	33
7	55	39
8	63	44
9	71	50
10	79	55
11	87	61
12	94	66
13	102	72
14	110	77
15	118	83
16	126	88
17	134	94
18	142	99
19	150	105
20	157	110
21	165	116
22	173	121
23	181	127
24	189	132
25	197	138
26	205	143
27	213	149
28	220	154
29	228	160
30	236	165
31	244	171
32	252	176
33	260	182
34	268	187
35	276	193
36	283	198
37	291	204
38	299	209
39	307	215
40	315	221

mm	Y	X
41	323	226
42	331	232
43	339	237
44	346	243
45	354	248
46	362	254
47	370	259
48	378	265
49	386	270
50	394	276
51	402	281
52	409	287
53	417	292
54	425	298
55	433	303
56	441	309
57	449	314
58	457	320
59	465	325
60	472	331
61	480	336
62	488	342
63	496	347
64	504	353
65	512	358
66	520	364
67	528	369
68	535	375
69	543	380
70	551	386
71	559	391
72	567	397
73	575	402
74	583	408
75	591	413
76	598	419
77	606	424
78	614	430
79	622	436
80	630	441

mm	Y	X
81	638	447
82	646	452
83	654	458
84	661	463
85	669	469
86	677	474
87	685	480
88	693	485
89	701	491
90	709	496
91	717	502
92	724	507
93	732	513
94	740	518
95	748	524
96	756	529
97	764	535
98	772	540
99	780	546
100	787	551
101	795	557
102	803	562
103	811	568
104	819	573
105	827	579
106	835	584
107	843	590
108	850	595
109	858	601
110	866	606
111	874	612
112	882	617
113	890	623
114	898	628
115	906	634
116	913	639
117	921	645
118	929	650
119	937	656
120	945	662

9. INCH/STEP CONVERSION TABLE

inch	Y	X
0,05	10	7
0,10	20	14
0,15	30	21
0,20	40	28
0,25	50	35
0,30	60	42
0,35	70	49
0,40	80	56
0,45	90	63
0,50	100	70
0,55	110	77
0,60	120	84
0,65	130	91
0,70	140	98
0,75	150	105
0,80	160	112
0,85	170	119
0,90	180	126
0,95	190	133
1,00	200	140
1,05	210	147
1,10	220	154
1,15	230	161
1,20	240	168
1,25	250	175
1,30	260	182
1,35	270	189
1,40	280	196
1,45	290	203
1,50	300	210
1,55	310	217
1,60	320	224
1,65	330	231
1,70	340	238
1,75	350	245
1,80	360	252
1,85	370	259
1,90	380	266
1,95	390	273
2,00	400	280

inch	Y	X
2,05	410	287
2,10	420	294
2,15	430	301
2,20	440	308
2,25	450	315
2,30	460	322
2,35	470	329
2,40	480	336
2,45	490	343
2,50	500	350
2,55	510	357
2,60	520	364
2,65	530	371
2,70	540	378
2,75	550	385
2,80	560	392
2,85	570	399
2,90	580	406
2,95	590	413
3,00	600	420
3,05	610	427
3,10	620	434
3,15	630	441
3,20	640	448
3,25	650	455
3,30	660	462
3,35	670	469
3,40	680	476
3,45	690	483
3,50	700	490
3,55	710	497
3,60	720	504
3,65	730	511
3,70	740	518
3,75	750	525
3,80	760	532
3,85	770	539
3,90	780	546
3,95	790	553
4,00	800	560

inch	Y	X
4,05	810	567
4,10	820	574
4,15	830	581
4,20	840	588
4,25	850	595
4,30	860	602
4,35	870	609
4,40	880	616
4,45	890	623
4,50	900	630
4,55	910	637
4,60	920	644
4,65	930	651
4,70	940	658
4,75	950	665
4,80	960	672
4,85	970	679
4,90	980	686
4,95	990	693
5,00	1000	700
5,05	1010	707
5,10	1020	714
5,15	1030	721
5,20	1040	728
5,25	1050	735
5,30	1060	742
5,35	1070	749
5,40	1080	756
5,45	1090	763
5,50	1100	770
5,55	1110	777
5,60	1120	784
5,65	1130	791
5,70	1140	798
5,75	1150	805
5,80	1160	812
5,85	1170	819
5,90	1180	826
5,95	1190	833
6,00	1200	840