

**LABEL PRINTERS
and
DISPENSERS**
models:

**AH, BH
Dispenser**

**HARDWARE AND PROGRAMMING
MANUAL FOR I/O SIGNALS
EXPANSION BOARD
MK3**



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INTRODUCTION

I/O expansion board for CPU 80.087.5000 allows you to expand the standard 3 I/O signals (StartPrint, PrintEnd e Alarm) to 32 opto-insulated lines (16 IN + 16 OUT); these 32 I/O lines are driven directly by printer/dispenser main CPU.

Input signals control and output signals driving may be programmed by user with a simple sequence of ASCII commands similar to:

```
"DELAY,0,50"
```

```
"IF,2,D"
```

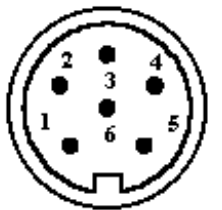
```
"ABORT"
```

```
"OUT,1,E"
```

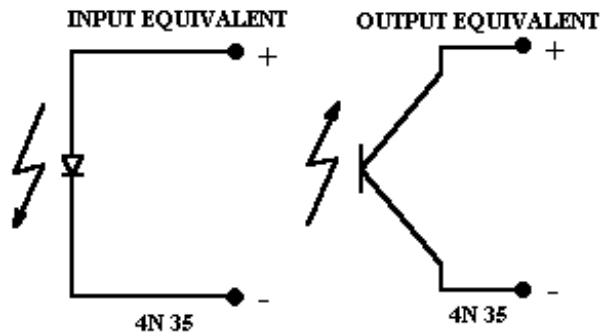
Detailed syntax of commands can be found in “Software programming” chapter.

1. OPTOISOLATED I/O PICK & PLACE SIGNALS

Minimum required I/O signals to synchronize printing system with external devices are located on 6 pins DIN connector.



External front view



If expansion board is equipped with 24V internal additional power supply pins 1,3 and 5 are connected to + pole of diode or transistor; pins 2 and 6 are connected to GND and 24V power supply as shown in underneath table.

1	START PRINT +
2	GND
3	OUTAUX +
4	-
5	PRINT END +
6	24V

WARNING: If expansion board is NOT equipped with internal 24V pick and place connector signals connection is the same explained on main user and programming manual of your printer/dispenser model.

2. OPTOISOLATED INPUT SIGNALS

Input signals, 16 opto-insulated lines, have a photodiode that can be directly tied to 24Vdc signals.

3. OPTOISOLATED OUTPUT SIGNALS

Output signals, 16 opto-insulated lines, have a NPN darlington transistor. They can drive up to 1,5A current when voltage is 24 Volt.

4. CONNECTIONS

Each I/O signal and its ground terminal is available on DB-25 male connectors and are divided as follow:

Connector <u>CN1</u> - DB25 – M			
Pin	Signal	Signal with internal 24V	Notes
1	EXTIN1	EXTIN1	Input 1
2	EXTIN2	EXTIN2	Input 2
3	EXTIN3	EXTIN3	Input 3
4	EXTIN4	EXTIN4	Input 4
5	EXTIN5	EXTIN5	Input 5
6	EXTIN6	INTPOWER	Input 6 / 24V (see JZ, jumpers table)
7	EXTIN7	EXTIN7	Input 7 (see JE, jumpers table)
8	EXTIN8	EXTIN8	Input 8 (see JF, jumpers table)
9	EXTGND	GND	External/internal ground
10	MOT2.1	MOT2.1	Stepper motor n.2, phase1
11	MOT2.2	MOT2.2	Stepper motor n.2, phase2
12	SHIELD	SHIELD	Earth connection of shielded cable
13	EXTGND	GND	External/internal ground
14	EXTOUTC1	EXTOUTC1	Output 1, collector
15	EXTOUTC7	EXTOUTC7	Output 7, collector
16	EXTOUTC2	EXTOUTC2	Output 2, collector
17	EXTOUTC8	EXTOUTC8	Output 8, collector
18	EXTOUTC3	EXTOUTC3	Output 3, collector
19	SENS1	SENS1	Input sensor 1
20	EXTOUTC4	EXTOUTC4	Output 4, collector
21	SENS2	SENS2	Input sensor 2
22	EXTOUTC5	EXTOUTC5	Output 5, collector
23	MOT2.3	MOT2.3	Stepper motor n.2, phase3
24	EXTOUTC6	EXTOUTC6	Output 6, collector
25	MOT2.4	MOT2.4	Stepper motor n.2, phase4

Connector <u>CN2</u> - DB25 - M			
Pin	Signal	Signal with internal 24V	Notes
1	EXTIN13	EXTIN13	Input 13
2	EXTIN14	EXTIN14	Input 14
3	EXTIN15	EXTIN15	Input 15
4	EXTIN16	EXTIN16	Input 16
5	EXTIN9	EXTIN9	Input 9
6	EXTIN10	EXTIN10	Input 10
7	-	-	(see JB, jumpers table)
8	-	-	(see JC, jumpers table)
9	EXTOUTC9	EXTOUTC9	Output 9, collector
10	MOT3.1	MOT3.1	Stepper motor n.3, phase1
11	EXTOUTC10	EXTOUTC10	Output 10, collector
12	SHIELD	SHIELD	Earth connection of shielded cable
13	EXTGND	GND	External/internal ground
14	EXTOUTC11	EXTOUTC11	Output 11, collector
15	EXTIN11	EXTIN11	Input 11
16	EXTOUTC12	EXTOUTC12	Output 12, collector
17	EXTIN12	EXTIN12	Input 12
18	EXTOUTC13	EXTOUTC13	Output 13, collector
19	EXTOUTC14	EXTOUTC14	Output 14, collector
20	EXTOUTC15	EXTOUTC15	Output 15, collector
21	MOT3.2	MOT3.2	Stepper motor n.3, phase2
22	EXTOUTC16	EXTOUTC16	Output 16, collector
23	MOT3.3	MOT3.3	Stepper motor n.3, phase3
24	MOT3.4	MOT3.4	Stepper motor n.3, phase4
25	EXPPOWER	INTPOWER	Esternal/internal +24V power supply

5. INTERNAL JUMPERS SETTING

I/O expansion board may be configured to work with internal printer/dispenser power supply, internal additional power supply or external power supply.

Each output signal and EXTGND signal of CN1 DB-25 may be tied to internal ground by jumpers setting. Photodiodes of input signals may be powered with 5V or 24V by setting of JR jumper.

WARNING: If you are using internal printer/dispenser power supply and ground, optoinsulation is no longer effective: so noise immunity of overall system (printer/dispenser and applicator) may be compromised.

WARNING: If the expansion board is installed in a printer/dispenser with applicator device an additional internal 24V power supply is present for GND and INTPOWER signals. Power supply is therefore internal to printer but anyway CPU optoinsulation is assured.

Jumper	Setting	Signal	Note
JQ	On	GND	Printer/dispenser internal ground
JR	1-2 = 24V internal	INTPOWER	Printer/dispenser power supply
JR	2-3 = 5V internal	INTPOWER	Printer/dispenser power supply
JQ	Off	GND	Additional internal ground
JR	Off	INTPOWER	Additional internal power supply
JQ	Off	EXTGND	External ground
JR	Off	EXPPOWER	External power supply

There are jumpers to set some I/O expansion board options, they change the behaviour of some pins

Jumper	Setting	Signal	Connector and pin
JA	Off	-	Y23.2
JA	On	Encoder	Y23.2
JB	Off	-	CN2.7
JB	On	GND printer/dispenser	CN2.7
JC	Off	-	CN2.8
JC	On	+5V printer/dispenser	CN2.8
JE	1-2	EXTIN7	CN1.7
JE	2-3	+5V printer/dispenser	CN1.7
JF	1-2	EXTIN8	CN1.8
JF	2-3	GND printer/dispenser	CN1.8
JZ	Off	EXTIN6	CN1.6
JZ	On	EXPPOWER	CN1.6

6. SOFTWARE PROGRAMMING

Structure of a program for I/O expansion board signals

I/O expansion board signals are verified by printer during next situations:

- At printer power on (INIT)
- Before beginning printing (BEFORE)
- After finishing printing (AFTER)
- During alarms as end of paper or end of ribbon (ALARM)
- During alarms reset operation

Programming commands for I/O expansion board signals must be included into previous sections (INIT, BEFORE, AFTER, ALARM and ALARMRESET).

The structure of programming commands for I/O expansion board signals must be the one shown in the next table:

?B0&1	To begin applicator INIT cycle programming. Next commands refer to INIT section
...	Commands referring to INIT section
ENDINIT	It ends programming of INIT section. Next commands refer to BEFORE section
...	Commands referring to BEFORE section
ENDBEFORE	It ends programming of BEFORE section. Next commands refer to AFTER section
...	Commands referring to AFTER section
ENDAFTER	It ends programming of AFTER section. Next commands refer to ALARM section
...	Commands referring to ALARM section
ENDALARM	It ends programming of ALARM. Next commands refer to ALARMRESET section
...	Commands referring to ALARMRESET section
ENDALARMRESET	It ends programming of ALARMRESET section and of all I/O expansion board signals

Sections of an I/O signals program

INIT section

All commands contained into INIT section are executed at power on; usually they are used to set a starting initialisation for outputs.

INIT section begins immediately after ?B0&1 command and is ended by ENDINIT command. When it shouldn't be necessary to run any initializing command you must specify ENDINIT into the line immediately after ?B0&1 command.

BEFORE section

All commands contained into BEFORE section are executed just before printing operations start. BEFORE section begins immediately after ENDINIT command and is ended by ENDBEFORE command. When it shouldn't be necessary to run any command before label ejection you must specify ENDBEFORE into the line immediately after ENDINIT command.

AFTER section

All commands contained into AFTER section are executed just after printing operations stop. AFTER section begins immediately after ENDBEFORE command and is ended by ENDAFTER command. When it shouldn't be necessary to run any command after label ejection you must specify ENDAFTER into the line immediately after ENDBEFORE command.

ALARM section

All commands contained into ALARM section are executed each time printer is in an alarm state, such as end of paper or end of ribbon state.

ALARM section begins immediately after ENDAFTER command and is ended by ENDALARM command. When it shouldn't be necessary to run any command during alarm situations you must specify ENDALARM into the line immediately after ENDAFTER command.

ALARMRESET section

All commands contained into ALARMRESET section are executed when an alarm condition is reset. ALARMRESET section begins immediately after ENDALARM command and is ended by ENDALARMRESET command. When it shouldn't be necessary to run any command during alarm reset operation you must specify ENDALARMRESET into the line immediately after ENDALARM command.

List and syntax of commands for I/O expansion board signals

Commands for programming of expansion board I/O signals are the next:

- OUT
- WAIT
- IF
- GOTO
- LABEL
- DELAY
- COUNT
- EXIT
- ABORT
- SEND
- PRINT
- SET
- COMP
- INC
- DEC
- MOD
- SLEEP
- TX

Each of them, when used, must be written in UPPERCASE letters.

Let's see them in detail.

OUT command

Command to enable / disable output signals

OUT,n,s

n	Output channel	1...16
s	status	E = enabled D = disabled

WAIT command

Command to control input signals. Flow control waits until s status is verified on input channel n

WAIT,n,s

n	Input channel	1...16
s	status to check before continuing	E = enabled D = disabled

IF command

Command to control input signals. Flow control executes instruction line immediately after IF command if s status of input channel n is verified, otherwise it will execute command written two lines after IF instruction.

IF,n,s

n	Input channel	1...16
s	status to check	E = enabled D = disabled

In this sample if input channel 3 is enabled, line "GOTO,5" is executed else "EXIT" line is executed.

```
.....  
IF,3,E  
GOTO,5  
EXIT  
LABEL,5  
.....
```

GOTO command

Unconditionated jump command. It executes a jump to specified label label. It needs a corresponding "LABEL,n" instruction for which n = label

GOTO,label

label	label index	0...255
-------	-------------	---------

In this sample if input channel 3 is enabled GOTO,5 is executed else EXIT is executed.

```
.....  
IF,3,E  
GOTO,5  
EXIT
```

LABEL,5

.....

LABEL command

Program label. It marks a point in program flow for a GOTO jump

LABEL,n

n	label index	0...255
---	-------------	---------

In this sample if input channel 3 is enabled GOTO,5 is executed else EXIT is executed.

.....

IF,3,E

GOTO,5

EXIT

LABEL,5

.....

DELAY command

Command for a defined delay. It stops program flow execution for a time equivalent to seconds and hundredth of second.

DELAY,sec,cent

sec	seconds
cent	hundredth of sec

COUNT command

Command to count transitions into Input signals. It waits **ct** times an on/off transition on input channel **n**.

COUNT,n,ct

n	Input
ct	cycles

EXIT command

Command to terminate application cycle. It exits program flow control from any point after a delay equivalent to seconds and hundredth of second.

EXIT,sec,cent

sec	seconds
cent	hundredth of sec

ABORT command

Command to terminate application cycle. It exits program flow control from any point and stops printing operations of current label.

ABORT no parameters

SEND command

This command transmits a string to serial port. Strings can be up to three characters long. If they are shortest than three characters, blanks will be added by printer to complete the length. Printers send always three characters strings.

SEND,sss

sss	String to be sent
-----	-------------------

PRINT command

Command to print another label. It allows to enable / disable printing of another label after the end of running application cycle.

PRINT,s

s	status	E = enabled D = disabled
---	--------	-----------------------------

List and syntax of commands to drive memory variables

It has been defined a commands set to drive up to 26 numeric variables in printer volatile memory. Variables names are already defined and named with 26 UPPERCASE letters of alphabet, from 'A' to 'Z'.

Using one or more memory variable it is possible to build very versatile application cycles.

SET command

Command to set a value in a memory variable

This command to not directly acts on input/output signals but it allows to drive 26 numeric variables used by programmer.

SET,n,v

n	variable name	A...Z
v	value to set	0...65535

COMP command

Command to test numeric variables. Next line under COMP instruction is executed if variable value is equal to v value, if it is not equal instruction 2 lines under COMP command is executed.

COMP,n,v

n	variable name	A...Z
v	value to verify	0...65535

In this sample if C è = 1025 line "GOTO,5" is executed to jump to LABEL,5 else "EXIT" line is executed.

.....

COMP,C,1025

GOTO,5

EXIT

LABEL,5

.....

INC command

Command to increment value stored in memory variables.
This command adds 1 to specified memory variable.

INC,n

n	variable name	A...Z
---	---------------	-------

DEC command

Command to decrement value stored in memory variables.
This command subtracts 1 to specified memory variable.

DEC,n

n	variable name	A...Z
---	---------------	-------

MOD command

Command to get remainder of division for memory numeric variables.
This command allows to store in specified memory variable the remainder of integer division **n/v**.

MOD,n

n	variable name	A...Z
v	divisor	1...65535

i.e.

SET,A,12
MOD,A,3
stores remainder of 12/3 (namely 0) into A variable

SET,A,11
MOD,A,3
stores remainder of 11/3 (namely 2) into A variable

SLEEP command

Command for a delay based on a memory variable. It stops program flow execution for a number of milliseconds stored in specified memory variable.

SLEEP,n

n	variable name	A...Z
---	---------------	-------

TX command

This command transmits numeric contents of specified memory variable to serial port.

TX,n

n	variable name	A...Z
---	---------------	-------

i.e.

SET,Z,1999

TX,Z

transmits string "1999" to serial port

Command to activate I/O signals scanning cycle

To enable instructions programmed into all sections, it's necessary to activate the I/O signals scanning cycle.

Syntax of command is:

?A2&7 , x

x = 0	Scanning cycle disabled
x = 1	Scanning cycle enabled

Settings programmed with this command is stored into permanent memory by printer also during power off.

Example about I/O expansion board signals programming

Control flow for an applicator with 3 electrovalves and 3 sensors .

Signals:

Input 1 = Piston up sensor

Input 2 = Piston down sensor

Input 3 = Label presence sensor

Output 1 = Applicator puff

Output 2 = Piston enable

Output 3 = Label suction

Program sequence

'start programming

?B0&1

'

'I/O init programming

OUT,1,D

OUT,2,D

OUT,3,D

'end of I/O init programming

ENDINIT

'I/O signal control flow BEFORE printing programming

'---- suction

OUT,3,E

'end of I/O signal control flow BEFORE printing programming

ENDBEFORE

'

'I/O signal control flow AFTER printing programming

'wait label under applicator

DELAY,0,50

```

'if no label ABORT application (and eject another label)
IF,3,D
GOTO,3
GOTO,4
'abort mark point
LABEL,3
'---- stop suction
OUT,3,D
ABORT
'
'---- application cycle
LABEL,4
'---- wait piston up
WAIT,1,E
DELAY,0,5
'---- piston enable
OUT,2,E
DELAY,0,5
'---- wait piston down
WAIT,2,E
DELAY,0,5
'---- stop suction
OUT,3,D
'---- enable puff
OUT,1,E
'---- piston off
OUT,2,D
DELAY,0,5
'---- puff off
OUT,1,D
DELAY,0,10
'end of I/O signal control flow AFTER printing programming
ENDAFTER
'
'no command into ALARM section
ENDALARM
'
'no command into ALARMRESET section
ENDALARMRESET
'
'applicator control enable
?A2&7,1

```