

THERMAL & THERMAL TRANSFER LABEL PRINTERS

models:

AH, BH
Dispenser

HARDWARE AND PROGRAMMING MANUAL FOR I/O SIGNALS EXPANSION BOARD



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INTRODUCTION

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

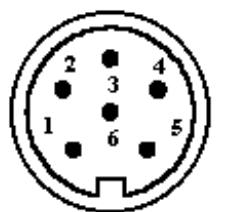
"IF,2,D"

"ABORT"

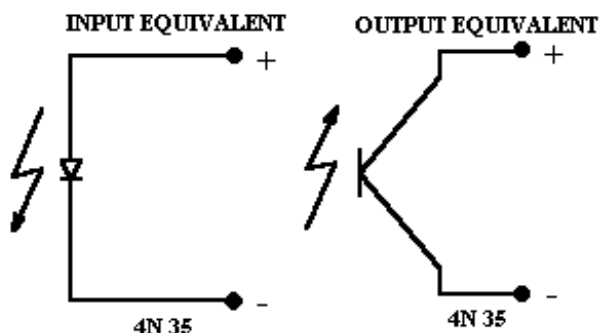
"OUT,1,E"

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



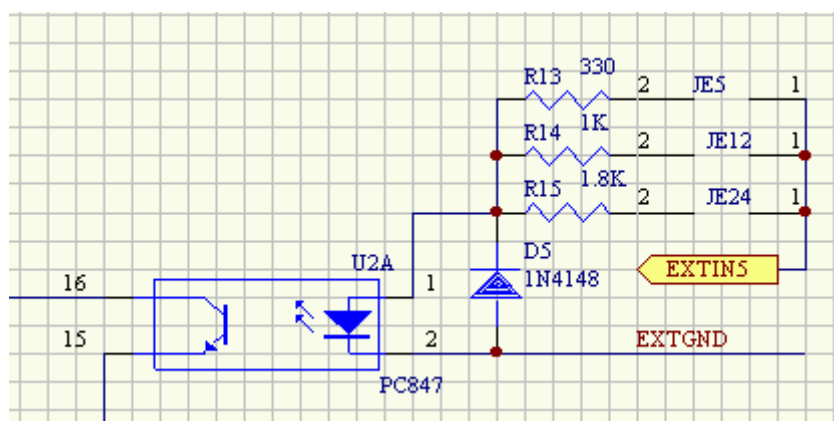
If expansion board is equipped with 24V internal power supply pins 1,3 and 5 are connected to + pole of diode or transistor; pins 2 and 6 are connected to GND and 24V power supply as shown in underneath table.

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 model.

2. OPTOISOLATED INPUT SIGNALS

Input signals, 16 opto-insulated lines, have a photodiode that can be tied to 5V, 12V or 24V external signals; to select the voltage you want to use for each channel you have only to set an internal jumper (see table “Internal Jumpers for Inputs”).

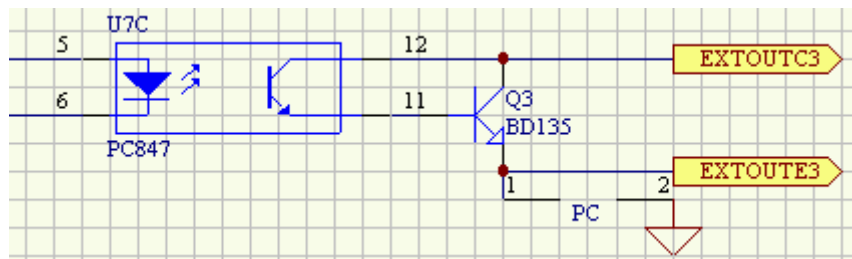


3. OPTOISOLATED OUTPUT SIGNALS

Up to 16 output signals are available.

15 lines are opto-insulated and their outputs have a NPN darlington transistor. They can drive up to 1,5A current when voltage is 24 Volt.

1 line is made by a relay with NC (normally closed) and NO (normally opened) contacts that can support a maximum current equal to 8A-AC/250V-AC or 3A-DC/24V-DC.



3. 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
7	EXTIN7	EXTIN7	Input 7
8	EXTIN8	EXTIN8	Input 8
9	EXTIN9	EXTIN9	Input 9
10	EXTIN10	EXTIN10	Input 10
11	EXTIN11	EXTIN11	Input 11
12	EXTIN12	EXTIN12	Input 12
13	EXTGND	GND	External / internal ground
14	EXTOUTC1	EXTOUTC1	Output 1, collector
15	EXTOUTE1	GND	Output 1, emitter
16	EXTOUTC2	EXTOUTC2	Output 2, collector
17	EXTOUTE2	GND	Output 2, emitter
18	EXTOUTC3	EXTOUTC3	Output 3, collector
19	EXTOUTE3	GND	Output 3, emitter
20	EXTOUTC4	EXTOUTC4	Output 4, collector
21	EXTOUTE4	GND	Output 4, emitter
22	EXTOUTC5	EXTOUTC5	Output 5, collector
23	EXTOUTE5	GND	Output 5, emitter
24	EXTOUTC6	EXTOUTC6	Output 6, collector
25	EXTOUTE6	EXTOUTE6	Output 6, emitter

Connector CN2 - 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	EXTOUTC7	EXTOUTC7	Output 7, collector
6	EXTOUTE7	EXTOUTE7	Output 7, emitter
7	EXTOUTC8	EXTOUTC8	Output 8, collector
8	EXTOUTE8	EXTOUTE8	Output 8, emitter
9	EXTOUTC9	EXTOUTC9	Output 9, collector
10	EXTOUTE9	EXTOUTE9	Output 9, emitter
11	EXTOUTC10	EXTOUTC10	Output 10, collector
12	EXTOUTE10	EXTOUTE10	Output 10, emitter
13	EXTGND	GND	External / internal ground
14	EXTOUTC11	EXTOUTC11	Output 11, collector
15	EXTOUTE11	EXTOUTE11	Output 11, emitter
16	EXTOUTC12	EXTOUTC12	Output 12, collector
17	EXTOUTE12	EXTOUTE12	Output 12, emitter
18	EXTOUTC13	EXTOUTC13	Output 13, collector
19	EXTOUTC14	EXTOUTC14	Output 14, collector
20	EXTOUTC15	EXTOUTC15	Output 15, collector
21	EXTOUTECOM	EXTOUTECOM	Output 13,14,15, emitter
22	EXTOUT16	INTPOWER	Output 16, common relay pin
23	EXTOUT16NO	INTPOWER	Output 16, NO really pin
24	EXTOUT16NC	EXTOUT16NC	Output 16, NC really pin
25	INTPOWER	INTPOWER	Internal power

4. INTERNAL JUMPERS SETTING

I/O expansion board may be configured to work with internal 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, 12V, 24V by proper jumper setting..

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

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

Internal Jumpers for OUTPUTs

Jumper	Signal	Output	Notes
PA	EXTOUTE1	Output 1, emitter	Switched off = external ground Switched on = internal ground
PB	EXTOUTE2	Output 2, emitter	Switched off = external ground Switched on = internal ground
PC	EXTOUTE3	Output 3, emitter	Switched off = external ground Switched on = internal ground
PD	EXTOUTE4	Output 4, emitter	Switched off = external ground Switched on = internal ground
PE	EXTOUTE5	Output 5, emitter	Switched off = external ground Switched on = internal ground
PF	EXTOUTE6	Output 6, emitter	Switched off = external ground Switched on = internal ground
PG	EXTOUTE7	Output 7, emitter	Switched off = external ground Switched on = internal ground
PH	EXTOUTE8	Output 8, emitter	Switched off = external ground Switched on = internal ground
PI	EXTOUTE9	Output 9, emitter	Switched off = external ground Switched on = internal ground
PJ	EXTOUTE10	Output 10, emitter	Switched off = external ground Switched on = internal ground
PK	EXTOUTE11	Output 11, emitter	Switched off = external ground Switched on = internal ground
PL	EXTOUTE12	Output 12, emitter	Switched off = external ground Switched on = internal ground
PM	EXTOUTE13	Output 13, emitter	Switched off = external ground Switched on = internal ground
PN	EXTOUTE14	Output 14, emitter	Switched off = external ground Switched on = internal ground
PO	EXTOUTE15	Output 15, emitter	Switched off = external ground Switched on = internal ground

Internal Jumpers for INPUTs

Jumper	Signal	Input	Notes
JA5, JA12, JA24	EXTIN1	Input 1	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JB5, JB12, JB24	EXTIN2	Input 2	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JC5, JC12, JC24	EXTIN3	Input 3	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JD5, JD12, JD24	EXTIN4	Input 4	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JE5, JE12, JE24	EXTIN5	Input 5	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JF5, JF12, JF24	EXTIN6	Input 6	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JG5, JG12, JG24	EXTIN7	Input 7	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JH5, JH12, JH24	EXTIN8	Input 8	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JI5, JI12, JI24	EXTIN9	Input 9	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JJ5, JJ12, JJ24	EXTIN10	Input 10	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JK5, JK12, JK24	EXTIN11	Input 11	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JL5, JL12, JL24	EXTIN12	Input 12	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JM5, JM12, JM24	EXTIN13	Input 13	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JN5, JN12, JN24	EXTIN14	Input 14	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JO5, JO12, JO24	EXTIN15	Input 15	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JP5, JP12, JP24	EXTIN16	Input 16	Switch on one of Jx5 = 5V, Jx12 = 12V, Jx24 = 24V
JQ	EXTGND	Internal / External ground	Switched off = external ground Switched on = internal ground
JR	INTPOWER	Internal power	1-2 = 20V internal 2-3 = 5V internal

5. 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 shorter 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 = 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

```