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PROFESSIONAL TIMING

**PTB605**

# **Transmission Protocol**

**version 13**

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TAG Heuer Professional Timing  
14a, Av. des Champs-Montants  
2074 Marin – Switzerland

[www.tagheuer-timing.com](http://www.tagheuer-timing.com)  
[info@tagheuer-timing.com](mailto:info@tagheuer-timing.com)

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## 2. Introduction

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The document called "PTB605 – Transmission Protocol v13 " describes to the detail the choice and implementation of the protocol between a PC and the PTB605 timing device. All commands used in the protocol are described in this document.

## 3. Analysis of the commands

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After analysing all commands used in the protocol very deeply, it was found out that they are to be classified in different categories. In fact, there are 4 categories of different types of commands.

*Query Commands (demand of information from the PC to the PTB)*

*Control Commands (order from the PC to the PTB)*

*Paramter Commands (PTB parameter configuration through PC)*

*Link Commands (redirection between the Printer and Display ports)*

The notion of category will be used again when we define the data frames.

## 4. Frame definition

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The choice of the used types of frames has been based upon different criteria as stated hereunder :

*Memory space at disposal on PTB (RAM + ROM)*

*Default type compared to existing protocols*

*Resistance in case of transmission errors*

*User friendlyness for a PC software programmer*

### **Delimiters**

First of all, making the protocol of default type allows for choosing a certain frame format. Defining a frame format consists in always having a frame start and a frame finish. Whilst choosing a standard frame format also needed to be taken into account the fact that the PTB had limited memory capacities. Though was found out that most standard frame formats had a frame start called STX (Start of TeXt) and a frame finish called ETX (End of TeXt).

This is why any command sent from the PC will have the following format :

STX	...	ETX
-----	-----	-----

## Checksum

In order to obtain a solid resistance against transmission errors, an error control and correction system needs to be set up. Seen the limited capacities of the PTB, only the error control could be realised. In order to equally correct transmission errors, the frame would need to be much heavier.

Controlling of errors will, for that reason, be done by a "Checksum" principle. This system will add all bytes of a frame. In order to place such a result in one byte only, a modulo 256 operation will be done.

This CS principle guarantees for enough reliability for the demanded applications.

So a command containing the "Checksum" will have the following format :

STX	...	CS	ETX
-----	-----	----	-----

## Command categories

As already described, command analysis allowed for defining the 4 different types of commands. There are query commands (**Q**uery), control commands (**C**ontrol), parameter commands (**P**arameters) and link commands (**L**ink). The first character of any command specifies its category. In ASCII format, this character is coded on 1 byte. This is why you will find the following 4 possible frames :

STX	'Q'	control bytes...	CS	ETX
STX	'C'	control bytes...	CS	ETX
STX	'P'	control bytes...	CS	ETX
STX	'L'	control bytes...	CS	ETX

## 5. Frame delivery report

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Always in the same precaution of having maximum solidity, the sending of a "Checksum" is not enough. It is also necessary to know if the PTB has received the command. For this, the PTB needs to send a delivery report.

When the PTB receives a frame, it will be analyzed and the received "Checksum" is compared to the "Checksum" calculated by the PTB. If this value is identical and the PTB recognises the command, it will respond with a delivery report **ACK** (**ACK**nowledge = 0x06). However, in case of errors, the PTB will return a delivery report **NACK** (**N**ot **ACK**nowledged = 0x15).

It is very important to know that the PTB works in software flow control mode, better known under the name "XON - XOFF". When the PTB is in XOFF mode, the frame sent by the PC will always be interpreted and, if possible, the command is executed. This means that the **ACK** and **NACK** delivery reports will automatically be sent to the PC (without waiting for the next XON).

## 6. Limits

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Problems may still appear. In fact, if the frame finish character (ETX) is transmitted with an error, the PTB will not know that the frame is finished. It will infinitely wait for the ETX character in order to return the delivery report. In order to respond to this situation, the programmer needs to take this into account. Herefor, a "timeout" needs to be implemented. Minimum timeout delay must be of 50 milliseconds. In fact, when a command is sent to the PTB, the PTB will need a certain amount of time to interpret and execute. Beyond this delay, this command needs to be repeated. Note that this 50 millisecond delay is a minimum and that bigger delays can naturally be used.

Particular attention needs to be paid to the parameter commands. When a parameter command, such as `Parameter Set Date and Time`, is sent, there will be no control of the hard values transmitted. If, for example, an eronous month is transmitted and the checksum is correct, this value will be accepted by the PTB. These values cannot be controlled by the PTB for reason of limited memory space. The 3 commands that can be concerned by this particular specialty (out of range) are :

*Parameter Input X LockTime*

*Parameter Printer Accuracy*

*Parameter Set Date and Time*

## 7. PTBdll.dll

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In order to help all programmers wishing to develop their own software applications, and to perfectly manage all communication aspects of the PTB605, TAG Heuer has develloped an interface called PTBdll.dll. This file is at disposal of all software programmers who wish to communicate with the PTB. It manages all frames sent to, and received from the PTB (data flow), as well as all timeout matters. The dll will control if frames need to be repeated to the PTB in case of [NAK] returns.

Feel free to contact your Official Agent or TAG Heuer Professional Timing in Switzerland ([info@tagheuer-timing.com](mailto:info@tagheuer-timing.com)) to receive this worthwhile help **free of charge !**

## 8. Physical transmission parameters

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The serial PC port of the PTB605 is configured for functioning with following parameters :

*Speed : 9'600 Bauds*

*Parity Bit : none*

*Stop Bit : 1*

*Flow Control : Software (XON – XOFF)*

By default, when turning on the PTB, the flow control status is activated. This means that all characters transmitted by the PTB are directly sent to the serial PC port.

### **Note**

The older command which allowed for modifying transmission speed to 19'200 Bauds got skipped. In fact, this transfer mode is impossible when characters need to be transferred to the printer or to a display, as input speed is much higher than output speed. A buffer would be needed in order to manage this option, which is not possible with the material resources of the PTB.

## 9. Command definition

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The list on the following pages describes, in detail, all commands interpreted by the PTB605. For each command, the frame as well as the returned frame(s) is (are) specified.

## Query – Date

### Definition

The PC user wishes to know current date and time of the PTB.

### Frame from PC to PTB to know current date and time :

STX	'Q'	'D'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'Q' = 0x51 query command  
'D' = 0x44 date query  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Return from PTB to PC without transmission error, european format :

ACK	'P'	'D'	J	J	M	M	A	A	h	h	m	m	s	s	' '
' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR

ACK = 0x06 OK command  
'P' = 0x50 parameter information  
'D' = 0x44 EURO date information  
J-J = ASCII current day, 2 bytes  
M-M = ASCII current month, 2 bytes  
A-A = ASCII current year, 2 bytes  
h-h = ASCII current hour, 2 bytes  
m-m = ASCII current minutes, 2 bytes  
s-s = ASCII current seconds, 2 bytes  
' ' = 0x20 spaces, 16 bytes  
<CR> = 0x0D (end of message)

### Return from PTB to PC without transmission error, US format :

ACK	'P'	'd'	M	M	J	J	A	A	h	h	m	m	s	s	' '
' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR

ACK = 0x06 OK command  
'P' = 0x50 parameter information  
'd' = 0x64 US date information  
M-M = ASCII current month, 2 bytes  
J-J = ASCII current day, 2 bytes  
A-A = ASCII current year, 2 bytes  
h-h = ASCII current hour, 2 bytes  
m-m = ASCII current minute, 2 bytes  
s-s = ASCII current second, 2 bytes  
' ' = 0x20 spaces, 16 bytes  
<CR> = 0x0D (end of message)

### Note

The type of the returned message depends on which format the PTB is programmed in.

## Query – Memory

### Definition

The PC user wishes to know available memory space of the PTB.

### Frame from PC to PTB to know available memory space :

STX	'Q'	'M'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'Q' = 0x51 query command  
'M' = 0x4D memory query  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Return from PTB to PC without transmission error :

ACK	'P'	'M'	x	x	x	x	x	' '	' '	' '	' '	' '	' '	' '	' '	' '
' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR

ACK = 0x06 OK command  
'P' = 0x50 parameter information  
'M' = 0x4D memory information  
x = ASCII available memory, coded on 5 bytes  
' ' = 0x20 spaces, 23 bytes  
<CR> = 0x0D (end of message)



## Query – Parameters

### Definition

The PC user wishes to know status of the different programmable parameters of the PTB.

**Frame from PC to PTB to know parameters status :**

STX	'Q'	'P'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
 'Q' = 0x51 query command  
 'P' = 0x50 parameters query  
 CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
 ETX = 0x03 frame finish

**Return from PTB to PC of the 14 parameters without transmission error :**

ACK	'P'	'D'	J	J	M	M	A	A	h	h	m	m	s	s	' '	
' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'C'	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'L'	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'P'	p	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'K'	'1'	u1	x1	x1	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'K'	'4'	u4	x4	x4	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'K'	'O'	uo	xo	xo	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'E'	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'B'	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'B'	'A'	'T'	'T'	'E'	'R'	'Y'	'O'	'K'	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'S'	x	x	x	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'M'	y	y	y	y	y	' '	' '	' '	' '	' '	' '	' '	' '	' '	CR
'P'	'R'	'I'	'N'	'T'	'E'	'R'	'O'	'F'	'F'	' '	' '	' '	' '	' '	' '	CR
'I'	'D'	z	z	z	z	'N'	'o'	' '	' '	' '	' '	' '	' '	' '	' '	CR

ACK = 0x06 OK command  
 'P' = 0x50 parameter information  
 'D' = 0x44 date parameter  
 'C' = 0x43 PC serial port parameter (always 9'600 bauds)  
 'L' = 0x4C display parameter (RT or OFF)  
 'P' = 0x50 printer accuracy parameter  
 'K' = 0x4B locktime parameter for each canal  
 'E' = 0x45 input 5 – 16 blocking parameter  
 'B' = 0x42 accoustic signal parameter  
 'S' = 0x53 current session parameter  
 'M' = 0x4D memory parameter  
 zzzz = ASCII devices' serial number parameter  
 <CR> = 0x0D (end of message)

**Note**

Each information frame contains 31 bytes, CR included. The field indicated [...] stands for the number of spaces to obtain 31 bytes. The battery [OK] or [LOW] and printer status [ON] or [OFF] are directly legible.

For further details on these information frames, please consult the parameter commands.

## Parameter – Buzzer ON/OFF

### Definition

The PC user wishes to turn on or to turn off the accoustic signal of the PTB.

### Frame from PC to PTB to activate the accoustic signal :

STX	'P'	'B'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'P' = 0x50 parameter command  
'B' = 0x42 buzzer parameter activated (ON)  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Frame from PC to PTB to deactivate the accoustic signal :

STX	'P'	'b'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'P' = 0x50 parameter command  
'b' = 0x62 buzzer parameter deactivated (OFF)  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Return from PTB to PC without transmission error (in both cases) :

ACK
-----

ACK = 0x06 OK command

## Parameter – Enable / Disable Inputs 5 – 16

### Definition

The PC user wishes to activate or deactivate inputs 5 – 16 of the PTB.

### Frame from PC to PTB to activate inputs 5 – 16 :

STX	'P'	'E'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'P' = 0x50 parameter command  
'E' = 0x45 parameter inputs enabled  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Frame from PC to PTB to deactivate inputs 5 – 16 :

STX	'P'	'e'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'P' = 0x50 parameter command  
'e' = 0x65 parameter inputs disabled  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Return from PTB to PC without transmission error (in both cases) :

ACK
-----

ACK = 0x06 OK command

## Parameter – Locktime Input X

### Definition

The PC user wishes to modify locktime of an input on the PTB.

### Frame from PC to PTB to modify a locktime :

STX	'P'	'K'	x	y	z	z	CS	ETX
-----	-----	-----	---	---	---	---	----	-----

STX = 0x02 frame start  
'P' = 0x50 parameter command  
'K' = 0x4B parameter locktime  
x = ASCII chosen input, [1 | 4 | 0], see note  
y = ASCII chosen resolution, [S | D], see note  
z-z = ASCII blocking value, 2 bytes, [00 . . 99], see note  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Return from PTB to PC without transmission error :

ACK
-----

ACK = 0x06 OK command

### Note

The chosen input, on which locktime should be modified, can have following values '1' (0x31) for input 1, '4' (0x34) for input 4 or 'O' (0x4F) for all other inputs.

The chosen resolution, in which locktime should be specified, can have following values 'S' (0x53) for seconds or 'D' (0x44) for tenths of seconds.

The blocking value, expressed in ASCII must be comprised between '00' and '99'. Nevertheless, it is interesting to see that a value of 00 seconds gives a blocking of 10 milliseconds, and a value of 00 milliseconds gives the minimum blocking (about 1 millisecond).

## Parameter – Printer Accuracy

### Definition

The PC user wishes to modify printing accuracy on the PTB Printer.

### Frame from PC to PTB to modify printing accuracy :

STX	'P'	'P'	x	CS	ETX
-----	-----	-----	---	----	-----

STX = 0x02    frame start  
'P' = 0x50    parameter command  
'P' = 0x50    parameter printer accuracy  
x = ASCII    accuracy digits,[0 . . 4], see note  
CS = SUM    checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03    frame finish

### Return from PTB to PC without transmission error :

ACK
-----

ACK = 0x06    OK command

### Note

The number of digits for accuracy, expressed in ASCII, can have following values, standing for accuracy from a second to 1/10'000<sup>th</sup> of a second.

x	accuracy
0	1 second
1	1/10 sec.
2	1/100 sec.
3	1/1'000 sec.
4	1/10'000 sec.

## Parameter – Running Time on Display ON/OFF

### Definition

The PC user wishes to activate or deactivate showing of running time on the display connected to the PTB.

### Frame from PC to PTB to activate running time on display :

STX	'P'	'L'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'P' = 0x50 parameter command  
'L' = 0x4C parameter running time activated (1/10 second)  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Frame from PC to PTB to deactivate running time on display :

STX	'P'	'l'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'P' = 0x50 parameter command  
'l' = 0x6C parameter running time deactivated (OFF)  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Return from PTB to PC without transmission error :

ACK
-----

ACK = 0x06 OK command

### Note

In "Running Time Activated" mode, the display receives frames every 1/10 of a second. These frames are of following format :

'R'	' '	H	H	':'	M	M	':'	S	S	'.'	D	CR
-----	-----	---	---	-----	---	---	-----	---	---	-----	---	----

'R' = 0x02 running time frame start  
' ' = 0x20 space  
H-H = ASCII running hour  
M-M = ASCII running minute  
S-S = ASCII running second  
D = ASCII running tenths of a second  
CR = SUM running time frame finish

In "Running Time Deactivated" mode, the display does not receive anything. She can be used with link commands.

## Parameter – Serial Number

### **Definition**

The PC user wishes to modify the serial number of the PTB.

### **Frame from PC to PTB to modify the serial number :**

STX	'P'	'N'	x	x	x	x	CS	ETX
-----	-----	-----	---	---	---	---	----	-----

STX = 0x02    frame start  
'P' = 0x50    parameter command  
'N' = 0x4E    parameter serial number  
xxxx = ASCII    serial number, coded on 4 bytes ASCII  
CS = SUM    checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03    frame finish

### **Return from PTB to PC without transmission error :**

ACK
-----

ACK = 0x06    OK command

### **Note**

The serial number can be composed of any ASCII character chain, except for STX or ETX.



## Parameter – Set Date and Time

### Definition

The PC user wishes to modify date and/or time of the PTB.

### Frame from PC to PTB to modify date and/or time (european format) :

STX	'P'	'D'	J	J	M	M	A	A	h	h	m	m	CS	ETX
-----	-----	-----	---	---	---	---	---	---	---	---	---	---	----	-----

STX	=	0x02	frame start
'P'	=	0x50	parameter command
'D'	=	0x44	EURO format date parameter
J-J	=	ASCII	current day, coded on 2 bytes ASCII
M-M	=	ASCII	current month, coded on 2 bytes ASCII
A-A	=	ASCII	current year, coded on 2 bytes ASCII
h-h	=	ASCII	current hour, coded on 2 bytes ASCII
m-m	=	ASCII	current minute, coded on 2 bytes ASCII
CS	=	SUM	checksum, modulo 256 sum of bytes between STX and CS
ETX	=	0x03	frame finish

### Frame from PC to PTB to modify date and/or time (US format) :

STX	'P'	'd'	M	M	J	J	A	A	h	h	m	m	CS	ETX
-----	-----	-----	---	---	---	---	---	---	---	---	---	---	----	-----

STX	=	0x02	frame start
'P'	=	0x50	parameter command
'D'	=	0x44	EURO format date parameter
M-M	=	ASCII	current month, coded on 2 bytes ASCII
J-J	=	ASCII	current day, coded on 2 bytes ASCII
A-A	=	ASCII	current year, coded on 2 bytes ASCII
h-h	=	ASCII	current hour, coded on 2 bytes ASCII
m-m	=	ASCII	current minute, coded on 2 bytes ASCII
CS	=	SUM	checksum, modulo 256 sum of bytes between STX and CS
ETX	=	0x03	frame finish

### Return from PTB to PC without transmission error :

ACK	'N'	x	x	x	x	' '	'S'	Y	Y	Y	' '	' '	' '	' '	' '
J	J	':'	M	M	':'	A	A	' '	'P'	'r'	' '	'O'	'f'	'f'	CR

ACK	=	0x06	OK command
'N'	=	0x4E	serial number information
xxxx	=	ASCII	serial number coded on 4 bytes ASCII
'S'	=	0x53	current session information
YYY	=	ASCII	current session coded on 3 bytes ASCII
J-J	=	ASCII	current day
M-M	=	ASCII	current month
A-A	=	ASCII	current year
CR	=	0x0D	(end of message)

### Note

In US mode, the return frame of the PTB has JJ and MM inverted (like the command frame). Printer status is shown entirely (Pr On or Pr Off).

## Control – Default

### Definition

The PC user wishes to set all PTB parameters to default.

### Frame from PC to PTB to parameters to default :

STX	'C'	'D'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02    frame start  
'C' = 0x43    control command  
'D' = 0x44    set parameters to default control  
CS = SUM      checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03    frame finish

### Return from PTB to PC without transmission error :

ACK
-----

ACK = 0x06    OK command

### Note

Default parameters are :

- display without running time
- printer accuracy to the 1/1'000<sup>th</sup> of a second
- blocking time input 1 = 1 second
- blocking time input 4 = 0.5 second
- blocking time other inputs = 0.5 seconds
- inputs 5 – 16 activated
- accoustic signal activated
- european date format

## Control – Session

### Definition

The PC user wishes to create a new session on the PTB.

### Frame from PC to PTB to create a new session :

STX	'C'	'S'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02    frame start  
 'C' = 0x43    control command  
 'S' = 0x53    new session control  
 CS = SUM      checksum, modulo 256 sum of bytes between STX and CS  
 ETX = 0x03    frame finish

### Return from PTB to PC without transmission error :

ACK	'N'	s	s	s	s	' '	'S'	x	x	x	' '	' '	' '	' '	' '
J	J	:	M	M	:	A	A	' '	'P'	'r'	' '	'O'	'n'	' '	CR

ACK = 0x06    OK command  
 'N' = 0x4E    new session information  
 ssss = ASCII    serial number coded on 4 bytes ASCII  
 'S' = 0x53    session information  
 xxx = ASCII    session number coded on 3 bytes ASCII  
 J-J = ASCII    current day in EURO format coded on 2 bytes ASCII  
 M-M = ASCII    current month in EURO format coded on 2 bytes ASCII  
 A-A = ASCII    current year coded on 2 bytes ASCII  
 CR = 0x0D    (end of message)

### Note

In US mode, the return frame of the PTB has JJ and MM inverted (like the command frame).  
 Printer status is shown entirely (Pr On or Pr Off).

## Control – Upload

### Definition

The PC user wishes to receive the entire memory of the PTB.

### Frame from PC to PTB to receive memory :

STX	'C'	'U'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
 'C' = 0x43 control command  
 'U' = 0x55 PC memory upload control  
 CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
 ETX = 0x03 frame finish

### Return from PTB to PC without transmission error :

ACK
-----

ACK = 0x06 OK command

### Note

After the delivery report [ACK], all frames in the memory are sent to the PC. These frames can have 3 different formats :

#### - Session frames (31 bytes), including CR :

'N'	x	x	x	x	' '	'S'	y	y	y	' '	' '	' '	' '	' '	H
H	':'	M	M	':'	S	S	' '	'P'	'r'	' '	'O'	'f'	'f'	CR	

This information is identical to those returned after a Set Date and Time command.

#### - Synchronisation frames (31 bytes), including CR :

'S'	x	x	x	x	' '	' '	' '	' '	' '	' '	' '	' '	' '	' '	H
H	':'	M	M	':'	S	S	'.'	d	c	m	dd	cc	mm	CR	

'S' = 0x53 synchronisation information  
 xxxxx = ASCII devices' serial number information

Times are in hours, minutes and seconds. The bytes from 1/10<sup>th</sup> to 1/1'000'000 are at '0'.

- *Time frames (31 bytes), including CR :*

'T'	' '	' '	' '	' '	' '	x	x	x	x	x	' '	y	y	' '	H
H	':'	M	M	':'	S	S	'.'	d	c	m	dd	cc	mm	CR	

'T' = 0x54 time information

x..x = ASCII impulse numbering on the measured input, coded on 5 bytes ASCII

yy = ASCII measured input, coded on 2 bytes ASCII, '01' to '16' for external inputs and 'M1' to 'M4' for manual inputs

d = ASCII shows the 1/10 of a second

c = ASCII shows the 1/100 of a second

m = ASCII shows the 1/1'000 of a second

dd = ASCII shows the 1/10'000 of a second

cc = ASCII shows the 1/100'000 of a second

mm = ASCII shows the 1/1'000'000 of a second

## Control – Upload and Print

### Definition

The PC user wishes to receive the entire memory of the PTB. In parallel, the memory upload will be printed on the PTB Printer.

### Frame from PC to PTB to receive memory with printing :

STX	'C'	'A'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02    frame start  
'C' = 0x43    control command  
'A' = 0x41    PC memory upload and print control  
CS = SUM      checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03    frame finish

### Return from PTB to PC without transmission error :

ACK
-----

ACK = 0x06    OK command

### Note

After the delivery report [ACK], all frames in the memory are sent to the PC and are printed. These frames can have 3 different formats :

- *Session frames (31 bytes), including CR (see Control – Upload description)*
- *Synchronisation frames (31 bytes), including CR (see Control – Upload description)*
- *Time frames (31 bytes), including CR (see Control – Upload description)*

## Control – Clear Memory

### Definition

The PC user wishes to erase the entire memory of the PTB.

**Frame from PC to PTB to completely erase of the memory :**

STX	'C'	'C'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02    frame start  
 'C' = 0x43    control command  
 'C' = 0x43    erase memory control  
 CS = SUM      checksum, modulo 256 sum of bytes between STX and CS  
 ETX = 0x03    frame finish

**Return from PTB to PC without transmission error :**

ACK	'N'	s	s	s	s	' '	'S'	'0'	'0'	'1'	' '	' '	' '	' '	' '
J	J	:	M	M	:	A	A	' '	'P'	'r'	' '	'O'	'n'	' '	CR

ACK = 0x06    OK command  
 'N' = 0x4E    new session information  
 ssss = ASCII    devices' serial number coded on 4 bytes ASCII  
 'S' = 0x53    session information  
 001 = ASCII    session number coded on 3 bytes ASCII (always session 1 after erasing memory)  
 J-J = ASCII    current day EURO format, coded on 2 bytes ASCII  
 M-M = ASCII    current month EURO format, coded on 2 bytes ASCII  
 A-A = ASCII    current year, coded on 2 bytes ASCII  
 CR = 0x0D    (end of message)

### Note

In US mode, the return frame of the PTB has JJ and MM inverted (like the command frame). Printer status is shown entirely (Pr On or Pr Off). The first session after a memory erasement is of course number 1.

## Link – Printer

### **Definition**

The PC user wishes to direct all characters coming from the PC directly to the PTB Printer. The PTB works like an intermediate passing point in this configuration.

### **Frame from PC to PTB to completely erase of the memory :**

STX	'L'	'P'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02    frame start  
'L' = 0x4C    link command  
'P' = 0x50    link to printer  
CS = SUM    checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03    frame finish

### **Return from PTB to PC without transmission error :**

ACK
-----

ACK = 0x06    OK command

### **Note**

After the delivery report [ACK], **all** characters sent from the PC are redirected to the printer. No other command can be sent to the PTB, except for the end-of-link command (Link Off). Of course, the PTB will not give any response [ACK] or [NAK] while functioning in redirected mode, only an [ACK] will be returned when a Link Off command is received without any transmission error.



## Link – Line

### Definition

The PC user wishes to direct all characters coming from the PC to the display output of the PTB. The PTB works like an intermediate passing point in this configuration.

### Frame from PC to PTB to completely erase of the memory :

STX	'L'	'L'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02 frame start  
'L' = 0x4C link command  
'L' = 0x4C link to display  
CS = SUM checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03 frame finish

### Return from PTB to PC without transmission error :

ACK
-----

ACK = 0x06 OK command

### Note

After the delivery report [ACK], **all** characters sent from the PC are redirected to the display output of the PTB. No other command can be sent to the PTB, except for the end-of-link command (Link Off). Of course, the PTB will not give any response [ACK] or [NAK] while functioning in redirected mode, only an [ACK] will be returned when a Link Off command is received without any transmission error.

If the display output is configured in running time mode, running time will automatically stop when this command (link to display) is sent. As soon as it returns to normal mode, after a Link Off command, running time will again be sent to the display output.

## Link – Off

### Definition

The PC user wishes to return to normal mode after sending a "Link Printer" or "Link Line" command.

### Frame from PC to PTB to return to normal :

STX	'L'	'X'	CS	ETX
-----	-----	-----	----	-----

STX = 0x02    frame start  
'L' = 0x4C    link command  
'X' = 0x58    link off  
CS = SUM    checksum, modulo 256 sum of bytes between STX and CS  
ETX = 0x03    frame finish

### Return from PTB to PC without transmission error :

ACK
-----

ACK = 0x06    OK command

### Note

No error control exists on this command. If any error occurred whilst sending this command to the PTB, the command will simply be redirected to the printer or the display.

The Link Off command is a bit particular because not all characters are sent to the printer or the display. When sent to a printer or a display, the [ETX] character is automatically replaced by a [CAN] cancel character. This character allows for neglecting the preceding characters. This should be the same for the printer as well as for any used displays.

If the display output should be configured in running time mode, running time will automatically continue when this command (Link Off) is received.