



TAGHeuer
PROFESSIONAL TIMING

TAG Heuer
branch of LVMH Swiss Manufactures
SA
Dept Timing
Rue Louis-Joseph Chevrolet 6A
CH-2300 La Chaux-de-fonds
Tel : + 41 (0) 32 919 80 00
Fax : +41 (0) 32 919 90 26
www.tagheuer-timing.com

TAG Heuer Communication Protocol 08

THCOM08



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1 Versions

Version	Date	Author	Description	Approved
2.00	24.04.2011	Y. Favre		
2.01	11.06.2011	Y. Favre	HL975 messages added	
2.02	12.04.2012	Y. Favre		
2.03	08.08.2012	Y. Favre	Messages added for Remote Ctrl	
2.04	11.03.2013	Y. Favre		
2.05	18.05.2014	Y. Favre	CP545 + Add Message for HL940	
2.06	08.10.2014	Y.Favre	Messages UN & PW removed	



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3 Protocol THCOM08

The protocol THCOM08 (TagHeuer Communication 2008) is an evolution of older protocols used in TagHeuer Timekeeping devices, and is implemented on all new generation devices (CP540, CP545, HL440, HL940, HL975 ...).

This new protocol allows the standardization of the communication between devices. A set of common commands to all devices as well as specific application oriented commands are implemented. The protocol was first implemented in 2008 for RS232 and Ethernet communication interface. However since GPRS communication and multi devices control were added to the specification, the basic protocol was not sufficient to cope with the new requirements. For this reason an extended version has been implemented. In the document, the word 'basic' will refer to the original THCOM08 version and 'Extended' to the improved version.

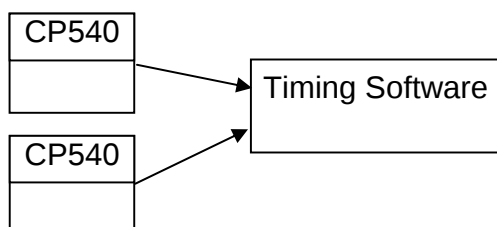
3.1 Supported devices

The following devices are compatible with the THCOM08 protocol:

- CP540 (Chronoprinter)
- CP545 (Chronoprinter)
- HL440 (Minitimer)
- HL940 (Clock)
- HL975 (Mini Display Line)

3.2 Topology

The basic communication protocol implemented in each timekeeping devices is a point to point topology. Therefore if a full control of the device is required, a direct connection to a PC application is required.

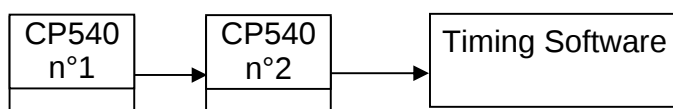




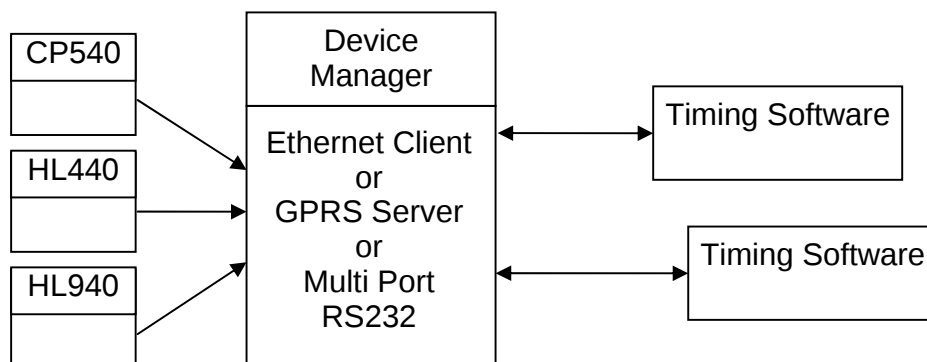
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It is still possible to chain two devices in RS232 as CP540, HL440... however only the device connected to the PC application (n°2) can be fully controlled. The device n°1 will just send its time to the n°2.



In order to allow computer applications to control more than one remote device, an extended frame has been defined.



On the diagram here above, Timing applications have access to each Time keeping devices through a Devices Manager which act as a router (can be GPRS server for example). In the extended protocol, the source and destination addresses have been included in the frame, thus allowing the Device Manager correct frame to dedicated device.



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4 Frame format

4.1 Basic frame

For RS232: [Data] + TAB + CS16 + CR + LF
For Ethernet: [Data] + CR + LF

Data : See messages description chapter 7
TAB : Checksum separator = 0x09
CR : 0x0D
LF : End of frame = 0x0A
CS16 : 16 bits Checksum coded in 4 digits (hexadecimal format).

CS16 is the sum of all byte in the [Data] field (except the char '#' if present).
The result in Hexadecimal is appended to the frame as 4 ASCII digits.
CS16 is optional, so if it is omitted (end of frame = TAB + CR + LF) the frame is accepted without checksum control.

Example: Let assume we want to print out the text 'Hello'

#PL Hello<TAB><CS16><CR><LF>

Data :

P = 0x50	L = 0x4C	Space = 0x20	H = 0x48	e = 0x65	l = 0x6C	l = 0x6C	o = 0x6F
----------	----------	--------------	----------	----------	----------	----------	----------

Sum = 02B0 (hexadecimal) = CS16

Frame:

#	P	L		H	e	l	l	o	<TAB>	0	2	B	0	<CR>	<LF>
0x23	0x50	0x4C	0x20	0x48	0x65	0x6C	0x6C	0x6F	0x09	0x30	0x32	0x42	0x30	0x0D	0x0A



4.2 Extended frame

Each frame receives a number [NB] which is valid only between the transmitter and receiver of the transport Layer. For example if a data frame is send from device A to device C via a server B. Each connection A-B and B-C will used its own numbering. Frame number must be increased by one for each new frame, and be reset to initial when the maximum value is reached.

!!! The maximal value depends of the transmitter and might not be always 255.

The frame acknowledge is also limited to the connection between the transmitter and receiver of the transport Layer (A-B or B-C in the example above).

All GPRS extended frames start with STX (0x02).

!!! It was not possible to keep the same start of frame character for device to device communication because of the possible interaction with other protocols already used as THDIS08 or HL960. Therefore the character STX2 (0x10) will be used instead.

Data frame:

STX/STX2 + NB + PROT + SRC + DEST + [Param] + SEP + [Data] + TAB + CKA + CKB + CR + LF

Acknowledge frame:

SAK + NB + CR + LF

STX	: Start of data frame = 0x02 (For GPRS frames)
or STX2	: Start of data frame = 0x10 (For Device to Device or PC frames)
SAK	: Start of acknowledge frame = 0x05
NB	: Frame number (000 – 255 over 3 digits)
PROT	: Protocol used in the [Data] field
	1 = THCOM08
	2 = Transponder
	3 = THDIS08
SRC	: Source address TDDDD (5 digits)
DEST	: Destination address TDDDD (5 digits)
	T : Device type
	0 = Broadcast (DEST only) ,
	1 = CP540
	2 = HL440
	3 = HL940
	4 = HL975
	5 = CP545
	P = PC
	D : Device ID
	0000 = Broadcast (DEST only)
	0001 – 9999 = Device ID
Param	: List of parameters for future used (size is not defined)
SEP	: Data separator = 0x04
Data	: See messages description chapter 7
TAB	: Checksum separator = 0x09
CR	: 0x0D
LF	: End of frame = 0x0A
CKA	: 1 byte Checksum coded in 2 digits (hexadecimal format).
CKB	: 1 byte Checksum coded in 2 digits (hexadecimal format).



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CKA and CKB are compute using the following algorithms:

```
Byte CKA = 0, CKB = 0  
  
For (I=0; I<N; I++)  
{  
    CKA = CKA + Buffer[I]  
    CKB = CKB + CKA  
}  
  
Buffer[0 .. N] = all bytes between STX and TAB
```

Note: CKA and CKB are optional. So if they are omitted (end of frame = TAB + CR + LF) the frame is accepted without checksum control.

Example:

Let assume the PC ID2405 send a print line cmd 'Hello' to the CP540 ID4050
The frame number is arbitrary set to 123

<0x10>1231P240514050<0x04>#PL Hello<0x09>CKA+CKB<0x0D><0x0A>

Checksum is compute with all bytes between <0x10> and <0x09> (green)
Here are the first and last iterations of the loop:

- 1) CKA = CKA + "1" = 0x00 + 0x31 = 0x31
CKB = CKB + CKA = 0x00 + 0x31 = 0x31
- 2) CKA = CKA + "2" = 0x31 + 0x32 = 0x83
CKB = CKB + CKA = 0x31 + 0x83 = 0xB4
-
- 24) CKA = CKA + "o" = 0x + 0x6F = 0x
CKB = CKB + CKA = 0x + 0x = 0x



5 Communication interfaces

5.1 RS232:

- 2400, 9600, 38400, 57600 bds
- 8 data bits, 1 stop bit, no parity
- Basic frame format: [Data] + TAB + CS16 + CR + LF (see chapter 4.1)

5.1.1 Flow control

In order to allow the use of RS232 peripherals unable to cope with a minimum baud rate of 2400bds (radio transmission for example), a flow control mechanism has been implemented. It can be activated by selecting the item « 9600bds Flow Ctrl » in the BaudRate menu. Once activated, the device send a first frame and wait to receive the char 0x06 « ACK » before sending the next one.

5.2 Ethernet (TCP/IP server):

- Default IP 192.168.001.050 (other IP can be set manually on the device)
- Listening ports 7000,13500,13501,13502,13503
- A maximum of four connections can be established simultaneously
- Basic frame format: [Data] + CR + LF (see chapter 4.1)

The device is listening on all ports specified above. However there is a difference between port 7000 and the other. In the first software version of the CP540 (VA & VB) devices were only listening on port 7000. Up to four connections can be established with this port. However using this solution can be problematic when a client loses the connection with the device. In fact there is no possibility for the device to recognize if a client wants to resume a lost connection or establish a new one. So when a connection is lost, the corresponding buffer is clear and data can be lost.

To avoid this situation, it is possible now to establish a connection using four different port numbers (13500, 13501, 13502, 13503). Each one of these ports support only one connection at a time. If a connection is not terminated properly, the device does not clear its corresponding buffer. Therefore when the client will resume the lost connection on the same port it will receive the remaining data if any. Closing properly the TCP/IP connection will clear the corresponding buffer.



5.3 GSM

The GSM modem integrated into the CP540 docking station or other new generation Timekeeping devices, allow the user to establish either CDS or GPRS connection.

Note: CDS connection will tend to disappear in future due to its cost and limitations.

5.3.1 Modem (Circuit Switched Data CDS):

A CDS connection is a point to point communication between two devices or any modem connected on the telephone network. The communication can be initiated by dialling the phone number of the target on any of the two devices.

If the communication is broken at any time or if the number called is busy the system will automatically try to resume the connection a few seconds later and send the remaining data. The connection can be definitely close anytime by one of the two devices (the escape command '+++ ' is then sent to the other devices to inform the end of communication.

5.3.1.1 Parameters

- Modulation: V.110 (digital network)
- 9600bds

5.3.2 GPRS

GPRS connection is more or less identical than CDS. However instead of the telephone number, some connection parameters saved in the docking station memory are used.

5.3.2.1 Client Identification and activation of the connection

At the beginning of each GPRS connection, the client sends the following 3 frames for identification:

SN (serial number), UN (User Name) and PW (Password)

No other data will be send until the server accept the connection by sending the command '#GC 1'

5.3.2.2 Parameters

Access point name (APN)	: Define by the operator ('gprs.swisscom.ch' for swisscom)
User name	: If required by the operator ('gprs' for swisscom)
Password	: If required by the operator ('gprs' for swisscom)
Remote IP address or	: Address of server (name or IP)
Remote Port	: Port number

5.3.3 Data exchange

CDS and GPRS connection use the extended protocol.



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Each frame gets a number from the transmitter. The receiver must acknowledge the reception of each valid frame. If after some predefined time the sender didn't get any acknowledge of a sent frame, he will send it again.

The sender will not send more than 10 frames before receiving the first acknowledge (then it will be waiting for a maximum of 10 acknowledge at the same time).

In order to permanently monitor the status of the GSM connection, the char '0x01' is periodically sent (30sec) from both side when no other traffic occur. If during 1 min the connection channel stay quiet (no data or heartbeat) the connection is consider as broken, and the calling device will try to restore the connection or establish a new one.

5.3.4 Data and acknowledge frames (extended)

Extended Data frame format (see chapter 4.2):

STX + NB + PROT + SRC + DEST + [Param] + SEP + [Data] + TAB + CKA + CKB + CR + LF

Acknowledge frame format:

SAK + NB + CR + LF

Remarks:

- The frame number NB has a range from 000 to 255. However some devices use a smaller range for TX frames (For example a CP540 range is 000 – 212).
Frame number 253, 254 & 255 are used for the GPRS client identification messages 'SN', 'UN', 'PW'.
- CP540, HL440, HL940, HL975 use the THCOM08 protocol in the [Data] field. So the PROT parameter is '1'.
- The field [Param] is empty.



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6 List of messages

Standard messages ID, from Device to Host:

AK	Command acknowledge
ID	Serial number
SN	Serial number + device type + soft version
OP	Opening a Run
CL	Closing a Run
DS	Start of download
DE	End of download
TN	New time
T-	Time whose identification has been removed
T*	Time which received a new identification
T+	Inserted Time
T=	Duplicated Time
TC	Cancelled Time
TS	Top Synchro
TI	Ideal start Time (HL940 only)
AN	Answer to #RT or #DL command: Original Time
A-	Answer to #RT or #DL command: Time with removed identification
A*	Answer to #RT or #DL command: Time with a new identification
A+	Answer to #RT or #DL command: Inserted Time
A=	Answer to #RT or #DL command: Duplicated Time
AC	Answer to #RT or #DL command: Cancelled Time
!N	Download a run device to device: Original Time
!-	Download a run device to device: Time with removed identification
!*	Download a run device to device: Time with a new identification
!+	Download a run device to device: Inserted Time
!=	Download a run device to device: Duplicated Time
!C	Download a run device to device: Cancelled Time
!T	Synchro Time (actual time + 1 sec)
IR	Intermediate Result
DR	Differential Result
RR	Result (Finish – Start or Lap)
GR	General Result (Finish – Start + Result of another run)
VE	Speed
&P	Parameter (Answer to a #RP, or in case of an event if the command #EE was previously activated)
UN	GPRS User Name
PW	GPRS Password
&S	System event



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Device Specific messages ID, from Device to Host:

&C Cadran event (LEDs)
&N Needles event (Hours and minutes)
&D Internal display event
&E Sme Program event

Standard messages ID (commands), from Host to Device:

#ID Get serial number
#SN Get serial number + device type
#PL Print out a line (24 chars maximum)
#DL Download a Run
#RT Recall Time
#IT Request date and time for synchro
#SL Start List
#BM Send a message to all ports (RS232, Ethernet, GPRS)
#EE Activate/Deactivate evens messages
#RP Read parameter (Parameter is sent in message &P)
#WR Write parameter
#WC Write Command
#UN Request GPRS User Name
#PW Request GPRS password
#GC GPRS connection accepted/rejected
#DF THDIS08 frame
#CR Communication Register

Remarks:

At every command received (identified with the char '#'), the device answer with a acknowledge AK.

Exceptions:

The following messages are also accepted and interpreted by the devices, however no acknowledge is send. This allows to receive times from another devices such as CP540, HL440 ...:

TN, T-, T*, T+,T=, TC, !N, !-, !*, !+, !=, !C



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7 Messages description [Data]

- Notes:**
- In the section below, the char '_' correspond to a space.
 - !!! The length of any messages is subject to change (Addition of new parameters at the end of the messages is possible).
 - <S> = Start of Frame Header. See 4.1 & 4.2
 - <E> = End of Frame Header. See 4.1 & 4.2

Acknowledge of a received command (AK):

<S>AK_X<E>

X = 'C' accepted, 'F' rejected, 'R' not supported

Serial number (ID):

<S>ID_NNNNN<E>

N = Serial number (0 - 65535)

Serial number + Device type + soft version (SN):

<S>SN_NNNNN_TTTTT_VVVV<E>

<S>SN_NNNNN_TTTTT_VVVV_DDDDD_WWWW<E>

N = Serial number (0 - 65535)

T = Device type (CP540, HL440, HL940)

V = Software version (example: VA05)

D = If a docking station is connected (CP540) -> Serial number of the docking

W = If a docking station is connected (CP540) -> Software version of the docking

Opening of a new Run (OP):

<S>OP_RR_TAA_XXXXXXXXXXXXXXXXXXXXX<E>

R = Run number (1 - 99)

T = 'T' if the added Run is itself the addition of two other Runs
'_' otherwise.

A = Added Run (1 - 99)

X = Name of the Timing Mode (Max 19 chars)

Closing of a Run (CL):

<S>CL_RR<E>

R = Run number (1 - 99)



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Download start marker (DS):

<S>DS_RR_TAA_XXXXXXXXXXXXXXXXXXXX<E>

R = Run number (1 - 99)

T = 'T' if the added Run is itself the addition of two other Runs
'_' otherwise.

A = Added Run (1 - 99)

X = Name of the Timing Mode (Max 19 chars)

Download end marker (DE):

<S>DE_RR<E>

R = Run number (1 - 99)

Time (TN, T-, T*, T+, T=, TC, TI):

<S>Tx_NNNN_SSSS_CC_HH:MM:SS.FFFFFF_DDDDD<E>

N = Candidate number (0 - 9999)

S = Sequential number (0 - 9999)

C = Channel number (1 - 99) in case of manual entry (M1 - M4)

H = Hours (0 - 23)

M = Minutes (0 - 59)

S = Seconds (0 - 59)

F = decimal part (0 - 99999)

D = Days (0 - 32767) counting from 01.01.2000

Top Synchro(TS):

<S>TS_HH:MM:SS_DD/XX/YY<E>

H = Hours (0 - 23)

M = Minutes (0 - 59)

S = Seconds (0 - 59)

D = Day

X = Month

Y = Year

Answer to the #RT or #DL command (AN, A-, A*, A+, A=, AC):

<S>Ax_NNNN_SSSS_CC_HH:MM:SS.FFFFFF_DDDDD<E>

N = Candidate number (0 - 9999)

S = Sequential number (0 - 9999)

C = Channel number (1 - 99) in case of manual entry (M1 - M4)

H = Hours (0 - 23)

M = Minutes (0 - 59)

S = Seconds (0 - 59)

F = decimal part (0 - 99999)

D = Days (0 - 32767) counting from 01.01.2000



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Download Time to other Timekeeping device (!N, !-, !*, !+, !=, !C):

<S>!x_NNNN_SSSS_CC_HH:MM:SS.FFFFFF_DDDDD<E>

N = Candidate number (0 - 9999)
S = Sequential number (0 - 9999)
C = Channel number (1 - 99) in case of manual entry (M1 - M4)
H = Hours (0 - 23)
M = Minutes (0 - 59)
S = Seconds (0 - 59)
F = decimal part (0 - 99999)
D = Days (0 - 32767) counting from 01.01.2000

Synchro time (!T):

<S>!T_HH:MM:SS_DD/XX/YY<E>

H = Hours (0 - 23)
M = Minutes (0 - 59)
S = Seconds (0 - 59)
D = Day
X = Month
Y = Year

Run, Added Run, Intermediate and Differential Result (RR, GR, IR, DR):

<S>RR_ZZZZ_NNNN_HH:MM:SS.FFFFFF<E>
<S>GR_ZZZZ_NNNN_HH:MM:SS.FFFFFF<E>
<S>IR_I_NNNN_HH:MM:SS.FFFFFF<E>
<S>DR_WWWW_LLLL_HH:MM:SS.FFFFFF<E>

Z = Rank
N = Candidate number (1 - 9999)
I = Inter number
W = Winner candidate number (1 - 9999)
L = Looser candidate number (1 - 9999)
H = Hours (0 - 23)
M = Minutes (0 - 59)
S = Seconds (0 - 59)
F = decimal part (0 - 99999)

Speed (VE):

<S>VE_I_NNNN_SSS.SSS_UUUUUUU<E>

I = Speed number
N = Candidate number (1 - 9999)
S = Speed (0.000 - 999.999)
U = Speed unit (Text 7 bytes)



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System Event (&S):

<S>&S_EAABBCCDDDEEFFGGHH<E>

E = Event ID

A = 1st parameter (Hex format)

B = 2nd parameter if required (Hex format)

...

H = 8th parameter if required (Hex format)

E = 0 -> Keyboard (A = Activated key)

1 -> Buzzer (A = Beep event, B = Beep time in 10ms)

Y: Bit 0-1 -> Volume (0-3)

Bit 2-3 -> Tune (Low/Med1/Med2/High)

2 -> Text Scrolling data for HL975 (A-H = Led value of right column)

HL940 Cadran Event (&C): See 13.2 for details

<S>&C_EEXX<E>

E = Event ID (Hex format)

X = Parameter (Hex format)

HL940 Needle Event (&N):

<S>&N_HHMM<E>

H = Hour Needle pos, Inc of 2° (Hex format)

M = Minute Needle pos, Inc of 6° (Hex format)

HL940 & HL975 Display Event (&D): See 13.2 for details

<S>&D_EEXXYZZ<E>

E = Event ID (Hex format)

X = Parameter 1 (Hex format)

Y = Parameter 2 (Hex format)

Z = Parameter 3 (Hex format)

Device specific Event (&E):

For HL940:



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<S>&E_XX<E>

X = HL940 program event register (Hex format)
BIT0 = Internal use
BIT1 = Running
BIT2 = Counting Down
BIT3 = Pause
BIT4 = Top Chrono

Serial number request (#ID):

<S>#ID<E>

Serial number and device type request (#SN):

<S>#SN<E>

Synchro time request (!T):

<S>#!T<E>

Print out a line (#PL):

<S>#PL_XXXXXXXXXXXXXXXXXXXXXXXXXXXX<E>

X = Text to print out (max 24 chars)

Start list (#SL):

Clear the list from memory:	<S>#SLR<E>
Add a candidate number to the list :	<S>#SLA_NNNN<E>
Close a new list from edition:	<S>#SLC<E>

N = Candidate number (0 - 9999)

Download a Run (#DL):

<S>#DL_RR<E>

R = Run number (1 - 99)

Recall Time (#RT):

<S>#RT_SSSS_CC<E>

S = Sequential number (0 - 9999)



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C = Channel number (1 - 99)

Send a message to all ports (#BM):

<S>#BM_XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX<E>

X = message (1 - 32 chars. Chars 0x00 to 0x0F, are forbidden).

Activation/Deactivation of events messages (#EE):

<S>#EE_X<E>

X = '1' -> activation, '0' -> Deactivation
This cmd will be replaced by #WC_013_X

Serial number programming (#MC): !!! For factory use only !!!

<S>#MC_04660_XXXXX<E>

X = Serial number (0 - 65535)

Read a parameters (#RP):

<S>#RP_III...<E>

I = parameter ID (000 - 999)
... = See the parameters list on chapter 8.

Write a parameters (#WP):

<S>#WP_III...<E>

I = parameter ID (000 - 999)
... = See the parameters list on chapter 8.

Activation of the GPRS connection (#GC):

<S>#GC_X<E>

X = Connection (0 → rejected; 1→ accepted; 2→ accepted + clear buffer)

THDIS08 frame (#DF):

<S>#DF_XXXXXXXX<E>

X = THDIS08 data (max 30 bytes)



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Communication register (#CR):

<S>#DF_XX<E>

X = Register (hex format)

For HL160:

X: Bit_0 -> 1 = RS232 MAIN is used for HL160 control



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8 List of parameters

8.1 Standard parameters

001 : Precision

#RP_001
#WP_001_X
&P_001_X

X = Precision (0-5)

002 : Timing mode

#RP_002
&P_002_XX

X = Timing mode

For CP540:

X = 0 -> PTB Sequential 1-4
1 -> PTB Sequential 5-8
2 -> Net Time
3 -> Net Time + 2 Inter
4 -> Parallel Sequential
5 -> Parallel Diff
6 -> Start - Finish
7 -> Start - Inter - Finish
8 -> Training
9 -> Split 1-4
10-> Split 5-8
11-> Split/Lap

For HL440:

X = 0 -> PTB Sequential 1-4
1 -> PTB Sequential 5-8
2 -> Split 1-4
3 -> Split 5-8
4 -> Training

For CP545:

X = 0 -> PTB Sequential 1-4
1 -> PTB Sequential 5-8
2 -> Net Time
3 -> Net Time + 2 Inter
4 -> Parallel Sequential
5 -> Parallel Diff
6 -> Jumping
7 -> Jumping 2 phase
8 -> Jumping Single phase
9 -> Start - Finish
10-> Start - Inter - Finish
11-> Training
12-> Split 1-4
13-> Split 5-8
14-> Split/Lap

For HL940:

X = 0 -> PTB Sequential
1 -> Split

003 : Run number

#RP_003
&P_003_XX_YY_HH:MM:SS_DDDDD

X = Run number (00-99). 00 = no run open
Y = Number of the next Run(00-99).
H = Hours
M = Minutes
S = Seconds
D = Date



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004 : Locking time

#RP_004_XX
#WP_004_XX_YYYY
 &P_004_XX_YYYY

X = Channel number (01-99).
Y = Locking Time (1/100 sec)

For HL940: Standard values are 0, 1, 10, 100, 1000

005 : Numbering

#RP_005_XX
#WP_005_XX_Y
 &P_005_XX_Y

X = Channel number (01-99).
Y = Numbering: 0->Manuel, 1->Automatic

006 : Input status

#RP_006_XX
#WP_006_XX_Y
 &P_006_XX_Y

X = Channel number (01-99).
Y = Status: 0->Blocked, 1->Unblocked

007 : Beep Volume

#RP_007
#WP_007_X
 &P_007_X

For CP540 & CP545:
 X = Off/On (0-1)

For HL440 & HL940:
 X = Off/On (0-1)

008 : GPS status

#RP_008_XY_ZZ
 &P_008_XY_ZZ

X = Status:
 Bit_0 -> On flag
 Bit_1 -> Ready flag
Y = Satellites number (0-9)
Z = UTC Leap time in second (00-99)



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009 : Time zone

#RP_009
#WP_009_XX
&P_009_XX

X = Time zone (0-35)

0	1	2	3	4	5	6	7	8	9
+12h	+11h30	+11h	+10h30	+10h	+9h30	+9h	+8h	+7h	+6h30
10	11	12	13	14	15	16	17	18	19
+6h	+5h30	+5h	+4h30	+4h	+3h30	+3h	+2h	+1h	GMT
20	21	22	23	24	25	26	27	28	29
-1h	-2h	-3h	-3h30	-4h	-4h30	-5h	-6h	-7h	-8h
30	31	32	33	34	35				
-8h30	-9h	-9h30	-10h	-11h	-12h				

010 : Synchro status

#RP_010
&P_010_AA_BB_HH:MM:SS_DD/XX/YY

A = Synchro Status. (hex format)

- 0 -> No synchro
- 1 -> Internal Synchro (take the internal time for synchro)
- 2 -> Manual Synchro
- 3 -> Synchro at Zero
- 4 -> Master/Slave Synchro
- 5 -> GPS Synchro
- 6 -> Initial Synchro (For CP540 and HL975 just after power on)
- 7 -> Master/Slave Docking Synchro
- Bit_7 -> Top Synchro event

B = Type of synchro available (hex format)

- Bit_0 -> Internal Synchro
- Bit_1 -> Manual Synchro
- Bit_2 -> Synchro at Zero
- Bit_3 -> Master/Slave Synchro
- Bit_4 -> GPS Synchro
- Bit_5 -> Master/Slave Docking Synchro

H = Hour of synchro

M = Minute of synchro

M = Second of synchro

D = Day of synchro

X = Month of synchro

Y = Year of synchro

011 : Printer status

#RP_011
#WP_011_XX
&P_011_XX

X = Status (Hex format)



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Bit_0 -> 0 = OFF, 1 = ON

012 : Language

#RP_012
#WP_012_X
&P_012_X

For CP440:

X = 0 -> English
1 -> 2nd language

For CP545 & HL440 & HL940 & HL975:

X = 0 -> English
1 -> French
2 -> German
3 -> Italian

013 : Speed Setting

#RP_013_S
#WP_013_S_XX_YY_ZZZZZZZ
&P_013_S_XX_YY_ZZZZZZZ

S = Speed Number (1-4 for CP540, 1-2 for HL975)

X = Start Channel

Y = Finish channel

Z = Distance (0-1000000 mm)

For HL975:

Y = Finish channel
= 98 (Share same Chn as Start but do Finish only)
= 99 (Share same Chn as Start, do start and Finish)

014 : Speed Unit

#RP_014
#WP_014_X
&P_014_X

X = 0->m/s, 1->km/h, 2->miles/h, 3->Knot

015 : RS232 Main protocol

#RP_015
#WP_015_X
&P_015_X

For CP540 & CP545:

X = 0-> RS232 data (PC)
1-> Display TAG HL960 & HL990
2-> Display TAG HL970 & HL980
3-> Display ALGE

For HL440 & HL940 & HL975: (Read only)



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016 : RS232 Main Baudrate

```
#RP_016
#WP_016_X
&P_016_X

X = 0-> 2400bds
      1-> 9600bds
      2-> 9600bds with flow ctrl
      3-> 38400bds
      4-> 57600bds
```

017 : RS232 Aux1 protocol

```
#RP_017
#WP_017_X
&P_017_X
```

For CP440: (not implemented on CP540)

For HL440:

```
X = 0-> Printer (Baudrate is set to 9600bds)
      1-> THCOM08 protocol
      2-> THDIS08 protocol (display)
```

For HL940:

```
X = 0-> Printer (Baudrate is set to 9600bds)
      1-> RS232 data 9600bds
      2-> RS232 data 9600bds With Flow ctrl
      3-> 38400bds
```

For HL975:

```
X = 0-> Printer (Baudrate is set to 9600bds)
      1-> THCOM08 Only protocol, (Input THDIS08 frames supported)
      2-> THDIS08 Only protocol, (Input THCOM08 frames supported)
      3-> THCOM08 & THDIS08 protocol
```

For CP545:

```
X = 0-> THCOM08 protocol
      1-> Display TAG HL960 & HL990
      2-> Display TAG HL970 & HL980
      3-> Display ALGE
```



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018 : RS232 Aux1 Baudrate

#RP_018
#WP_018_X
&P_018_X

For CP540 & HL940: (not implemented)

For HL440 & CP545:

X = 0-> 2400bds
1-> 9600bds
2-> 9600bds with flow ctrl
3-> 38400bds
4-> 57600bds

019 : RS232 Aux2 protocol

#RP_019
#WP_019_X
&P_019_X

For HL940: X = 0 -> Display (Baudrate is set to 9600bds)

020 : RS232 Aux2 Baudrate

#RP_020
#WP_020_X
&P_020_X

For HL940:

X = 0-> 2400bds
1-> 9600bds (default)
2-> 9600bds with flow ctrl

021 : External Display Mode

#RP_021
#WP_021_XX
&P_021_XX

For CP540 & CP545:

X = 0-> Running time
1-> Time of day
2-> Blank the board
3-> Advertising N°1
...
13-> Advertising N°10

For HL940:

X = 0-> Blank the board
1-> Time of day
2-> Start Split
3-> Start PTB
4-> Start Light ON
5-> Start Light OFF
6-> Start Light OFF with time of day



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022 : External Display time delay

#RP_022
#WP_022_XX
 &P_022_XX

X = Time delay in sec (0-99)

023 : Input direction Status

#RP_023
#WP_023_A_B_C_D
 &P_023_A_B_C_D

A = Input 1 Status (0->Out; 1->in; 2->Off)
B = Input 2 Status (0->Out; 1->in; 2->Off)
C = Input 3 Status (0->Out; 1->in; 2->Off)
D = Input 4 Status (0->Out; 1->in; 2->Off)

For CP540 & CP545 & HL440: A - D
For HL940: A - B
For HL975: A - B

024 : Capture Windows (For training mode)

#RP_024
#WP_024_XX_YYYY_ZZZZ
 &P_024_XX_YYYY_ZZZZ

X = Channel number
Y = Detection threshold Min (sec)
Z = Detection threshold Max (sec)

025 : Power supply status

#RP_025
 &P_025_XX_YYY_ZZZ

X = Status register (Hex format)
Y = Battery voltage (0.1V step)
Z = Battery level in % (0-100)

For CP545:

X: Bit_0 -> Battery Low
 Bit_1 -> Docking supply
 Bit_2 -> External power supply on CP545
 Bit_3 -> External power supply on Docking
 Bit_4 -> '0' = Non-Rechargeable Batteries; '1' NIMH = Batteries
 Bit_5 -> NIMH Charge Enabled
 Bit_6 -> NIMH Charging

For HL440:

X: Bit_0 -> Battery Low
 Bit_1 -> Battery very Low
 Bit_3 -> External power supply



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For HL940:

X: Bit_0 -> Battery Low
Bit_1 -> Power Save mode 1
Bit_2 -> Power Save mode 2
Bit_3 -> External power supply
Bit_4 -> Memory Backup Battery Low
Bit_5 -> Temperature Too Low
Bit_6 -> Temperature Too High

026 : Next candidate number

#RP_026
#WP_026_XX_YYYY
&P_026_XX_YYYY

X = Input number (0 -> next candidate number is set on inputs 1-4)
Y = Candidate number (0000 - 9999)

027 : Add a candidate number to the waiting list

#WP_027_XX_YYYY

X = Input number
Y = Candidate number (0001 - 9999)

028 : Extension modules

#RP_027_X
&P_027_X_YY

X = Slot number
Y = Module Id
0 -> No module
1 -> Ethernet Module
2 -> GSM Module
3 -> Timing Module
4 -> GPS Module

029 : Internal Display Intensity / Contrast / Backlight

#RP_029
#WP_029_XX_YY
&P_029_XX_YY

For CP540 & HL440: (not implemented)

For HL940:

X = Cadran Intensity (01 - 10)
Y = Display Intensity (01 - 10)

For HL975:

X = Display Intensity (01 - 10)
Y = Display Intensity according to the selector position (read only)



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030 : GPRS settings

#RP_030_X (RP is not supported by CP540 & CP545)
#WP_030_X_YYYYYYYYYYYYYYYYYYYYYYYYYYY
&P_030_X_YYYYYYYYYYYYYYYYYYYYYYYYYYY

X = '1' -> N°1 Access point name (APN)
X = '2' -> N°1 APN Username
X = '3' -> N°1 APN Password
X = '4' -> N°1 Address or IP number of Server
X = '5' -> N°1 Port number
X = '6' -> Special command to request the SIM card balance
X = '7' -> N°1 Server User Name (write only)
X = '8' -> N°1 Server Password (write only)
X = 'a' -> N°2 Access point name (APN)
X = 'b' -> N°2 APN Username
X = 'c' -> N°2 APN Password
X = 'd' -> N°2 Address or IP number of Server
X = 'e' -> N°2 Port number
X = 'f' -> N°2 Server User Name (write only)
X = 'g' -> N°2 Server Password (write only)

X = 'P' -> Print data (write only)
X = 'C' -> Clear all data (write only)

Y = Text (1 - 25 character)

Example :

<S>#WP 030 1 swisscom.gprs.ch<E>
<S>#WP 030 2 gprs<E>
<S>#WP 030 3 gprs<E>
<S>#WP 030 4 www.chrono.com<E>
<S>#WP 030 5 13000<E>
<S>#WP 030 6 *130#<E>
<S>#WP 030 7 Client<E>
<S>#WP 030 8 Pass1234<E>

031 : Ethernet settings

#RP_031_X
#WP_031_X_YYYYYYYYYYYYYYYYYYY
&P_031_X_YYYYYYYYYYYYYYYYYYY

For HL940:

X = '0' -> Standard IP address
Y = IP address (format 15bytes: 192.168.001.0DD)
X = '1' -> User defined IP address
Y = IP address (format 15bytes: AAA.BBB.CCC.DDD)



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032 : Device Address

#RP_032
#WP_032_X
&P_032_X

For HL975:
X = Line Address (0-9; A-F)

033 : GPS position

#RP_033
&P_033_XXXXXXXX_BYYYYYYY_ZZZZZ

A = Latitude (N/S)
X = Latitude in 1/100'000 deg
B = Longitude (E/W)
Y = Longitude in 1/100'000 deg
Z = Altitude in meter

034 : GSM Status

#RP_034
&P_034_XX_Y

X = Status register (Hex format)
Y = Signal level (0-4)

X: 0 -> GSM Off
Bit_0 -> GSM Enabled
Bit_1 -> GSM Connected To Network
Bit_2 -> GPRS Connected To APN
Bit_3 -> GPRS Connected To Server
Bit_4 -> GPRS Login Accepted
Bit_5 -> GPRS Login Rejected
Bit_6 -> GPRS Connection n°
Bit_7 -> Error Flag

035 : Ethernet Status

#RP_035
&P_035_AA_BB_CC_DD

A = Status Socket 0 (Hex format)
B = Status Socket 1 (Hex format)
C = Status Socket 2 (Hex format)
D = Status Socket 3 (Hex format)

status:
Bit_0 -> Socket Active
Bit_1 -> Socket Buffer Active
Bit_2 -> Socket Connected
Bit_7 -> Error Flag



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036 : Inputs mapping

```
#RP_036
#WP_036_M
&P_036_M
```

M = Mapping

```
For HL975:
  M = 0 -> IN1 & IN2
  M = 1 -> IN3 & IN4
  M = 2 -> IN5 & IN6
  M = 3 -> IN7 & IN8
```

037 : GSM Sim Card balance

```
#RP_037
&P_037_X_YYYYYYYYYYYYYYYYYYYYYYYYYYYY
```

X = Page number (0 - 2)
Y = Text

038 : Memory Free

```
#RP_038
&P_038_XXXXX
```

X = Memory free value

039 : GSM SMS Password

```
#RP_039
#WP_039_XXXXX
&P_039_XXXXX
```

X = XXXXX Password (0-9; A-Z; a-z)

040 : Logger Data

```
#RP_040_XYYYP
#WP_040_C
&P_040_XYYYP_AAAAAAAA_BBBBBBBB
```

C = Command ('R' = Reset variables; 'C' = Clear Events)

X = Read ('V' = variable; 'E' = Event)
Y = Variable or Event number
P = if X = 'E' -> Page offset (0-7); if X = 'V' -> 'space'
A = Returned data in hex format
B = Returned data in hex format (for X = 'E')

041: Timing Mode Register

```
#RP_041
&P_041_XXXX_YYYY
```



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X = Mode register 1 (Hex format)

Y = Mode register 2 (Hex format)



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8.2 Specific parameters for HL940

100 : SME status

#RP_100
&P_100_XX

X = SME status register (Hex format)
BIT0 = Internal use
BIT1 = Running
BIT2 = Counting Down
BIT3 = Pause
BIT4 = Top Chrono

101 : Program number

#RP_101
&P_101_XX

X = Program number (00-99)

102 : Program-Time Interval between Count Down

#RP_102_XX
#WP_102_XX_YYYY
&P_102_XX_YYYY

X = Program number (00-99)
Y = Time interval between Count Down (0000-3600 [sec])

103 : Program-Count Down

#RP_103_XX
#WP_103_XX_YYYY
&P_103_XX_YYYY

X = Program number (00-99)
Y = Count Down value (0000-3600 [sec])

104 : Program-Start switch

#RP_104_XX
#WP_104_XX_YY
&P_104_XX_YY

X = Program number (00-99)
Y = Start Count down position in sec (00, 15, 60 or 64 -> Disable)

105 : Program-Stop switch

#RP_105_XX
#WP_105_XX_YY
&P_105_XX_YY

X = Program number (00-99)
Y = Stop (00 -> Enable, 64 -> Disable)



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106 : Program-Reset switch (Not valid anymore)

#RP_106_XX
#WP_106_XX_YY
&P_106_XX_YY

X = Program number (00-99)
Y = Reset (00 -> Enable, 64 -> Disable)

107 : Program-Beep First

#RP_107_XX
#WP_107_XX_YYY
&P_107_XX_YYY

X = Program number (00-99)
Y = First beep position in sec (197-255 and 000) -> (-59 à 0 signed char)

108 : Program-Beep On

#RP_108_XX
#WP_108_XX_YYY
&P_108_XX_YYY

X = Program number (00-99)
Y = Beep start (197-255 & 000-059) -> (-59 to +59 signed char)

109 : Program-Beep Off

#RP_109_XX
#WP_109_XX_YYY
&P_109_XX_YYY

X = Program number (00-99)
Y = Beep end (197-255 & 000-059) -> (-59 to +59 signed char)

110 : Program-Green Disc

#RP_110_XX
#WP_110_XX_YYY
&P_110_XX_YYY

X = Program number (00-99)
Y = Start of Green Zone (197-255 & 000-059) -> (-59 to +59 signed char)

111 : Program-Yellow Disc

#RP_111_XX
#WP_111_XX_YYY
&P_111_XX_YYY

X = Program number (00-99)
Y = Start of Yellow Zone (197-255 & 000-059) -> (-59 to +59 signed char)



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112 : Program-Red Disc

#RP_112_XX
#WP_112_XX_YYY
 &P_112_XX_YYY

X = Program number (00-99)

Y = Start of Red Zone (197-255 & 000-059) -> (-59 to +59 signed char)

113 : Program Parameters

#RP_113_XX
#WP_113_XX_YY
 &P_113_XX_YY

X = Program number (00-99)

Y = Program Parameters (hex)

 Bit_0 -> Red / Green color inversion during countdown

114 : Program-Sequence

#RP_114_XX
#WP_114_XX_YY
 &P_114_XX_YY

X = Program number (00-99)

Y = Next Program number to be load (00-99)

115 : GPS Antenna

#RP_115_X
#WP_115_X
 &P_115_X

X = Selected Antenna (0=internal, 1=external)



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8.3 Specific parameters for HL975

120 : HL975 Operating mode

#RP_120
#WP_120_X
 &P_120_X

X = '0' -> PTB
X = '1' -> Speed / Net Time
X = '2' -> Counter (Up&Dwn)
X = '3' -> Start Light
X = '4' -> Display
X = '5' -> Clock
X = '6' -> Countdown
X = '7' -> HL970 PowerBox
X = '8' -> Demo

121 : Speed Format

#RP_121
#WP_121_X_Y_Z
 &P_121_X_Y_Z

X = '0' -> Speed 1/1'000 _999.999
X = '1' -> Speed 1/100 __999.99
X = '2' -> Speed 1/10 ___999.9
X = '3' -> Speed 1 ____999

Y = Display line for Speed 1
Z = Display line for Speed 2

122 : Net Time Format

#RP_122
#WP_122_X_Y_Z
 &P_122_X_Y_Z

X = '0' -> HH:MM:SS
X = '1' -> MM:SS.DD
X = '2' -> HH:MM:SS (Running Time)
X = '3' -> MM:SS.DD (Running Time)

Y = Display line for Net Time 1
Z = Display line for Net Time 2

123 : Split Time Format

#RP_123
#WP_123_X
 &P_123_X

X = '0' -> HH:MM:SS
X = '1' -> MM:SS.DD



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124 : HL960 Format

```
#RP_124
#WP_124_X
&P_124_X

X = '0' -> Net Time 1/1'000      9:59.999
X = '1' -> Net Time 1/100        9:59.999
X = '2' -> Net Time 1/10         9:59.999
X = '3' -> Net Time 1            9:59.999
X = '4' -> Rank + Candidate no   _001.123
X = '5' -> Speed 1/1'000        _999.999
X = '6' -> Speed 1/100          _999.99
X = '7' -> Speed 1/10           _999.9
X = '8' -> Speed 1              _999
X = '9' -> Diff Time 1/1'000 and winner
```

125 : Start Light Sequence

```
#RP_125
#WP_125_X
&P_125_X

X = '0' -> Manual
X = '1' -> Turn On
X = '2' -> Turn Off
X = '3' -> Count Down
```

126 : Start Light Color

```
#RP_126
#WP_126_AA_BB_CC_DD_EE_FF
&P_126_AA_BB_CC_DD_EE_FF

A = Start Light 1 color
B = Start Light 2 color
C = Start Light 3 color
D = Start Light 4 color
E = Start Light 5 color
F = Start Light 6 color
```

127 : Start Light Time

```
#RP_127
#WP_127_ATTT_BTTT_CTTT_DTTT_ETTT_FTTT
&P_127_ATTT_BTTT_CTTT_DTTT_ETTT_FTTT
```

For "Manual, Turn On, Turn Off" modes:

```
A = Start Light 1 Trigger; T = time in 1/10 sec
B = Start Light 2 Trigger; T = time in 1/10 sec
C = Start Light 3 Trigger; T = time in 1/10 sec
D = Start Light 4 Trigger; T = time in 1/10 sec
E = Start Light 5 Trigger; T = time in 1/10 sec
F = Start Light 6 Trigger; T = time in 1/10 sec
```



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Trigger = '0' -> Triggered after time
= '1' -> Triggered after Random Time
= '2' -> Triggered by Input 1
= '3' -> Triggered by Synch In and after time
= '4' -> Light is Disabled

For "Count Down" mode:

A = Start Light 1 Trigger; T = time interval in sec
B = Start Light 2 Trigger; T = NA
C = Start Light 3 Trigger; T = NA
D = Start Light 4 Trigger; T = NA
E = Start Light 5 Trigger; T = NA
F = Start Light 1-5 Trigger; T = time in 1/10 sec

Trigger = '0' -> Light is Enabled
= '1' -> NA
= '2' -> NA
= '3' -> NA
= '4' -> Light is Disabled

128 : Start Light Random min and max Time

#RP_128
#WP_128_AAA_BBB
&P_128_AAA_BBB

A = Random Min time in 1/10 sec (0-255)
B = Random Max time in 1/10 sec (0-255)

129 : Speed and NetTime Color

#RP_129
#WP_129_X_AA_BB_CC_DD
&P_129_X_AA_BB_CC_DD

X = Prg nb (1 or 2)
A = Color when Speed is greater than previous one
B = Color when Speed is less or equal than previous one
C = Color when NetTime is greater than previous one
D = Color when NetTime is less or equal than previous one

130 : Counter Init Value

#RP_130
#WP_130_VVVVV_S
&P_130_VVVVV_S

V = Initial Value (00000 - 65535)
S = Status register



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Bit_0 -> Split Display

131 : Advertising Text

#RP_131_NL
#WP_131_NL_TTTTTTTTTTTTTTTT
&P_131_NL_TTTTTTTTTTTTTTTT

N = Text number (hex). Select one of the 16 text locations.

L = Text part number (hex). Each text location is divided in 16 parts for a total of 256 bytes length).

T = Text part (16 bytes max)

132 : Default Color

#RP_132
#WP_132_XX
&P_132_XX

X = Color used when no other color is specified (00 - 16)

133 : Countdown init value

#RP_133
#WP_133_HH:MM:SS
&P_133_HH:MM:SS

H = Hours

M = Minutes

S = Seconds



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9 List of Commands

9.1 Standard commands

001 : Close a Run

#WC_001

002 : Open a new Run (Only for PTB and SPLIT modes)

#WC_002

003 : Open a timing Mode

#WC_003_XX

X = Timing Mode (00-99)

004 : Load an HL940 program

#WC_004_XX

X = Program number

005 : Clear Memory

#WC_005_XXXXX

X = Security code (12345)

006 : Clear an HL940 program

#WC_006_XX

X = Program number

007 : Start a new synchro

#WC_007_TT_HH:MM_DD/XX/YY

T = Synchro Type.

0 -> Not valid

1 -> Internal Synchro (take the internal time for synchro)

2 -> Manual Synchro

3 -> Synchro at Zero

4 -> Master/Slave Synchro

5 -> GPS Synchro

7 -> Master/Slave Docking Synchro

If Manual Synchro is chosen:

H = Hour

M = Minute

D = Day

X = Month

Y = Year



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008 : Trigger a manual input pulse

#WC_008_XX

X = Input number ('1'-'4' for CP540 & HL440; '1'-'2' for HL940 & HL975)

009 : System cmd

#WC_009_XYYZZ

X = Cmd Id

Y = First parameter (Hex format)

Y = Second parameter if required (Hex format)

For HL940 & HL440:

X = 0 -> Keyboard (Y = Activated Key, Z = Not used)

1 -> Buzzer (Y = Beep cmd, Z = Beep time in 10ms)

Y: Bit 0-1 -> Volume (0-3)

Bit 2-3 -> Tune (Low/Med1/Med2/High)

For HL940

X = 2 -> State (Y = 00 -> Jump To Main Display)

3 -> Buzzer Seq (Y = Beep seq number)

010 : GSM Control

#WC_010_X

X = 0 -> GPRS Off

1 -> GPRS Connection 1

2 -> GPRS Connection 2

011 : Ethernet Control

#WC_011_X

X = 0 -> Ethernet module Off

1 -> Listen with standard IP

2 -> Listen with user IP

012 : Download a Run

#WC_012_XX_YYYY

X = Run Number

Y = Target (hex format)

Y = 0 -> Download to printer

Bit_0 -> Download to RS232 Main

Bit_1 -> Download to RS232 Aux1

Bit_2 -> Download to RS232 Aux2

Bit_3 -> Download to GSM

Bit_4 -> Download to Ethernet Socket 0

Bit_5 -> Download to Ethernet Socket 1

Bit_6 -> Download to Ethernet Socket 2

Bit_7 -> Download to Ethernet Socket 3



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013 : Change the identification of a time record

#WC_013_CC_SSSS_NNNN

C = Channel number of the record to identify
S = Sequential number of the record to identify (0001-9999)
N = New candidate number (0001 - 9999).
If value = 0000 -> remove identification of the record.
If value = __C -> Cancel the record.

014 : Insert a time record

#WC_014_CC_NNNN_HH:MM:SS.FFFFFF_DDDDD

C = Channel number
N = Candidate number (0000 - 9999)
H = Hours (0 - 23)
M = Minutes (0 - 59)
S = Seconds (0 - 59)
F = decimal part (0 - 99999)
D = Days (0 - 32767) counting from 01.01.2000

015 : Duplicate a time record (create one or more copy)

#WC_015_CC_SSSS_XXXX_ZZZZ

C = Channel number of the record to copy
S = Sequential number of the record to copy (0001-9999)
X = Candidate number 'from' (0001 - 9999).
Y = Candidate number 'to' (0001 - 9999).

If Y = X -> create one record.
If Y > X -> create Y-X records.
If Y < X -> invalid.

016 : Activation/Deactivation of events messages

#WC_016_XX

X = Activation register (hex format)

X = 0 -> All events are deactivated
Bit_0 -> Activate Parameter events '&P'
Bit_1 -> Activate Display events '&D, &C, &N'
Bit_2 -> Activate System events '&S'
Bit_3 -> Activate Device specific events '&E'

017 : Activation/Deactivation of Keyboard or ctrl switches

#WC_017_X

X = '1' -> activation, '0' -> Deactivation

018 : HL975 Start Light Mode Display all Lights

#WC_018_CC

C = color



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019 : HL940 Set Cadran Leds color

#WC_019_SS_EE_CC

S = Start Led (0-59)

S = End Led (0-60)

C = color

020 : HL940 Set Display (Disc & Digits)

#WC_020_XXXX

X =



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10 CP540 section

10.1 List of supported messages:

Messages ID, from Device to Host:

AK Command acknowledge
ID Serial number
SN Serial number + device type + soft version
OP Opening a Run
CL Closing a Run
DS Start of download
DE End of download
TN New time
T- Time whose identification has been removed
T* Time which received a new identification
T+ Inserted Time
T= Duplicated Time
TC Cancelled Time
AN Answer to #RT or #DL command: Original Time
A- Answer to #RT or #DL command: Time with removed identification
A* Answer to #RT or #DL command: Time with a new identification
A+ Answer to #RT or #DL command: Inserted Time
A= Answer to #RT or #DL command: Duplicated Time
AC Answer to #RT or #DL command: Cancelled Time
!N Download a run device to device: Original Time
!- Download a run device to device: Time with removed identification
!* Download a run device to device: Time with a new identification
!+ Download a run device to device: Inserted Time
!= Download a run device to device: Duplicated Time
!C Download a run device to device: Cancelled Time
!T Synchro Time
IR Intermediate Result
DR Differential Result
RR Result (Finish – Start or Lap)
GR General Result (Finish – Start + Result of another run)
VE Speed
&P Parameter (Answer to a #RP, or in case of an event if the command #EE was previously activated)
UN GPRS User Name
PW GPRS Password

Messages ID (commands), from Host to Device:

#ID Get serial number
#SN Get serial number + device type
#PL Print out a line (24 chars maximum)
#DL Download a Run
#RT Recall Time
#!T Request date and time for synchro



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#SL Start List
#GP GPRS parameters (only with GSM Docking station)
#BM Send a message to all ports (RS232, Ethernet, GPRS)
#EE Activate/Deactivate evens messages
#RP Read parameter (Parameter is sent in message &P)
#WR Write parameter
#WC Write Command
#UN Request GPRS User Name (only with GSM Docking station)
#PW Request GPRS password (only with GSM Docking station)
#GC GPRS connection accepted/rejected

Parameters:

001 : Precision
002 : Timing mode
003 : Run number
004 : Locking time
005 : Numbering
006 : Input status
007 : Beep Volume
008 : GPS status (Only with docking GPS station)
009 : Time zone (Only with docking GPS station)
010 : Synchro status
011 : Printer status
012 : Language
013 : Speed Setting
014 : Speed Unit
015 : RS232 Main definition
016 : RS232 Main Baudrate
019 : RS232 Aux2 definition
020 : RS232 Aux2 Baudrate
021 : External Display Mode
022 : External Display time delay
023 : Input direction Status
025 : Power supply status
026 : Next candidate number
027 : Add a candidate number to the waiting list
029 : Internal Display Intensity
030 : GPRS settings (Only with GSM docking station)
032 : GPS position

Commands:

001 : Close a Run
002 : Open a new Run (Only for PTB and SPLIT modes)
003 : Open a timing Mode
005 : Clear Memory
007 : Start a new synchro
008 : Trigger a manual input pulse



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11 CP545 section

11.1 List of supported messages:

Messages ID, from Device to Host:

AK Command acknowledge
ID Serial number
SN Serial number + device type + soft version
OP Opening a Run
CL Closing a Run
DS Start of download
DE End of download
TN New time
T- Time whose identification has been removed
T* Time which received a new identification
T+ Inserted Time
T= Duplicated Time
TC Cancelled Time
TS Top Synchro
AN Answer to #RT or #DL command: Original Time
A- Answer to #RT or #DL command: Time with removed identification
A* Answer to #RT or #DL command: Time with a new identification
A+ Answer to #RT or #DL command: Inserted Time
A= Answer to #RT or #DL command: Duplicated Time
AC Answer to #RT or #DL command: Cancelled Time
!N Download a run device to device: Original Time
!- Download a run device to device: Time with removed identification
!* Download a run device to device: Time with a new identification
!+ Download a run device to device: Inserted Time
!= Download a run device to device: Duplicated Time
!C Download a run device to device: Cancelled Time
!T Synchro Time
IR Intermediate Result
DR Differential Result
RR Result (Finish – Start or Lap)
GR General Result (Finish – Start + Result of another run)
VE Speed
&P Parameter (Answer to a #RP, or in case of an event if the command #EE was previously activated)
UN GPRS User Name
PW GPRS Password

Messages ID (commands), from Host to Device:

#ID Get serial number
#SN Get serial number + device type
#PL Print out a line (24 chars maximum)
#DL Download a Run
#RT Recall Time



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#!T Request date and time for synchro
#SL Start List
#GP GPRS parameters (only with GSM Docking station)
#BM Send a message to all ports (RS232, Ethernet, GPRS)
#EE Activate/Deactivate evens messages
#RP Read parameter (Parameter is sent in message &P)
#WR Write parameter
#WC Write Command
#UN Request GPRS User Name (only with GSM Docking station)
#PW Request GPRS password (only with GSM Docking station)
#GC GPRS connection accepted/rejected

Parameters:

001 : Precision
002 : Timing mode
003 : Run number
004 : Locking time
005 : Numbering
006 : Input status
007 : Beep Volume
008 : GPS status (Only with docking GPS station)
009 : Time zone (Only with docking GPS station)
010 : Synchro status
011 : Printer status
012 : Language
013 : Speed Setting
014 : Speed Unit
019 : RS232 Aux1 protocol
020 : RS232 Aux1 Baudrate
021 : External Display Mode
022 : External Display time delay
023 : Input direction Status
025 : Power supply status
026 : Next candidate number
027 : Add a candidate number to the waiting list
029 : Internal Display Intensity
030 : GPRS settings (Only with GSM docking station)
032 : GPS position (Only with GSM docking station)

Commands:

001 : Close a Run
002 : Open a new Run (Only for PTB and SPLIT modes)
003 : Open a timing Mode
005 : Clear Memory
007 : Start a new synchro
008 : Trigger a manual input pulse



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12 HL440 section

12.1 List of supported messages:

Messages ID, from Device to Host:

AK Command acknowledge
ID Serial number
SN Serial number + device type + soft version
OP Opening a Run
CL Closing a Run
DS Start of download
DE End of download
TN New time
T- Time whose identification has been removed
T* Time which received a new identification
T+ Inserted Time
T= Duplicated Time
TC Cancelled Time
TS Top Synchro
AN Answer to #RT or #DL command: Original Time
A- Answer to #RT or #DL command: Time with removed identification
A* Answer to #RT or #DL command: Time with a new identification
A+ Answer to #RT or #DL command: Inserted Time
A= Answer to #RT or #DL command: Duplicated Time
AC Answer to #RT or #DL command: Cancelled Time
!N Download a run device to device: Original Time
!- Download a run device to device: Time with removed identification
!* Download a run device to device: Time with a new identification
!+ Download a run device to device: Inserted Time
!= Download a run device to device: Duplicated Time
!C Download a run device to device: Cancelled Time
!T Synchro Time
&P Parameter (Answer to a #RP, or in case of an event if the command #EE was previously activated)
&S System event

Messages ID (commands), from Host to Device:

#ID Get serial number
#SN Get serial number + device type
#PL Print out a line (24 chars maximum)
#DL Download a Run
#RT Recall Time
#!T Request date and time for synchro
#BM Send a message to all ports (RS232, Ethernet, GPRS)
#EE Activate/Deactivate evens messages
#RP Read parameter (Parameter is sent in message &P)
#WR Write parameter
#WC Write Command



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Parameters:

001 : Precision
002 : Timing mode
003 : Run number
004 : Locking time
005 : Numbering
006 : Input status
007 : Beep Volume
009 : Time zone
010 : Synchro status
011 : Printer status
012 : Language
015 : RS232 Main port protocol
016 : RS232 Main port Baudrate
017 : RS232 Aux1 protocol
018 : RS232 Aux1 Baudrate
021 : External Display Mode
022 : External Display time delay
023 : Input direction Status
024 : Capture Windows (For training mode)
025 : Power supply status
026 : Next candidate number
038 : Memory Free

Commands:

001 : Close a Run
002 : Open a new Run (Only for PTB and SPLIT modes)
003 : Open a timing Mode
005 : Clear Memory
007 : Start a new synchro
008 : Trigger a manual input pulse
009 : System cmd
012 : Download a Run
013 : Change the identification of a time record
014 : Insert a time record
015 : Duplicate a time record (create one or more copy)
016 : Activation/Deactivation of events messages (Idem as #EE)
017 : Activation/Deactivation of Keyboard or ctrl switches



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13 HL940 section

13.1 List of supported messages:

Messages ID, from Device to Host:

AK Command acknowledge
ID Serial number
SN Serial number + device type + soft version
OP Opening a Run
CL Closing a Run
DS Start of download
DE End of download
TN New time
T- Time whose identification has been removed
T* Time which received a new identification
T+ Inserted Time
T= Duplicated Time
TC Cancelled Time
TS Top Synchro
TI Ideal start Time
AN Answer to #RT or #DL command: Original Time
A- Answer to #RT or #DL command: Time with removed identification
A* Answer to #RT or #DL command: Time with a new identification
A+ Answer to #RT or #DL command: Inserted Time
A= Answer to #RT or #DL command: Duplicated Time
AC Answer to #RT or #DL command: Cancelled Time
!N Download a run device to device: Original Time
!- Download a run device to device: Time with removed identification
!* Download a run device to device: Time with a new identification
!+ Download a run device to device: Inserted Time
!= Download a run device to device: Duplicated Time
!C Download a run device to device: Cancelled Time
!T Synchro Time
&P Parameter (Answer to a #RP, or in case of an event if the command #EE was previously activated)
UN GPRS User Name
PW GPRS Password
&S System event
&C Cadran event (LEDs)
&N Needles event (Hours and minutes)
&D Internal display event
&E Sme Program event

Messages ID (commands), from Host to Device:

#ID Get serial number
#SN Get serial number + device type
#PL Print out a line (24 chars maximum)
#DL Download a Run
#RT Recall Time



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#!T Request date and time for synchro
#BM Send a message to all ports (RS232, Ethernet, GPRS)
#EE Activate/Deactivate evens messages
#RP Read parameter (Parameter is sent in message &P)
#WR Write parameter
#WC Write Command
#UN Request GPRS User Name
#PW Request GPRS password
#GC GPRS connection accepted/rejected
#&S System event

Parameters:

001 : Precision
002 : Timing mode
003 : Run number
004 : Locking time
005 : Numbering
006 : Input status
007 : Beep Volume
008 : GPS status
009 : Time zone
010 : Synchro status
011 : Printer status
012 : Language
015 : RS232 Main port protocol
016 : RS232 Main port Baudrate
017 : RS232 Aux1 protocol
018 : RS232 Aux1 Baudrate
019 : RS232 Aux2 protocol
020 : RS232 Aux2 Baudrate
021 : External Display Mode
022 : External Display time delay
023 : Input direction Status
025 : Power supply status
026 : Next candidate number
028 : Extension modules
029 : Internal Display Intensity
030 : GPRS settings
031 : Ethernet settings
032 : Device Address
033 : GPS position
034 : GSM Status
035 : Ethernet Status
036 : Inputs mapping
037 : GSM Sim Card balance
038 : Memory Free
039 : GSM SMS Password

101 : Program number
102 : Program-Time Interval between Count Down
103 : Program-Count Down
104 : Program-Start switch



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105 : Program-Stop switch
106 : Program-Reset switch
107 : Program-Beep First
108 : Program-Beep On
109 : Program-Beep Off
110 : Program-Green Disc
111 : Program-Yellow Disc
112 : Program-Red Disc
113 : Sme Parameters
114 : Program-Sequence

Commands:

001 : Close a Run
002 : Open a new Run (Only for PTB and SPLIT modes)
003 : Open a timing Mode
004 : Open an HL940 program
005 : Clear Memory
006 : Clear an HL940 program
007 : Start a new synchro
008 : Trigger a manual input pulse
009 : System cmd
010 : Gsm Control
011 : Ethernet Control
012 : Download a Run
016 : Activation/Deactivation of events messages (Idem as #EE)
017 : Activation/Deactivation of Keyboard or ctrl switches
019 : HL940 Set Cadran Leds color



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13.2 Details of specific messages:

HL940 Cadran Event (&C):

<S>&C_EEXX<E>

E = Event ID (Hex format)

X = Data (Hex format)

Command and data are encoded on 7 bits (0..127) .

The eight bit (Msb) when '1' means a command, when '0' a data .

All Data are in hexadecimal format.

<i>Event_ID (Msb 1)</i>	<i>Description</i>	<i>DATA</i>
0x80	Seconde 0	Color
0x81	Seconde 1	"
...		"
0xBB	Seconde 59	"
0xF0	Seconde 0 - 59	"
0xF2	Intensity	Intensity
0xF4	Gain of green component	Gain
0xF5	Gain of red component	Gain

Color: 0 0 0 0 0 0 G R , R-G a 1 => Led on

Intensity: 0..100 (%)

Gain: 0..100 (%)

HL940 Display Event (&D):

<S>&D_EEXXYZZ<E>

E = Event ID (Hex format)

X = Data 1 (Hex format)

Y = Data 2 (Hex format)

Z = Data 3 (Hex format)

Command and data are encoded on 7 bits (0..127) .

The eight bit (Msb) when '1' means a command, when '0' a data .

All Data are in hexadecimal format.

<i>Event_ID (Msb 1)</i>	<i>Description</i>	<i>DATA 1</i>	<i>DATA 2</i>	<i>DATA 3</i>
0x80	Write to display (digits)	Sign	Digit 1	Digit 2
0x8A	Write to display (7 segments)	Sign	Digit 1	Digit 2
0x81	Write to Semaphore	Color	-	-
0xF4	Set Red color gain	Gain	-	-
0xF5	Set Blue color gain	Gain	-	-
0xF6	Set Green color gain	Gain	-	-
0xF7	Write to Semaphore RGB	R	G	B
0x82	Intensity	Intensity	-	.



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Color: 0 0 0 0 0 B G R , B-R-G a 1 => Led on
Gain : 0..100 (%)
R/G/B: 0..100 (%)
Intensity: 0..100 (%)

If Event Id = 0x80
Sign: ASCII character ('+' = 0x2B, '-' = 0x2D)
Digit1 & digit2 -> ASCII character ('0' = 0x30)

If Event Id = 0x8A
Sign: 0 => none, 1 => '-', 2 => '+'
Digit1 & digit2 -> 7 segment data (0x3F for '0')

Cmd 0xF7 is used by default for semaphore with the following data:

```
const unsigned char Gui_DiscColorTbl[16*4] = {
    0xF7, 0, 0, 0, // Black
    0xF7, 100, 0, 0, // Red
    0xF7, 0, 100, 0, // Green
    0xF7, 100, 90, 0, // Yellow
    0xF7, 0, 0, 100, // Blue
    0xF7, 100, 0, 100, // Magenta
    0xF7, 0, 100, 100, // Cyan
    0xF7, 100, 100, 100, // White
    0xF7, 100, 15, 0, // Orange
    0xF7, 0, 100, 15, // Turquoise
    0xF7, 100, 10, 20, // Rose
    0xF7, 30, 30, 100, // Bleu Claire
    0xF7, 0, 0, 0,
    0xF7, 0, 0, 0,
    0xF7, 0, 0, 0,
    0xF7, 0, 0, 0
};
```



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14 HL975 section

14.1 List of supported messages:

Messages ID, from Device to Host:

AK Command acknowledge
ID Serial number
SN Serial number + device type + soft version
OP Opening a Run
CL Closing a Run
DS Start of download
DE End of download
TN New time
T- Time whose identification has been removed
T* Time which received a new identification
T+ Inserted Time
T= Duplicated Time
TC Cancelled Time
TS Top Synchro
AN Answer to #RT or #DL command: Original Time
A- Answer to #RT or #DL command: Time with removed identification
A* Answer to #RT or #DL command: Time with a new identification
A+ Answer to #RT or #DL command: Inserted Time
A= Answer to #RT or #DL command: Duplicated Time
AC Answer to #RT or #DL command: Cancelled Time
!N Download a run device to device: Original Time
!- Download a run device to device: Time with removed identification
!* Download a run device to device: Time with a new identification
!+ Download a run device to device: Inserted Time
!= Download a run device to device: Duplicated Time
!C Download a run device to device: Cancelled Time
!T Synchro Time
RR Result (Finish – Start or Lap)
VE Speed
&P Parameter (Answer to a #RP, or in case of an event if the command #EE was previously activated)
UN GPRS User Name
PW GPRS Password
&S System event
&D Internal display event

Messages ID (commands), from Host to Device:

#ID Get serial number
#SN Get serial number + device type
#PL Print out a line (24 chars maximum)
#DL Download a Run
#RT Recall Time
#!T Request date and time for synchro
#BM Send a message to all ports (RS232, Ethernet, GPRS)



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#EE Activate/Deactivate evens messages
#RP Read parameter (Parameter is sent in message &P)
#WR Write parameter
#WC Write Command
#UN Request GPRS User Name
#PW Request GPRS password
#GC GPRS connection accepted/rejected

Parameters:

001 : Precision
002 : Timing mode
003 : Run number
004 : Locking time
005 : Numbering
006 : Input status
008 : GPS status
009 : Time zone
009 : Time zone
010 : Synchro status
012 : Language
013 : Speed Setting
014 : Speed Unit
015 : RS232 Main port protocol
016 : RS232 Main port Baudrate
017 : RS232 Aux1 protocol
018 : RS232 Aux1 Baudrate
023 : Input direction Status
025 : Power supply status
026 : Next candidate number
028 : Extension modules
029 : Internal Display Intensity
030 : GPRS settings
031 : Ethernet settings
032 : Device Address
033 : GPS position
034 : GSM Status
035 : Ethernet Status
036 : Inputs mapping
037 : GSM Sim Card balance
038 : Memory Free
039 : GSM SMS Password

120 : HL975 Operating mode
121 : Speed Format
122 : Net Time Format
123 : Net Time Format
124 : HL960 Format
125 : Start Light Sequence
126 : Start Light Color
127 : Start Light Time
128 : Start Light Random min and max Time
129 : Speed and NetTime Color



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130 : Counter Init Value
131 : Advertising Text
132 : Default Color
133 : Countdown init value

Commands:

001 : Close a Run
002 : Open a new Run (Only for PTB and SPLIT modes)
005 : Clear Memory
007 : Start a new synchro
008 : Trigger a manual input pulse
018 : HL975 Start Light Mode Display all Lights

14.2 Details of specific messages:

HL975 Display Event (&D):

<S>&D_NEEXXXXXXXXXXX<E>

N = Display number (1 or 2)
E = Evend Id (Hex format)
X = Data (Hex format)

Command and data are encoded on 7 bits (0..127) .
The eighth bit (Msb) when '1' means a command, when '0' a data .
All Data are in hexadecimal format.

Event ID	Description	DATA 1	DATA 2	DATA 3	DATA 4	DATA 5
0x80	Write to display (digits)	Digit 1	Digit 2	Digit 3	Digit 4	-
0x85	Write shape (rectangle)	X0	X1	Y0	Y1	F
0x89	Clear display	-	-	-	-	-
0x82	Set Luminosity	0-100%	-	-	-	-
0xF6	Palette RGB 232	-	-	-	-	-
0xF7	Set color RGB 232	RGB	-	-	-	-
0xF8	Set color RGB 777	R	G	B	-	-

X0, X1 : (0 to 23)
Y0, Y1 : (0 to 7)
F : '0' = Filled, '1' = Not Filled
R,G,B : (0 - 100)



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15 HL160 section

15.1 List of supported messages:

Messages ID, from Device to Host:

AK Command acknowledge
SN Serial number + device type + soft version
&P Parameter (Answer to a #RP, or in case of an event if the command #EE was previously activated)
UN GPRS User Name
PW GPRS Password
&S System event

Messages ID (commands), from Host to Device:

#SN Get serial number + device type
#IT Request date and time for synchro
#EE Activate/Deactivate events messages
#RP Read parameter (Parameter is sent in message &P)
#WR Write parameter
#WC Write Command
#UN Request GPRS User Name
#PW Request GPRS password
#GC GPRS connection accepted/rejected
#CR Communication Register

Parameters:

008 : GPS status
009 : Time zone
012 : Language
016 : RS232 Main port Baudrate
018 : RS232 Aux1 Baudrate
020 : RS232 Aux2 Baudrate
025 : Power supply status
028 : Extension modules
030 : GPRS settings
031 : Ethernet Settings
032 : GPS position
034 : GSM Status
035 : Ethernet Status
037 : GSM Sim Card balance
039 : GSM SMS Password

Commands:

010 : GSM Control
011 : Ethernet Control