PROFESSIONAL TIMING

TIMING DEVICE WITH RADIO TRANSMISSION AND GPS CONTROL

SPLITMASTER 650

OPERATING INSTRUCTIONS

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This device has been developed with the aim to make timing easier when there is no cable connection between start and finish. However, in order for the SPLITMASTER to give total satisfaction, it is preferable to use it at places where radio communication is possible!

1. DESCRIPTION OF THE SYSTEM (continued)

INPUTS AND OUTPUTS OF THE SPLITMASTER 650

IN / OUT	Transmitter (TRANSMIT)	Receiver (RECEIVE)
SYNCHRO	Output of the synchronization impulse (Delayed 600 ms)	Input of the synchronization impulse and TOP MINUTE output
INPUT 1	Start impulse input (start gate or photocell)	See chapter 12
INPUT 2	Input for speed measurement between INPUT 2 and INPUT 1 (SPEED)	Finish impulse input (Ex: Photocell)
OUTPUT 1		Start impulse output
OUTPUT 2		Finish impulse output delayed of 600 ms (DELAY)
PRINTER	To print start times ON LINE or finish times ON LINE or OFF LINE	To print start and finish times ON LINE or OFF LINE
RS 232	Transmission ON LINE or OFF LINE to a PC	To print start times and finish time directly to a PC or data device either ON LINE or OFF LINE
	RS232 Data transmission at 9600 bds (from a timing device for example)	Reception of the data (for a PC or driving data to a display)
POWER	Plug for battery charging or external power supply	
GPS		Connection of the GPS antenna
ANTENNA	Connection of the VHF antenna	
HEADSET	Connection of the voice communication headsets (HL 650-V)	

The inputs are driven by working contact timing impulses without potential (short circuit or open collector). For example : manual contactor or photocell. Polarities must be respected.

BATT ☼ Power and battery charge control:
- Green -> Charged
- Red -> Partially discharged
- Red blinking -> Completely discharged

TRANSMIT Power ON in TRANSMIT mode

OFF Power OFF

RECEIVE Power ON in RECEIVE mode

IMPULSE Transmission or reception of times and timing impulses

DATA Transmission or reception of timing information through RS 232 connection

GPS ON Time base synchronization and control via GPS. Reception of the satellite signals with the GPS antenna, automatic setting of time-of-day

GPS OFF GPS not used, control of time base by internal time base only

GPS ☼ Control LED of the satellite signals reception

BUZZER Buzzer ON

OFF Buzzer OFF

AM
PM
- **For Time-of-day for SYNCHRO use :**
  0h to 12h -> AM
  12h to 24h -> PM

- **For GPS use :** positive time difference (AM) or negative time difference (PM) between UTC (GMT) time and your time zone.

- **For SPEED use (at receiver) :** distance in meters between photocells (INPUT 2 – INPUT 1)
  Selected distance on HOURS + AM = distance in meter x1
  Selected distance on HOURS + PM = distance in meter x10

HOURS
- HOURS of time-of-day for SYNCHRO without GPS (AM / PM)
- With GPS difference in HOURS between UTC / GMT and your time zone (AM⊕ / PM ⊖)
- distance between photocells for speed measurement in meters (AM / PM) (For MPH, multiply the distance in meters between photocells by 1.6093 – Example : for 10 meters configured, distance = 16.093 meters = 52.788 feet)

MINUTES MINUTES of time-of-day for SYNCHRO with GPS

TIME BASE ☼ Time base LED control :
- Red -> Not active
- Green -> Time base synchronized
- Flashes red when turn on during 10 sec. (see chapter

SYNCHRO Manual synchronization

CODE - 12 code channels for additional starts or intermediates time locations

SIGNAL ☼ Quality control of VHF radio transmission and reception signal strength
- Green -> High
- Yellow -> Medium
- Red -> Low

REPEAT
- From start or an intermediate, repeating the last non-received or non-confirmed timing information to the finish (RETURN LED)
- Download of the transmitter and/or receiver memory (on PRINTER or RS232)

TEST Bi-directional transmission test from the transmitter (SIGNAL + RETURN)
Clears data memory during the 10 seconds at power-on that the TIME BASE led is flashing red.

RETURN ☼ Bi-directional transmission control
If RETURN is flashing -> press REPEAT at transmitter

1 ☼ Transmission or reception control of impulses transmitted via INPUT 1 (start)

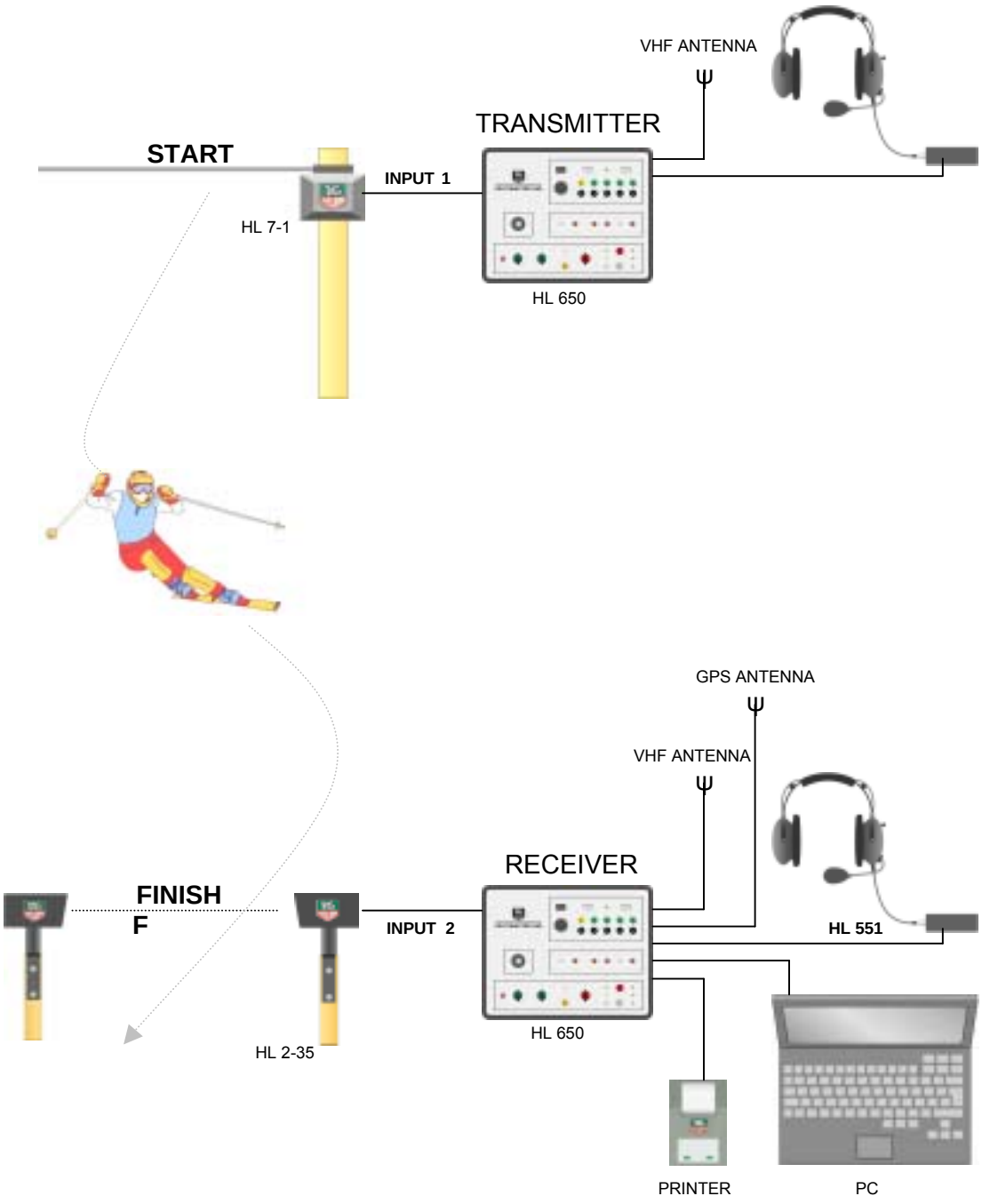
2 ☼ Control of impulses transmitted via INPUT 2 (SPEED)

WARNING !

- **INSTALL THE VHF ANTENNAS** (on Transmitter and Receiver) **BEFORE SWITCHING ON THE SPLITMASTER 650** (risk of destruction of the radio modules)
- It is also advised to **carry out all hardware connections BEFORE switching on the system**
- **Recharge your SPLITMASTER before use :**
  Connect your charger to the 220V/110V network,
  connect it to the HL 650 POWER socket,
  the red LED of the charger lightens up (CHARGING),
  when the red LED is flashing slowly (1/sec.) the battery is CHARGED.
  When the red LED is flashing fast (more than 1/sec.) the battery is strongly DISCHARGED

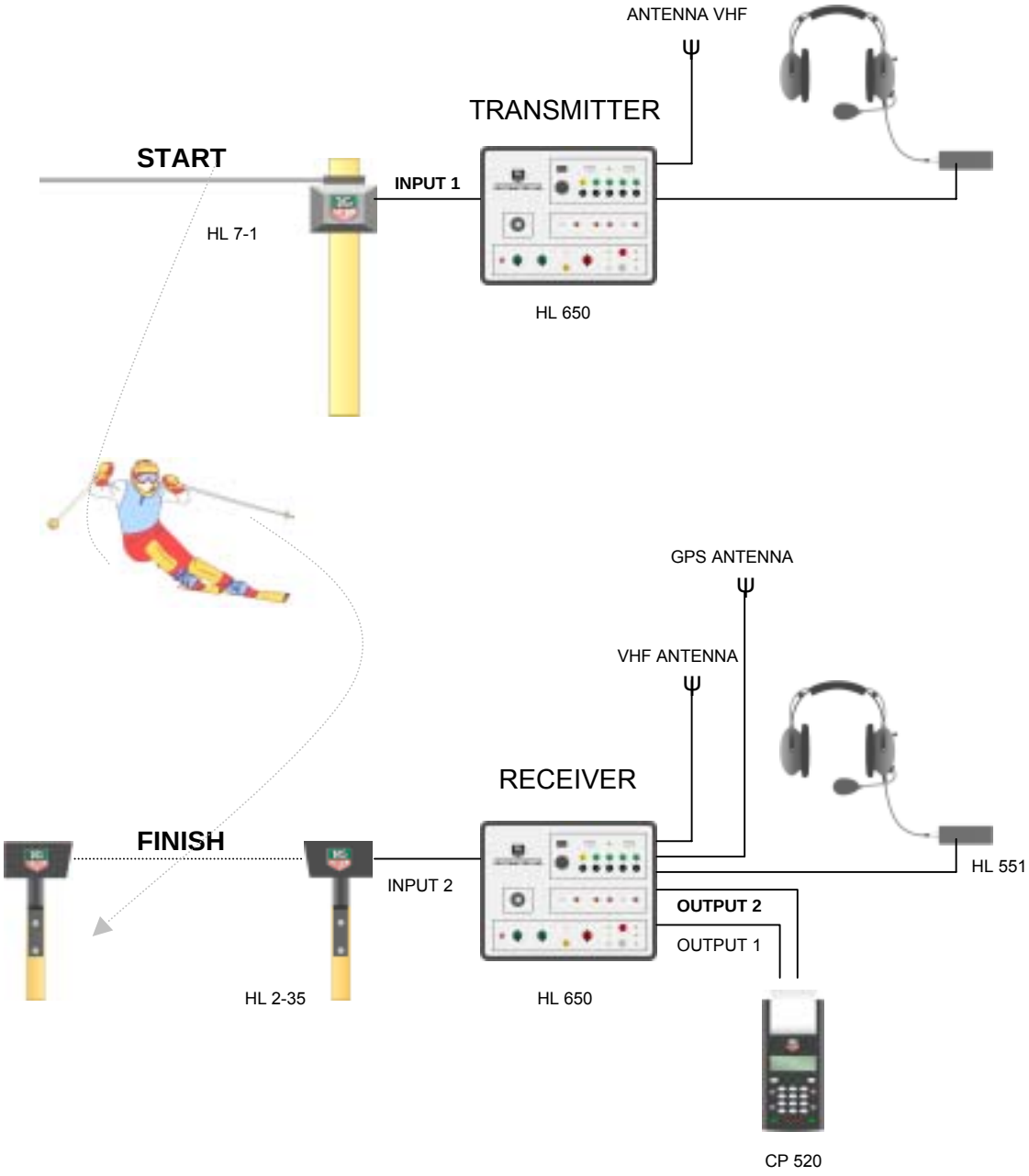
2. INSTALLATION DIAGRAMS AND EXPLANATIONS

Most common set-up with a PC receiving start and finish times in Time-of-day



Undeceived times at the finish can be recovered by downloading the memorized time data from the transmitter to a PC or to a Printer (paragraph 4)

Use with a timing system being triggered by impulses received from start and finish

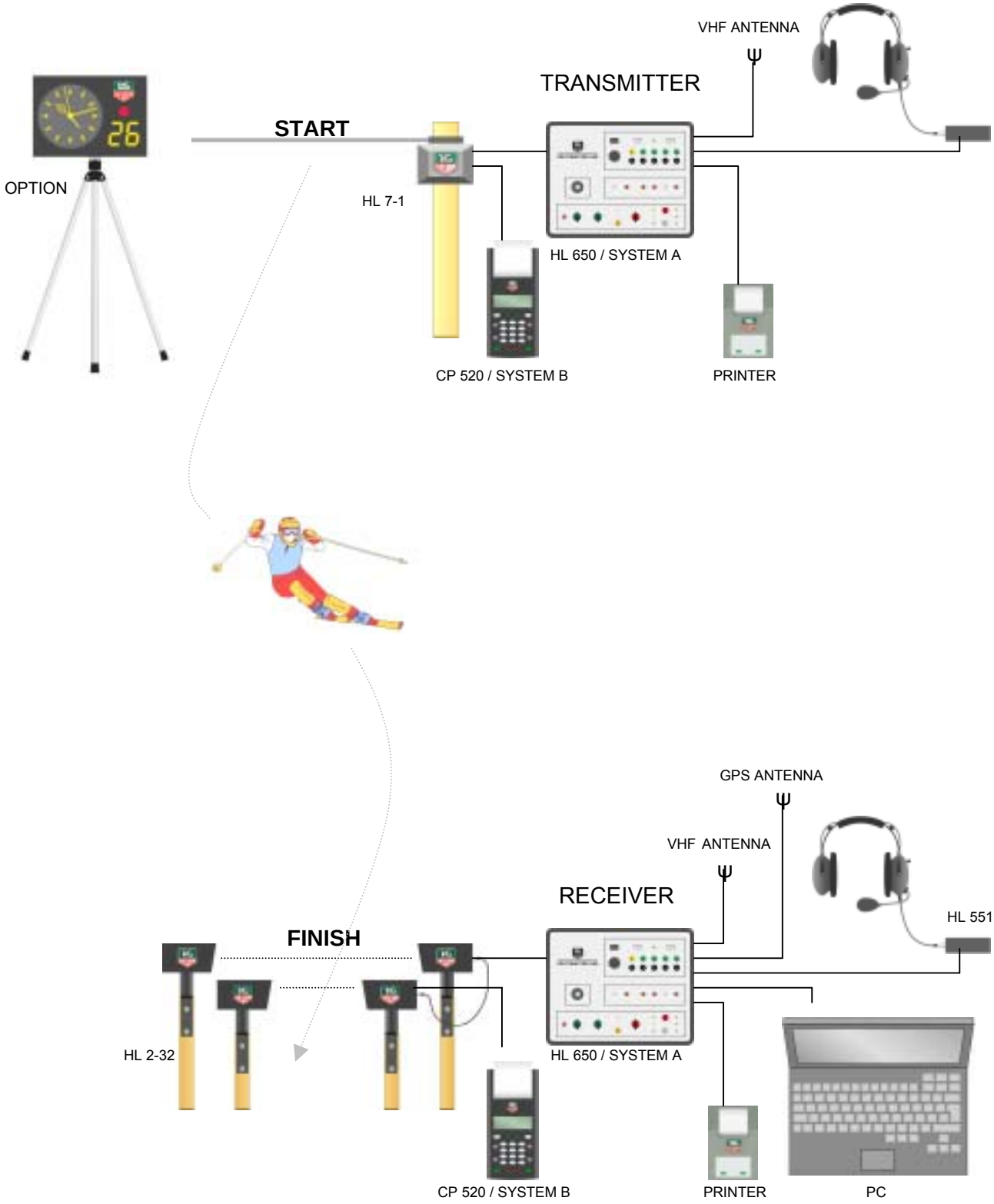


WARNING **The start impulses of the transmitter reach the receiver with a delay of 600 ms. It is thus necessary to synchronize your devices on the SYNCHRO plug of the transmitter where the impulse is also delayed of 600 ms.**

If timing impulses were not received, it will be thus possible to recall the real times of the transmitter (take the time base drift into account if needed).

The memorized times of the receiver are real time finish times (non-delayed of 600 ms) If the synchronization is made with GPS, please refer to Chapter 7.2 and links SYNCHRO and INPUT 2 on the receiver. OUTPUT 2 is then connected to the external timing device which receives a trigger impulses delayed by 600ms. Warning : In this case the original SYNCHRO of the external timing device must be done in the same manner as described in Chapter 7.2 (SYNCHRO with GPS)

Deluxe installation with start clock and back-up system (FIS rules)



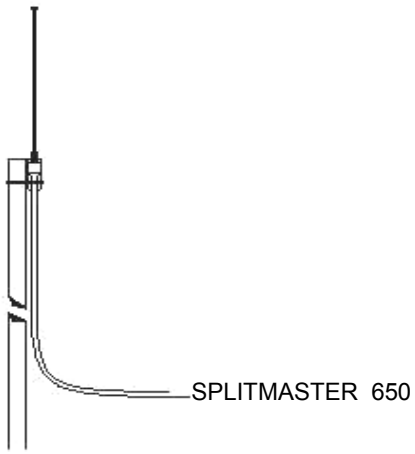
In order to respect the FIS rules, it is obligatory to connect a PRINTER at the start even if you have the possibility to download the transmitter data using the finish PRINTER at the end of the race.

3. MOUNTING THE VHF ANTENNAS

A good radio transmission quality guarantees the timing reliability !

Thus, we highly recommend to pay particular attention to antennas installation and placement of the devices

- Install the antennas as high as possible (on the roof of the timing cabin or on a pole in the starting area for example). The antenna must surpass the support used for the installation and be free of any obstruction of the mounting device. (see drawing)



- Connect the antennas to the SPLITMASTER with the delivered connection cables (length 5 meters). Do not use any other cable of thus type other than originally provided with your system.

4. TURNING ON THE SPLITMASTER AND MEMORY DOWNLOAD

Turning on the SPLITMASTER, erasing or preserving time-data memory, and downloading of memorized times to printer or PC device.

Warning !  **When either the Receiver or the Transmitter are switched on, the Time Base LED will flash for the first 10 seconds**

During this time:

- To ERASE the data memory, push the TEST button
  If a printer is connected, it will indicate:

```
MEMORY USED 25/31216

PRESS TEST TO CLEAR MEM.

MEMORY CLEAR

PRESS REPEAT TO DOWNLOAD
```

  Use REPEAT to ensure the erasure and evaluate the memory available.

- To SAVE the memorized times , simply wait the 10 seconds without any action until the Time Base LED stops flashing.
  If a printer is connected, it will indicate:

```
MEMORY USED 8/31216

PRESS TEST TO CLEAR MEM.

PRESS REPEAT TO DOWNLOAD
```

- To DOWNLOAD memorized time data after a timing session, first TURN OFF the Transmitter or receiver you with to obtain data from.

Download to PRINTER:

- Attach and turn on the Printer
- Turn on the Transmitter or Receiver IN THE SAME OPERATING MODE (transmit or receive)
- Press REPEAT when the Time Base LED stops flashing (download operation can be repeated).

Download to PC:

- Proceed as above if the SPLITMASTER has been turned off. You can also control the download of data on the PC port using a bi-directional code protocol that requests the data download. (See Chapter 15)

5. FUNCTIONING PRINCIPLE WITHOUT GPS

Each unit can be used as a Transmitter or as a Receiver

1. Place both units side by side, open the covers (laterally removable) and install the VHF antennas

2. Program the TRANSMITTER

AM

HOURS	on 0
MINUTES	on 0
CODES	on 1 (see coding)
BUZZER	active (if desired)
GPS	OFF
IMPULSE	
Switch on	Switch ON in selecting TRANSMIT and press the TEST button during the 10 sec. that the TIME BASE LED flashes red

3. Program the RECEIVER

Select the time of synchronization

***Ex: 9h15* morning**		***Ex :2h30 afternoon (14h30)***	
AM		PM	
HOURS	on 9	HOURS	on 2
MINUTES	on 15	MINUTES	on 30

CODE	on 1 (see coding)
BUZZER	active (if desired)
GPS	OFF
IMPULSE	
Switch on	Switch ON in selecting RECEIVE and press TEST to erase the MEMORY during the 10 sec that the TIME BASE flashes red.

4.
- Press SYNCHRO of the receiver at the configured time (the receiver sends the synchronization to the transmitter)
- TIME BASE LEDS become green (both time bases are synchronized)
- SIGNAL “H” on the transmitter is green (quality of VHF radio synchro reception is HIGH)

5.
- Press TEST on the transmitter (bi-directional transmission test)
- The SIGNAL “H” on the receiver becomes green (quality of TEST reception is HIGH)
- RETURN on the transmitter becomes red (the receiver acknowledges reception of TEST)
- SIGNAL “H” on the transmitter is green again (quality confirmation of RETURN is HIGH)

6. FUNCTIONING PRINCIPLE WITH GPS

WARNING !

- The GPS antenna must be fixed in an UNCONFINED PLACE in order to receive the satellite signals correctly.
- It must be positioned horizontally on its magnetized base and ideally on a support or metal square in order to guarantee a good mechanical stability.
- The GPS antenna is connected to the unit using the corresponding connector. This unit becomes the RECEIVER of the system which is marked on the alu-case by RED dots (the transmitter has GREEN dots).

1. Position both units side by side, open the covers (they are also laterally removable once opened) and to install the VHF antennas on each units.

2. Program the TRANSMITTER

AM

HOURS	on 0
MINUTES	on 0
CODES	on 1 (see coding)
BUZZER	active (if desired)
GPS	OFF
IMPULSE	
Switch on	TRANSMIT And press TEST to erase the MEMORY during the 10 sec that the TIME BASE flashes red.

3. Connect the GPS antenna cable to the receiver. Hold the plug between your thumb and index finger at the largest diameter end and plug it onto the receiver's connector.
To remove the plug, proceed in the same way paying attention to pull it straight out.

4. Program the RECEIVER

The AM / PM and HOURS switches allow for programming of the time difference between UTC (GMT) time and your time zone. See following table:

AM relates to a positive time difference
(from GMT in against-the-sun direction)
PM relates to a negative time difference
(from GMT in with-the-sun direction)
Example for North America:
Winter time: GMT - 3, so "PM" and "HOURS" on "3"

MINUTES	on 0
CODE	on 1 (see coding)
BUZZER	active (if desired)
GPS	ON
IMPULSE	
Switch on	RECEIVE and press TEST to erase the MEMORY during the 10 sec that the TIME BASE flashes red.

HOURS	AM	PM
0	0h	-1h
1	+1h	-2h
2	+2h	-3h
3	+3h	-4h
4	+4h	-5h
5	+5h	-6h
6	+6h	-7h
7	+7h	-8h
8	+8h	-9h
9	+9h	-10h
10	+10h	-11h
11	+11h	-12h

5. - The red GPS LED on the receiver flashes until the reception of at least 4 satellites (this is the minimum number required to ensure enough accuracy to set and control the time bases). The automatic time-of-day setting of the system with synchronization of both time bases happens after approximately 1 minute, depending on the satellite positions.
- The GPS and TIME BASE LEDS (on both transmitter and receiver) stop flashing red and turn green.
- The Signal "H" on the transmitter turns green (indicates that the quality of the synchronization reception (VHF) is HIGH).

6. Press TEST on the transmitter (effects a bi-directional transmission test between the tow units)
- Signal "H" on the transmitter becomes green (quality of TEST reception is HIGH)
- RETURN of the transmitter becomes red (the receiver acknowledges reception of TEST)
- SIGNAL "H" on the transmitter is green again (quality confirmation of RETURN is HIGH)

WARNING!

- If the GPS reception degrades (less than 4 satellites available) longer than one minute, the GPS function is automatically switched off for the rest of the timing session in progress. GPS OFF information is given on the RS 232 and PRINTER outputs data ports of the receiver and is likewise memorized.

- When the GPS switches off, the corresponding GPS LED turns red. The system continues to work accurately with the internal time base precision of the receiver taking control.

- We recommend particular care be taken when handling the GPS antenna. Handle the cable delicately while installing or removing your GPS antenna. The cable is shielded, so do not fold it, tie it or wedge it in a window as this may break the shielding.

7. PRINTER AND TIMING TAPES

In timekeeping, the use of a printer is necessary for audit and precision. It provides the timing tape (sleeve) which is the hard-copy evidence of all start, intermediate and finish information. It also allows for reprinting of all memorized events of the transmitter and/or the receiver.

We propose a printer MARTEL (modified with the TAG Heuer specifications)

- MARTEL printer (special edition) with internal rechargeable batteries.
- Big thermal paper roll.
- Autonomy of more than 6'000 times (at 20°C).
- Delivered with charger and data connection cable.
- Possibility of external power supply by battery.
  (Warning ! Respect the polarities NEGATIVE is the central pin of the plug)
- Excellent autonomy (also in low temperatures)

Pay attention to properly connect your printer to the PRINTER output of the unit.

Switch ON the printer before turning on the SPLITMASTER. This way, the logo, device ID version and indications that the MEMORY has been managed or erased will be printed.

See printed examples on following pages

Timing tapes examples WITHOUT GPS:

TRANSMITTER

```
      TAG Heuer
HL650 v05 – No 0051

SYNCHRO AT 10:30:00.000 ——— 1

T01 TEST   10:30:21.211 ——— 2

T01   1  1 10:30:59.048
T01   2  1 10:31:31.134      } 3
T01   3  1 10:32:00.861
T01   4  1 10:32:30.199

T01 TEST   16:14:23.110 ——— 5

TO1 ADJUST       +0.008
T01   5  1 16:15:01.623
T01   6  1 16:15:29.822

T01   7  1 16:51:03.946      } 6
T01 ADJUST       +0.001
T01   8  1 16:51:59.813
T01   9  1 16:52:58.953      } 7
T01 ADJUST       ******

T01 REPEAT 16:52:58.953 ——— 8
T01  10  1 17:01:22.382
```

RECEIVER

```
      TAG Heuer
HL650 v05 – No 0027

1 ——— SYNCHRO AT 10:30:00.000

2 ——— T01 TEST   10:30:21.211

      T01   1  1 10:30:59.048
      T01   2  1 10:31:31.134
      R01   1  2 10:31:46.959
      T01   3  1 10:32:00.861
4     R01   2  2 10:32:13.888
      T01   4  1 10:32:30.199
      R01   3  2 10:32:46.902
      R01   4  2 10:33:13.901

5 ——— T01 TEST   16:14:23.110

      T01   5  1 16:15:01.623
      T01   6  1 16:15:29.822
6 ——— T01   7  1 16:51:03.946
      T01   8  1 16:15:59.813
      R01   7  2 16:52:36.300

8 ——— T01 REPEAT 16:52:58.953
      R01   8  2 16:53:47.396
      T01  10  1 17:01:22.382
```

1. SYNCHRONIZATION

2. TEST

3. Start times

4. Start times transmitted and finish times

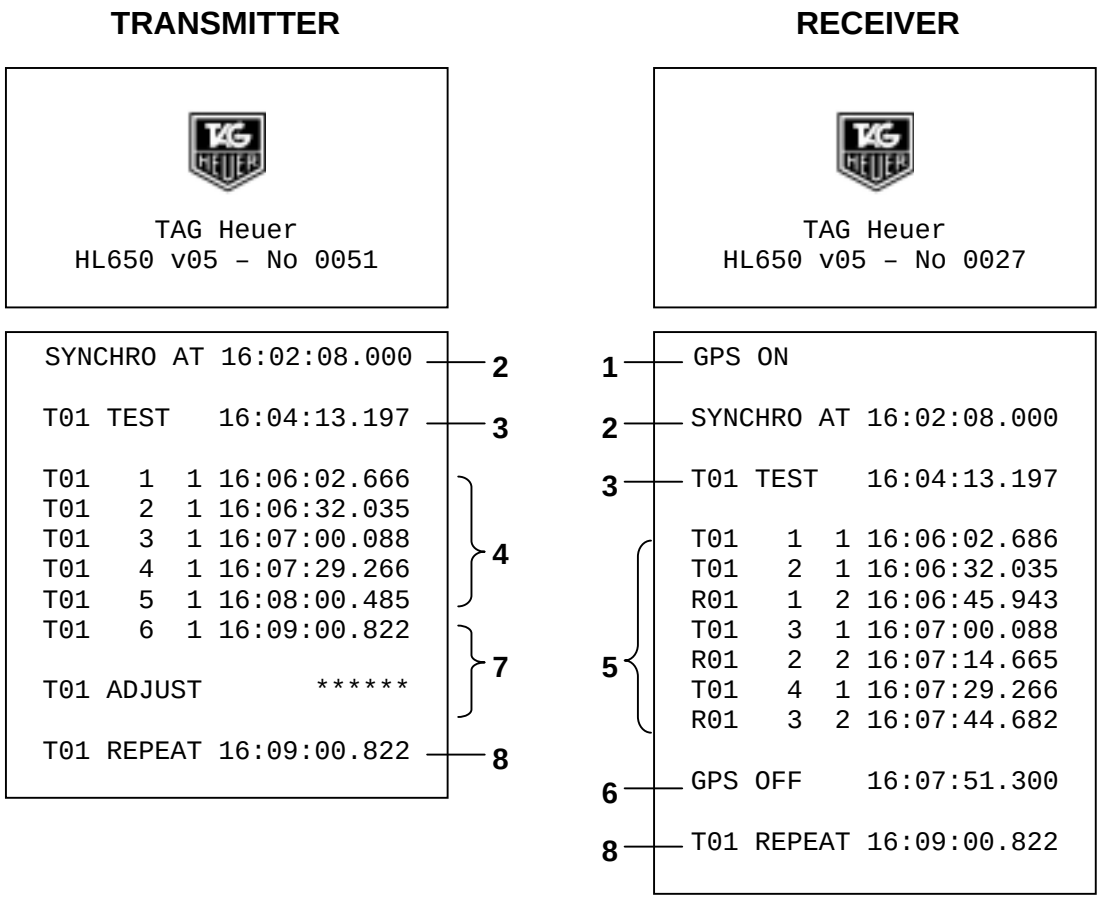
5. After a race interruption (5h40) TEST is pressed. A drift of + 0.008 second is registered. That means that at the moment of the TEST, the transmitter time base had drifted away from of this value as referenced to the Receiver time base considered as the “master time base”. ADJUST means that the two time bases are now perfectly synchronized for the start of the 5th competitor.

6. After a new race interruption, the TEST procedure has been forgotten. After the start of the 7th competitor, the time base of the transmitter is ADJUSTed by +0.001 second. It will thus be necessary to add 0.001 second to the start time of this particular competitor.

7. The start time of the 9th competitor was not received at the finish (RETURN is flashing on the transmitter). The ADJUST value is indicated by asterisks (*) because a calculation could not be carried out.

8. The REPEAT button of the transmitter is pressed, the non-received time for the 9th competitor is retransmitted to the finish and reconfirmed on the transmitter by RETURN. No drift is printed which means that the time base drift is less than 0.001 second.

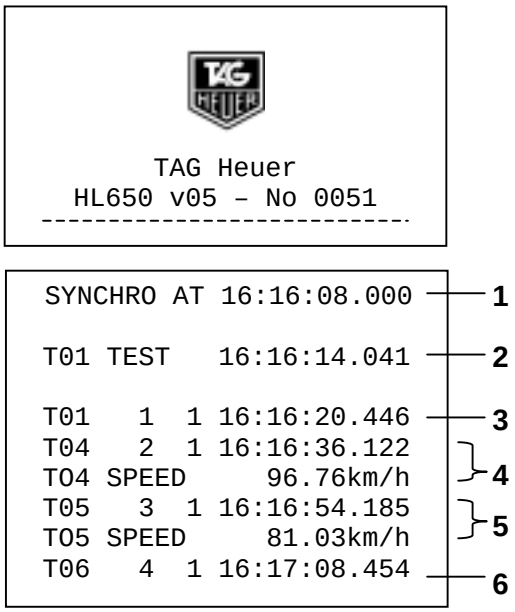
Timing tapes example WITH GPS:



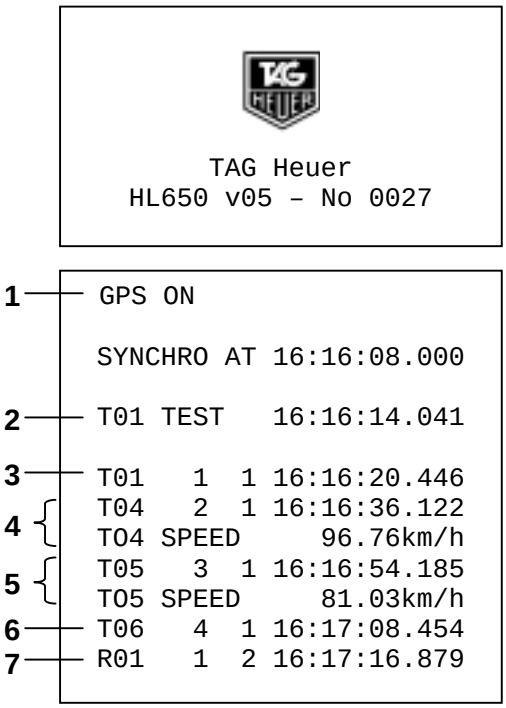
1. Indication that the GPS is connected
2. SYNCHRONIZATION
3. TEST
4. Start times
5. Received start times and finish times
6. The GPS signal is no longer received or reliable (GPS OFF)
7. Start time which did not reach the receiver or not confirmed by the receiver (see previous example)
8. REPEAT is pressed. No time base drift (greater than 0.001 second) is registered.

Timing tapes example WITH GPS, intermediates times and speeds:

TRANSMITTER



RECEIVER



1. GPS connected and SYNCHRO
2. TEST
3. Start time
4. 1st intermediate with speed (see coding)
5. 2nd intermediate with speed (see coding)
6. 3rd intermediate without speed
7. Finish time

8. SYNCHRONISATION AT TIME-OF-DAY

To guarantee the synchronization between different timing devices, we recommend to do this where the receiver is installed.

It is possible to carry out the synchronization of time-of-day while having already installed the transmitter at the remote start and the receiver at the finish. The only risk is to not have good VHF radio transmission quality at the requested time.

On the other hand, we remind you that the TEST button of the transmitter is able to recall the time of reference of the receiver time base at any time (see chapter 8).

1. SYNCHRONIZATION WITHOUT GPS

- Connect the back-up devices to the SYNCHRO output of the receiver (respect polarities)
- Program the back-up devices to the same time-of-day as the SPLITMASTER
- Switch ON the transmitter
- Switch ON the receiver
- Arm the INPUTS of the back-up devices
- Press SYNCHRO on the receiver at the exact programmed time-of-day
- Verify that all time bases are synchronized
- Block the INPUTS of the back-up devices and disconnect them
- For installation examples, see chapter 2

2. SYNCHRONIZATION WITH GPS

- The automatic synchronization of the time base for the time-of-day through GPS signals can occur at any second. It is thus not possible to synchronize other devices simultaneously with the SPLITMASTER while the GPS synchronization is taking place.
  As soon as the time base is running the SYNCHRO output of the receiver, it provides a synchronization impulse every minute (TOP MINUTE).
  Connection of back-up devices to the SYNCHRO output of the receiver and their subsequent triggering to the same time-of-day is possible. Leave their INPUTS blocked until the programmed time of synchronization occurs.
- By observing the GPS synchronization on the printer or the computer, choose the following minute (for example) to synchronize all back-up devices :
  Ex. GPS synchronisation at 10:03:26.000
  if possible, set the back-up devices at 10:04:00.000
- Arm the INPUTS of the back-up devices
- To the exact programmed time-of-day, all devices are synchronized automatically.
- Verify that all time bases are synchronized at the same time-of-day
- Block the INPUTS of the back-up devices and disconnect them
- For installation examples, see chapter 2

9. ACCURACY OF THE SYSTEM AND TIME BASE DRIFT CONTROL

The receiver is the main time base (MASTER) of the SPLITMASTER, the time base of the transmitter is called the SLAVE.

To ensure the accuracy of the system, the receiver systematically controls the time base of the remote transmitter by VHF radio signals in order to always be perfectly synchronized.

The function of the GPS is to guarantee "absolute" accuracy of the receivers' time base, in particular for long events.

Drift control principle

During the synchronization of the system at time-of-day (with or without GPS), the receiver sends its time to the transmitter which perfectly synchronizes with the receiver.

Lets call **DTR** the reference time-of-day of reference of the receiver and **DTT** the subsequent time-of-day of the transmitter.

As each timing impulse is provided to the transmitter from INPUT 1, or each time the TEST button is pressed, **DTT** of the transmitter is sent to the receiver. At the reception of **DTT**, the receiver replies its time base time-of-day (**DTR)** to the transmitter.
If **DTR** is different from **DTT**, the transmitter calculates this positive or negative difference. This value is called time base DRIFT and is memorized to the 1/100'000th of a second. The difference in the times is printed if equal to or greater than 0.001 second and the time base is realigned to that of the receiver's MASTER

The time bases of the SPLITMASTER are of excellent quality, but it is possible, after a certain time, that **DTT** has drifted compared to **DTR**.

Let's take the example of a ski race interrupted after starting for 1 hour for bad weather conditions. Just before the restart of the competition, press **TEST** on the transmitter for a control of the correct operation of the system. This action checks and if necessary realigns the synchronization between **DTT** and **DTR**. If a drift is noted, it will be printed in hard copy as well as memorized (see chapter 9)

WARNING!

- TEST has a double utility which must be used after a race interruption. TEST can be pressed several times if RETURN should still be flashing.
- If the user at the start forgot to press TEST before the restart of the competition, the start time of the first competitor can be accompanied by a printed drift indication (if the drift is equal to or greater than 0.001 second). When printed, it will be necessary to take this drift value into account for that particular competitor.
- If the transmission from start to finish is disturbed entirely and not possible any more, it will also be necessary to take the drift (s) of the time base during the race into account .

Remark : This very sophisticated system guarantees perfect timing accuracy to well within 0.001 sec. The honesty and integrity of the timekeeper however will consist in taking exceptional cases into account, such as if he/she forgot to press TEST after the race delay and that the drift is greater than 0.001 second. These exceptional cases will automatically appear on the timing tape for audit or review !

10. CODINGS OF THE TANSMITTERS

Each units is delivered with its own personalized CODE that prevents the receipt of data from another uses on the same frequency. The programmed code corresponds with that or the serial number of the receiver. If many transmitters are used (such as for intermediate times) they must all have this same code.

Please see the text on this subject in Chapter 11 that describes how to load the appropriate code into each device.

When many transmitter are used, it is necessary to differentiate between them within the same coded system. We use the code knob to effect this.

Example : Start Transmitter on CODE 1.
CODE 2 for the 1st intermediate followed by code 3 for the 2nd pour intermediate and so on.

The printer indicates :

```
T01   1  1    9:00:17.788
T02   2  1    9:00:23.700
T03   3  1    9:00:28.361
```

The Receiver Code knob stays at CODE 1.
It is possible to use up to 12 transmitters with 1 receiver

11. SPEED MEASUREMENT AND INTERMEDIATE TIMES

Each transmitter can be used for speed measurement and/or intermediate time.

Each receiver can receive specific timing information from up to 12 transmitters
(see chapter 10 coding).

Speed measurement

The SPLITMASTER is a highly accurate speed measurement device (calculation to the 1/100'000th of a second).

Impulses for speed measurements are provided by 2 photocells (or other contactors / sensors) connected to INPUT 2 (start / trap open) and INPUT 1 (stop / trap closed) – SPEED.

The distance between photocells is programmable using the AM/PM and HOURS switches.
With the known distance and recorded time between the sensors the SPLITMASTER can render speed data

See following table

NUM	AM	PM
0	0m	0m
1	1m	10m
2	2m	20m
3	3m	30m
4	4m	40m
5	5m	50m
6	6m	60m
7	7m	70m
8	8m	80m
9	9m	90m
10	10m	100m
11	11m	110m

Intermediate time measurement

Intermediate time impulses are those provided to INPUT 1 of the SPLITMASTER by a photocell (or any other impulse provider or sensor.

For printing examples : see chapter 7

12. USE OF THE RECEIVER ALONE

When a cable connection exists between start and finish locations the SPLITMASTER can be used as a non-radio stand-alone timing system for start and finish times.

The cable from the start sensor is connected to INPUT 1 and the finish sensor (photocell) is connected to input 2

13. RS 232 AND PRINTER CONNECTORS

Female 9 pole RS 232 connector

PIN	SIGNAL	DESCRIPTION
1	-	not used
2	TXD	RS 232 data transmission
3	RXD	RS 232 data reception
4	-	not used
5	GND	Ground RS 232
6	-	not used
7	-	not used
8	-	not used
9	-	not used

Female 9 pole PRINTER connector

PIN	SIGNAL	DESCRIPTION
1	-	not used
2	TXD	Data transmission to printer
3	-	not used
4	-	not used
5	GND	Ground printer
6	-	not used
7	-	not used
8	PRN ON	Printer status
9	-	not used

14. VOICE COMMUNICATION

The microphone headsets allow for high quality radio voice communication between start and finish.

Connect the headset adaptor box to the HEADSET plug of the SPLITMASTER.

Connect the headset to the headset adaptor box.

The volume adjustment is on the left side of the Headset.

We insist on total discipline while using the voice communication system for the following reasons :

- **Operating life of the rechargeable batteries**
- **Timing security by limiting the conversations between start and finish**

Operating principle :

Let's call **A** the timekeeper at the start and **B** the one at the finish.

To speak, press the red button of the headset adaptor box and keep it pushed during the conversation. An acoustic BEEP is produced at the beginning and the end of a communication, to both timekeepers.

- **A** can speak with **B** before and after a start.
  If **A** speaks during a start time, the communication will be cut to allow the sending of the timing information, but it will not receive the reception confirmation (RETURN) because it is transmitting.
- **B** can freely speak with **A** except during the start impulse. Being in transmission, it would not receive the starting time. In such a case, **A** can retransmit the missing time by pressing REPEAT if the RETURN Led flashes.

WARNING !

- It is obviously possible to speak simultaneously
- The maximum time of conversation cannot exceed 30 seconds
- Depending on the situations, it is possible to hear unpleasant noises in the Headsets. In this case, just shortly push on the red button and it will settle the problem.
- For an intense use of the voice communication system, we advise an additional external power supply (12V battery).
- The use of an external battery is possible at the condition that you use it with the internal batteries of the Splitmaster well charged (security of use)

15. COMMUNICATION PROTOCOL AND COMMANDS

General

The ON-LINE and OFF-LINE transmissions of the SPLITAMSTER via the computer serial port RS 232 always respects the format described below.

The frame always includes **28 characters + < CR >,** and it works at 9' 600 Bds, 8 data bits, 1 stop bit, without parity.

It contains:

1 character for **frame identification**
1 space
3 characters for **source identification**
1 space
4 characters for **sequential numbering** (or the competitor number with external keyboard)
1 space
1 characters for **timing channel (impulse)**
1 space
15 characters for **time**
1 <CR>

Each unused characters is replaced by a space.

frame identification

Y Synchronization
T Times
E TEST
R REPEAT
G GPS
S SPEED
C Correction (only on the Transmitter)

Source identification

T01 Transmitter 01 à 12
R01 Receiver 01 à 12

Sequential numbering (or the competitor number with external keyboard)

1234 Numbering from 1 to 9999

Timing channel

1 For start gate input or for the 2nd photocell using for speed measurement (on T)
2 For finish photocell input (on R) or for the 1st photocell using for speed measurement (on T)

Characters for time

15 characters for the time at the 1/100'000th in the following format: 12:34:56.987650

frames Examples produced by the HL 650

E T01			9:25:02.432160	<CR>	TEST before start
T T01	12	1	9:25:04.376650	<CR>	Start gate impulse
T T02	19	1	9:25:25.063370	<CR>	2nd photocell for speed measurement and intermediate time
S T02	19		123.45	<CR>	SPEED
T R01	14	2	9:25:56.897510	<CR>	Finish photocell Impulse

16. TECNICAL SPECIFICATIONS

General
Timing device within each unit integrates a thermocompensated time base and a radio module allowing for the transmission and the reception of timing information in synchronized time-of-day.

Time Base
Programmable at the time-of-day or automatically by GPS. Sequential numbering of times from 1 to 9' 999. The last 31'216 times are memorized (First IN - First OUT)

Timing Accuracy
1/1'000 sec. on the printed times
1/100'000 sec. on the PC Output
1/100 Km/h for the speed (programmable distance between photocells)

Time Base Accuracy
Thermocompensated Quartz 8MHz.
Better than ± 0.5 ppm at 20°C (± 0.0018 sec/h)
± 2,5 ppm between – 20°C and 75°C

Radio Transmission Accuracy
Fixed delay of 600 ms for the VHF transmission of the impulse with a precision better than ± 5/100' 000 sec.
The finish impulse can be delayed at same value so that net time is accurate without compensating for + 600 ms.
The transmission of timing information on all data ports is carried out in real time.

Mean Operating Frequencies
VHF programmable from 146 to 174 MHz (exclusively performed by the TAG Heuer agent)

Transmission Mode
Bi-directional (Half-duplex)

Programmable Power
At 2.5 W or 5 W (exclusively by the TAG Heuer agent)

Range
Depends on the topographic configuration and antenna type and positioning. Better behavior than a traditional radio transmission system (Ex: HL 620)

Power
Internal: 12 V rechargeable
External: 12 ÷ 18 V DC

Autonomy
24 hours with 1 impulse or data transmission every second (2.5W).
More than 10 hours at –20° C

Operating Temperature
From – 20°C to + 60°C

Weight
Transmitter or Receiver ~ 4.9 Kg

Dimensions (aluminum transport case)
~ 280 x 240 x 80 mm

Complete Set Includes
- 1 Transmitter
- 1 Receiver
- 1 Charger
- 2 Antennas (Type FSP 2/h)
- 2 Antenna cables (5 m)
- 1 GPS antenna with connection cable

Options :
- Additional Transmitter / Receiver (s) or Charger (s)
- Coaxial cable for external fixation of a professional Antenna
- Professional antenna (s) with corresponding cable