



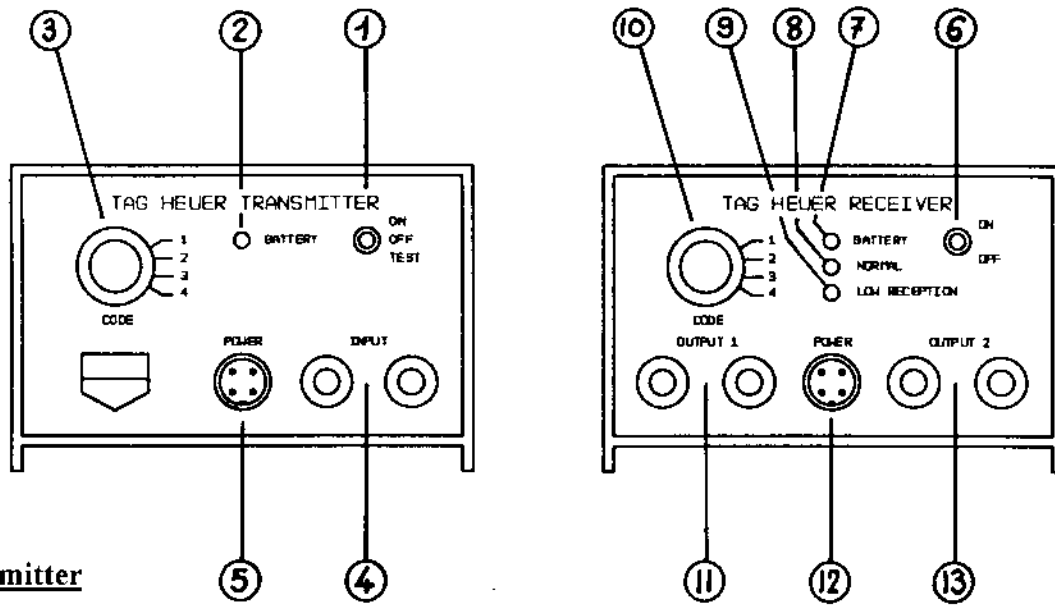
ELECTRONIC TIMING

**TIMING IMPULSE TRANSMISSION BY RADIO
TAG HEUER MODEL HL600**

INSTRUCTIONS

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Radio Transmission of timing impulses HL600



• Transmitter

1. ON / OFF / TEST Switch
2. LED Lamp for battery condition
3. Channel Selector Knob (1-4)
4. Input Triggering Contact Point (Start Gate, Photocell, Hand Switch...)
5. Connector for automatic battery charger and power supply (110VAC @ 6-12 VDC)

Note: An audio signal (beeb) accompanies every impulse transmission.

• Receiver

6. ON / OFF / TEST Switch
7. LED Lamp for battery condition
8. Green LED Lamp: "Excellent" Signal Indicator.
9. Red LED Lamp: "Acceptable" Signal Indicator.
10. Channel Selector Knob (1-4)
11. Timing contact output: (OUTPUT 1)
12. Timing contact output: (OUTPUT 2) when two transmitters are in use.
13. Connector for automatic battery charger and power supply (110VAC @ 6-12 VDC)

Note: An audio signal (beeb) accompanies every impulse transmission

Points to remember

- Charge the transmitter and receiver for 24 hours just prior to use. (see page 4)
- Never activate the transmitter without the antenna being connected.
- Always turn both units off after the timing session.
- When the radios are used in very cold conditions, care should be taken to reduce the effects of condensation that will occur when returning them to a warmer environment. In this case, protect the electronics by wrapping the units in material and make certain they are stored in a cool, dry condition as soon as possible.

*Note: On Receiver
Black to Black
Green to Red
will not work
if switched.*

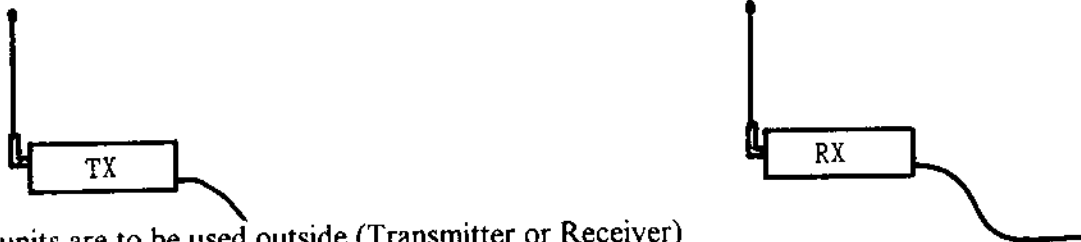
System Testing

- Attach antennas to both the Transmitter and Receiver.
- Select the same channel number on knobs ③ and ⑩ on each unit.
- Turn on the Receiver and the Transmitter.
- LED 7 should turn on.
- Place the Transmitter and Receiver about 1 meter (3 feet) apart.
- Press and hold the TEST switch. The BATTERY ② LED should light.
- The transmitter will now send a signal every 2.5 seconds. Listen for the audio beeps that will correspond to the proper reception of those signals on the Receiver.
- With each properly received transmission, LED ⑧ and ⑨ will light in addition to the emission of audio beeps on the Receiver.

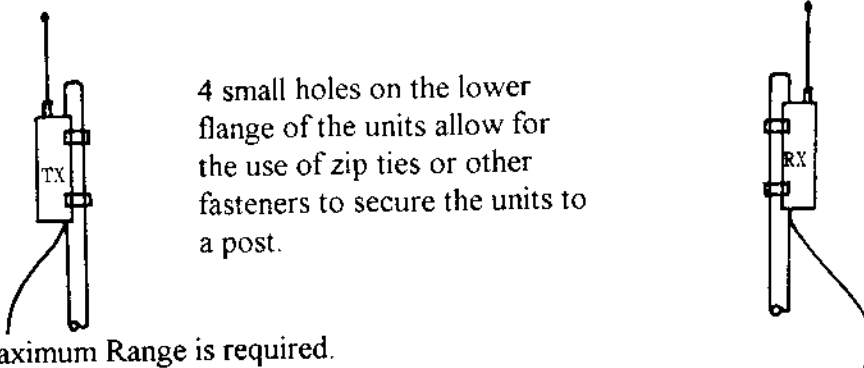
Setting Up the Transmitter (TX)

- The Transmitter must be placed in an open environment. If timing operations demand that the Transmitter is to be installed within the confines of a building is **highly recommended** that the use of an external antenna, linked to the transmitter by coaxial antenna cable, be used. Alternatively, an extension from the timing sensor (start gate, photocell, etc.) can be used to link to the timing inputs on the Transmitter while placing the entire unit outside. In all cases, the greater the height at which the Transmitter is installed, the better the transmission will be. Note also that other RF sources such as Walkie Talkies, TV sets, CD Players, and Computers can interfere with the operation of these units, even if they are not on the same frequency. Do not install the timing radios near any of these sources of potential difficulty.
- Installation Examples

a) Short Distances

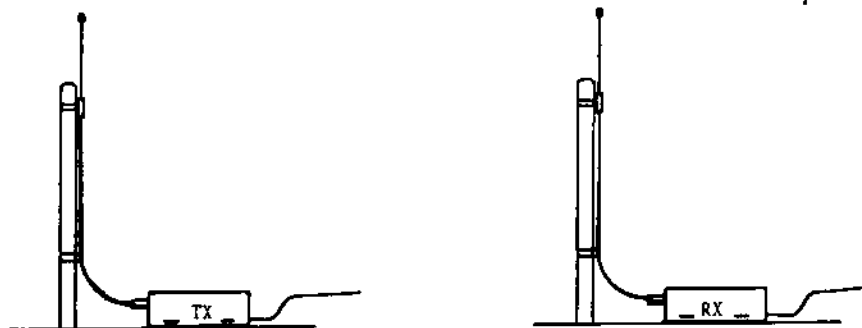


b) If the units are to be used outside (Transmitter or Receiver)



4 small holes on the lower flange of the units allow for the use of zip ties or other fasteners to secure the units to a post.

c) When Maximum Range is required.



- When ready to begin timing operations, use the TEST switch ① to test the transmission quality. Turn the TEST switch back to the “on” position when ready to begin actual timing operations.

Set Up of the Receiver (RX)

- The Receiver must be placed in an open environment. If timing operations demand that the unit is to be installed within the confines of a building, is **highly recommended** that the use of an external antenna, linked to the transmitter by coaxial antenna cable, be used. Alternatively, a simple 1 pair wire extension (2 pairs if both outputs are being used) from the timer can be used to link to the timing inputs on the Receiver while placing the entire unit outside. In all cases, the higher the Antenna is, the better the transmission quality will be.
- In circumstances where the maximum range is necessary, testing the quality of the signal being received and searching for the best reception location by moving the Receiver around within a 10 to 20 meter radius of the timing position will allow you to achieve best performance from the system.

For this test, the Transmitter is placed in TEST Mode, and at the Receiver end we look for the quality of the reception with LED's ⑧ and ⑨.

This procedure is highly recommended in difficult topographical terrain or in environments of high RF activity such as in urban centers.

- Once the best placement location has been found, connect OUTPUT ⑪ on the Receiver to your timer, respecting the polarity of the connections. (Green: Signal, Black: Ground)

Signal strength testing

LED's ⑧ and ⑨ allow us to observe the activation and quality of each transmission being received.

- Green and Red LED's working ⇒ “ NORMAL ” transmission quality, optimal.
- Red LED Only ⇒ “ LOW RECEPTION ” Sufficient transmission quality, allows for assured timing operations.
- No LED's activating ⇒ If the audio beep is being heard but no LED's are lighting when transmissions are received, the system is operating at the limits of range and complete transmission reception cannot be guaranteed.

Charging and Care of Batteries

Red LED's on both the Transmitter and Receiver (② and ⑦) allow us to monitor BATTERY condition. They are lit when the condition of the rechargeable batteries are sufficient. When flashing, transmission quality can be affected and is not guaranteed.

Reminder: Charge batteries for 24hours the day before timing operations.

The units are equipped with rechargeable Ni-MH (Nickel-Metal Hydride) batteries that allow for impressive operating life, even under very cold conditions.

The charger furnished with the units is highly recommended for these batteries since it allows for rapid charging of both the Transmitter and Receiver, even though they operate on differing voltages.

Use :

- Connect the charger to a 110 Vac line socket

- Connect the small bayonet type plug to the POWER jack (5 or 13). Once properly inserted in the jack, continue to push the collar of the plug gently into the jack and then with a ¼ turn lock it in position to assure the connection. DO NOT FORCE.
- When properly connected, a red LED on the charger will light

Charger LED Functions

- Red LED Flashing: ⇒ (a) Immediately after connecting (Test Phase).
(b) Damaged batteries or incorrectly installed (inverted polarity).
(c) While DISCHARGING the batteries after pressing “PRESS ”

- Red LED On ⇒ Batteries are being CHARGED

- Green LED On ⇒ Batteries are CHARGED

IMPORTANT

It is recommended to cycle (discharge and completely charge) the batteries 3 or 4 times when the units are first put into service, or after having been stored for a while.

DISCHARGE - CHARGE

Connect either a Transmitter or Receiver to the charger and when the Red LED is lit press the button marked “PRESS”. The Red LED will now flash during the hours that the batteries are being discharged completely to safe levels. The LED will stop flashing and burn steadily as the charger switches back to charge mode. When completely charged the green LED will light. A complete cycle will typically take 12 hours.

Back Up Timing for Protection

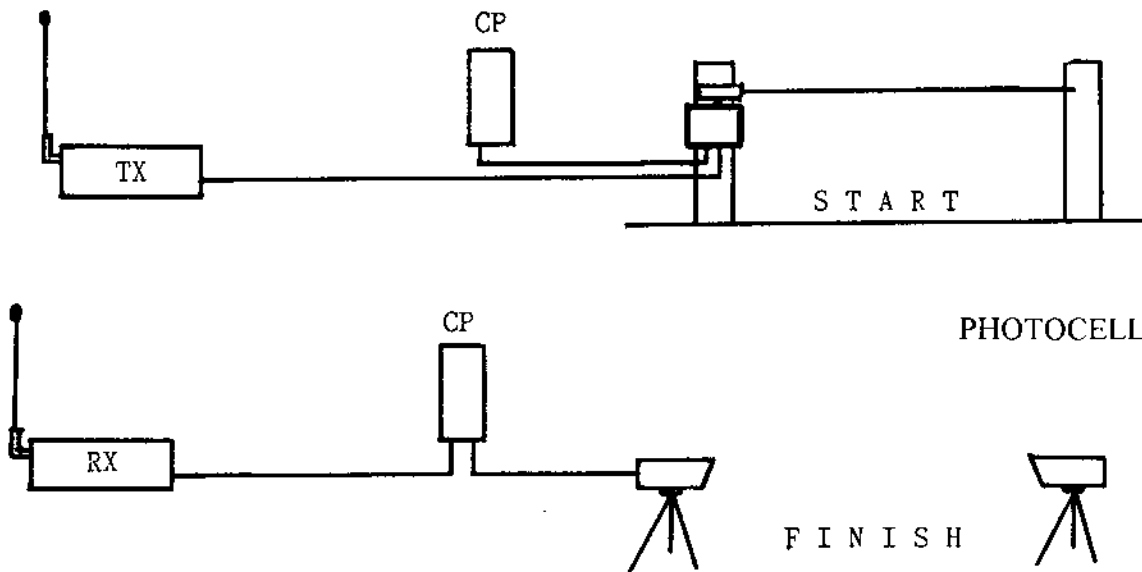
To add a level of technical protection to your timing of important events, it is **highly recommended** that you install a synchronized Time-of-Day back up system in parallel with **any** “wireless” timing system. As users of cellular phones well know, any type of radio transmission system is susceptible to disruption from other RF sources.

Please consult with our TAG Heuer agents for complete details on how to accomplish this.

Set up examples:

START GATE

(with a photocell connect in parallel to a CP timer and the Transmitter).



To synchronize the system, use the set up diagram above. At the requisite moment, open the start gate (or send an impulse). The two systems will be synchronized taking into consideration the 1 second delay in the radio transmission.

IMPORTANT

The radios send the timing pulse exactly 1 second (to within 1/1000th/second accuracy) after the actual impulse is sensed at the Transmitter Input. If the real time on a race course was:

1 min. 11 sec. 312, the net the use of radios will **shorten** this time by **exactly 1 second** and display a net time on course of 1:10.312.

It is critically important to take this 1 second delay into account in sports where records are being kept and in cases where back-up times are being compared to times generated by radio transmission.

Note that in cases where Radio transmitters are used at both the start and the finish, the net times recorded are "real", since the 1 second delay is taken into account at both timing points thereby negating the effect.

Weather Protection Recommendations

When used outdoors in bad weather, the units **must** be protected from the elements. We recommend the use of small plastic bags placed over each unit.

Special Configurations

2 Transmitters may be used with 1 Receiver

Applications :

- Intermediate timing for alpine or X-Country ski events

Start and Finish Impulse transmissions to remote timing placement (equestrian, skiing, etc.

System Programming:

Switch CODE (3) on Transmitter No.1 set to 4

Switch CODE (3) on Transmitter No. 2 set to 1

Switch CODE (10) on Receiver set to 4

Transmitter No.1 impulses available on (11) OUTPUT 1 of Receiver

Transmitter No. 2 impulses available on (13) OUTPUT 2 of Receiver

Equipment List (typical)

- 1 Transmitter HL600-1
- 1 Receiver HL600-2
- 1 Charger 110Vac/6-12V HL600-3
- 2 Antennas, ¼ wave HL600-4
- 2 BNC 90° connectors HL600-5
- 1 carry case HL600-7

OPTIONS

- 2 coaxial cable extensions (50 Ω, 2 meters) for external antenna placement

Technical Specifications

Transmission Theory: For each timing impulse received at the inputs of a transmitter, a resulting radio transmission is sent which is comprised of 5 distinct and identified "frames" spaced at 200 msec. The reception of only one of these 5 signals is enough to guarantee the proper operation of the system.

The transmission of the triggering signal is delayed for exactly one second. This transmission delay value allows for the simple conversion of radio produced times into "actual net times on course" when one Transmitter at the start or the finish is used.

In all cases, the accuracy of the transmission is better than 1/1000th /sec.

OFCOM certified: BAKOM 97.1006.K.P.

<u>Transmission Type:</u>	FM on 433.92 MHz.
<u>Coding</u>	4 Channels, user delectable
<u>Power</u>	0.5 Watt
<u>Range</u>	15 kilometers under optimal conditions
<u>Antennae</u>	¼ wave, BNC 90° connector
<u>Options</u>	50 Ω coaxial antenna cable (2 meters)
<u>Input Triggering</u>	Normally Open working contact
<u>Output Triggering</u>	2 N/O outputs, isolated by optocoupler.
<u>Output Signal Monitoring</u>	By audio signal (Beep)
<u>Receiver Monitoring</u>	With 2 LED's that indicate reception quality in conjunction with beeper operation
<u>Battery Condition</u>	1 LED. On=OK. Flashing=Batteries need charging

<u>Transmitter Power Source</u>	Internal rechargeable 12 volt Ni-MH (Nickel-Metal Hydride) batteries.	
<u>Receiver Power Source</u>	Internal rechargeable 6 volt Ni-MH (Nickel-Metal Hydride) batteries.	
<u>Charger</u>	Multi-function rapid charger with discharge, charge and trickle charge. 120vac/6-12vdc.	
<u>Autonomy</u>	30 h at 20° C (68° F) 22 h at 0° C (32° F) 12 h at -20° C (-4° F)	Sending 2 impulsions / minute
<u>Operating Temperature</u>	- 30 °C to + 60°C	
<u>Mounting</u>	Vertical mounting on post with 2 zip ties or straps is possible	
<u>Dimensions</u>	90x62x190 mm (2x)	
<u>Weight</u>	Transmitter : 850 g.	Receiver : 1050 g.

Warranty

The radio impulse transmission system ref. HL600 is guaranteed for one year since date of purchase. The warranty is not valid :

- if the accumulators are damaged
- if a bad maintenance of the system is noticed
- if the system has been opened without authorization

We wish you a successful timekeeping.

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