Ballistic Chronograph

Models: R2 / R2A / R2H

R2	R2A	R2H
		
139x71x100	210x105x100	260x105x100

Operating Manual

IMPORTANT SAFETY INFORMATION

INTRODUCTION

* **Thank you** for purchasing one of our products.
* **Please read the manual** to understand how to operate the unit correctly. After reading the manual, **please keep it in a safe place** for future reference.

WARNINGS:

* **Do not** place heat sources or open flames on or anywhere near the device.
* When disposing of batteries, **environmental considerations must be strictly observed**. Please follow your local regulations and laws governing disposal as batteries contain chemical substances.
* To prevent fire or electric shock, **do not** expose the unit to rain or moisture.
* Remove the batteries when they are discharged or have not been used for a long time.

Setup:

- **Open** the cover of the battery case.
- **Insert** 2x AA batteries (not supplied) into the clamps.
- **Ensure** that the batteries match the terminals.

Correct Position:

For the power supply unit (not supplied) from an external source, use:

~ 230V / 7-12V AC / DC adapter with 5.5mm diameter plug and 2.1mm aperture.

The pin of the plug has a "+" polarity.

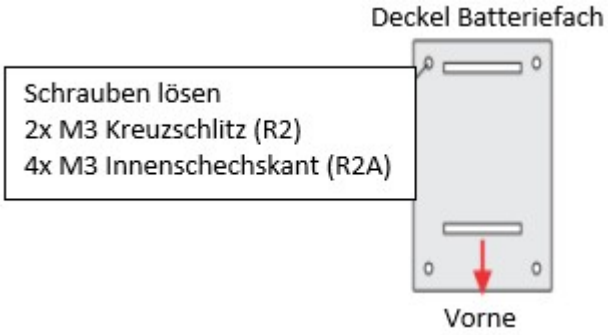


Illustration 1: Battery Case. Loosen screws. 2x phillips-tip screws (R2). 4x Hexagon socket (R2A). Front.

GENERAL SAFETY INSTRUCTIONS:

- Only use the weapon in a **safe and stable** position!
- Keep the chronograph away from the **discharged gases**
- Shoot only if a suitable **bullet trap** is provided!
- When handling the weapon always make sure that the **muzzle points in a direction in which you can not accidentally damage or endanger other people or things**!
- Wear **protective glasses/goggles and ear protection**

Please follow the legal regulations relevant to your location!

Ballistic Chronograph

The device is designed to determine the **speed and kinetic energy** of projectiles/ammunition in air rifles and air pistols; firearms and bows [Models R2A / R2H].

Properties:

Speed: 6 to 2000 m / s
· Measurement error: <= 1% @ 250m / s
. Power consumption: 100 mA
· Power supply: 2x AA (alkaline or rechargeable battery)
. Dimensions Model R2 (H x W x D) 139x71x100mm
· Dimensions Model R2A (H x W x D) 210x105x100mm
. Dimensions Model R2A (H x W x D) 260x105x100mm
· Weight approx. 600g / 995 g

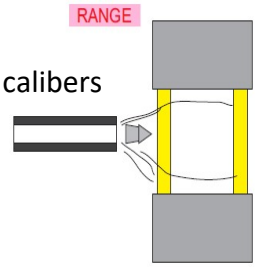
Measurement Functions:

· Velocity V [m / s]
· Kinetic Energy E [J]
· Shot counter
· Mean kinetic energy Esr [J]
. Average speed Vsr [m / s]
· Minimum speed Vmin [m / s]
· Maximum speed Vmax [m / s]
· Absolute speed dV = | Vmax-Vmin |
· Standard deviation SV [m / s]
· Speed in fps V [fps]
· Rate of fire RoF

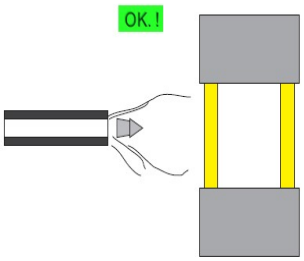
Additional Functions:

. Setting weight of the projectile: 0.01 - 25.00 g
. Calibration
. Optional conversion to LG or CO2 / firearm
. Memory: 250 readings
. Transmission of measured values to a PC via RS232 connection possible

Advice on the measurement of firearm projectiles:



- Keep the chronograph away from the discharged gases
- Ensure that the device is a **sufficient distance** away from firearms with larger calibers to protect its mechanism from blast damage.
- No guarantee is offered and no liability exists for damage caused by gases or ammunition
- **Do not use shotguns or black powder weapons** with this device!



Adjustment of the projectile weight:

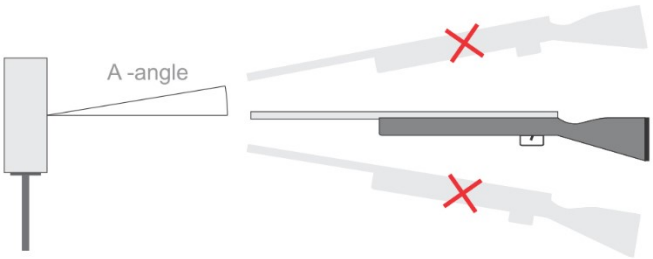
In mode **E [J]** and **V [m/s]** **press S1** (first from the left).
With the key **S2** (**decrease**) and **S3** (**increase**) the value.
Holding **S2** or **S3** **changes the values quickly**.

Switching high/low sensitivity of air guns to CO2/firearms:

To change sensitivity to **High** for air guns or **Low** for CO2/firearms, hold the **S1** and **S2** buttons and turn on the device. To confirm the setting, turn the device off and on again.

Measurement:

To take a measurement, place/hold the muzzle at a distance of: 80-100mm for air guns and for small calibres about 1.5m, horizontally in front of the device and take a shot.



If the speed is less than 6 m/s or if the second sensor cannot detect a projectile, the display shows the message: **"Range"**

- **Press S2** to **display** the measurement function.
- **Pressing** the **S3** key (third key from the left) returns you to the **main menu**.
- **Press S3** (for more than 1 second) to **clear** the measurement results.

Saving and reading stored measurement results:

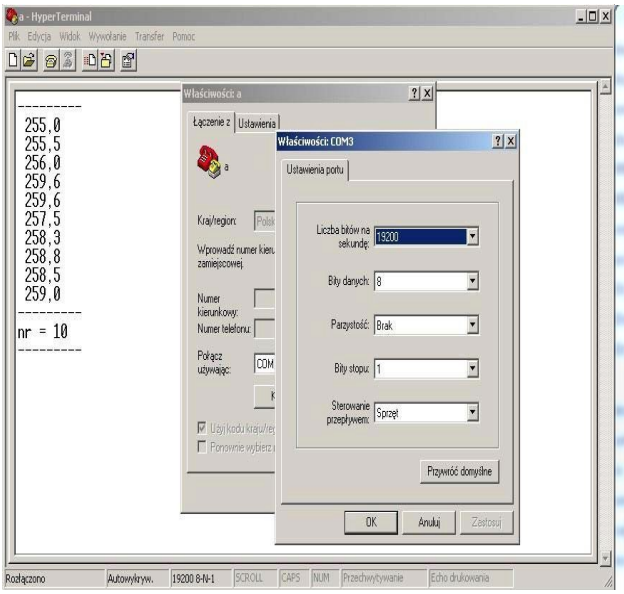
The chronograph memory stores up to **250 measurements**.

- **To access the list**, press the buttons **S2** and **S3**. If the memory list is full, the existing results are overwritten.
- **To save the results**, take the measurements, then press the **S2** key twice, then **S1**, then **S2** (W) to complete the save.
- **To obtain a readout** of results on a PC, press the **S2** key 3 times, then **S1**, then **S1** (R)
- **To clear the results**, press the **S2** key 3 times, then **S1**, then **S3** (CL)

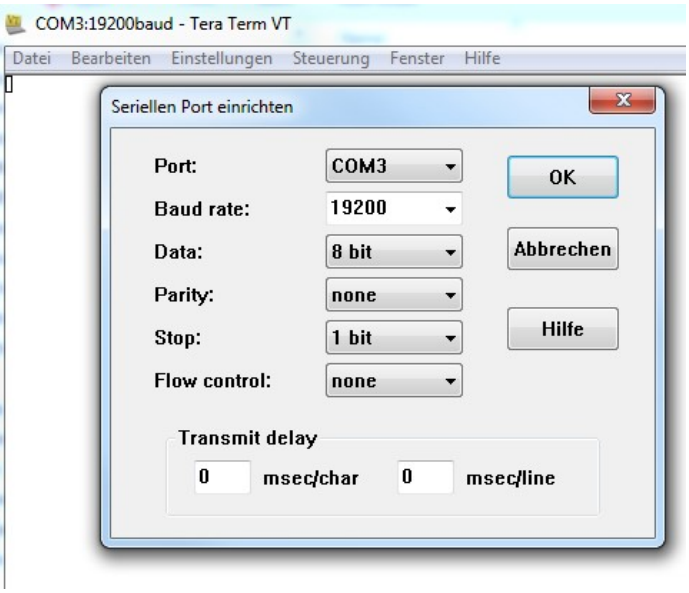
Connection to a computer:

Connect the PC to the device using an **RS232 COM cable** (not included).
The transmission speed is 19200 bps. The data is sent to the computer and displayed after each shot.
The data can be selected for readout using **Hyper Terminal** from Windows or **TeraTerm**.
The displayed results can be copied to a **text file** or to an **Excel sheet**.

Hyper Terminal



Tera Term



Flow control - without flow control or devices:

Hyper Terminal:
-> Save as file: configured connection in Hyper Terminal can be saved as a session file.
- After starting the session file, Hyper Terminal will run with the new settings.

Tera Term:
- Save settings: Settings > Save setup.
- After starting, Tera Term will run with the new settings.

Calibration:

Press S3 and switch on the device - after 1 second <gate> will be displayed as well as the distance between optical sensors. If you change the distance value, it will change the measuring speed.

V = distance of the photoelectric sensors/measured time

If the "distance of the photoelectric barriers" is increased by about 0.1 mm - the speed increases at v = 100m / s by about 0.2m / s, at 200m / s by 0.4m / s, at 500m / s around 1m / s etc.

- Use the buttons S2 and S3 to **change the distance** parameters.
- Press S1 to **save and return** to measurement mode.

The distance between the light barriers can also be measured with a ruler.
LZ and LW distances between the two sensors. LZ = outer distance, LW = inner distance:

$$L = (LZ + LW) / 2$$

Calibration can also be conducted by comparing the speed with another measuring device. With this method **you must calculate** the parameters L - distance between the photoelectric sensors.

$$L = Lk * VW / Vk$$

L [cm] - calculated distance between the light grids
Lk [cm] - the distance between the photoelectric sensors in the chronograph
Vk [m / s] - the speed measured by your chronograph
VW [m / s] - speed measured by the second measuring device

Measurement rate of (RoF - rate of fire):

RoF displays the number of shots per second (RPS) or per minute (RPM). The lower limit of the measurement is 3.5 min.

Setting the measurement mode to RoF:

Press **S2** and turn on the device for the RoF selection mode.

Measurement:

Take a few shots. The projectile **must pass** the first photoelectric sensor.
The display shows the following results:
Number of shots (rounds) per second (**RPS**) or number of shots per minute (**RPM**). Switch between RPS and RPM by pressing **S1**.
The measurement is **triggered by the first shot**. The result will be displayed after the second shot.

Measurement cycle time:

t1 + t2 + t3 + + ... tn + 16 Seconds

where "*n*" calculates the number of shots and "t" the duration of each shot. After the last shot, the device remains in the measuring mode for **16 seconds**.

After this time the display shows the symbol *.
The symbol * indicates the end of the measuring cycle.
A new measurement cycle begins with the next shot.

Deletion of the measurements:

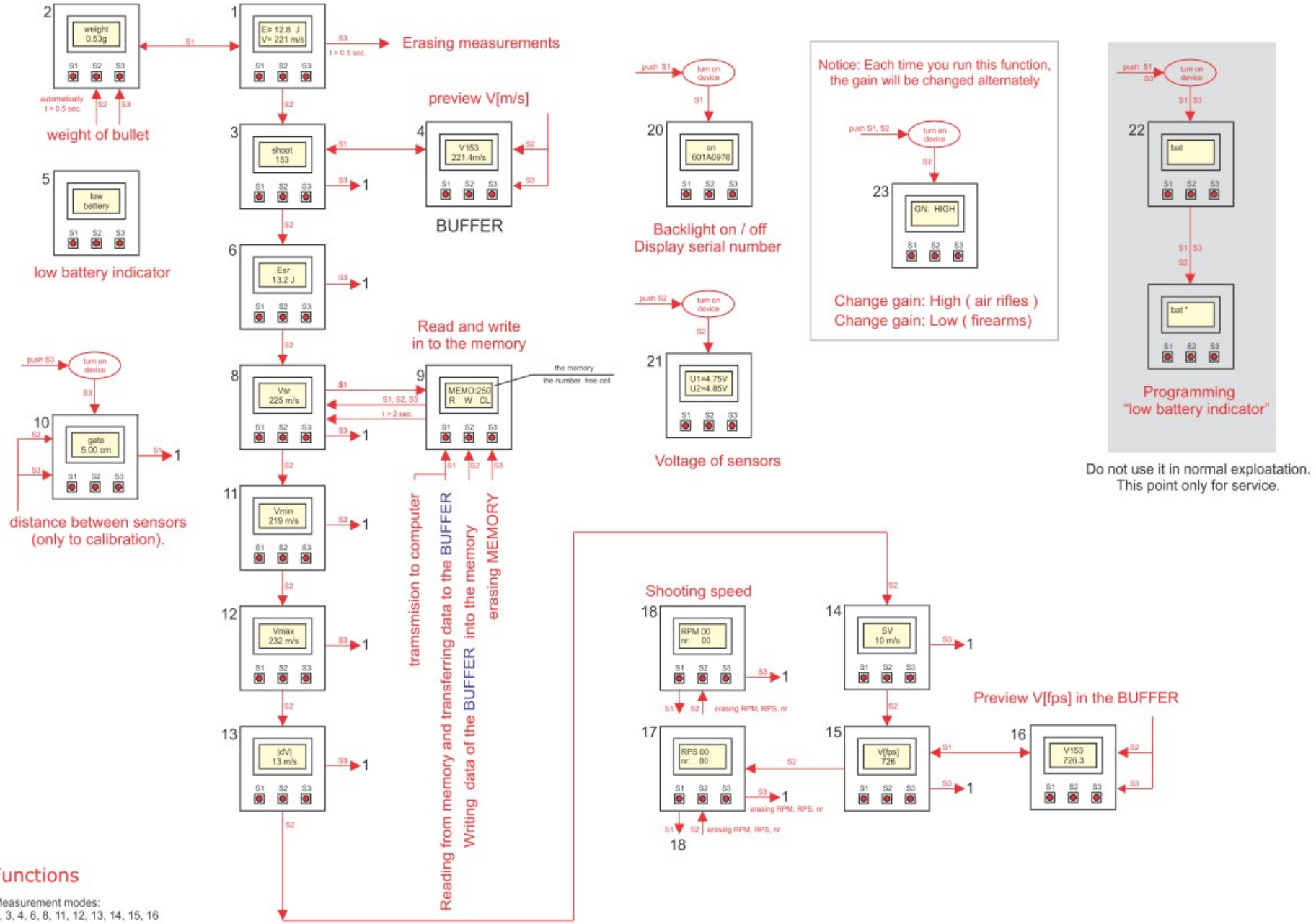
Press S2 or S3. The S3 button will exit the measurement mode and the RoF clears the RPS, RPM and the number of shots. A measurement of the rate of fire cannot be conducted simultaneously with the measurement speed.

Background lighting on and off:

Press S1 and switch on the device. The lighting is switched on / off.

Show voltage of the optical sensors:

Press S2 and switch on the device. The voltage is displayed. This feature is useful when diagnosing faulty sensors. With impaired/clouded/obscured sensors, the voltage increases up to 4.99V. Normal voltage: 4.0 - 4.7 V [base model R2]



Functions

Measurement modes:
1, 3, 4, 6, 8, 11, 12, 13, 14, 15, 16