

**USER'S MANUAL**  
**FOR THE SHOOTING CHRONY® CHRONOGRAPHS,**  
**MODELS: F-1\*, M-1\*, ARCHERY\* and PAINTBALL-CHRONY\*® as well as the**  
**respective MASTER CHRONY® units for these Models. (\*see page 9)**

**INTRODUCTION** (\*\* Please Read These Instructions Carefully Before Using The Chronograph)

SHOOTING CHRONY INC. assumes no responsibility, either directly or indirectly, for any action or consequences of any actions associated with the use of its products.

Every *Shooting Chrony*® measures the speed of bullets, arrow, shotgun-pellets, airgun-pellets and paintballs, etc.- from 30/FPS (feet per second) to 7000/FPS and with better than 99.5% accuracy. Your Chrony will go with you anywhere. Just unfold, mount on a tripod or place on a table, insert Diffusers (if needed) and shoot in less than 2 minutes. All Chronys come with a 3 year limited Warranty. The *Master Chronys* have the same capabilities as their respective *Shooting Chrony* counterparts. In addition to that, the *Master Chronys* have a LCD Monitor which brings the LCD (Liquid Crystal Display) readout right up to your bench, away from the bullets path.

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**FUNCTIONS**

## ***F-1 CHRONY***

Gives Numbered Shot Velocities; + Velocity stays on display until you shoot again; + Uses 9 Volt Alkaline Battery with 48 hours of continuous use; + Stereo Jack for optional Remote Control or Chrony Ballistic Printer. The Chrony Ballistic Printer, will also function as a Remote Control. It prints velocities as you shoot and, on real paper. When done shooting, press STAT button on Printer and it will print Hi, Low and Average-velocities, Extreme Spread and Standard Deviation. !! This information becomes available only if and when the F-1 Chrony is used together with the Remote Control or the Chrony Ballistic Printer. !! + Upgrades to Alpha, Beta or Gamma Shooting Chrony or Master Chrony.

## ***M-1, ARCHERY and PAINTBALL CHRONY***

Same functions as the F-1 Chrony. However, Stereo Jack is optional. The Archery Chrony comes with the Indoor Shooting Light Fixture. The Paintball Chrony comes with Splatguard and Gun Cradle. The Archery and Paintball Chronys can also be used with Rifles, Handguns, etc.

## **HOW IT WORKS**



The *Chrony* has two eyes (or photo sensors) located in each of the black plastic housings at the front and back of the main unit. They are located under the Twin Lenses at the bottom of these housings and they detect the passage of a bullet over them by sensing the change in the amount of light. (They detect a momentary change in light intensity.)

*If it doesn't unfold, it's not a Chrony!*

**Fig. 1. Closed Chrony.**

As the bullet passes over the first detector, it trips a counter, which begins to count very rapidly (much as a super-fast stop watch). The counter is shut off by the second photo sensor when the bullet passes over it. The computer in the Chrony then converts this information into feet per second (FPS) or metres per second (MPS), whichever mode it was set to work in at the factory. The F-1 Chrony measures in FPS; the M-1 Chrony measures in MPS.

When used with a **Remote Control** or **Chrony Printer**, the computer inside the F-1 Chrony will, after the first shot, compute all statistical information, such as **Hi(gh)**, **Lo(w)**,

**Av(erage)** velocities, **Extreme Spread** and **Standard Deviation**, following each new shot. The use of our **Remote Control** or **Chrony Printer** gives access to the temporary working memory, which allows the erasing of part of the data. Only the Beta and Gamma Chronys have a permanent memory, which allows the unit to be turned off without losing data.

## **GETTING STARTED**

### **THE BEST WAY TO LEARN TO USE THE SHOOTING CHRONY**

It is best to proceed slowly, safely, and have fun doing it. Getting the Chrony ready to use is easy.

1. First, unfold the unit, making certain that the unit is FULLY OPEN. The base (such as a tripod) may prevent full opening, in which case the chronograph will read higher (faster) than true velocities because the space between the points where the bullet crosses the photocells is shorter than is the distance for which the unit is calibrated.

2. Attach a **9-volt Alkaline Battery** to the short cable inside the front housing and tuck it under the spring. If it is not an Alkaline battery, the Chrony may not work properly. With a standard model Chrony, the unit is ready to turn on with the switch on the face. With a Master Chrony, attach the long telephone cable into the LCD (Liquid Crystal Display) Monitor and to the inside terminal of the front black sensor housing of the unit. It is now ready to be turned ON.

## STEPS ON SETUP

1. The first step is to set up a safe backstop. Chronographs should never be used without a safe and certain backstop that stop the projectiles (bullets, shot, arrows), and prevents ricochets.

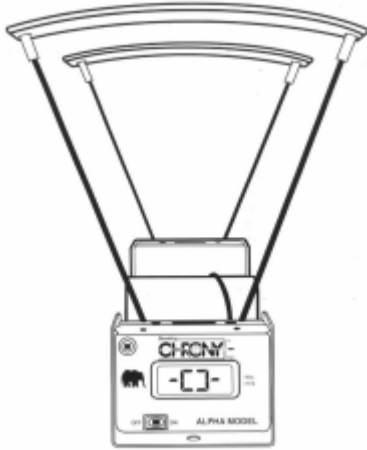


Fig. 2. Shooting Chrony, front view

2. To safeguard the Chrony and to prevent missing the backstop, any firearm used must be fired from a good rest. A bench with sandbags is the best type of rest.
3. For the best use of chronographs, velocity measurements should be combined with target shooting (that is, you are chronographing the same bullets that are being shot at the targets). Set up a suitable target against the backstop.
4. To safeguard the instrument (and to obtain the best results), the projectile must pass between 6 and 4 inches (15 and 10 cm) directly OVER the Twin Lenses in the black plastic boxes at the front and back of the chronograph. These are the chronograph's "eyes". Attaching pieces of dark-coloured tape on the guide rods (wire rods) at these heights, will help you to accurately aim your shots.

5. **The Shooting Area.** Every Shooting Chrony and Master Chrony comes equipped with an adjustable-size, triangular shooting area (actually an upside down trapezium) from 8"X8" to 14.5"X14.5" (Fig. 2). All Chronys come equipped with four 9.25" wire rods as well as four 6.5" wire rods with brass connectors attached. The 9.25" wire rods are to be inserted at an angle into the outer holes visible on the black plastic boxes of the unit. On bright, sunny (blue sky) days, install the white plastic diffusers on top of the wire rods (to simulate clouds). The photo-sensors are pointed at the diffusers, which create a white background (clouds or diffusers). On cloudy days, use wire rods for alignment, but without the diffusers.

6. Chronographs should be at least 10 feet (3 m) from the muzzle of a high-powered rifle, but can be closer to guns with a lesser blast. Five feet (1.5 m) is about right for .22 rimfire firearms. Shotguns should be fired at 5 feet because of the spreading pattern of the shot and errant wads. Arrows must be clear of the bowstring before passing over the first "eye".

7. The Chrony may be mounted on a (camera) tripod, or on any adjustable device having a 1/4 inch by 20 thread that will screw into the hole on the bottom of the unit. It is also possible to rest the Chrony on a table, though this is probably the most difficult type of mounting to adjust properly.

8. With an F-1, or M-1 Master Chrony (Fig. 3), place the LCD Monitor near you on the bench, well away from muzzle blast.

9. Have a notebook and pen with you to record your results and to make notes.

## STOP! BEFORE YOU FIRE THAT FIRST SHOT!

- A. Be Sure that the backstop is adequate.

- B. **RIFLES:** Be aware that the bullet line of travel will be as much as two inches BELOW the line of sight on scope-sighted rifles. Adjust upward in order NOT to hit the Chrony. If a bullet hits the Chrony, the Chrony will

be destroyed, and will endanger you and others because of bullet ricochet and flying parts of the Chrony. Mark the Wire Rods with tape four inches above the Chrony unit for open-sighted rifles, and six inches for scope-mounted rifles.

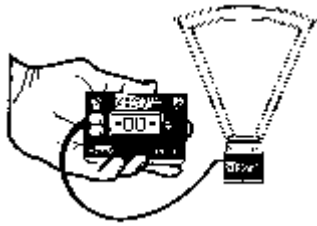


Fig.3. Master Chrony



Fig.4. Protective Shields

**C. HANDGUNS:** When shooting sub-sonic ammo, the muzzle blast will get to the Chrony before the bullet, which may cause erratic numbers. Increase distance from Chrony.

**D. SHOTGUNS:** because flying wads may go in any direction, protect the face of the Chrony by taping a thick piece of clear acrylic over the front of the unit. The acrylic must not extend above the face. Shooting Chrony Inc. offers such protection (see Accessories List). NOTE: When shooting without Diffusers one may substitute soda straws or wooden dowels for the Wire Rods. Hitting the Wire Rods with a bullet could break the Sensor Housings, whereas straws and dowels provide a safer sighting guide

**E. MUZZLE LOADERS AND OTHER BLACK POWDER FIREARMS:** In addition to protecting the face of the Chrony from wads and patches, you may cover the slots (eyes) of the photo sensors with strong and clear tape or Protective Shields (Fig.4) to prevent powder residue from entering these slots. Glass or clear plastic taped over these slots may also be used.

**F. ARCHERY:** Bow to Chrony distance should be at least an Arrow's length. Blunt-tipped or flat-tipped arrows give more Accurate velocity measurements.

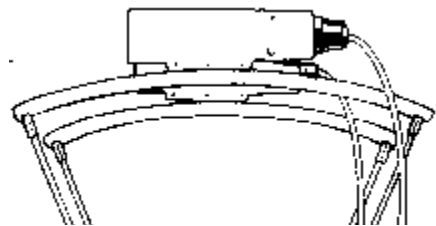
## O.K., NOW YOU ARE READY

Until you are familiar with the Chrony, shoot inexpensive ammo, such as airgun-pellets or .22 rimfire bullets. Doing so will save you money.

1. **TURN UNIT ON.** If you purchased the Chrony in the United States, it will automatically record and read in feet per second (FPS). If you purchased it in a country that uses the metric system, it will record and read in metres per second (MPS).
2. A F-1 Chrony will display **AL** with the flashing symbols on each side. These flashing symbols indicate that the unit is working and is ready for use. For units that are set to read in MPS, the display has a dot between the two letters (e.g., **A.L**) with flashing symbols on each side; without the dot (e.g., **AL**) the unit readout is in FPS.
3. You cannot change the standard of measure on the *F-1 and M-1* Chrony units. The *F-1 Chrony* will show **AL** in **FPS** and the *M-1 Chrony* will show **A.L** in **MPS**.
4. The *F-1 and M-1* Chrony and the respective *Master Chrony* units report only the shot number and shot velocity up to 32 shots. Record on paper each shot number and velocity, as these units do not have a memory. After the 32nd shot, Ln appears, and the velocity readout flashes. Shot 33 and all subsequent shots report as shot 32. To start a new string, turn the *Chrony* **OFF** then **ON** again.

## DECIMAL POINT

When chronographing projectiles which display a velocity reading of less than 1000, the readout will display a Decimal Point and tenths or tenths and hundredths, e.g., 985.7, 43.69, etc.; The display will report velocities either in FPS (feet per second) or MPS (metres per second), depending upon factory default setting.



**Fig.5. Indoor Shooting Light Fixture.**

## **INDOOR USE**

For proper functioning, a light-diffuser and an incandescent light source must be located above each photo-sensor window (Fig. 5). The Optional Indoor Shooting Light Fixture enables owners of the Chrony to pursue indoor use. Neon or other fluorescent lights cannot be used as a chronograph light source because they flicker at twice the AC (alternating current) frequency and cause false readings.

### ***To get the following information, requires the use of a Remote Control or Chrony Printer:***

The push button on the Remote Control is the equivalent of the **FU** button (or Function button) on the Chrony Printer.

The *F-1 Chrony* will provide you with summary data such as **Hi, Lo, Average** velocities and the total number of shots fire. Plus: **Extreme Spread, Standard Deviation** as well as numbered shots and retrieval of individual shot velocities.

#### **1. Deleting Single Shot:**

Press & release the **FU** button repeatedly until the desired shot number is displayed (NOT the velocity). Press & hold the **FU** button until display flashes. Release button immediately. The Chrony will automatically adjust the statistics.

#### **2. Starting a new String:**

Turn your *Chrony* OFF and the ON again. Or, (if you don't want to get up) press & release the **FU** button until **-Hi-** is displayed. Hold the button in until the display changes to **-CL-**, then release the button. **-Clr-** is now displayed. Press & release the button until the display changes to **-CLS-**, then press & hold button in until the display flashes. Release button immediately.

#### **3. Retrieve Information:**

Anytime you wish, you may view the data you have produced. To do this, simply press the **FU** button, identify the information you are about to receive, release button and read the information. Repeat this process for each piece of information shown below.

<b>What you see on press</b>	<b>What it means</b>	<b>What you see on release</b>
<b>-Sn-</b>	String number	Will always be #1 with the F-1 Chrony;
<b>-Lo-</b>	Lowest velocity	velocity of the slowest shot
<b>-Hi-</b>	Highest velocity	velocity of the fastest shot
<b>-Av-</b>	Average velocity	Average velocity of all shots
<b>-ES-</b>	Extreme Spread	Hi velocity minus Lo velocity
<b>-Sd-</b>	Standard Deviation	Standard deviation of string of shots
<b>-To-</b>	Total number of shots recorded since <i>Chrony</i> was turned on.	The number of shots fired.
<b>-10-</b>	# of last shot fired	velocity of 10th shot
<b>-9-</b>	# of next to last shot fired	velocity of 9th shot

etc., etc., repeat until all the shots have been shown, then **-[ ]-** appears. This means the end of the data and, that you are ready to shoot again. If you press the **FU** button again, you start the viewing cycle over again. Simply pressing and releasing the **FU** button takes you from one piece of data to the next.. If you wish at any time during the viewing process to return to the working mode, stop pressing the button and wait 15 seconds. It returns to the working mode by itself. Sometimes, if you hold the **FU** button down for more than two seconds at a time, the unit will go into a sub-menu. Wait 15 seconds, it will return to normal by itself. When you think that you may have done something wrong, take your hands off, and it will go back to normal by itself. Features like this make the *Chrony* very forgiving and easy to use.

## TROUBLE SHOOTING

### A) PROBLEM: =Lb=flashing. Cause & Remedy:

Battery is low and must be replaced.

### B) PROBLEM: No LCD display. Cause & Remedy:

1. No battery: connect battery;
2. Unit is not turned on; turn unit -ON-;
3. Bad connection: tighten battery snaps;
4. Battery is dead: replace battery;
5. Battery NOT Alkaline: replace with ALKALINE battery.

### C) PROBLEM: No reading after shooting. Cause & Remedy:

1. not using diffusers on blue sky, sunny day; add diffusers;
2. using diffusers on a cloudy day; remove diffusers;
3. unit too close to muzzle; move unit farther away;
4. not shooting directly over photocells; aim more carefully;
5. unit not properly aligned with bullet path; realign rifle to point directly at target; and,
6. shooting too early or too late (poor light conditions); wait for better light, or end chronographing session.

**D) Err 1** shows on screen; the first sensor did not detect the passage of the bullet. This means either that the shot was not fired directly over the centre of the first sensor, or, that there are poor light conditions. Be sure that the Chrony is aligned with the line of fire.

**E) Err 2** shows on screen; the second sensor did not detect the passage of the bullet. Same as above: poor light or poor alignment.

**F) Err 3** through Err 8 shows on screen; the exact number relates to internal codes, and is of no significance to the user. May indicate poor light condition. Installation of Diffusers may help.

**G)** Low velocity reading. Light conditions not right; try diffusers. You may be shooting during poor light conditions.

**H)** False reading (usually high); can result from very strong light, or by operation near electric motors, radar, powerlines, electric fences, static electricity, radio transmitters, etc. It may also be caused by the Chrony being too close to the gun's muzzle. Remedy: try using diffuser, moving away from electrical interference, moving unit farther from the muzzle, or all of these.

**I)** Very high velocity readings: 1) can result from muzzle blast; move Chrony farther from muzzle; 2) Chrony is not fully open; check for interference from tripod or base.

**J)** Dead display in cold weather; replace battery with a warm battery.

## OTHER TIPS AND HINTS

Make allowances for temperature differences between chronographing your loads and their use in competition. In cold weather, powders burn more slowly and will produce lower velocities than they will at higher

temperatures. Different altitudes may also affect velocity. Loads developed which are near maximum velocity during cold weather may produce dangerously high pressures and be unsafe during hot weather. Always try to match conditions while chronographing with those conditions you will face when shooting or hunting. That is, if you hunt in late autumn, do the chronographing in late fall.

### **ALWAYS WEAR EYE AND EAR PROTECTION WHEN CHRONOGRAPHING.**

On sunny days, at certain angles, light may reflect from the bullet and cancel the bullet's shadow. Mark the bullets all the way around with a dark-coloured felt marker if this seems to be happening.

On sunny days, the Chrony may be tilted sideways toward the sun, so that the Diffusers are between the sun and the photocells. Be sure that the Chrony unit remains fully open, and that it is perfectly aligned with the target. Using diffusers on cloudy days may shut out too much light.

Using diffusers on cloudy days is not necessary, since you have the clouds as a white background for contrast.

**FORMULAS:** Your Chrony calculates data similar to formulas shown below:

To calculate:

$$\sum V / n \text{ Where } V \text{ is velocity and } n \text{ is the number of shots}$$

#### **Average (Mean) Velocity (-Av-)**

Total all shots in a string and divide by the number of shots in the string,  
e.g.,  $(2990 + 3010 + 2996 + 3004) \div 4 = 3000 \text{ FPS}$

#### **Standard Deviation, population, (-Sd-)**

$$Sd = \left[ \left( \sum V^2 - n \cdot Av^2 \right) \div (n - 1) \right]^{1/2}$$

Multiply the square of the average velocity by the number of shots and deduct it from the sum of the squares of all shot velocities, then divide this total by the number of shots minus 1, and then take the square root of this figure.

**For example:**  $[(2990^2 + 3010^2 + 2996^2 + 3004^2 - 4 \times 3000^2) \div (4-1)]^{1/2} = 9 \text{ FPS}$

Standard Deviation is a measure of how close each shot's velocity will be to the "average" shot. It is called STANDARD because it is computed in such a way that it has a standard meaning when compared to the NORMAL CURVE. Nearly all things we measure fit a normal curve [such as the height of people, the diameter of (supposedly) identical motor pistons, and the velocity of (supposedly) identical cartridges]. The NORMAL CURVE shows that all variables occur more frequently at or near the average, and less frequently as they deviate further from the average. We use a STANDARD Deviation measure so that all things we measure can be compared with each other and to this curve [68% of all things we measure falls between one standard deviation above or below average, 95.4% falls between two Standard Deviations above and below the average, and 99.7% falls between three Standard Deviations above and below the average]. Thus, Standard Deviation is a universal method in statistics and measurement for dealing with and interpreting data.

Therefore, if the bullets are traveling at an average velocity of 3000 feet per second, and there is a Standard Deviation of 20, then 68% of the shots you fire will fall between 2980 and 3020 fps, and 95.4% will fall between 2960 and 3040 fps. Nearly all of them (99.7%) will fall between 2940 and 3060 fps.

Since Standard Deviation is the most important information your chronograph can give you, it is useful to understand the reason for this. At least ten (10) shots are required to obtain a reliable average and Standard Deviation. Fewer shots (such as 3 or 5) are typically "small samples", and are considered unreliable when measuring anything variable.

#### **Extreme Spread (-ES-)**

**Hi - Lo**

Subtract the slowest shot from the fastest. **For example: 3010 - 2990 = 20 FPS**

### ***Energy Calculation***

Average velocity X Average velocity X Weight of bullet in grains ÷ 450 240 = \_\_\_\_\_ft. lbs.

## **TECHNICAL SPECIFICATIONS**

The *Chrony* reads velocity in feet-per-second (or metres-per-second) and works in a velocity range from 30 fps to 7000 fps (10 mps to 2134 mps). Operating Temperature range: 32o Fahrenheit to 110 o Fahrenheit (0 o Celsius to 43 o Celsius), non-condensing. (Ambient temperature must be above dew-point temperature and not fall below dew-point temperature while *Chrony* is being used.) Storage Temperature range: 14o Fahrenheit to 120o Fahrenheit (-10o Celsius to 50o Celsius) non-condensing. (Ambient temperature must be above dew-point temperature and not fall below dew-point temperature where the *Chrony* is being stored, unless the *Chrony* is sealed in an air-tight container.)

Accuracy: 99.5% or better. Displayed velocity will not differ from actual velocity by more than 1 part in 200, i.e., ±10 fps on a velocity reading of 2000 fps. Typical performance is generally better, and shot-to-shot repeatability is always more accurate, i.e., Reported Mean Instrumental Velocity may differ by as much as 0.5% from actual mean instrumental velocity, but Standard Deviation calculated from data gathered with a *Chrony* will always be closer than 0.5% to actual Standard Deviation for a string. This is an important fact because an accurate measurement of a load's uniformity is of considerably more importance than is an exact measure of its average velocity.

## **PHYSICAL/FUNCTIONAL SPECIFICATIONS**

LCD Display: 0.5" (1.37 cm) high; Weight: 2.5 lbs (1.2 kg).

Battery life: 48 hours of continuous use. Photo sensors have wide sensitivity range, and are electronically calibrated to obtain maximum accuracy.

Should you have to return your *Chrony* because of a malfunction, do not return it to the Dealer, Distributor or Mail-Order House you bought it from. It must be returned directly to SHOOTING CHRONY, INC.

***US residents, please return your CHRONY to:***

SHOOTING CHRONY INC.  
3840 East Robinson Rd., PMB # 298  
Amherst, NY 14228 USA

***CANADIAN residents and other Non-U.S. senders please return your CHRONY to:***

SHOOTING CHRONY INC.  
2446 Cawthra Rd, Building 1, Unit 10  
Mississauga, Ontario  
CANADA, L5A 3K6  
Phone: 1-(905) 276-6292; FAX: 1-(905) 276-6295

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[Web-Site: http://www.shootingchrony.com](http://www.shootingchrony.com)



**If it doesn't  
unfold, it's  
not a  
Chrony®**

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