

P.A.C.T. MKIII CHAMPIONSHIP TIMER

Preliminary User's Manual

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INTRODUCTION

Congratulations! You are now the owner of the finest shooting timer on the market. P.A.C.T. MKIII was designed with one purpose in mind - to help the shooter make effective use of available time by providing him with an accurate time accounting of his shots fired and, at his option, providing him with audible "cues" to encourage his performance while shooting.

Realizing that the MKIII is there to help you - not the other way around, we designed it to be operated with minimum of button pushing. However, it would behoove you to read this manual and practice operating the timer before you run out to the range to impress your friends.

GETTING STARTED

The on/off switch is located in the back of the MKIII. Switch it to "ON." The timer will give a short "BEEP", display the version number of the software installed, such as "PACT MKIII w/CHRONO V147.e." Our copyright notice is then displayed followed by "TIMER COMMAND" and a flashing cursor. At this point you are ready to roll. Note that the MKIII always wakes up in TIMER MODE.

Whenever you turn the timer on it is ready to issue a randomly delayed starting beep and count shots. To use the timer in this manner, just push the "GO" button, 2 to 3.5 seconds later you hear a beep - this is your go command.

As you fire, the timer will automatically display and record the shot number, split time and the time that each shot was fired. It will also keep track of the time between shots, lap times and cues.

Okay, let's say you just timed an "El Presidente." You check the display and it reads " #012 .37 6.87 ". This is telling you that the last shot it heard was shot number 12, which came .37 seconds after shot 11. Your total time from the start to your twelfth shot was 6.87 seconds. If you push the review key ("RVW"), the display will show when your first shot occurred. (Which in this case would also let you know how long your pivot and draw took). Each time you press "RVW", you step to the next shot.

If you purchased our printer you can print the string at this point by simply pressing the "PRT" key.

While you are looking at your shot times, the second line of the display will read "FIND SHOT:

". Let's say you want to skip to shot seven to see how long your reload took. Push the " 7 " key. The number 7 will appear on the right end of the lower line on the display. Now press "RVW". The display will now show your time for shot seven. For example, " #007 1.86 3.52 ". This is telling you that shot seven occurred 1.86 seconds after shot number six, hence, your reload time is 1.86 seconds.

To begin another string just push "GO".

How To Enter A Time Limit or "PAR" time. If you want the MKIII to give you a time limit, push the "PAR" button. The display will read "ENTER PAR TIME AND PRESS SET". For example, to set a time limit of 2.5 seconds, push the " 2 " key, the " . " key, and the " 5 " key then push "SET". The timer will confirm the par time by displaying it below "TIMER COMMAND", this will virtually eliminate the possibility of giving the shooter an incorrect par time in a match, a common problem with "PRO TIMERS." Simply push "PAR" "SET" to remove the par time.

Note: When you are entering a number the "GO" key turns into a "backspace" key allowing you to correct errors made entering numbers.

When you are ready to shoot, push "GO" and the timer will behave as it did before except that it will now beep to start you and then beep at 2.5 seconds to stop you. It will of course continue to count shots past the 2.5 seconds limit. If you beat the PAR time glancing at your timer will tell you how much time you had left: PAR .36 2.50. In other words when you fired your last shot you had .36 seconds remaining. If you went over time you would see:#02 .24 2.74. You fired your second shot .24 seconds after the buzzer.

OPTIONS

As you have seen, the MKIII can be used with a minimum of button pushing and in a very straight forward manner. There are, however, quite a few options at your disposal which allow you to simulate complex courses of fire. You can step through these options with the "SET/MENU" key.

Delayed or Random Go. Get the display to read "TIMER COMMAND". An easy way to do this is to turn the timer off and then back on. Now push the "SET" button. This allows you to adjust how the timer works to fit a particular situation. When you push the "SET" button, the screen will display " DELAYED GO? ". The "Y" or "N" in parenthesis tells you how that option is currently set. **If you like the way it is set, push "SET" again** to move to the next option. If you want to make a change, push either "YES" or "NO". If you push "NO" to this option the timer will start running immediately when "GO" is pushed. If you push "YES", the display will ask, " RANDOM GO? ", push "YES" or "NO". If you push "NO", the display will read " DELAY: ". Enter the amount of delay you wish up to 999.99 seconds and press "SET". If you want a random delay, push "YES" in response to the " RANDOM GO? " query. The timer will then ask you to input the upper and lower limits. After you finish entering a time you must push "set" to move to the next screen.

Benchmarks. After you have set up your go command, the timer will display " BENCHMARKS? ". A benchmark is a beep that comes a certain number of seconds after the go command. This can help you set up cadence in your shooting, or to simulate a target popping up. If you would like to set some benchmarks, press "YES" and then enter the time of each beep you want. Remember to press the "SET" key after each time. For example: 1, SET. 2, SET, 3, SET, 4, SET. When you are finished, press "SET" when it asks you for a time. When you press GO the MKIII will provide you with a beep at each Benchmark time. PMKIII and NRA Action and S&W masters shooters can get a lot of benefit from training with benchmark beeps.

Keyed Beeps. The next option you will see is " KEYED BEEPS? ". A keyed beep comes a specified number of seconds after a specific shot. For example: You are practicing the Double Kansas Speed Match and you want to simulate the hostage target coming up. You would answer "YES" to the " KEYED BEEPS? " and set it to beep 1 second after shot #5. Again, press "SET" when you have set all the keyed beeps you want.

Lets say that you have a movement stage where you fire three shots and move to a second firing position. You have determined that you ought to be at the second position and on your front sight within 2.5 seconds after firing your third shot. Simply tell the timer to give you a keyed beep 2.5 seconds after shot number three. Chip McCormick used this feature extensively in his training for the 1986 Steel Challenge (which he won).

Open circuit stop plates. If you are not using stop plates don't worry about this section. Your timer is normally looking for an "open" when the stop plate is "UP" and expects the switch to "close" when the plate is hit. You can reverse this by answering "NO" to this question.

The "GO" & "CST GO" Keys. You have the option of starting the timer either of the two go keys. The "GO" key clears the memory and starts the timer. The comstock go key ("CST GO") does not clear the memory, and starts the clock at the time of your last shot. When shooting a comstock drill, use the "GO" key for your first stage (to clear the memory) and "CST GO" key for subsequent stages.

We do not recommend using this feature during matches. Because the inadvertent pushing of the "CST GO" key will cost the shooter his string.

How To Edit Your Times. That covers most of the operation of the timer, and at this point you can effectively use the MKIII. A few finer points of operation are worth mentioning, however. When you set Keyed or Benchmark Beeps, you are able to edit the times without typing them all back in. For instance, if you set some benchmarks and then go through the setup procedure again, you will see all of the benchmark times you set. By pressing "SET" each time, a previously set benchmark is displayed that benchmark beep is re-entered. By entering a new benchmark time you can change when a benchmark beep will be issued. By entering zero for a benchmark time, you delete that benchmark. Much the same process works for the keyed beeps. The one difference is that you enter a shot number of zero to delete a keyed beep instead of a time of zero.

The "SET" key. When the timer asks a YES/NO question, or asks for a time, the display will show how that feature is currently set. Pushing the "SET" button in response to a YES/NO query is the same as pressing YES or NO to match the (Y) or (N) appearing on the display. The same

shortcut will work when the timer is asking you for numbers. For instance, when the display asks you for a lower limit for the starting beep randomization, the display will read something like, "LOWER: 2.50 ". If you push the "SET" button, the timer will think you pressed "2.5", because 2.5 was the last value the lower limit was set to.

The back arrow key ("GO" key). One more point to cover is the back arrow key, which is the same as the "GO" key. Any time that you are entering numbers into the timer, the back arrow key will correct mistakes. (This includes searching for a specific shot when you are reviewing your shots.)

The "LAP" key. The MKIII can be used as a stop watch with the "LAP" key. Lap times are recorded in much the same manner as shots. A typical lap time would be displayed as " LAP 2.75 8.63 " (for a lap time 2.75 seconds after the last recorded event, occurring 8.63 seconds after the go command). Use of the "LAP" key does not interfere with the operation of the timer. The "STOP" key is no longer in use on this series TIMER\CHRONO.

On the back of your MKIII are three 1/8" jacks that relate to timer functions: PLT1, PLT2 and AUX.

PLT1 and PLT2 are your stop plate inputs. Plugging a jack into PLT2 will automatically change the timer from "TIMER COMMAND" to "MVM COMMAND." In MVM (Man Vs Man) mode the microphone is disconnected and the timer becomes a dedicated "shoot off" timer. When a plate fall the shooters time is displayed. When both plates are down the timer will be displaying both shooters times, who won and the margin of victory.

AUX. Every time the buzzer buzzes for as long as the buzzer is buzzing five volts is available from the "AUX" jack. You can use this to switch a five volt relay (available from Radio Shack). Most folks will want to use the relay to switch a car horn on and off, but keep in mind that the same relay can be used, for example, to turn a mover on, perhaps triggered by a Keyed beep.

NOTES

If you find that you timer is picking up echoes, a common problem on indoor ranges, try putting a piece of tape over the microphone. This should eliminate the problem. The sensitivity control for the microphone is located on the back panel of the timer between "PLT 1" and "AUX". Turning the sensitivity clockwise makes the unit more sensitive. We set them at the factory to just being able to hear a loud hand clap directly over the microphone.

THE CHRONO-MOD

The Chrono-mod should provide you with years of trouble free service. If you are already familiar with your Timer, you could probably use your Chrono-mod without reading this section but take a few minuets to look it over, you'll be glad you did.

A Few Points to Remember

**ALWAYS WEAR EYE PROTECTION WHEN SHOOTING!
DO NOT PLACE ARMOR PLATE IN FRONT OF YOUR SKY SCREENS!**

**IF YOU SHOOT A PLATE OF STEEL A FEW FEET IN FRONT OF YOUR FACE
BITS OF METAL WILL FLY BACK AT YOU AND *RIP YOUR EYES OUT!***

* When you set your skyscreens up, put them two feet apart, center to center. (The PACT bracket is already set to an exact 24" separation). When you turn the Chrono-mod on, it assumes this separation. If you are using a different screen separation, just push the "SET" key and enter your separation in inches, i.e; 48 inches would be 48, then push "SET" again.

* Chronographs don't like sunlight reflecting off of shiny bullets. If you are chronographing on a sunny day and start getting odd velocities, this is probably the cause. Rigging up some sort of sun screen so that the bullet is in the shade while it passes over the skyscreen will eliminate this problem.

*Chronographs also don't like florescent lights. If you are going to use your chronograph indoors, you will have to rig an incandessent light over each screen.

SKYSCREENS

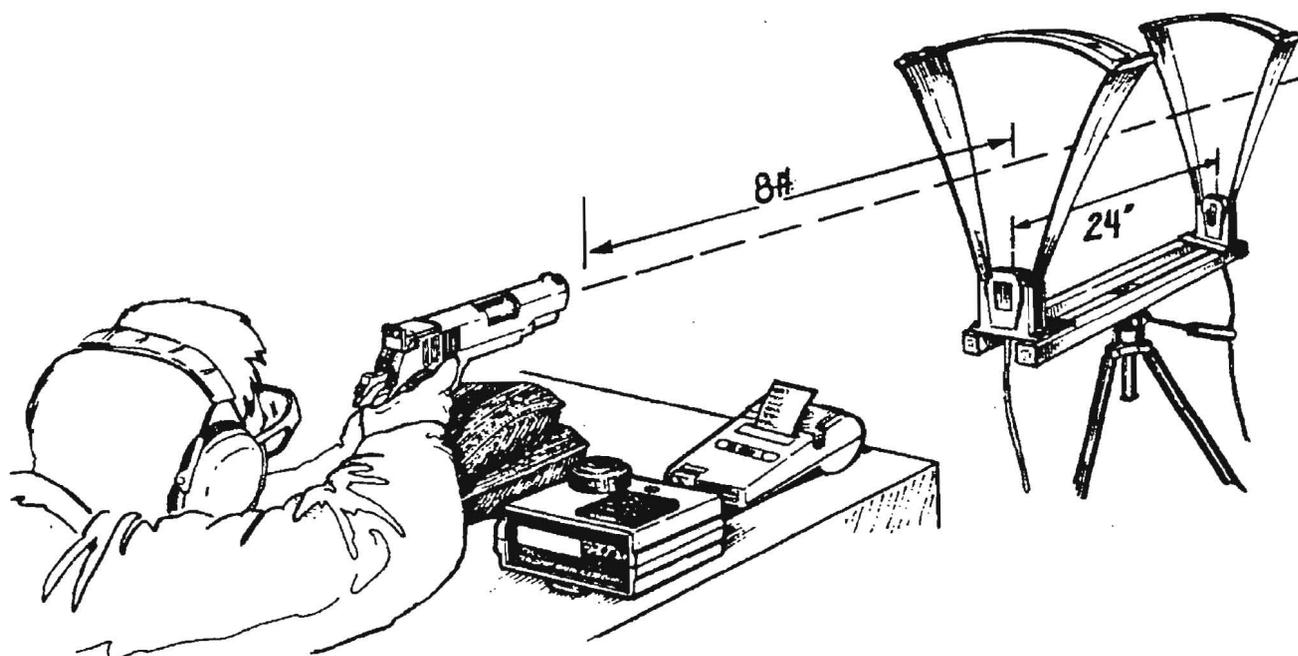
Your MKIII comes equipped with the finest Skyscreens on the market. The new PACT MKV Professional Skyscreen contains two lenses that serve to magnify the bullet and bring it into sharp focus. This provides more accurate triggering at a given range than un-lensed skyscreens. The diffuser screens provide serve as both an aiming guide and light diffuser. (On blue sky sunny days they make it easier for the chronograph to see the bullet by providing a portable cloud for the sun to illuminate.)

If you have our optional skyscreen mounting bracket just screw the skyscreens to it as shown in the illustration. The skyscreens should fit snugly against the cross pieces to insure proper screen separation. The center of the bracket is threaded for a standard camera tripod (1/4-20). If you have one this is a pretty good way to go although you can set the bracket on any flat surface.

If you are fabricating your own mounting bracket take care to insure that the screens are precisely 24 inches apart, center to center. Whatever % error you make in screen separation will result in the same % error in velocity readings.

Carefully peel off the adhesive backing off of the diffuser material. Affix a diffuser to the underside of each arched cross piece. The diffuser material should be smooth with out any "waves" in it. When you are satisfied that you have it on straight rub the edges down firmly with your thumbs.

Fit the side pieces into the cross piece and slip the unit into the skyscreen. When you have done this to each skyscreen the completed package should look like this:



Plug the first screen into the "START" plug located on the back of your timer, and the second screen into the "STOP" plug. Switch the timer on, from "TIMER COMMAND" push "SET", "YES." The timer will switch to "CHRONO COMMAND" and display the current screen separation on the bottom line of the display. If you need to adjust the screen separation, you can do so now.

When you fire, aim in such a way that the bullet passes over the center of each screen at an altitude of between 4 and 6 inches above the screens. If you get lazy and fail to set up an aiming point, you will probably shoot your second screen. (Welcome to the club!)

Let's do some shooting. Push "GO", the timer will display "Chronograph mode running". Fire a round over your skyscreens. The display should say something like this:

```
#001    856.2  FPS
AV      856.2  FPS
```

Each time you fire, the shot number and velocity of your last shot will appear on the top line of the display and your current average velocity will appear on the bottom.

```
#001  714.5 FPS
AV:   714.5 FPS
```

Now let's say that an odd-ball velocity appears, like "6952.3 FPS". This is an obvious error. You can remove it from memory by pushing the "NO" key. The MKIII will "back up" to the previous shot.

Note: The Chrono-mod needs about 1.5 seconds between shots. This is to allow the smoke to clear. If you fire too soon, the Chrono-mod will not record the shot or get a very odd reading and another 1.5 seconds will be required before it is again ready.

When you are done with your string, the MKIII will provide you with a statistical summary of your string. If you have a printer just push the PRT key and you will receive a hard copy of your string number, statistical summary and each shot.

Push "RVW"

HI #003 868.2
LO #007 823.5

The highest and lowest shot velocities and their corresponding shot numbers are displayed.

Push review again:

SD: 45.8
CV: 5.99%

The Standard Deviation of your string is displayed in addition the SD is displayed as a percent of your average velocity (coefficient of variation).

Push review again:

MAD: 38.4
CV: 5.02%

Your MKIII calculates the Mean Absolute Deviation (average variation) of your string and once again displays it as a percent of your average velocity. This number is **the key** to measuring the velocity variations in your loads. The load illustrated *varies an average of 5.02%*. This is the number that should be used to compare one load to another. The smaller the better.

One more time:

ES: 105.9 FPS
AVRG: 763.8 FPS

"ES" stands for Extreme Spread which is the difference between the high and low shot velocities. "AVRG" is obviously the average velocity of you string. At this point you can continue to press the review key and review each shot. The "FIND SHOT" function is identical to counterpart in timer mode.

You can EDIT out individual bad shots with the NO button during review. The MKIII will recalculate your statistical summary less the edited shots.

When you are done reviewing your data, you can push "GO" and the timer will clear its memory an you can start another string or you can push "CST GO" (Comstock Go) and add more shots to the existing data base.

Note: If you don't want to mess around with all the review functions, you can start a fresh string by pushing "GO" at any time.

Automatic Power Factoring (APF) With "CHRONO COMMAND" displayed on the screen push the "PAR" button. The timer will ask you to "ENTER BULLET WEIGHT AND PUSH SET". PUSH "2", "0", "0", "SET". Now press "GO" and chronograph a round.

#001 866.2 FPS
200 GRN,PF 173.2

Remember that the power factor for the individual shot is displayed, *not the average*.

RECOMMENDATIONS

Having worked with dozens of chronographs, both our own and those of our competitors, I have one strong recommendation to IPSC and NRA Action Shooting competitors. Make sure to give yourself some leeway on the velocity of your match ammo. In other words, if you need 850 FPS to make Major, don't load 851 and think that are safe.

The problem is not so much one of inaccuracy on the chronographs, but variation in the performance of ammo due to weather conditions, i.e; barrels expand and contract with temperature changes, in addition, powder burns at different rates at different temperatures. In addition, despite what chronograph manufactures may claim, **the shot to shot variation will go up on sunny days** although the average will generally work out to be the same. We recommend that you give yourself at least a 25 fps cushion, 50 fps would be better.

If you get into trouble at a match, you might whip out your tape measure and check the skyscreen separation. If the screens are too far apart, the velocity will read low.

HOW IT WORKS

Each skyscreen contains a photo-transistor which is constantly measuring the current light level. Because the bullet is darker than the sky, when a bullet goes over the skyscreen the light level drops a little bit. The amplifier inside your MKIII takes note of this drop in light level and amplifies it to the point that the drop is big enough for the computer to notice. The computer then times how long it took for the bullet to travel from the first screen to the second screen where the light level again drops. Accurately converting this time into a velocity is easy; provided the computer knows how far apart the screens are. The MKIII always tells you the skyscreen separation it is looking for when you turn it on:

CHRONO COMMAND
SCR SEP 24.

NOTES ON SCREEN SEPARATION

The screen separation of your MKIII can be set at increments from 6 to 120 inches. So what's the "best" screen separation for you?

First of all understand that, unlike some other chronographs on the market which use very dated designs, there is no electronic limit on how close you place your screens. In other words you can set your screens at 6" and blaze away with your 4000+fps .17 wizbang and, while the quality of your readings will be poor, the MKIII will read. Secondly, because the bullet starts decelerating as soon as you drop it into our nice thick atmosphere, the farther apart your screens are the **greater** the instrumental error. To illustrate this principal with another extreme example, imagine the sort of readings you would get with you screens set at 100 yards. To be sure, you would have a wonderfully "accurate" reading which would shed little light on the question of your actual muzzle velocity.

The effect of mechanical errors in set up, such as improperly spaced skyscreens and manufacturing variances in the photo transistors and skyscreens, is aggravated by close screen separation. On the other side of the coin, lugging a six foot long mounting bracket around in your Porsche 959 is a drag.

We recommend a screen separation of 24" for most applications. This is a pretty good compromise between accuracy and ease of transport and set up. If most of your shooting is done in the 3000+ fps range you might consider stretching your screen separation out to 36 or 48 inches. However we have had some very knowledgeable people opt for the closer screen separation right through the 4000 fps mark. They have felt that the slight loss of accuracy was a small price to pay for the convenience of the closer screen separation.

LIGHT CONDITIONS

Many light sensitive chronographs have a reputation for being flaky under certain light conditions. We have gone to great lengths to minimize this problem, but you may still occasionally run into a combination of conditions that may make it hard for your chrono to read correctly. It will help if you develop an understanding of how your chronograph works.

Your PACT MKIII is looking for a decrease in light level when the bullet passes over the screen. Assuming that enough light was entering the screen to begin with, your MKIII will always get an accurate reading. If, on the other hand, the light level increases as the bullet crosses the skyscreen, you will probably get no reading at all.

How could the light level increase? Let's say that you are chronographing under a dark blue sky and that the sun is reflecting brightly off of the bullet. Now the bullet is actually brighter than the sky above it. When it crosses over the skyscreen the light level goes up instead of down, thus we get no reading. Note that with a slow bullet like a 45 ACP fired under these conditions you may still get a reading. This is because the bullet may be over the screen long enough for the bullet to be considered the "normal" light condition. When the bullet leaves the light level drops and triggers the computer. This will still give you an accurate reading, but it is not "ideal".

If you find that your MKIII is having trouble getting readings on a sunny day with a dark blue sky you should try shooting lower over the skyscreens. You may also eliminate the problem by

changing the light conditions. Put a shade to the **side** of your screens so that the bullet is in the shade when it crosses over the skyscreens, thus increasing the **contrast** in light level between the bullet and the sky. You might also try changing the direction of fire and/or tilting your skyscreens. Remember we are trying to get as big a contrast between the bullet and the sky as possible.

MUZZLE BLAST

Most of our original customers were pistol shooters and we designed into our chronograph some special "anti blast" circuitry which really minimizes muzzle blast problems without sacrificing sensitivity. When you fire a subsonic (below around 1200 FPS) round, the sound of the gun reaches the skyscreens before the bullet does. If it shakes the screens hard enough they will trigger and give you an incorrect reading. For example, let's say that you are firing a .45 ACP at 850 FPS and find that your MKIII is telling you that your round is going 680 FPS. What's happening is that the muzzle blast is triggering the start screen before the bullet gets there, but it lacks sufficient power to trigger the stop screen by the time its traveled that far. So we have a situation where the blast started the computer and bullet stopped it, hence the low reading. If the blast is severe enough to trigger both screens, you will be measuring the speed of sound instead of your bullet velocity. In either case the solution is simple: **BACK UP!**

When you fire a supersonic round the bullet gets to the skyscreen before the blast does. Keep the muzzle a couple of feet back from the first skyscreen to keep from beating it up. Remember that the farther your screens are from the muzzle the lower the velocity your chronograph will read (the bullet starts slowing down as soon as it leaves the barrel). If the blast shakes the screens hard enough they may trigger together causing an erroneous reading.

Another muzzle blast problem occurs when the skyscreens trigger on the **shadow of the muzzle blast**. This can happen when the sun is quartering to directly behind you and fairly low on the horizon (otherwise known as shooting north in the winter months). What happens is that you have a fairly dark blue sky, so the Glint Guard turns up its sensitivity. The sun is reflecting off the edge of the slit in your skyscreen. When you fire, your muzzle blast expands rapidly outward and as it crosses the line between the sun and your skyscreen the amount of light impacting the edge of the skyscreen slit drops producing an absurdly high reading (like 2700 FPS for your rim fire 22 pistol). Changing the direction of fire **will** solve the problem. Another solution is to attach a small piece of cardboard to the front of each skyscreen so that the slit is in the shade.

One other odd effect of muzzle blast occasionally crops up when the blast so severe that it will cause the skyscreen jacks to vibrate in the chronograph causing both the start and stop screens to trigger together. Because this occurs before the bullet to gets to the start screen no velocity will be recorded and the unit will appear to be dead. This problem seems to crop up most often with heavy revolvers, pistols chambered for center fire rifle cartridges and rifles with **muzzle brakes**. If your MKIII seems to have mysteriously crapped out the moment you pulled out your .500 Linbough try firing a few rounds with a .22 rim fire or other low blast gun. If the MKIII goes back to working you'll know that shock wave was causing the trouble.

To correct the problem make sure that the cables are not stretched out (they should be touching the ground between the MKIII and the skyscreens. Secondly don't run the cables directly under the muzzle, place them to the side. The last thing to try would be to place the MKIII behind

something (shooting box, jacket, bench) so that the MKIII is not **line of sight** to the muzzle. The problem seems to only crop up with high blast guns and is worse when the sky is dark because the Glint Guard circuit will turn its sensitivity up under these conditions which of course also increases the units sensitivity to blast.

ODDS AND ENDS

How do you know if your CHRONO MOD is telling you the truth? If the reading you get is close to what it should be you can count on it being within .5%. That's point five per cent **not** five percent. Normally you will find that the reading are actually better than that. If the unit prints a bad velocity it should be off by enough to be obviously wrong. If you get a bad reading just hit the "NO" button.

DON'T BE A DUMB ASS!
ALWAYS WEAR EYE PROTECTION!

Good Luck and Good Shooting!