Timing Operations Clinic
Operation of the timers and software.

How it works- the basics of hardware
Know Your Gear
The Rules
Timing Software
Setup and Test
The Race File
Timing Technical Report
Power On
Get in Sync
Required Timing Data
Get Ready to Time
Communications
Timing Simulations
After the run

Our goal is that TIMEKEEPERS DO NOT RUN THE RACE. Timekeeping personnel is there to quietly document and record the achievements of the athletes as THE JURY RUNS THE RACE.

How it works – The basics of timing hardware.

Modern alpine ski race timing is what is generally called a time trial type event. This means that competitors are started one at a time and usually finish, one at a time. Compared to mass start events like some Cross Country races where order of finish can determine the winner, timing in a Time Trial type event is critical and accuracy must be maintained or the results will be compromised. If the rules for timing are followed with respect to redundant synchronized systems, all racers will have an accurate time.

In ski racing we use 3 basic components for timing.
1. Start Gate
2. Photocell
3. Timer

A start gate is a wand or stick that is hinged on the gate that attaches to one of the two start posts. When the wand is moved from the closed to the open position, a switch inside the gate completes a circuit from two wires, a pair, that is connected to the timer. This is called an IMPULSE. For scored races the gate must have two separate switches with inputs for 4 wires (two pairs) and must be closed manually.

A photocell is an infrared light that is shined across the finish line (the beam) at a height set below the knee of the racer. When the beam is broken (light restricted from crossing the finish blocked by a racer crossing) the photocell completes a circuit from two wires connected to the timer. This is also called an IMPULSE.

Startgates and Photocells are basically the same functionally in the sense that when triggered they complete a circuit to the timer, they connect the two wires and complete the circuit. Completion of the circuit is what the timer (clock) needs to do its job which is to accurately record the event by producing a time stamp. To make sense of what happened, and when, the wires are connected to separate inputs or CHANNELS on the timer. Example is the start is connected to channel 1 and finish is connected to channel 2. The timer prints the event on the timing tape and also will make this information available electronically to timing software when an IMPULSE is received.

Once turned on the timer never stops, it keeps running the entire race and records the events, starts and finishes, with a TOD or Time Of Day stamp complete with the channel that received the IMPULSE.

Alpine ski race timing with a timer can be compared to a workplace time clock that is at your average hourly wage type job. When an employee starts his day he clocks in and a time stamp is printed on his time card or recorded electronically. When he finishes he clocks out and again a time stamp is generated. If you subtract the start time from the finish time you can see how long that employee was working that day. Ski race timing is doing the same thing, just with more accuracy and frequency.

Know your gear
Take the time to read all manuals associated with the equipment that you are using. Have the gear in front of you and test/ try all functions described in the written materials. Most manuals can be found online from the timing equipment manufacturer if the hard copy is not available. Get familiar with the equipment BEFORE race day for efficient setup and troubleshooting during a race.

The Rules
US Ski and Snowboard timing rules are detailed in the US and FIS rulebooks in the section beginning with rule 611. Further information can be found in the FIS Timing Booklet available for download from the FIS websites and other locations. Timing rules dictate the proper equipment, setup and procedures that are required for events of various levels. While lower level events offer some leniency, **every racer should be treated like he/she is competing for an Olympic medal or World Cup globe.** In almost every case the following should be in place.

Two synchronized homologated timers operating in TOD mode. These can be described as SYSTEM A and SYSTEM B

Homologated Start gate with separate contacts for each timer with 4 separate wires connecting them. The gate must have a manual return.

Two sets of Homologated Photocells set up according to FIS rules (below the knee, not more than 20cm separation).

Communication wires between start/finish and timing.

Hand timing that is independent of system A and system B.

The word HOMOLOGATED is simply a way of saying that the equipment has been inspected/ tested and meets the minimum requirements. Use of HOMOLOGATED equipment is required for all races for both US and FIS events. A current list of HOMOLOGATED equipment can be found on the FIS and RMSRO websites. Homologation numbers are needed from this list to complete the Timing and Data Technical Report.

Tools and Procedures
Most people in the USA use software to manage race timing equipment. US Ski and Snowboard has approved two programs for Alpine, Split Second and Vola. Both programs are acceptable and you must work with the RA to decide which is best. For timing you will need to have the computer that will be running the timing software set up and connected to your System A timer and display boards that will be used. You will also need to have the appropriate software key (dongle) connected to the timing computer. Printers, keypads, mouse, network connections and any other devices should also be connected. Besides the computer and timer you will also need the following documents:

Timing and Data Technical Report (TDTR) – For FIS events you must use the TDTR Program that is available for download from the FIS website. For US events it is recommended that you use the FIS TDTR Program however handwriting on a printed TDTR blank is acceptable. In either case you can complete the equipment information section and make copies and/or save to your computer.
Start Lists – Get from RA, Chief of Timing or print one yourself from the race file
Report by the Referee
Electronic Time Recording Sheet – make copies

Coordinate with the RA and Chief of timing or prepare copies of these documents yourself. These four documents should be able to tell the entire story for the run if completed correctly. You will need separate documents for each gender and each run for all except the TDTR. The TDTR can handle BOTH runs for ONE gender for GS and SL. Make copies of all except the Start lists and have them available in the timing cabin as spare for the next run/race.

Timing Software
All races that are scored to the US/FIS points lists must use either approved timing software for results processing. Split Second has been used for many years and an offering from Vola is now also accepted. The software is free to download but you MUST have a license or KEY to utilize the timing functions beyond testing. Software keys come in USB format. Again, it is best to test the recognition and available port for the key BEFORE race day. Some computers have a limited number of USB ports for the many peripherals. If a USB hub is going to be used BE SURE that the key is recognized in the hub.

After you have downloaded and installed software you must configure your timer and scoreboards within the program for these to be recognized. This is accomplished differently depending on the software you are using. Work with your clinician to configure the software to work with your hardware. Both softwares have a test screen where you can see if your settings work for the hardware that you are using. TEST EVERYTHING before your race.

Another critical item that can be overlooked is the cable that connects the Timer to the computer. Currently the software can accommodate several connections depending on the timing device used and can be USB, ETHERNET and/or SERIAL PORT. New laptop computers do not have built in serial

ports requiring an adapter. The most common is a USB to Serial adapter. These are inexpensive and are available from most other computer accessory suppliers. If you have a USB software key and a USB to Serial converter you will need at least two USB ports for your timing computer. Just like the software key the USB to serial converter can be a problem if a hub is used. BENCH TEST EVERYTHING!

Load a Race File
Check with the chief of timing and the Race Administrator about the method of race file transfer before race day. For most events the RA will be able to give the race file to timing the evening before a race, after the Team Captains meeting, but sometimes it might have to wait until morning. If the Timing cabin has internet access emailing the file back and forth is very efficient. Cloud and Network type file sharing also can work. Without an internet or network option you will probably be transferring the race file on a USB flash drive. Depending on your software choice the method of opening a transferred file is different, work with your clinician for the process for each software.

Once open you will have access to the competitors screen. DO NOT MAKE ANY ADJUSTMENT OR ADDITIONS TO THIS PAGE WITHOUT TALKING WITH THE CHIEF OF TIMING OR RA. **DO NOT CHANGE ANY COMPETITOR INFORMATION IN THE RACE FILE INCLUDING BIB NUMBERS!**

You should make sure the file has racers with bib numbers. Waiting to look until the race is about to start is not good preparation.

Other items for timing to work with pre-race include:

Intermediates; intermediates must be configured within the software for them to be recognized. You can change the number of intermediates and also have access to how the mapping looks based on your selections in the Timing Device configuration screen. If you did not previously identify channels for your intermediates.

Check the LIVE TIMING parameters if you will be running your race live. Usually, the RA will set this up but you should talk to them about it before you get the race file.

Open the TIMING TEST screen. Here you can see if the data transmission is happening and correct. If the hardware setup is not made correctly your clock will not be able to transmit its data to the software. Remember that the cable from the timer will need to be in place for testing.

Set up and Test Display boards
Once setup, click the button for TEST DISPLAY and check the board for the data to be cycling. Close the Test screen after all is set and tested.

Timing Data Technical Report – TDTR
The TDTR is a document that must be completed for each run in any scored US or FIS race. This document supports and records the measures taken in compliance with the timing rules. The FIS TDTR Program completes the document electronically for transmission to the FIS but a PDF output is also made available so you can print and sign it. The top section of the US TDTR and first page of the FIS program records the event name, location, type of event, date and gender (FIS adds TD, Timekeeper and Chief of timing infos also). The next section (US, second page FIS) records the brand and model of

equipment used along with specific homologation and serial numbers. Software information is listed next. This is followed by the area for timing information that is taken from the timer for System A and System B for side by side comparison of the timing data. The bottom section (US, last page FIS) has space for recording and explaining any timing anomalies followed by signature blocks for Chief of Timing and Technical Delegate. This form must be completed for every race code that is on the FIS or USSA calendar. As a timer you should be aware of the data that is needed and record or mark this on the tape for easy placement on the TDTR.

Record equipment used on the top of the TDTR (second page on the FIS program). The FIS Program also allows you to save this info for future events. It is a good idea to do this before the race. You know what you are using and it is easier to do this in the beginning of the season and to them make copies of the TDTR (save with the FIS program) with all of the static information filled in. Have plenty of copies available in the timing cabin in case of mistakes. For the FIS program you will need to use a computer either in the cabin or you can record the data on the US paper form and take that to input into the FIS program later. This report must be completed in ink or type-written for submission. Some chose to complete the form on their computer and print it out at the end, this works too. For FIS you must use the program and email the data directly to FIS. Instructions are provided in the program.

Power On
Timers should be powered on first thing; this is to allow the quartz crystals time to stabilize. Always be sure that you will be able to keep the power on by maintaining the batteries in the timer by charging or replacing BEFORE you start timing operations. In case of power failure, the timer MUST be able to operate on battery power.

Synchronize System A and System B
This is when you Sync the clocks, this must happen prior to the first run each day. Because you have to set the time of the synchronization to Time of Day, it is best to be accurate about this. Have your personal watch or master clock set to the correct time or if it is available use the internet to find out the real time of day. Proper procedure is to use a common time source to set both homologated and manual timekeeping (hand timing) equipment. Set the System A and System B timers to the SAME TIME. This should be in the future at a time that is as close as possible to the start of the first run (5 minutes or one hour, depends on what is "possible" for you. Often the Chief of timing will be there to give you the accurate time of day and instruct you on when they want the sync to happen. One minute after the SYNC another impulse must be generated in the same way as the sync impulse and the time stamps from both timers recorded. If the SYNC PLUS ONE MINUTE impulse is more that .001 in difference from System A and System B the sync must be redone. Per rule, sync and sync plus one must come from a single contact switch.

Synchronization of Hand Timers
It is important to synchronize the hand timers with the System A and System B timer for consistency in data across all platforms. If the hand timing device is in sync it will be far easier to find any times that are needed on all the synchronized devices. For this reason, it is best to use a common time source to set ALL timing equipment. Again, this can be a common time source supplied by the chief of timing or can be an accurate time of day source (clock/watch set correctly) or the clock on the timing computer. Hand timing devices that allow for setting of the TOD are preferred over devices that start from zero however both are acceptable providing that they record times to the .01 precision or better. Hand

timing devices, just like the homologated timers are never stopped once started. They only provide time stamps, or splits, for when a timing event or impulse occurs (ie. Start or Finish). Hand Timing equipment must never be connected to any impulse device (start gate or photocell) and must be operated manually.

Start and Finish of first racer
The TOD start time and finish time along with NET or Elapsed time of the first racer with complete data must be recorded. If the first racer to start is a DNF then the next racer is used, provided that they finish and have complete data. Complete data is TOD start and finish from both electronic systems AND hand timing. Hand timing start and finish TOD is not recorded, just the hand timing NET time for comparison to the System A net time.

Start and Finish of Last Racer
Again this is the last racer with COMPLETE DATA meaning that start, finish and hand timing data FROM ALL SYSTEMS is available.

Best Run Time
More than anything this is a reality check to make sure that a false impulse that was missed did not make it to the results. If you have a time that beats the field by an unreasonable margin or just looks way to low, check it out on the timing tapes and compare it to the hand times. This will help ensure that the results or second run start list comes out accurately.

All the required information from the System A and System B timers will be printed on the timing tape. Be sure that you can identify ALL DATA for the chief of timing and the TD if requested. If your timer does not print bib numbers on the tape for each impulse, then it should be marked with bib information manually for easy reference.

Communication
Communication between the TIMER, STARTER, FINISH and JURY is critical to a successful operation. Most times you will have headset communication to the starter. A communication protocol should be developed for redundancy and accuracy. Some prefer to repeat back all communications received to be sure it is accurate. A brief transcript of the communication could be something like this

Starter – Racer 1 in the gate
Timer – Send racer 1 at next interval
Starter –1 on course, racer 2 in the gate
Timer – Send 2 at next interval
Starter – 2 on, FOUR in, racer 3 will be a Did Not Start
Finish – racer 1 finish
Timer – Copy 3 DNS, send 4 at next…
Starter – 4 on, 5 in
Finish – 2 finish
Timer – Send 5 at next

The repeating of numbers between starter and timer will help eliminate problems caused by DNS or racers lining up in the wrong order. The DNS for racer 3 should have also been transmitted by the start referee on the Jury radio.

Keep communications short on both the radio and headset to allow for maximum utilization by all connected parties. Headset communication can be interrupted but a radio cannot.

Start Racing

Now you have a race file on your timing computer, Synchronized timers and hand timing devices setup and tested with the software, display boards setup and tested, start lists, report by referee, electric timer recording sheet and your TDTR partially completed and your communication protocol established. You are ready for a course clear and the first forerunner. You should refer to the race program or start list for the start time of the first forerunner. Be ready to start on time!

The course clear will usually be initiated by the TD, Start Ref or the Chief of Race. The call on the jury radio will sound something like "the course is ready, lets clear from the bottom up". Timing will usually start with the response "Timing Clear" followed by "Finish Clear" from the finish ref. From here all positions on the hill will report that their section is clear and ready for racing. Once the hill has been cleared the TD or Chief of race will let the start referee know when it is ok to send the first forerunner. Be sure to get the names of all of the forerunners from the starter as the RA will need them for the reports later. You can record this on your start list or Electric timer recording sheet. If the RA already has them on the start list you should still check with the starter to be sure that the correct athletes did forerun. Make notes of any changes and give them to the RA, DO NOT CHANGE THEM IN THE RACE FILE.

Once the first forerunner takes their start your note taking will also begin. As the race is run the start list should be followed and checked of for each racer who starts or did not start, TDTR data that is needed should be marked on the tape or recorded, the Report by Referee kept current with all DNS and DNF racers and the electric timer recording form used for a handwritten record of all finishers net times. The timing tapes should also be marked with the bib number for which the impulse was received or marked as a false impulse (start or finish). These tasks should be divided among the available crew that is working in the timing cabin.

A typical division of tasks can be

Timekeeper –Operates timing hardware and/or software, marks Start List and records net times on Electric Timer Recording form or Start List

Assistant Timekeeper – Marks tapes from system A and System B timers

Chief of Timing – Jury Radio Communications, Completes TDTR and Report by the Referee DNS/DNF data

Chatter and any other distractions should be kept out of the Timing Cabin during the race. FOCUS on the race! Stop the race to correct problems if needed.

Once the race is completed the race file or timing data MUST be sent to the RA as quickly as possible. You can either COPY the race file or EXPORT the timing data (bibs and times) to your transfer media. This MUST be worked out with the RA before racing begins. Most RAs prefer the race file transfer method.

Typical Race circumstances that cause Timing issues
If all racers start in order, finish in order and record impulses on all timing systems then the job would be easy. Unfortunately this is not the case. There will be:

Did Not Start
Did Not Finish
False Start
False Finish
Missed start impulse
Missed finish impulse
Start out of order
Miscommunication
No Communication

The Demo that we will go through will illustrate all of these common problems. If the timer does not react and take the proper actions, the timing will be compromised for one or more athletes. Not reacting will make one racers problem a timing problem for many racers very quickly. Stop the race if you need to and get it sorted out before continuing.

Once a run is completed, data on the Report by Referee and TDTR should be double checked. The Referee will be looking for their report and for some space to go over the Gate Judge cards. You will also be preparing the race file for transfer to the RA to produce second run start lists or final results. RA will also need the Report by Referee original once it has been signed and the copy has been posted. Information on DSQ competitors must also be communicated to the RA if the Ref Report physical transport is delayed.

Getting the race file back to the RA can happen a few ways depending on the infrastructure and location of the timing cabin. If you have an internet connection and so does the RA, email is by far the fastest and most efficient. Cloud or Network file sharing also works well if it is available. If you don't have these options you probably will use USB Flash drives and runners. However you will do it, copy the race file and get it to the RA with all supporting documents/information, in a timely manner.

Practice and experience
As you become more comfortable and experienced with the timing hardware and software you will be able to react more efficiently and instinctively to timing anomalies. Your goal is all times from system A with no anomalies and no timing delays. Everyone develops their own way of doing things and this is ok as long as the rules are being followed and that proper documentation is maintained. **Our goal is that TIMEKEEPERS DO NOT RUN THE RACE. Timing crews are there to quietly document and record the achievements of the athletes as THE JURY RUNS THE RACE.**