FÉDÉRATION INTERNATIONALE DE SKI
INTERNATIONAL SKI FEDERATION
INTERNATIONALER SKIVERBAND

TIMING-BOOKLET
Alpine Skiing

Version 2.57
January 2019

Changes compared to Version 2.56

Page 9	We added Level 0 for the following sentence: For **Level 0** a photo finish is mandatory.

Changes compared to Version 2.55

Page 7	Synchronisation
Page 9	Parallel Competitions (Photo Finish and World Cup)
Page 15	Set-Up Diagram for Parallel Competitions Level 0 and 1
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Changes compared to Version 2.54

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Changes compared to Version 2.53

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Please check for the latest version of FIS Timing Booklet on the website:
https://www.fis-ski.com/en/inside-fis/document-library/timing-data

FIS Alpine Timing Guide

All timing devices used including start gates and photocells must be homologated as per the attached list. The most updated list can be found at the FIS website:
https://www.fis-ski.com/DB/information/homologated-timing-equipment.html

Races using devices not mentioned on that list will not be considered for FIS points.

Please note references to race Level classifications as listed here:

Catcode	Description	Race Level
COM	Combined Disciplines	0
OWG	Olympic Winter Games	0
WC	FIS World Cup	0
WQUA	World Cup Qualification	0
WSC	FIS World Ski Championships	0
ANC	Australian New Zealand Cup	1
EC	European Cup	1
ECOM	Speed EC Event	1
EQUA	European Cup Qualification	1
FEC	Far East Cup	1
NAC	Nor-Am Cup	1
SAC	South American Cup	1
UVS	Universiade	1
WJC	FIS Junior World Ski Championships	1
NC	National Championships	2
AWG	Asian Winter Games	3
CISM	Military and Police	3
CIT	CIT Race	3
CITWC	CIT Race Arnold Lunn World Cup	3
FIS	FIS Race	3
FQUA	FIS Qualification	3
JUN	Junior Race	3
NJC	National Junior Championships	3
NJR	National Junior Race	3
UNI	University Race	3
YOG	Youth Olympic Winter Games	3
ENL	Entry League FIS races	4

Cabling of a higher category can also be used.
Example: Level 2 can use same cabling as Level 1 or 0.

Equipment Set-Up (see drawing)

Cable connection

For Level 3 and 4 competitions, timing without cable connection from the start is permitted for both A and B timing systems. Refer to set-up diagrams that describe in detail how this may be accomplished.
Attention: The cable dedicated to timing functions must be reserved for that purpose only and must be protected from any interference (e.g. speaker systems, snow gun data, etc.). No technical changes during the competition that may alter the transmission of trigger signals (length, capacitance, resistance, etc.) may be carried out.
The organizer must ensure that cable conduits and other cable runs do not interfere with timing cable functions. It is highly recommended that expert technical testing and verification of these timing cables be performed to assure timing cable integrity.

Start and Finish

Starting Gate

Minimum of 2 electronically isolated contacts to activate by 1 wand. Timing wires ❶ & ❷ must be connected to separate start gate contacts using separate connectors. The wand must be installed so that starting is impossible without it opening.

Start Clock

Can show time of day, and countdown status, but must have acoustic signal. Must be synchronized with the other timing systems. Use of such a start clock is highly recommended for all DH/SG and GS disciplines and is mandatory for use at event Levels 1 and 0.

Voice Communication ❽

Timing impulse and voice communication functions can be separated on different wire pairs if manufacturer's specifications dictate.

If radios are used for voice communication, a dedicated channel must be used.

Timing Cables

Make sure that cables cannot be torn out at the start by a competitor, or by any other person next to the starting area.
Optical Cables: If a converter is necessary between timing cables and optical cables, then the converter must be approved by FIS.

Cells at intermediate time

Locate Cells carefully in co-ordination with the Technical Delegate and/or the Race Jury.
To avoid the cells being triggered by anyone other than the competitors, it is recommended that the person responsible for that intermediate timing point use a push-button to arm the photocells only when a competitor crosses the line.

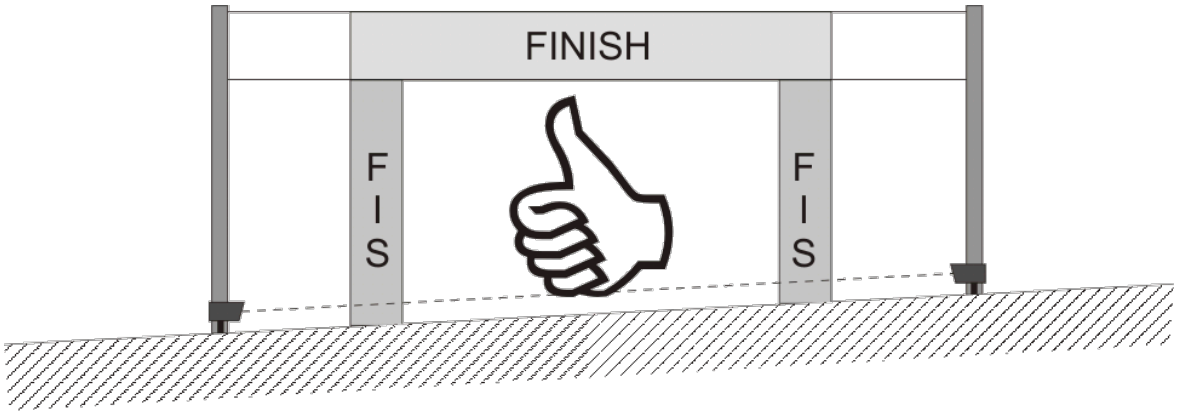
Cells at the finish line ❸ & ❹

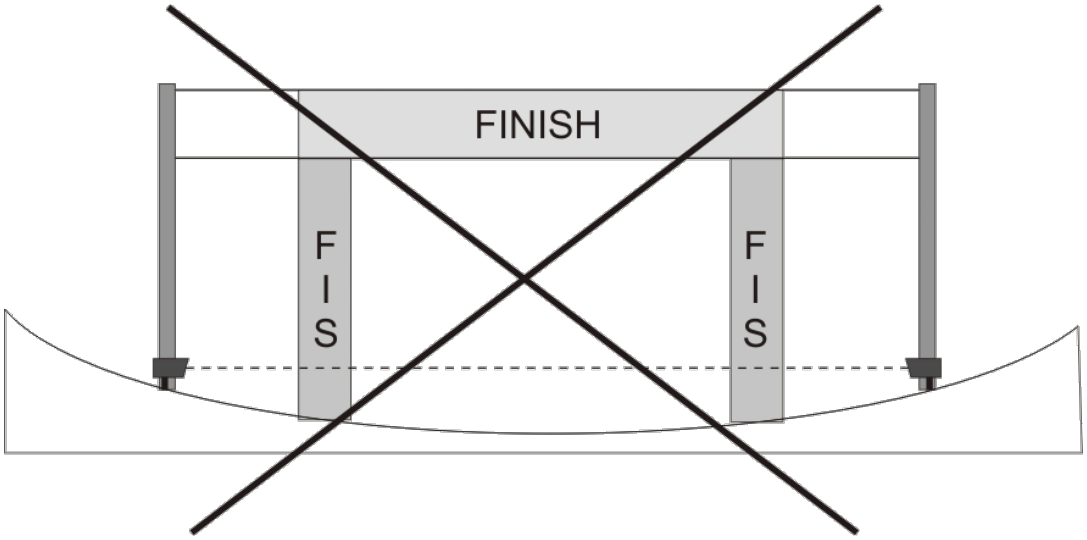
Please refer to the attached section that explains photocell use.

Wire must be used to connect photocells to the timer. Wireless is not allowed.

The use of a homologated timer with printer installed at the finish line directly attached to the photocells is recommended for Level 1 and Level 0 competitions or any time a lengthy wire connection to the finish area from the timing cabin is used.

FINISH
F I S
F I S


FINISH
F I S
F I S


FINISH
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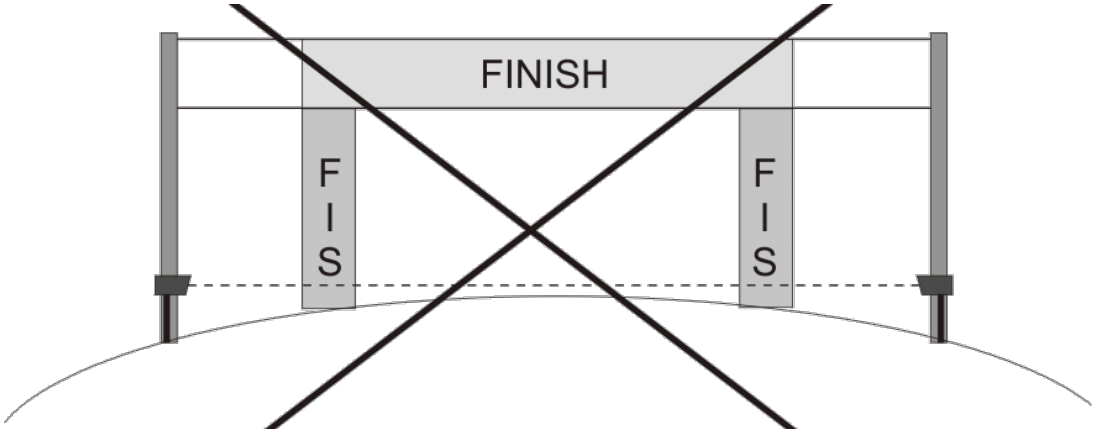

FINISH
F I S
F I S

TIMING DEVICES

System A Timer ❺ Start line ❶ and finish cell ❸ must be connected.

System B Timer ❻ Start line ❷ and finish cell ❹ must be connected.

The use of any electronic device (e.g. optocoupler and impulse distributors) between startgate and timer or photocell and timer must be specifically compatible and authorized by the manufacturers.

Homologated timers ❾ must be used.

Manual hand timing ❼ In all cases for all competitions at all levels, **hand timing is mandatory**.

Stopwatches, with or without printers, showing times to at least 1/100th second should be synchronized to the time of day and used at the start and at the finish.

A complete list of hand times recorded at the start and the finish must be given to the chief of timing at the end of each run, or immediately upon request.

Photo Finish System A photo finish system with synchronized time of day mode may be used for backup reasons at the finish line. A photofinish system is mandatory for Olympic Games and World Championships.

Transponder are not determined to be used as official time (for system A and B).

Synchronisation All elements of the timing installation, must be installed and be in good working order at least one hour before the beginning of the competition.

The synchronisation impulse for all timers must come from one single source (one contact) for all timing devices. After synchronisation is done, a new impulse must be sent by the same source to check synchronisation accuracy on Systems A and B. The maximum allowed difference between system A and B is 0.001 seconds.

Should any important discrepancies be observed when this check is performed, synchronisation should be redone and checked again prior to the start of the run.

In case you use a startclock, it has to be synchronized together with the system A and B timer.

Manual stopwatch synchronisation must be done before or together with the synchronisation of the whole system.

Competition in progress

Reminders

In case of timing problems, the chief of timing must inform members of the jury or the finish referee immediately.

Starter and official timekeeper should agree upon using specific terms and commands during communication. This dialogue should be short and precise, as well as systematically repeated for each competitor. In all cases it is recommended that the starter always informs the timekeeper(s) at the finish before and after a competitor leaves the start.

At the end of each run or competition, before sending out the results, times and ranking from the timing systems and the computer results system must be compared and cross checked for accuracy

Missed Time A missed time is a time of day that is not shown on the printed tape of the system A timer. If a time from system B is missed but you have it printed on system A it is not considered as a missed time.

In case you have a missed time of system A and must replace it by time of day of system B or of a hand time, then you have to recalculate the missed time of day using ICR-rule 611.3.2.1.

Notes At the end of the competition, it is compulsory to send electronically the “Timing & Data Technical Report Form” to FIS (see section Timing & Data Technical Report Form in this booklet). The printed tapes from the System A, System B and all hand timing records must be handed to the race organization who has to keep it at least 3 months after the competition or after any appeal dealing with timing.

A member of the Timing Working Group could check at any time and at any race the timing system connection. A contact of each starting line and finish photocell must be available to connect a FIS timing device. Of course, such connection will be done at least 2 hours before the race or training start and not during the race or training.

Parallel Competition

Parallel competitions include parallel slalom, parallel GS and team events. At parallel competition two racers run down on two courses side by side.

As in Parallel Events two competitors race side by side; it is possible to measure either the difference in time (at Finish) or the individual run times (Start to Finish). If run times are measured the difference in time has to be calculated from the run times (in 1/100th seconds).

The TD has to announce at the Team Capitan Meeting which timing method will be used.

Difference Time Calculated from Run Times	**RED**	**Blue**
Start Time	10:00:00,334	10:00:00,334
Finish Time	10:00:34,345	10:00:34,341
Calculated Run Time	00:00:34,011	00:00:34,007
Published Run Time	**34,01**	**34,00**
Difference Time	**0,01**	

Difference Time Calculated from Finish Times	**RED**	**Blue**
Finish Time	10:00:34,345	10:00:34,341
Calculated Difference Time	00:00:00,004	
Published Difference Time	**0,00**	

If a parallel competition has a second run (same competitors run against each other with changed course), it is possible to start the second run with the time difference of the first run (for level 0 races this is a must).

In the middle of the finish line between the two slopes only obstacles that are not higher than 40 cm are allowed.

For parallel competitions a photocell for each course is needed at the finish line. For level 0 and level 1 a system B photocell for each course is also mandatory.

For Level 0 a photo finish is mandatory. In case of a missing A or B time the time of the day of the photo finish can replace the A-time.

The photo finish time is taken when any part of the competitor's body crosses the finish line
Example of Finish Setup:

Setup not allowed, sight in middle is blocked

very good setup

Timing without Cable Connection Between Start and Finish

FIS Timing Working Group recognizes the importance of allowing emerging and technically responsible technologies to be used in modern FIS competitions. For this reason, and because of the flexibility that it affords, FIS Level 3 and 4 competitions may use timing solutions that do not require any hard wire connection between start and finish for either A and/or B systems. Level 2,1 and 0 competitions are not allowed to use this solution.

Regardless of the technology being used, every solution without hill cable must include the use of 4 homologated timers operating in synchronized Time-of-Day with active printers. System A will be represented by one timer at the start and one timer at the finish. One timer at the start and one timer at the finish will represent system B.

All timing rules remain in force in this situation (set-up, synchronisation, time-of day precision, printing, hand timing). In addition, for race results to be valid the TD must gather and submit to FIS all four timer printer tapes with the Timing Technical Report Forms.

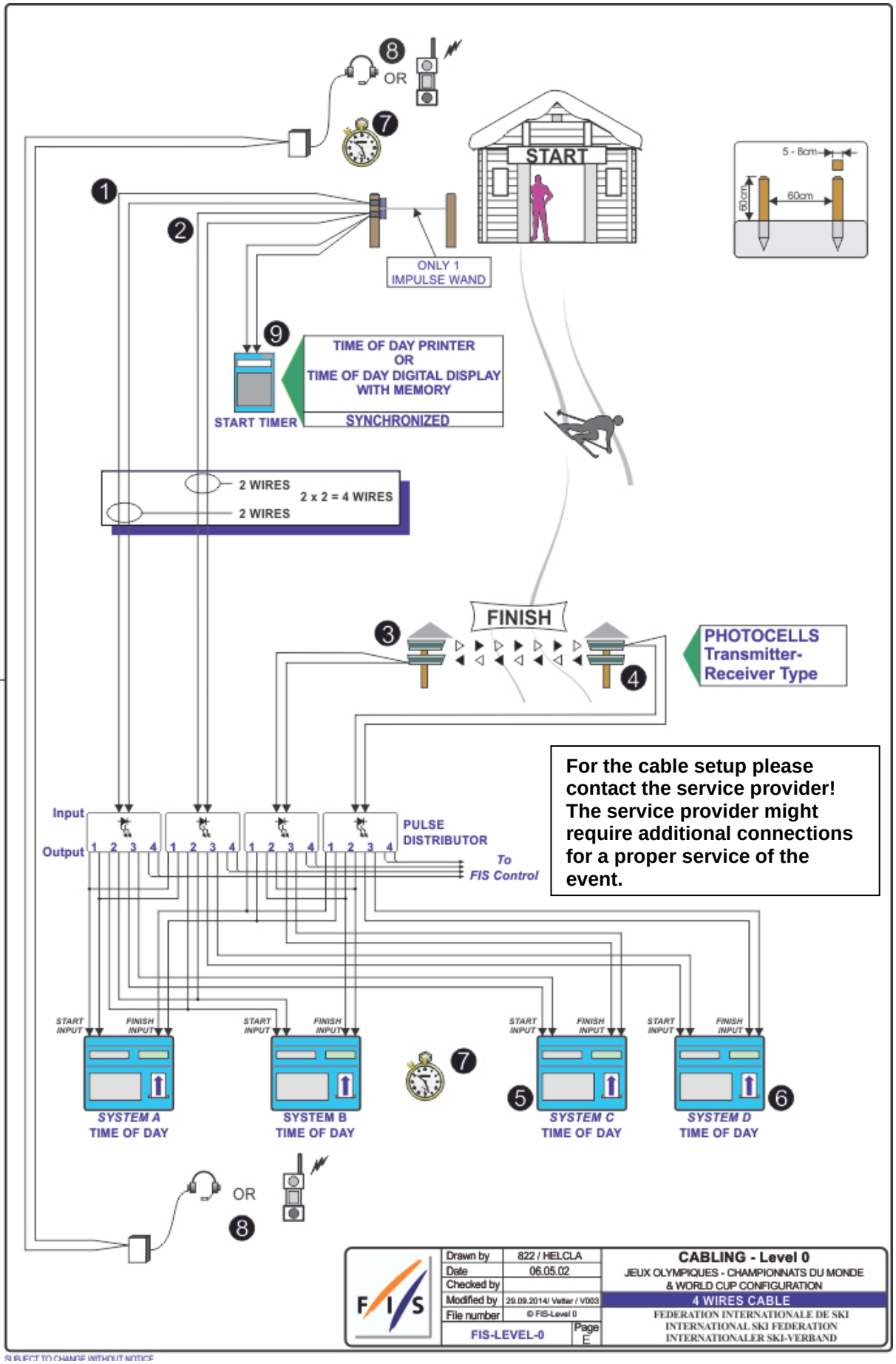
The Chief of Timing must make sure that all timers and printers work in the physical environment of the start and finish regardless of the weather conditions and temperature particularly if the temperature is expected to be less than –10° C.

When a radio system with impulse transmission is used, every start time transmitted has a delay. This delay must be consistent within +/- 1/1000 second. The delay must be clearly described in the manual of the radio system. FIS rules must be applied, if a time from system B is used.

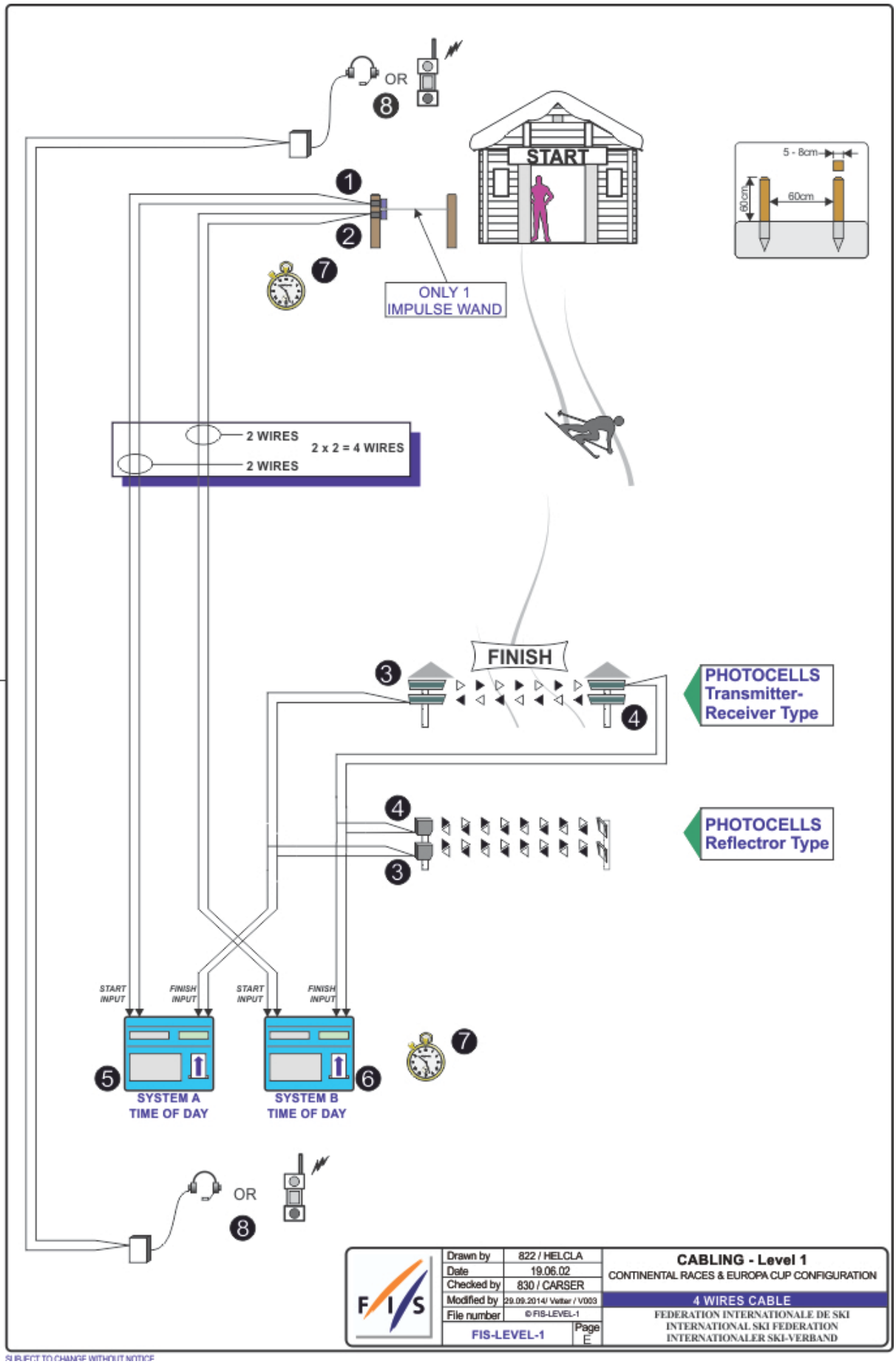
This allows race organizers to use many types of timing solutions without wires as long as these 4 timers are in place and are used to verify the results. If times are generated by a timing solution other than system A or B in all cases these times must be checked against system A and must match exactly. In case results deviate from system A, the competition must be evaluated on the A system times as per the normal timing set-up rules and procedures.

Please refer to the set-up diagram that illustrates the correct use of this technique.

Set-Up Diagram Level 0

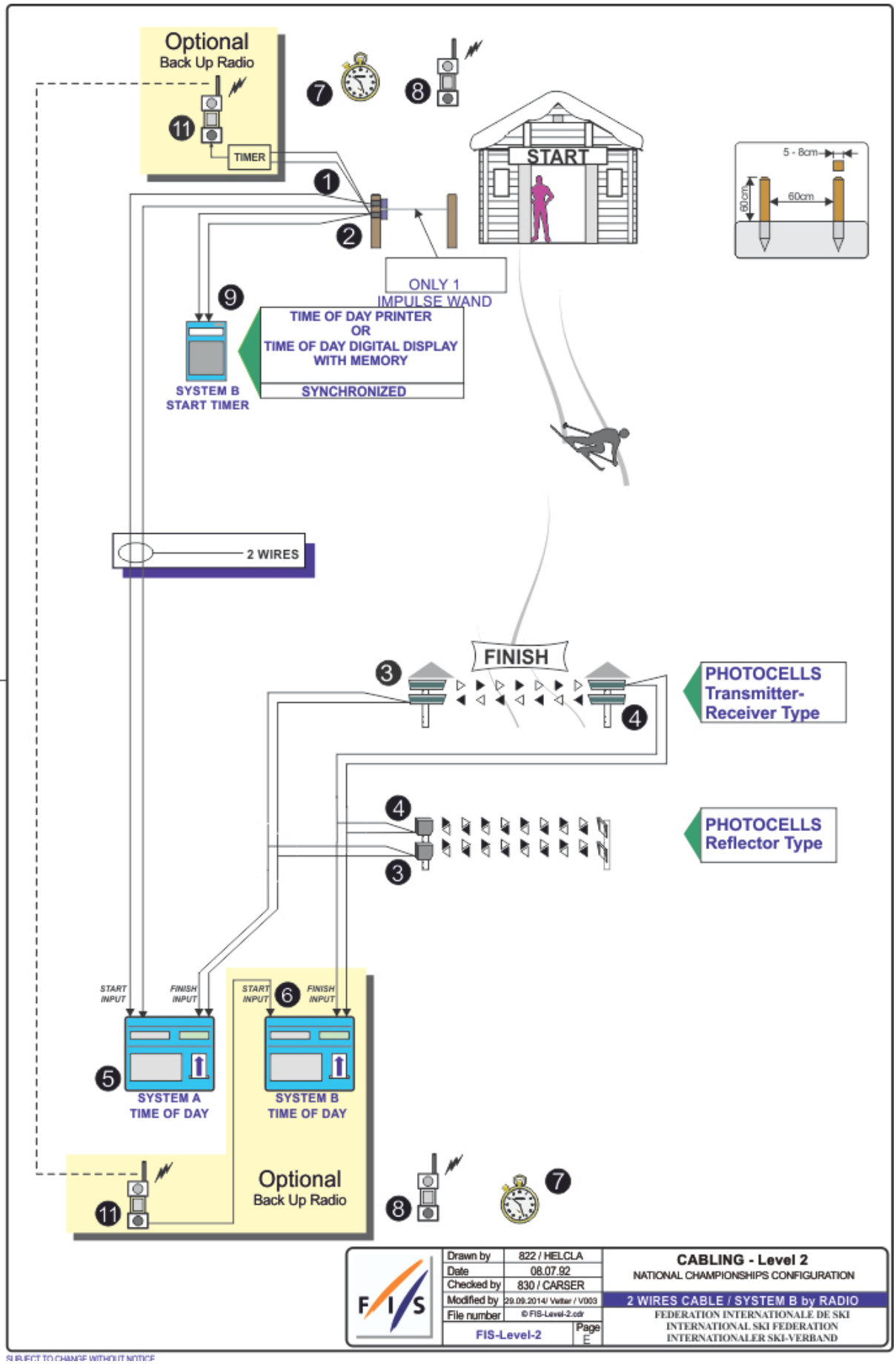


Set-Up Diagram Level 1

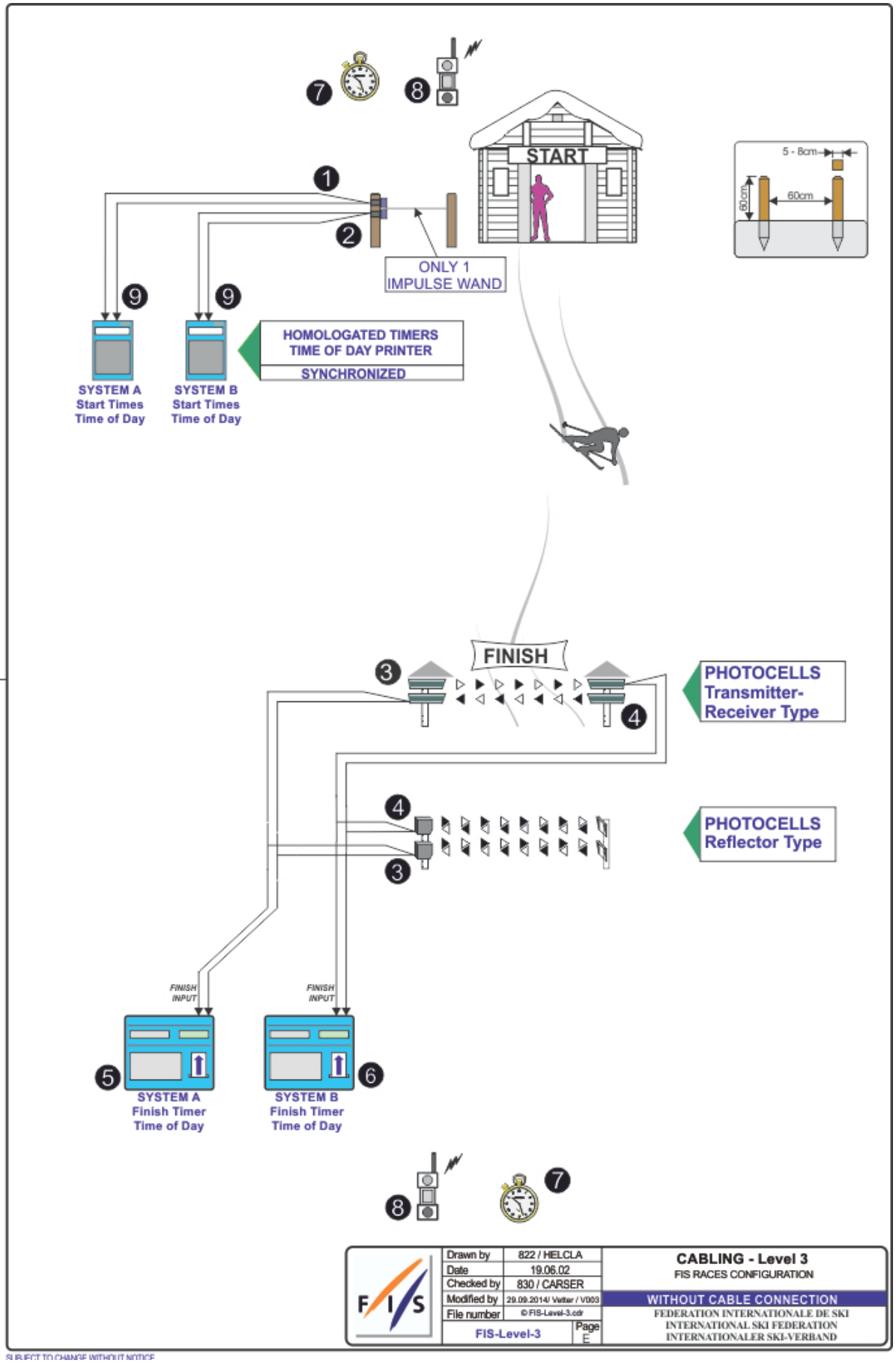


SUBJECT TO CHANGE WITHOUT NOTICE

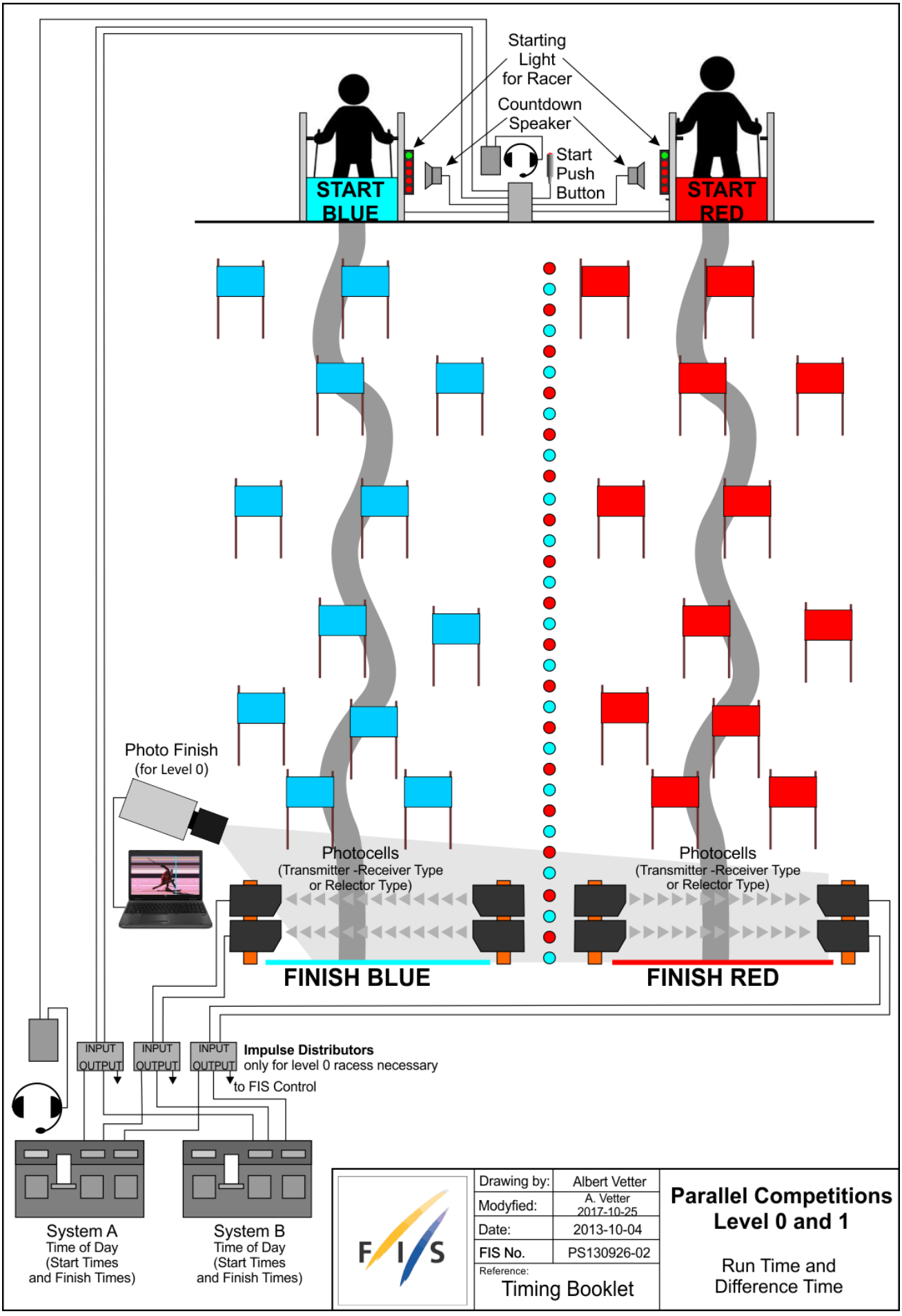
Set-Up Diagram Level 2 (Cable)



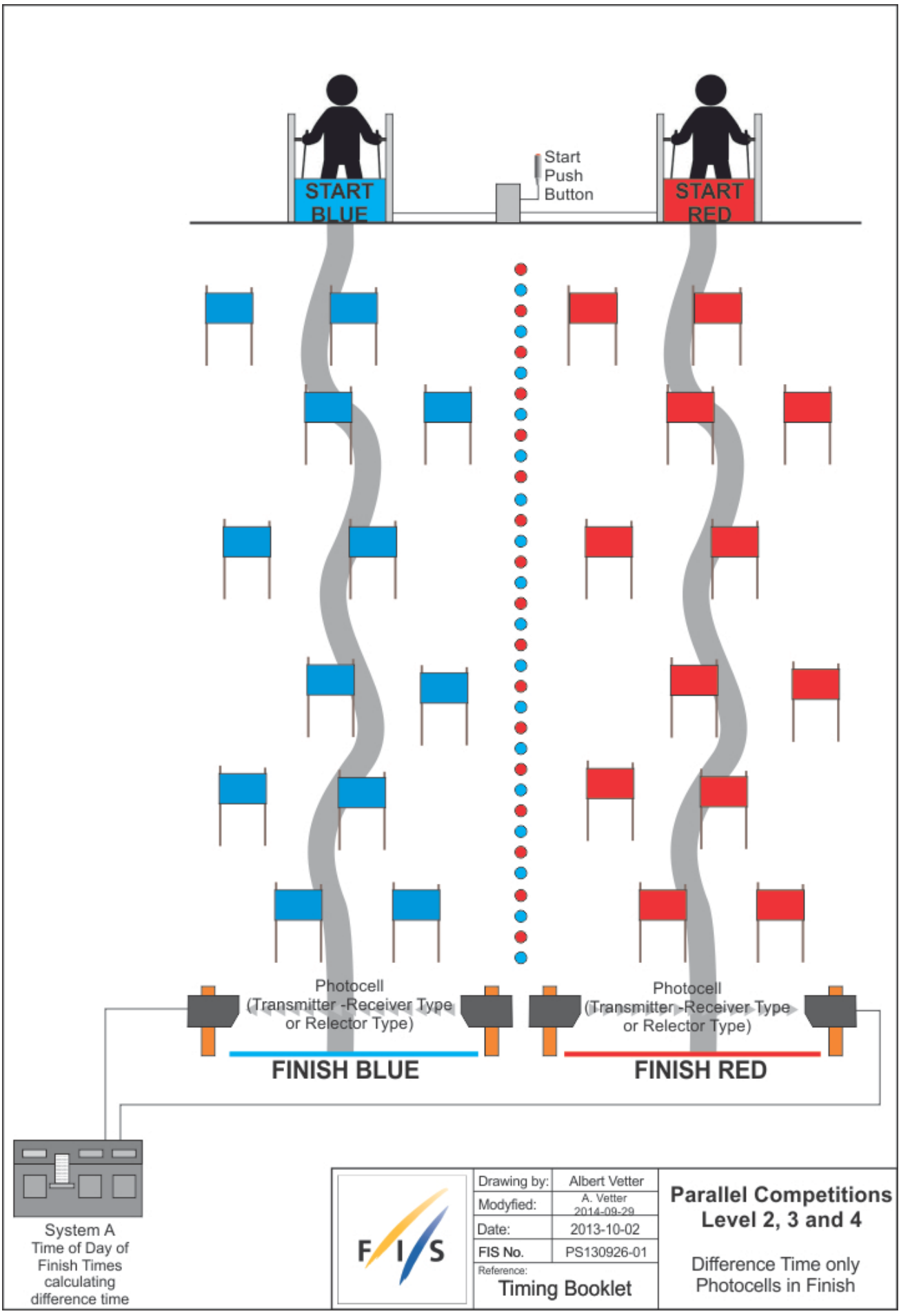
Set-Up Diagram Level 3 (Without Cable)



Set-Up Diagram for Parallel Competitions Level 0 and 1



Set-Up Diagram for Parallel Competitions Level 2, 3 and 4



ICR 611 - Technical Installation

611.1 Communications & Cabling

In all international competitions, it is highly recommended that there is multiple communications (telephone or radios, etc.) between the Start and Finish. Voice communication between Start and Finish must be assured by fixed wire connection or radio. In case of radio, this must be on a separate channel from that used by any other function of the OC.
In Olympic Winter Games and FIS World Championships all communications and timing connections between Start and Finish must be assured by fixed wiring.

611.2 Timing Equipment

For all events in the FIS Calendar, electronic timers, start gates and photocells homologated by the FIS must be used. A list of these approved devices will be published. Races using timing equipment other than those on the homologated FIS list will not be considered for FIS points. Specifications and procedures for timing are more fully described in a separate FIS Timing Booklet.

611.2.1 Electric Timing

For all international competitions, FIS World Cup, FIS Continental Cups and FIS competitions, two synchronised electronically isolated timing systems operating in time-of-day must be used. One system will be designated system A (main system), the other system B (back up system) prior to the beginning of the race.
Time of day times must be immediately and automatically sequentially recorded on printed strips at the maximum precision of the timing device according to the requirements for homologation. The final result is calculated by subtracting the start time from the finish time for each skier's run and is then expressed to 1/100th (0.01) precision by truncating the calculated net time on course.
All times used for the final result must be from system A. If there is a failure of system A, a calculated net time from system B must be used following the same procedure as set out in art. 611.3.2.1. It is not permitted to substitute time-of-day times from system B for use with system A for the purpose of net time calculations.
For all events, system A must be connected to its respective start gate contact. System B must be separately connected to another electronically isolated start gate contact.
Refer to the FIS Timing Booklet for more details regarding cabling and complete wiring descriptions, diagrams and start gate installations.
All timing equipment and technical installation should be set up or protected in such a way that danger to the competitors is avoided where possible.
Synchronisation of the timing systems must occur as close as possible to the scheduled start for the first run of the day. Synchronisation of all systems must be maintained throughout each run. Timers must not be re-synchronised during any run.

611.2.1.1 Start Gate

The start gate must have separate electronically isolated switch contacts for triggering the start inputs of both system A & B.
If a start gate or start wand requires replacement during a run, it must be replaced with identical equipment in the same position.

611.2.1.2 Photocells

For all events, there must be two photocell system(s) homologated by the FIS installed at the finish line. One is connected to system A. The other is connected to system B.
Procedures and regulations for start gates and photocells are found in the FIS Timing Booklet.

611.2.1.3 Start Clock

For DH, SG and GS, the use of a start clock that provides at least an acoustic countdown signal on the fixed start interval as prescribed by the Jury should be used as an aid to race management. This is mandatory for all Level 0,1 and 2 races.

611.2.2 Hand Timing

Manual (hand) timing, completely separate and independent of the electronic timing, must be used for all competitions listed in the FIS Calendar. Stopwatches or hand operated battery powered timers that are installed at both the start and the finish and capable of expressing times to at least 1/100th (0.01) precision qualify as proper hand timing devices. They must be synchronised prior to the start of each run, preferably with the same time-of-day as system A and system B. Printed records, either automatic or hand-written, of recorded hand times must be immediately available at the start and at the finish.

611.2.3 Presentation of times
Organisers should provide appropriate facilities for continuous presentation of all registered times of all competitors.
611.2.4 Timing without Cable
For FIS Level 3 events only, it is permitted to use homologated timing equipment in such a way that hill cable connection between start and finish is not required. Refer to the FIS Timing Booklet for a detailed discussion of how this is possible.

611.3 Timing

611.3.1 With electronic timing, the time is taken when a competitor crosses the finish line and triggers the beam between the photo cells.
In case of a fall at the finish where the competitor does not come to a full stop, the time can be taken without both of the competitor's feet having crossed the finish line.
For the registered time to become valid, the competitor must immediately completely cross the finish line with or without skis. With hand timing the time will be taken when any part of the competitor crosses the finish line.
The finish controller determines the correctness of passage across the finish line.

611.3.2 In the case of a failure of the main electronic timing system (system A), the results of the electronic back-up system (system B) will be valid as per art. 611.2.1. For the Olympic Winter Games, FIS World Ski Championships and FIS World Cup, a synchronised electronic timing system with printers, connected to the starting gate and to the photocells at the finish is obligatory.
In case of a failure in the lines of the timing system between start and finish, this back-up system will allow the calculation of the times to 1/100ths of a second.
In the case that time of day from either system A or system B are not available for a competitor, the calculated time of day as per art. 611.3.2.1 will be considered valid.

611.3.2.1 Utilisation of times taken by hand
Hand times may be used in the official results after a correction has been calculated.
Calculation of the correction:
Subtract the electronic time from the time taken by hand for the 10 competitors starting before the missing time. If there are not 10 times before, complete the calculation with the remaining times after the missed time.
The sum of the 10 time differences is divided by 10 and rounded up or down (0.044 -> 0.04, 0.045 -> 0.05) to give the correction which must be applied to the hand time of the competitor without an electronic time.

611.3.2.2 Photo Finish
A Photo Finish System may be used to determine a competitor´s finish time. In case of a failure of system "A" and "B", and where the competition has been recorded by the Photo Finish System, this time must be used in place of hand-timing. The photo finish time is taken when any part of the competitor´s body first crosses the finish line. The photo finish result is to be provided to the Jury only.

611.3.3 The official timing strips from the printer will be given to the Technical Delegate for review. They will be kept by the OC until the official approval of the race or after any appeal dealing with timing or race results.
A technical timing report form as prescribed by the FIS must accompany the race results and must be reviewed and sent by the chief of timing and reviewed and confirmed by the TD as his approval of the race.
All printed records from system A, system B and hand timing must be retained by the OC for a period of three (3) months after the competition or after any appeal dealing with timing or race results.

611.3.4 When the official printing timer allows manual input or correction of a time, some type of indication (star, asterisk or other) concerning any effected change must be printed on all timing documentation.

611.3.5 Computer software calculating net times must use the precision of the time of the day as used in the timing device.

611.4 Private timing and speed measurement equipment of the Teams
Any request to install such equipment has to be made to the Jury by the team captain concerned, and the Jury decides concerning approval of the installation. At Olympic Winter Games, FIS World Ski Championships and FIS World Cup only the organisers timing equipment is permitted.

EET Calculation

The EET (Equivalent Electronic Time) you need in case a time from system A is missing. All times used for the final result must be from system A. If there is a failure of system A, a calculated net time (EET) from system B must be used following the same procedure as shown below. It is not permitted to substitute time-of-day times from system B for use with system A for the purpose of net time calculations. If the time is not available from system B use the photo finish time (if available), otherwise hand time.

Calculation of the correction:
To calculate the correction time, use the 10 times of day of the competitors started before the one with the missing time. If there are not 10 times before, complete the calculation with the remaining times after the missed time. Subtract the backup times from system A times for these 10 competitors. The sum of the 10 calculated time differences is divided by 10 and rounded up or down (0.0449 = 0.04, 0.0450 = 0,05). This correction time must be added or subtracted to the replacement time of the competitor without a system A time.

The EET calculation must only use time of day precision to a minimum 1/1000th for the correction value of the time of day. If Hand timing is only available to precision of 1/100th, the full precision of 1/1000th or better must be used for the system A times.

Electronic A Finish Time in TOD: 10:48:31.9781 Hand Timing: 10:48:31.86(00)

EET Calculation - Example if System A and Backup Time has the precision of 1/1000th:

BIB	Finish Time System A	Finish Time System B or Hand Time	Difference	Explanation
11	13:00:00.263	13:00:00.483	-0,220	time difference of BIB 11
12	13:00:26.880	13:00:26.521	0,359	time difference of BIB 12
13	13:00:47.368	13:00:47.410	-0,042	time difference of BIB 13
14	13:01:04.368	13:01:04.232	0,136	time difference of BIB 14
15	13:01:27.775	13:01:27.544	0,231	time difference of BIB 15
16	DNF	DNF	0,000	Racer did not finish
17	13:02:12.912	13:02:12.993	-0,081	time difference of BIB 17
18	13:02:42.616	13:02:42.501	0,115	time difference of BIB 18
19	13:03:00.944	13:03:00.211	0,733	time difference of BIB 19
20	13:03:20.280	13:03:20.694	-0,414	time difference of BIB 20
21	13:03:48.559	13:03:48.560	-0,001	time difference of BIB 21
22	**missed time**	**13:04:12.158**	**0,816**	sum of above time differences
apply correction time		***+0.082***	***0,082***	0,082 = 0,816 / 10
EET for Bib 22		**13:04.12.240**		

EET Calculation - Example if System A and Backup Time has the precision of 1/10,000th:

BIB	Finish Time System A	Finish Time System B or Hand Time	Time Difference	Explanation
1	10:00:50.1292	10:00:50.3548	-0,2256	time difference of BIB 1
2	10:01:52.1921	10:01:52.0189	0,1732	time difference of BIB 2
3	10:02:49.4920	10:02:49.4978	-0,0058	time difference of BIB 3
4	10:03:50.9812	10:03:50.6148	0,3664	time difference of BIB 4
5	10:04:49.8729	10:04:49.2741	0,5988	time difference of BIB 5
6	10:05:50.5129	10:05:50.4702	0,0427	time difference of BIB 6
7	10:06:48.8615	10:06:48.9125	-0,0510	time difference of BIB 7
8	**missing time**	10:07:51.5814	0,0000	**missing time**
9	10:08:50.0002	10:08:49.8751	0,1251	time difference of BIB 9
10	10:09:49.4278	10:09:49.2459	0,1819	time difference of BIB 10
11	10:10.50.3473	10:10.50.3954	-0,0481	time difference of BIB 11
8	**missing time**	10:07:51.5814	**1,1576**	sum of above time differences
apply correction time		***+0,1158***	***0,1158***	0,1158 = 1.1576 / 10
EET for Bib 8		**10:07:51.6972**		

EET Calculation - Example if Using a Hand Time with 1/100th:

BIB	Finish Time System A	Hand Time (only with 1/100th)	Time Difference	Explanation
1	10:00:50.1292	10:00:50.35(00)	-0,2208	time difference of BIB 1
2	10:01:52.1921	10:01:52.01(00)	0,1821	time difference of BIB 2
3	10:02:49.4920	10:02:49.49(00)	0,0020	time difference of BIB 3
4	10:03:50.9812	10:03:50.61(00)	0,3712	time difference of BIB 4
5	10:04:49.8729	10:04:49.27(00)	0,6029	time difference of BIB 5
6	10:05:50.5129	10:05:50.47(00)	0,0429	time difference of BIB 6
7	10:06:48.8615	10:06:48.91(00)	-0,0485	time difference of BIB 7
8	**missing time**	10:07:51.58(00)	0,0000	**missing time**
9	10:08:50.0002	10:08:49.87(00)	0,1302	time difference of BIB 9
10	10:09:49.4278	10:09:49.24(00)	0,1878	time difference of BIB 10
11	10:10.50.3473	10:10.50.39(00)	-0,0427	time difference of BIB 11
8	**missing time**	10:07:51.58(00)	**1,2071**	sum of above time differences
apply correction time		***0,1207***	***0,1207***	0,1207 = 1.2071 / 10
EET for Bib 8		**10:07:51.7007**		

Timing & Data Technical Report Form

FIS provides free of charge a program to fill out the »The Timing & Data Technical Report Form ». You can download it from FIS ftp-server: ftp://ftp.fisski.com/Software/Programs/TimingReport
Now you have to select the operating system that you use and download the software.

With the electronic report the time keeper can send the report independently from the TD to FIS. The time keeper just goes through the form and fills in all the fields and sends it as XML-file. Of course, the time keeper can still print the timing &data technical report to have a printed document.

The FIS only accepts the Timing & Data Technical Reports that are sent as XML-file. Printed reports that are sent by mail, fax or e-mail will be not accepted.

"How-To" Explanation Text
Timing & Data Technical Report Form

FIS Alpine Timing Technical Report Form is a required document that must be correctly completed and submitted with all race results for all alpine events in the FIS calendar. Events that do not submit this form, duly completed, will not be considered for FIS points.

Technical surveys conducted by FIS since 1995, and the mountain of timing evidence collected by the Timing Working Group during this period led to the introduction and ongoing use of this form. It is a valuable tool and audit document. There is without a doubt a need to have all information concerning the correct determination of an event by the timing equipment, and techniques being used, properly indicated on the Timing Technical Report Form.

An annual summary of the data from these forms is conducted. Although the vast majority of FIS competitions are conducted correctly, the form asks questions that can only be replied to if certain minimum technical standards are met. It ensures that at least two homologated, synchronized Time-of-Day systems, plus hand timing are used, and it makes you pay attention to the details of how well the systems operate together. The Timing Technical Report Form minimizes errors and is designed to assist you to make the event fair for all who take part.

This document represents a step-by-step explanation of what is needed in each field of the Timing & Data Technical Report. Since some of the information being provided will most likely remain consistent (example: equipment being used, equipment serial numbers, event locations…) you can fill out most of this information once and store it.

Notes and Suggestions:

Quite fortunately, alpine ski racing is judged purely from the standpoint of objective criteria. Make it through the course correctly, and a skier is judged by the passage of time alone. The Homologated Timing Equipment list that is approved by FIS, the rules described in section 610 of the ICR, and the use of the Timing Technical Report Form ensure that many common mistakes that can jeopardize the simple truth of this timing judgment are minimized or avoided.

We are certain that your attention to detail will contribute to a successful event and we extend our thanks and best wishes for the serious work that you undertake for the benefit of ski racing world-wide.

Codex:
All competitions in FIS Calendar are assigned with a code number so that they can be correctly identified. This competition ID-code number is called the „CODEX" and there is one codex for each competition that is assigned by event and gender.
The Codex for your competition can be found in FIS Calendar. It must match the Codex number used on your Official Results: Do not include information other than the four-numeric-character code.
Example: 0321

Location:
Use the location as described in FIS Calendar, or if the event has been moved, the name of the ski area you are at. Include event, nation and race gender information, using the DH/SG/GS or SL and Men / Women indicators as appropriate.

Event Name:
Enter the same name of the event as it is described in FIS Calendar and on your Official Results documents. Include category details.

Date:
FIS uses the dd/mm/yy format.

The following section identifies the timing equipment you use at your race.

Brand:
This is the brand name of the manufacturer.
Exempels: Longines / ALGE / TAG Heuer / Seiko /

Model:
This is the model name of the particular device you are using.
Examples: TL5005 / TdC 8001 / CP 540 / CT 400 /

Serial Number:
Each device should have a manufacturer's serial number. This is found in a variety of places on timing equipment depending on the model and manufacturer. If not found on the bottom, rear or side of the device, check inside the printer or battery compartment. Contact your manufacturer or agent for complete information and have it handy. If one cannot be found, a number should be assigned and marked on the device.

Homologation #:
FIS issues a list of timers, start gates and photocells that have met the technical standards required for use at FIS competitions. **Only timing equipment on the approved list may be used at any and all alpine FIS competitions that appear in FIS Calendar**. **You can find the list with homologated timing equipment on FIS website at www.fis-ski.com. Failure to use equipment on that list will cause your event not to be considered for FIS points.** Each piece of approved timing equipment will have a code number associated with it. A complete list of those codes can be found in the Homologated Timing Equipment List. Use the appropriate code number for the approved device you are using.
Example: TAG.070T.08

Sys A Timer:
This is the Main Timing System Timer at finish

Sys B Timer:
This is the Back-Up Timing System Timer at finish

Start Gate:
Describe the homologated start gate you used with the name of the manufacturer and model designation. Include the serial number and homologation code.

Finish Cells:
Describe the homologated Finish Cells of Systems A and B using the name of the manufacturer and the model designation. If different models are used for the A or B system, describe them both. Include serial numbers and homologation codes.

Photo finish camera (if used):
Describe the homologated photo finish cameras of systems A and B using the name of the manufacturer and the model designation. If different models are used for the A or B system, describe them both.

Connections to Start:
This section deals with how your **connections to the start** were made for both the Main (System A) and Back-Up (System B) timers, and how you handled the voice communications requirements. In the boxes, insert the method used based on how you set up the two systems and the voice communication. Use the word "Cable" or indicate how the start time data was transmitted or carried to the timer at the finish.

Scoring and Results Preparation:
Specify the software, version and/or release date of the software that you use to produce the lists for the race.
Attention: Check always the results of the printed tape of the timing device with the results that you get from the software. These data must be identical.

Time Data Section
This is the section that provides the proof that your two systems and hand timing were synchronized and functioning as required by the rules. There are 15 pieces of information for each run that you can get only from the timer tapes and that allow FIS to see that you did the timing correctly. Two other times come from Hand timing data. Be prepared to gather this information from the timer tapes as it happens, or at least to know where to find it after each run. It is critical that this information be correctly retrieved and indicated on the form.

Synch confirm after Sync:
Synchronisation to the Time of Day for all systems must be accomplished. Connect all timing devices that run in time of day at one start source (one single contact only for checking) and start the time of day of all timing devices. Trigger the timing devices again after 1st Sync and check if the time of day for this impulse is within a 1/1000ths (0.001 sec.) for System A and System B timers. If they are not, you must re-synchronize and try again. Note that four spaces are provided for indications about synchronisation of the four required timers when events are being timed without hill cable.

Indicate the actual readings in Time of Day (TOD) you take from the System A and System B tapes to the 1/1000th of a second or better (same precision as printed on the timing tape).
Example: 10:00:51.225

Start TOD First Competitor*: give the Start Time of Day from the first competitor to finish his run.
Finish TOD First Competitor*: give the Finish Time of Day from the first competitor to finish his run. Show bib.
Start TOD Last Competitor*: give the Start Time of Day from the last competitor to finish his run.
Finish TOD Last Competitor*: give the Finish Time of Day from the last competitor to finish his run. Show bib.

This data section has on the left side space to insert the times of the first run, and on the right-side space for the second run. These 8 boxes provide locations for the readings from the two systems of the start and finish times of your first and last racers who make it through the course. **Insert the Time of Day Times that are recorded on the System A and System B tapes for these racers to the 1/1000th (0.001) of a second or better.** Note that there are spaces for indicating what the bib numbers of the particular racers used in your samples were.
Use only the first and last skiers who finish having **complete timing data**.

Net Time:
These 4 positions are used to indicate the actual elapsed net times on course for the two samples of the first and last racers on course who made it to the finish, as recorded on System A. **These must be identical to the net times used on the results, and are indicated to the 1/100th (0.01) of a second.** This allows you to check, if the calculation of the net times on course, as derived from the Time of Day times recorded on the System A tapes, was done correctly. Times are expressed in Min/Sec/100ths. You should also use this as an opportunity to check that the times used on the results match those calculated from the timer tapes.
Example: 1:00.91

Hand Time:
Hand Timing is mandatory for all competitions in FIS Calendar. These positions allow you to provide the evidence that hand timing was used and how well it was done. The hand times used here are net times on course calculated from the Time of Day start and finish times your hand timers record. Calculate the elapsed hand times on course for these athletes and indicate them here. The Net Time of the Hand Time should be comparable (no big-time difference).

Best run-time System A:
Indicate the fastest time obtained in that run and which bib it was assigned to.

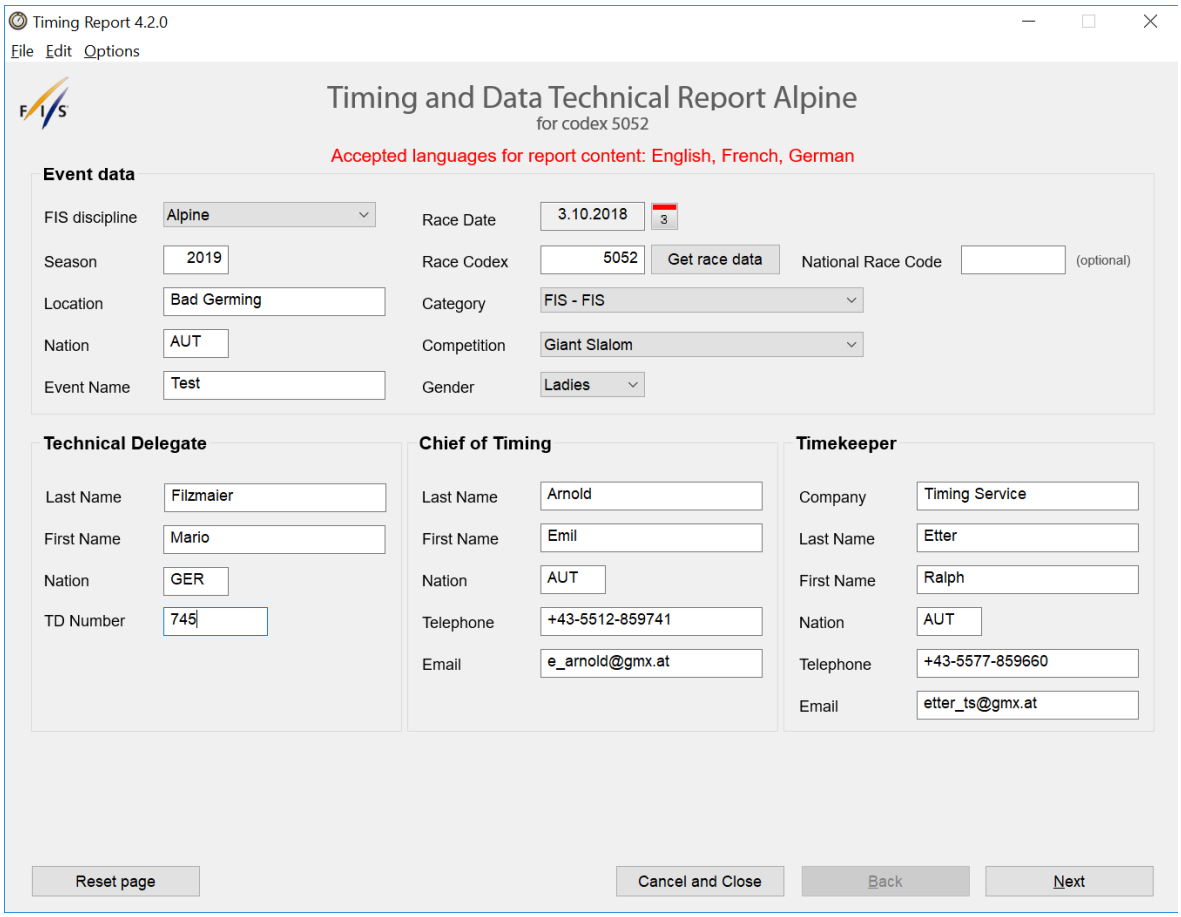
Were all times from system A?:
Indicate if all racers were timed during this run using System A as required by FIS rules. Check the appropriate box „yes“ or „no“.

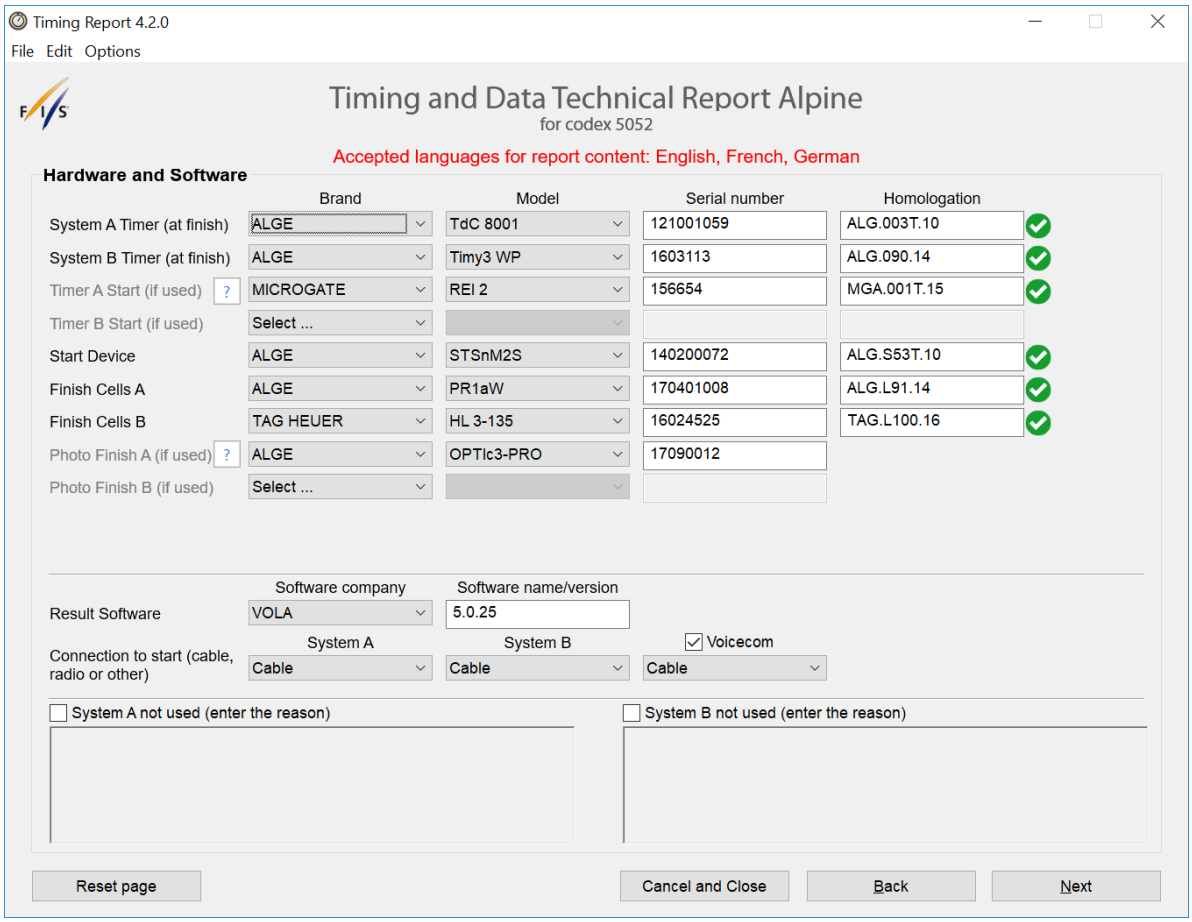
List the bib numbers used in the results timed on any system other than system A in all runs (indicate run)
If you answered “No“ in the section above, list the bib number(s) of the racer(s) and the respective run number, who were timed on System B or using Hand Timing for each **replacement System A time calculation**. Indicate the reason for the problem(s) by marking it and/or describe it.

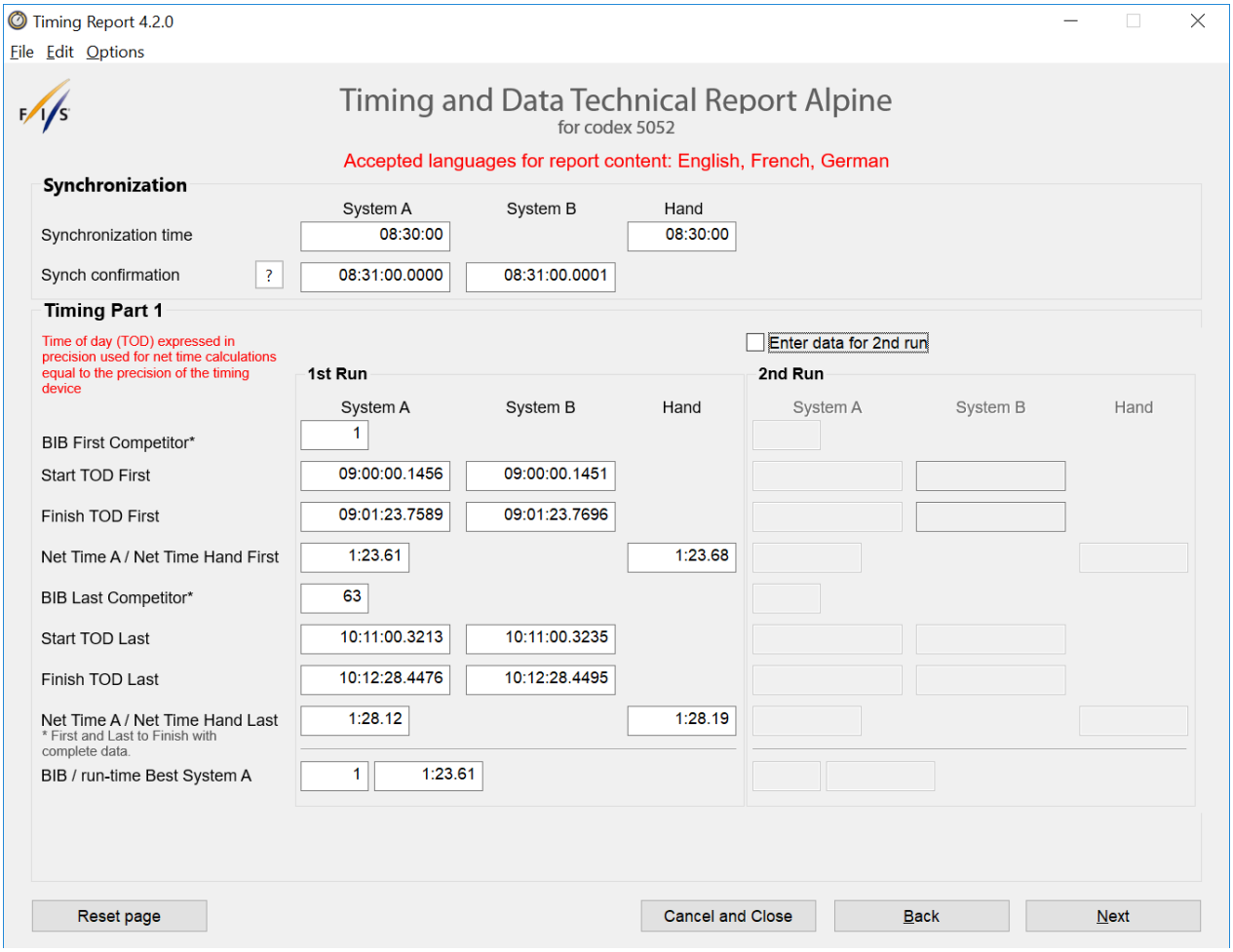
Comments:
Describe any problems or comment upon corrective actions that were necessary during the timing of any run held during this series. Obviously if you have any racers who have times used on the results from anything other than System A, you should explain this here. The TD should indicate if any timing component used requires verification or service before the next event. This provides the opportunity to indicate if any of the equipment, wiring or other components requires service or corrective actions before the next event. This could apply to staff and procedures as well as equipment. This can include comments even if all times were derived from System A.

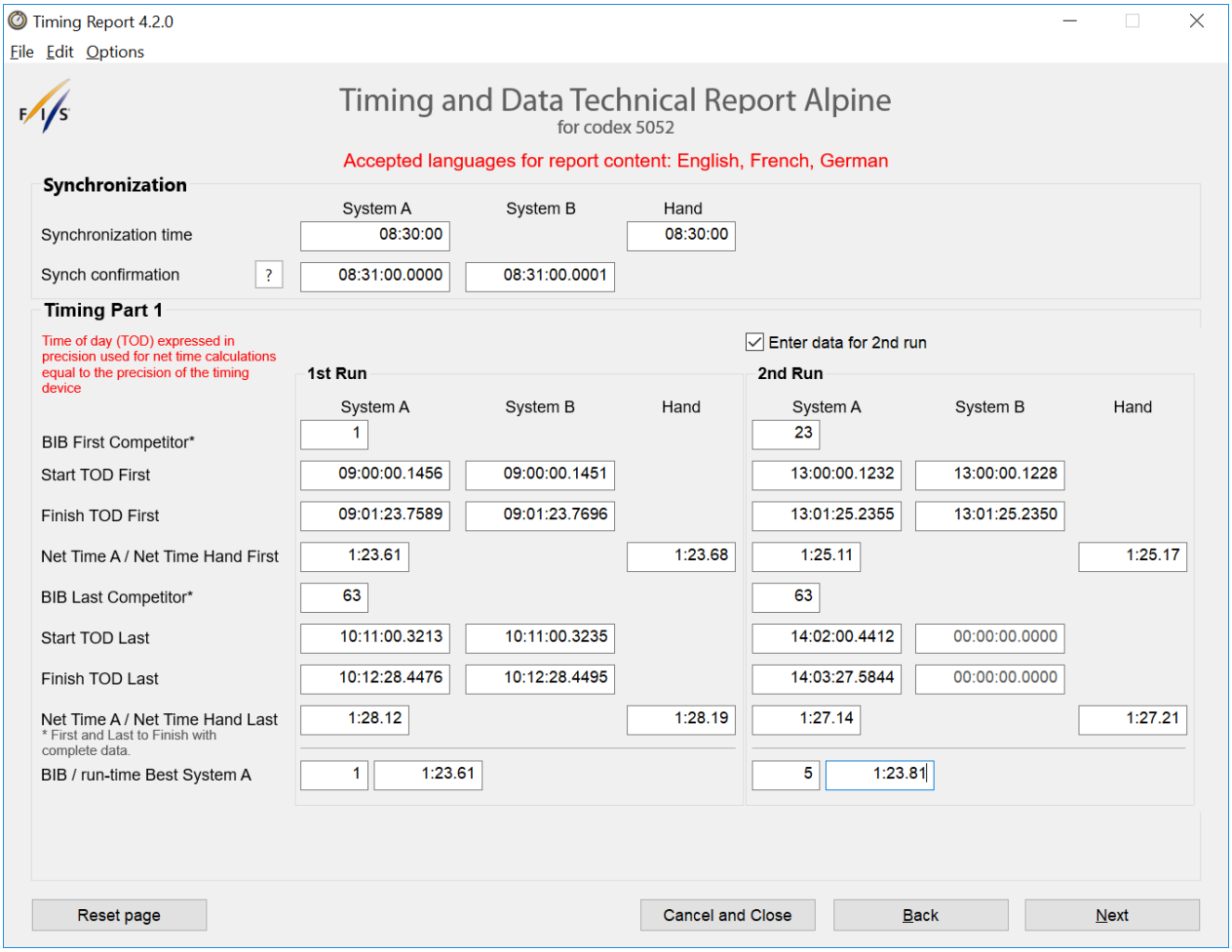
We certify that the timing and calculations of this event adhered to the rules.
This is a direct statement that requires a “yes“ or “no“ answer.
Both FIS Technical Delegate and the Chief of Timing must review and complete this documentation and attest to the accuracy of the information contained herein.

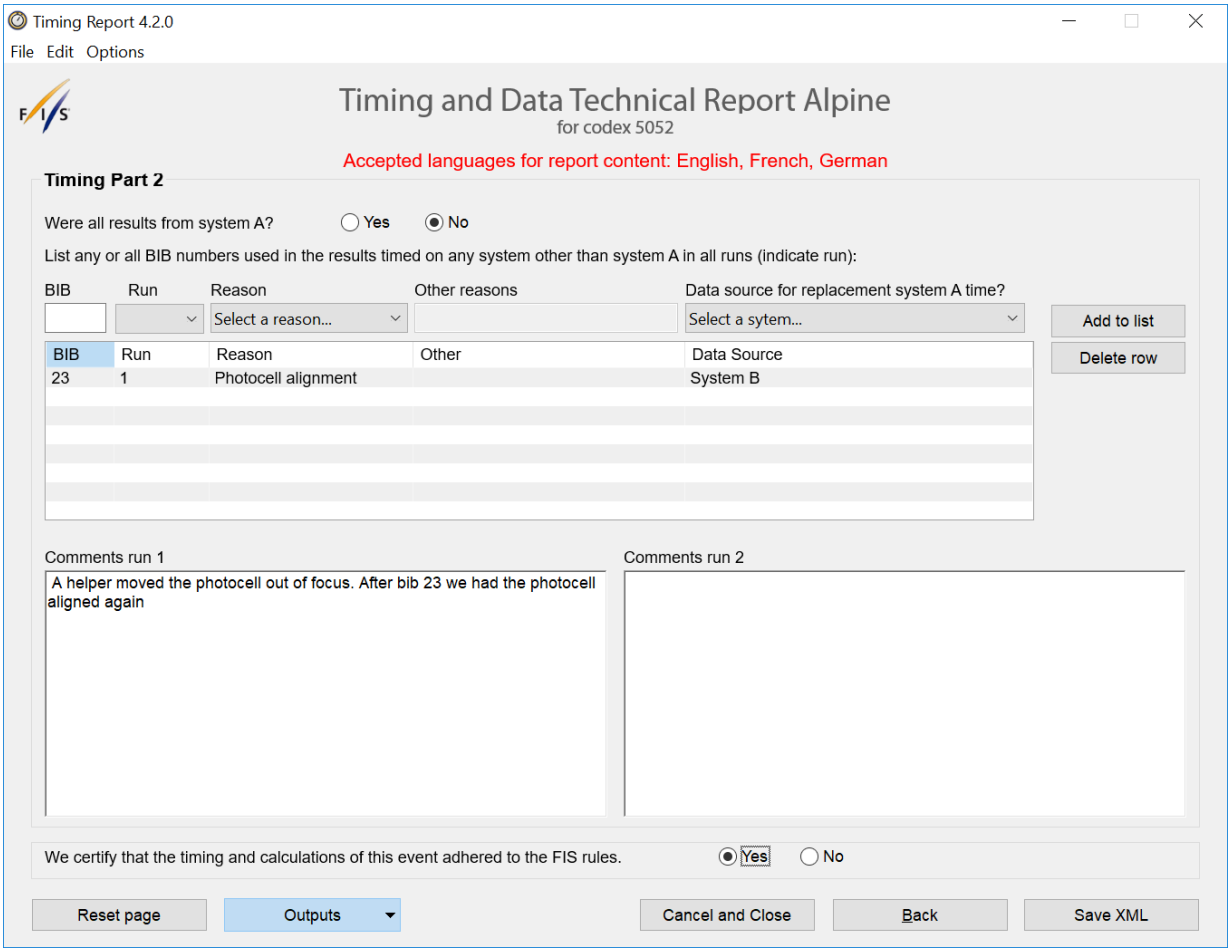
Timing Technical Report (examples)






Timing Report 4.2.0
File Edit Options
Timing and Data Technical Report Alpine
for codex 5052
Accepted languages for report content: English, French, German
Synchronization
System A
System B
Hand
Synchronization time
08:30:00
08:30:00
Synch confirmation
?
08:31:00.0000
08:31:00.0001
Timing Part 1
Time of day (TOD) expressed in precision used for net time calculations equal to the precision of the timing device
Enter data for 2nd run
1st Run
2nd Run
System A
System B
Hand
BIB First Competitor*
1
Start TOD First
09:00:00.1456
09:00:00.1451
Finish TOD First
09:01:23.7589
09:01:23.7696
Net Time A / Net Time Hand First
1:23.61
1:23.68
BIB Last Competitor*
63
Start TOD Last
10:11:00.3213
10:11:00.3235
Finish TOD Last
10:12:28.4476
10:12:28.4495
Net Time A / Net Time Hand Last
* First and Last to Finish with complete data.
1:28.12
1:28.19
BIB / run-time Best System A
1
1:23.61
Reset page
Cancel and Close
Back
Next


Timing Report 4.2.0
File Edit Options
Timing and Data Technical Report Alpine
for codex 5052
Accepted languages for report content: English, French, German
Synchronization
System A
System B
Hand
Synchronization time
08:30:00
08:30:00
Synch confirmation
?
08:31:00.0000
08:31:00.0001
Timing Part 1
Time of day (TOD) expressed in precision used for net time calculations equal to the precision of the timing device
Enter data for 2nd run
1st Run
2nd Run
System A
System B
Hand
BIB First Competitor*
1
23
Start TOD First
09:00:00.1456
09:00:00.1451
13:00:00.1232
13:00:00.1228
Finish TOD First
09:01:23.7589
09:01:23.7696
13:01:25.2355
13:01:25.2350
Net Time A / Net Time Hand First
1:23.61
1:23.68
1:25.11
1:25.17
BIB Last Competitor*
63
63
Start TOD Last
10:11:00.3213
10:11:00.3235
14:02:00.4412
00:00:00.0000
Finish TOD Last
10:12:28.4476
10:12:28.4495
14:03:27.5844
00:00:00.0000
Net Time A / Net Time Hand Last
* First and Last to Finish with complete data.
1:28.12
1:28.19
1:27.14
1:27.21
BIB / run-time Best System A
1
1:23.61
5
1:23.81
Reset page
Cancel and Close
Back
Next


Timing Report 4.2.0
File Edit Options
Timing and Data Technical Report Alpine
for codex 5052
Accepted languages for report content: English, French, German
Timing Part 2
Were all results from system A? Yes No
List any or all BIB numbers used in the results timed on any system other than system A in all runs (indicate run):
BIB
Run
Reason
Other reasons
Data source for replacement system A time?
Select a reason...
Select a sytem...
Add to list
Delete row
BIB Run Reason Other Data Source
23 1 Photocell alignment System B
Comments run 1
A helper moved the photocell out of focus. After bib 23 we had the photocell aligned again
Comments run 2
We certify that the timing and calculations of this event adhered to the FIS rules. Yes No
Reset page
Outputs
Cancel and Close
Back
Save XML

Criteria for FIS Approved Timing Devices for Alpine Ski Races

All timing devices must be homologated by FIS and used respecting FIS rules. Validity of the homologation is 15 years.

Timers

Timer:	The timing device must have an internal or external printer. Printing through a computer is not allowed. The timer must be able to operate in Time-of-Day. The output of the time must always have the same precision (e.g. printer, display and interface).
Printer:	This printer must print at least in a chronological order the time of day. For each printed time of day there must be an indication of the timing channel. If it is possible to do manipulation or correction of times in the timer the printer must mark such a corrected time.
Interface:	The timing device needs an interface (e.g. RS232, RS422, USB, Ethernet) to connect a PC and transfer the data for data processing (result service) online.
Power Supply:	The timing system must work without external power supply on internal batteries for 4 (four) hours at +10° C and two impulses per minute with printout. The timing system must work without power supply from the mains for four (4) hours at 23°C and one printout per minute and two (2) hours at –10°C and one printout per minute.
Operation Temperature:	The timing device and printer must work at ambient temperatures from -10° to +60°C*
Measuring Range:	Time of day mode must be possible in hours, minutes, seconds and 1/10000, or better.
Timer Precision:	Must measure 1/10000 second in time of day mode. Timer accuracy must be below +/- 10 PPM at a device temperature from –10° to +60°C.
Quartz:	Ageing of the quartz must be below +/- 3 PPM per year. With adjusted quartz frequency the time drift must be below +/-0.5 PPM at 23°C.
Impulse Triggering:	The delay of impulses is not allowed to be higher than 1/1000 sec. for the same channel (the channel is triggered from a reference impulse device in minute intervals). If two channels are triggered at the same time they times must be within 1/1000 second. The delay of impulses must be constant; the range must be less than 1/10000 sec.
Timing Channels:	The timing device needs a minimum of two independent channels, one for start and one for finish.
Synchronisation:	Synchronisation between main- and backup timer must be possible.
Electromagnetic:	The timing device must meet the standards of IEC (International Electronic Commission). This means the timing device must function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.
Truncation:	The truncation to 1/100 of seconds must be made after the calculation of the run time. The digits of the run time after the 1/100 are thrown away.

e.g.:	Start Time:	10:00:00.1327
	Finish Time:	10:01:30.2599
	Calculated Run Time:	1:30.1272
	Run Time after truncation:	1:30.12

Timers with External Synchronisation

For timing devices with external synchronisation (e.g. GPS-Synchronisation) all specifications of “Timers” (see previous page) are valid. Additional it must fulfil the following features:

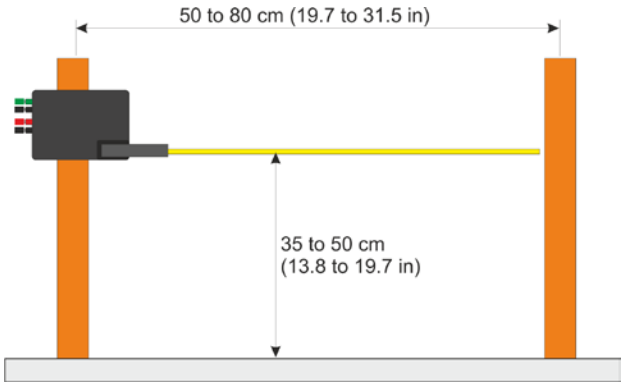
- The external synchronisation solution must have a constant accuracy from 0.0001 s or better.
- The timing device must run independent with the internal quartz.
- The time synchronisation of the external device can be in periodic intervals or permanent.
- If the difference between the internal timing (quartz) and the external synchronisation is within an accuracy of +/-0.0003 seconds it is allowed to resync the timing device with the external time.
- If the difference between the internal time (quartz) and the external time is higher than +/-0.0003 seconds it is not allowed to resync the timer with the external time. From now on the timing device must run with the internal quartz only (no further resynchronisations are allowed).
- The printer of the timer must print a message when the external synchronisation is switched off. The message must inform about the reason for switching the external synchronisation off and the time when this happens.
- In case the external synchronisation signal is lost the timer has to print it a message. If the timer gets the synchronisation signal again further synchronisation is allowed, if the time difference is within the allowed +/-0.0003 seconds.

Start Gate

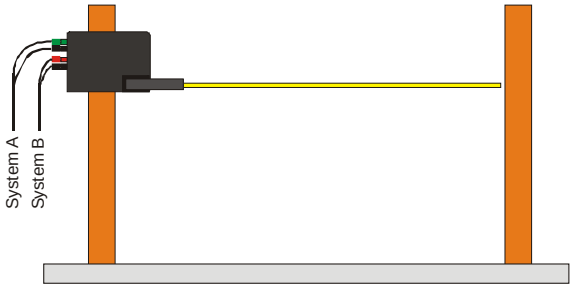
Install the Start Gate in close co-ordination with the Technical Delegate and/or the Race Jury. Only Start Gates homologated by FIS are allowed (see section of homologated timing equipment in this booklet and on FIS website).

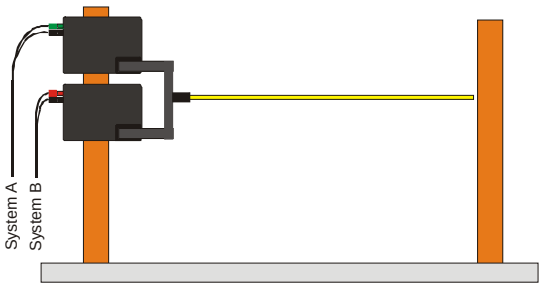
The following elementary rules should be considered:

- Start Gate mounting post must be put into the ground or snow or firmly connected to a fixed structure under the snow. It is essential that the support post be solidly fixed and not permitted to move in any way.
- The Start Gate must likewise be attached to the mounting post without the possibility of rotation or movement of any kind.
- The height above the ground of the Start Gate must permit the athletes to hit the bar below the knee not too close to the boot top. In all cases the range shall not be less than 35cm nor more than 50 cm above the snow surface at the start.
- The start gate may be placed either to the left or the right of the starting competitor, in all cases making sure that the angle of departure to the first gate ensures that the start gate must open.



- The length of the wand (bar) must be within 50 cm (20 in) and 80 cm (31,5 in)
- The Start Gate must have two different and completely isolated lines, two separate connectors, one for timing system A and one for timing system B





- If two Start Gates are used in parallel, they must be solidly mounted on the same physical bracket and each arm must be stiffly connected together (both mechanism and box)
- Only the use of one wand (bar) is permitted
- If the Start Gate has to be replaced during the competition, it must be a Start Gate of the same type and manufacturer
- The position of the Start Gate (both height and rotation) must be marked before the beginning of the competition in order to make sure that a replacement can be installed in the same position if necessary

Technical Specifications for Start Gates:

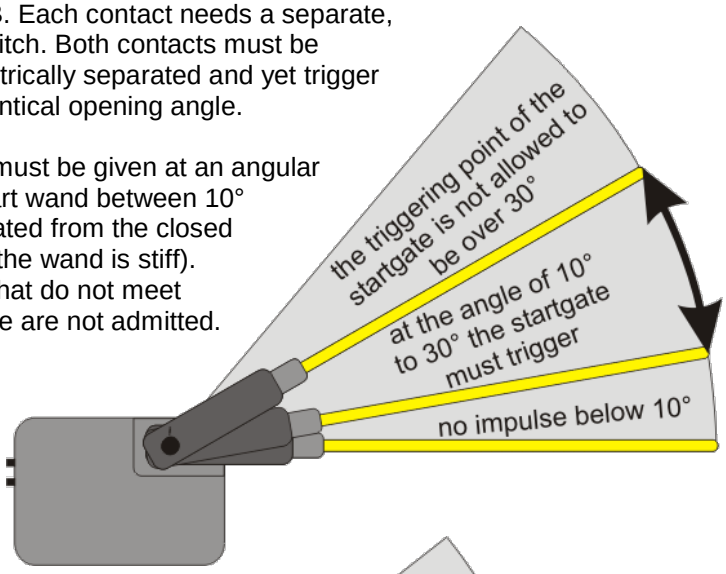
Only Start Gates that meet the following technical specifications will be homologated by FIS:

Contacts:

The Start Gate shall provide a separate contact for system A and B. Each contact needs a separate, but identical switch. Both contacts must be completely electrically separated and yet trigger at the same identical opening angle.

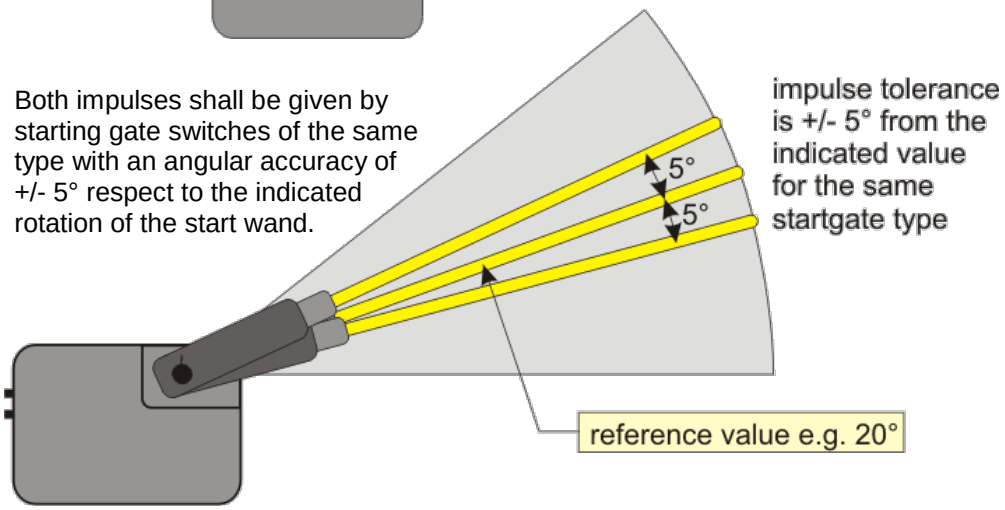
Angular Range:

Both impulses must be given at an angular range of the start wand between 10° and 30°, calculated from the closed position (when the wand is stiff). Starting gates that do not meet this trigger angle are not admitted.



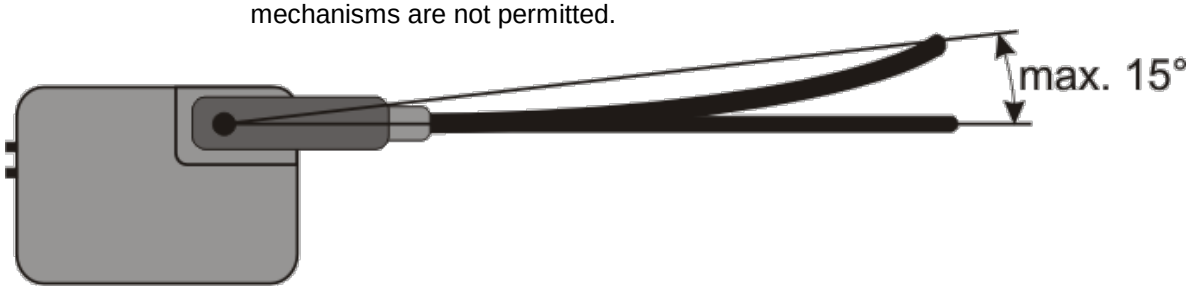
Angular Accuracy:

Both impulses shall be given by starting gate switches of the same type with an angular accuracy of +/- 5° respect to the indicated rotation of the start wand.



Start Wand:

The start wand cannot be so stiff that it could cause injury and that it will not break. On the other hand, it must be as stiff as possible to avoid unfair starts.
If you rotate the start wand at the far end, it is not allowed to bend more than 15° without causing the triggering mechanism to actuate.
The wand must stay open once it is activated. Spring return “Self-Returning” mechanisms are not permitted.



Start Gate Impulses:

Two different possibilities are accepted:

1) **Single Shot:** the line is activated for predetermined time even if the wand remains open
2) **Continuous:** the line remains activated as long as the wand remains open.

Startclock

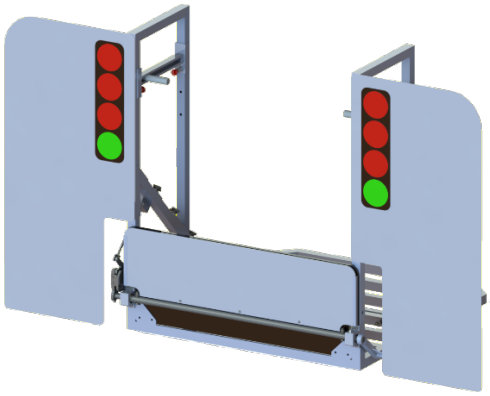
(Homologation is necessary starting from season 2019/2020)

A Startclock is a device that helps the starter to organize the start. A Startclock is highly recommended for DH, SG and GS disciplines and is mandatory for use at level 0, 1 and 2. It must work in time of day mode.

Display:	The startclock has a visible start display to the athletes. The display can be analogue or digital. Analogue Clock: The clock must be visible over a distance of at least 10 m Digital Clock: The figures must be visible over a distance of at least 10 m Time of day: hours, minutes and seconds (min. 6 digit) Countdown: minutes and seconds (min. 3 digit) Bib: to show the bib is not mandatory, but can be an option
Start Indicator light:	The startclock must show if the start is free (green indicator) or not allowed (red indicator).
Acoustic Countdown:	The startclock needs an acoustic countdown. The acoustic countdown has at least one beep at each second during the last five seconds (low tone from five seconds to 1 second and high tone at zero).
Countdown:	The startclock needs at least three start interval countdown times. During the race it must be possible to change form one start interval to another. The duration of each start interval must be adjustable at any time (before the race or during the race).
Interface:	The startclock needs an interface (e.g. RS232, RS422, USB, Ethernet) to transfer the data.
Power Supply:	The startclock must work without power supply from the mains for eight (8) hours at 23°C. The startclock must work without external power supply on internal batteries for 6 (six) hours at -20° C.
Operation Temperature:	The startclock must work at ambient temperatures from -20° to +60°C*
Measuring Range:	Time of day mode must be possible.
Timer Precision:	Must measure up to 1/1000 second in time of day mode. Timer accuracy must be below +/- 10 PPM at a device temperature from –10° to +60°C.
Quartz:	Ageing of the quartz must be below +/- 3 PPM per year. With adjusted quartz frequency the time drift must be below +/-0.5 PPM at 23°C.
Impulse Triggering:	The delay of impulses is not allowed to be higher than 1/1000 sec. for the same channel (the channel is triggered from a reference impulse device in minute intervals). The delay of impulses must be constant; the range must be less than 1/10000 sec.
Timing Channels:	The timing device needs a minimum of two timing channels. One is for synchronisation and one for output of the start impulse (zero tone, e.g. to start the timing device).
Synchronisation:	Synchronisation with other timing devices must be possible.
Electromagnetic:	The timing device must meet the standards of IEC (International Electronic Commission). This means the timing device must function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

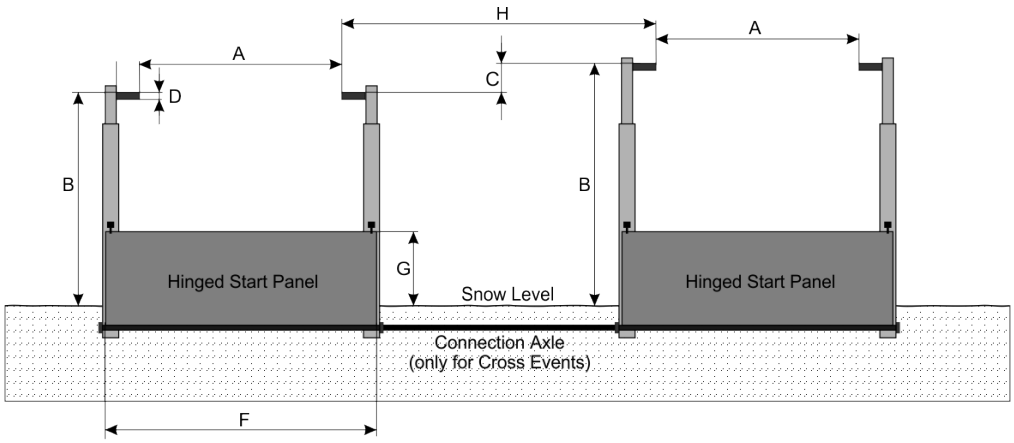
Startdoor

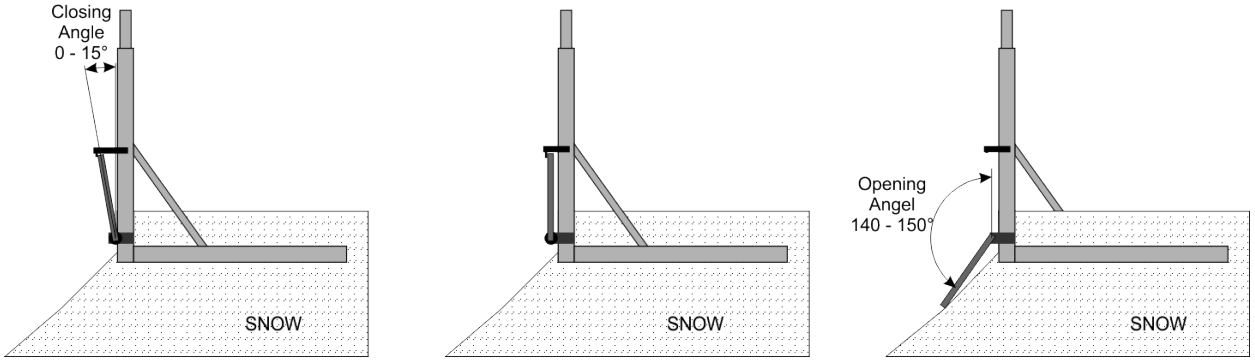
A start door homologated by the FIS is needed for the following events: parallel events, team events, Boarder Cross, Ski Cross.



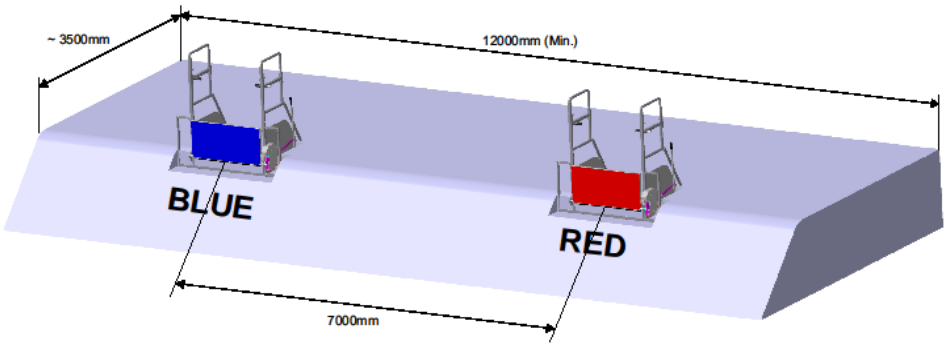
- Dimension of the hinged flap panel, outside the snow must be more than 95 cm wide, 25 to 40 cm height
- The side that has contact with the skis must be protected using material that protects the skis.
- Competitors must not be able to push the gates open. A force applied at any position on the hinged flap panel at 25 cm above the snow with 150 N is not allowed to open or block the startdoor.
- A handle is on each side of the startdoor. It is used for the competitors to start. The handle is mounted on the inside. The handle must be adjustable in the height between 60 and 100 cm (measured from the snow level).
- One push button must start the automatic start sequence for all involved startdoors.
- The startdoor or start-electronic must provide an output channel to start the timing.
- The startdoor must be able to be opened with a delay (e.g. for one racer at the second run at parallel races). For level 0 events it is mandatory.
- Starting lights visible for the athletes may be available for parallel competitions and team events. Red light(s) shows the countdown and a green light the start (door opens). For level 0 it is mandatory. For cross events the starting lights must be able to be switched off.
- Starting sound for the athletes may be available for parallel competition and team event. It is counting down synchron with the light. The sound and light must start exact with the full second. For level 0, 1 and 2 it is mandatory. For cross events the starting sound must be able to be switched off or changed to one start tone.
- Sound and light must be synchronized. Same sound for the red lights and different sound for green light.
- For Cross-Events the hinged start panels must be connected for all gates by one bar. This means all gates must open at the same time.
- The manufacturer of the startdoor must provide a checklist to maintenance the startdoor. Before each FIS race that uses the startdoor the startdoor has to be checked by the checklist and a copy of the checklist has to be provided to the TD at least 2 weeks before the race.
- Validity of the homologation is 10 years

Startdoor Measurements:	
Discribtion	**Specifications**
Distance between handles or knob [A]	80 - 90 cm
Handle or knob height over snow [B]	ajustable, 60 - 100 cm
Vertical handle movement [C]	max. 10 cm step
Handle diamenter [D]	3 - 5 cm
Width of hinged flap panel [F]	min. 95 cm
Highed of hinged flap panel over the snow [G]	25 - 40 cm
Distance between startdoors for cross events [H]	60 - 70 cm
Closing angle of hinged flap panel	0 - 15°
Opening angle of hinged flap panel	min. 140°
Time to open hinged flap panel to 90°	max. 0.3 s
Variation of opening duration of hinged flap panel	max. 0.1 s
Time to open hinged flap panel from start impules to 90°	max. 0.4 s
Force applied on hinged flap panel to 25 cm over snow level without opening	min. 15 kg
Operating temperature	-30°C to +60°C
Surface of hinged start panel (side that skier moves over)	protection for skies

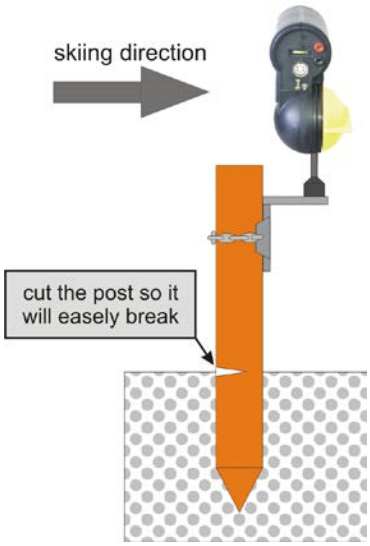




Installation for parallel races and team events has to follow the plan below:



Photocell



Install photocells in close co-ordination with the Technical Delegate and/or the Race Jury. It is strongly recommended that the approach to the finish and the width of the line be made as levelled as possible, making it impossible for athletes to slide under or jump over the beams when installed.

Only wooden posts with a maximum diameter of 6 cm should be used to mount the photocells at the finish. You should cut the wood posts so they can break away in case of being struck by a racer. This cut must be made facing uphill. All brackets and elements of the photocells should be placed on the downhill side of the post. If photocells for intermediate are used they should be mounted on hinged poles that will break away.

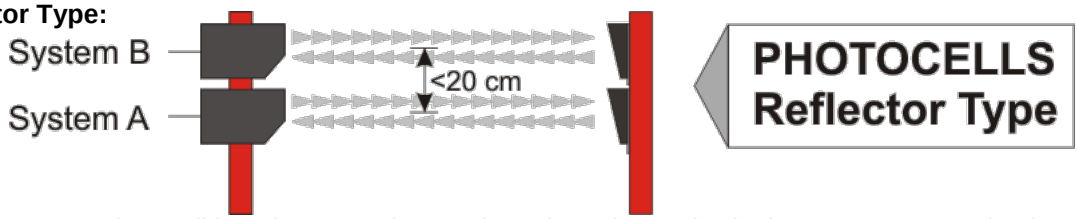
Photocell system A and B must always be completely separate (separate case and mounting brackets).

For photocells appropriate protection must be provided by the organizer.

Only photocells homologated by FIS are allowed to be used for the finish (see section of homologated timing equipment is this booklet or on FIS website).

There are two categories of cells:

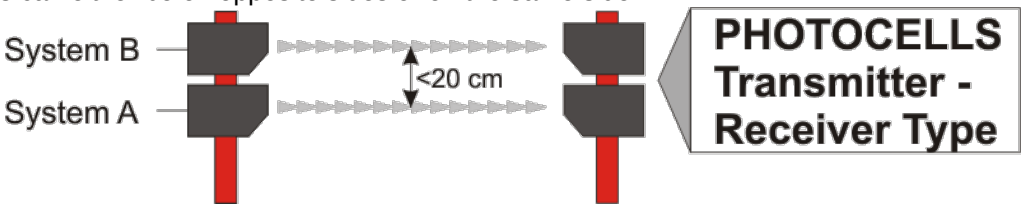
1. Reflector Type:



The reflector-type photocell has the transmitter and receiver electronics in the same case. A simple reflector on the opposite side of the finish line is used to reflect the photocell beam back to the main unit. For System A and B the reflectors should be on the same side.

2. Transmitter-Receiver Types:

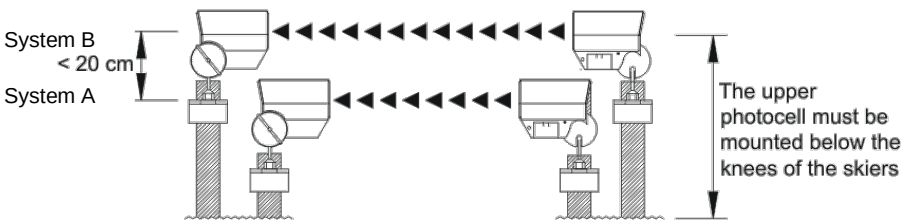
In this case the transmitter is on one side of the finish, and the receiver is on the other side. For System A and B transmitters can either be on opposite sides or on the same side.



Photocells for the Finish:

It is necessary to have two independent sets of photocells for the finish, one connected to Timing System A and one for Timing System B. The cells must be mounted so that both beams are triggered at a height that is lower than the knee of racers at the finish. It is recommended that the lowermost photocell be connected to Timing System A.

The photocells must be set up parallel to the finish on top of each other. Either the same post or two separate posts for both photocells can be used. The maximum vertical separation of the beams may not exceed 20 cm (8"), and in all cases should be less than that if possible.



For the Transmitter-Receiver Type the transmitters of the photocell can be either on the same side or opposite side (see manufacturer specifications). The beams may be installed in a crossed configuration but in all cases the 20cm maximum vertical separation must be observed.

The photocells must be connected to the timing devices by fixed cable. No radio transmission of photocell signals to the timers is allowed for the finish photocells.

Photocells for Intermediate Time:

There is no requirement to have a backup (System B) photocell for the intermediate time.

If you use photocells install them in close co-ordination with the Technical Delegate and/or the Race Jury.

To avoid the photocells (if used) being triggered by anyone other than the competitors, it is recommended that the person responsible for that intermediate timing point use a push-button to arm the photo cells only when a competitor crosses the line.

Technical Specifications for the Photocell

The technical concept of the photocell is not restricted by FIS, although it must be assured that the photocell cannot be influenced by any other light, camera flash/strobes, radio waves (EMI) or mobile reflectors for photocells of reflector type.

The photocell must meet the standards for electronic devices in the country that it is sold.

Accuracy:	Sensing Time - The time delay from the instant the photocell is triggered to moment an output impulse is generated may not exceed 0.005 sec. Repeatability (Random Jitter) - The delay of impulses must be constant, the range must be less than 5/10.000 sec. This range is measured in a "peak-to-peak" manner, minimum to maximum extremes, it is not averaged.
Operating Distance:	The photocell must work over a minimal distance of 20 m. The maximum size of the reflector (if used) is 100 mm (in all directions).
Triggering Object:	An 8 mm object moving with a speed of 10 km/h is not allowed to trigger the photocell (measured at a distance of 2 m from lens of the receiver). A 100 mm object moving with a speed of 200 km/h must trigger the photocell (measured at a distance of 2 m from lens of the receiver). The object must be a black cylinder.
Temperature Range:	-20 to +60°C (for colder weather you should prepare a cover so the photocell will still work).
Power Supply:	If the photocell is supplied power from the timing device (within the same cable as the impulses) it needs no external power supply. If a battery is used as the power supply (external or internal) the Photocell must work for four (4) hours at –20°C.
Reflector:	max. size is 10 cm (diagonal)
For homologation of photocells:	When sending photocells to the FIS for homologation, the photocell needs an input contact to switch the photocell transmitter off, in order to make precise tests.

Photofinish Systems

A photofinish system can be used to determine a competitor's finish time. A photofinish system is a line scan camera that scans the finish line with an adjustable scan rate.

In the case of a failure of System A and System B, and where the competitors finish has been recorded by the photofinish system, this finish time must be used in the place of hand timing using a correction factor. The correction factor should be the difference between the time taken by the photofinish system and the electronic times of the 3 competitors before the missed time. The sum of the 3 time differences is divided by 3 which must be applied to the photofinish time of the competitor without an electronic time.

The photofinish time is taken when any part of the competitor's body crosses the finish line. The photofinish result is only to be provided to the jury.

For night races using a photofinish a light with min. 2000 Lux is necessary. If possible, the light should be without bright and dark phases. LED light is recommended.

All photofinish systems must meet the following criteria for use in FIS Alpine races:

Timer:	The timer must be able to operate in Time-of-Day mode and be synchronized with all timing devices.
Operation Temperature:	The photofinish camera must operate (once it is started) at ambient temperatures from -10° to + +60°C.
Measuring Range:	Time of day mode must be possible in hours, minutes, seconds and 1/1000, or better.
Timer Precision:	Must measure up to 1/10000 second in time of day mode. Timer accuracy must be below +/- 10 PPM) at a device temperature from –10° to +60°C.
Quartz:	Ageing of the quartz must be below +/- 3 PPM per year. With adjusted quartz frequency the time drift must be below +/-0.5 PPM at 23°C.
Impulse Triggering:	The delay of impulses is not allowed to be higher than 1/1000 sec. for the same channel (the channel is triggered from a reference impulse device in minute intervals). The delay of impulses must be constant; the range must be less than 1/10000 sec.
Timing Channels:	The timing device needs a minimum of one timing channel for time of day synchronisation.
Synchronisation:	It must be possible to synchronize the timing device with other timing devices.
Image Production:	The photofinish system must scan the finish line at a minimum of 2000 scans per second and show images sequentially and show scanned finish line images in sequential order on a monitor screen and store it on a memory device.
Image Evaluation:	The photofinish system must be capable of showing the time of day for each line scan image.
Power Supply:	Backup power supply must be granted for a minimum of 20 minutes (e.g. internal battery or external UPS).
Electromagnetic:	The timing device must meet the standards of IEC (International Electronic Commission). This means the timing device must function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

Homologation of Timing Equipment

Manufacturers wishing to have their timing devices, startgate, photocells or photofinish system homologated for use in FIS races must send a request to the Timing Working Group through the FIS office which will instruct the manufacturer to provide all technical information indicated above. Software for photofinish systems are not part of the homologation. The costs of homologation have to be paid by the manufacturer.

If a manufacturer homologates prototypes the FIS will not consider it for homologation. Only final versions of a device (as it is sold in public) will be homologated by the FIS.

Attention:
All temperatures for the specification of timing equipment are given with a tolerance of +/-1°C.

List of Homologated Timing Equipment

The List of homologated timing equipment is not included in the timing booklet any more. Please check this list on FIS webpage.

https://www.fis-ski.com/en/inside-fis/document-library/timing-data

Conclusion

We hereby wish to thank all members of the "FIS Timing Working Group" who have always used every endeavour to realize this "FIS GUIDE" for their Technical Delegates and event organizers. Our progress since 1996 reflects the balance between accepting new technologies and ensuring the correct evaluation of human performance through fundamental timekeeping concepts.

We wish to acknowledge the major contributions of participating manufacturers, FIS professionals and volunteers from our many member National Associations and race organizers who give so much of their time and expertise without which it would be impossible to generate such a document or perspective.

The FIS is pleased to support such a unique group in the world of timekeeping regulation and notices the absence of similar structures in many other high-performance sports that rely so heavily on timing technology for fair and impartial judgement.

We are fully aware that there are still some imperfections in these rules and descriptions and would welcome any constructive proposal as the works proceed. This document will be continually revised to improve the knowledge of the FIS community for the benefit of all Alpine Skiing competitions.

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FIS Timing Working Group

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Alpine Skiing
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