

# REPLACEMENT TIME RULE CHANGE

Alpine Technical Delegates – Update 2017



## ***FALL UPDATE TIMING RULE CHANGE***

### Hand Timing

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 ~~calculated net times~~ time of day from either system A or system B are not available for a competitor, the ~~calculated net~~ manual time of day as per art. 611.3.2.1 will be considered valid.**

## ***FALL UPDATE TIMING RULE CHANGE***

### *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 Calculate the difference between the times taken by hand and the electronic times of the 10 5competitors starting before the missing time.and the 5 starting after or if necessary, the 10 nearest competitors. 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.

## DIFFERENCES

NEW – 10 before miss for sample group

OLD – 5 before and 5 after

NEW – TOD times (missing half) used

OLD – Calculated NET times used

10 times before advantage, Can usually be done immediately

Possible improvement in consistency

TOD advantage, Slightly closer to actual, most of the time.

Works without sync

## LETS HAVE A LOOK

For our samples we have actual system A times for all but we will do the math to show how it compares

We are using three misses in a row with the same sample group to show how the variation can improve or worsen the replacement time compared to actual primary time

All of these calculations are done to .001 precision for better clarity, precision will be discussed after.

## OLD METHOD - MISSED LAST 3 RACERS

Bib	Primary	Replacement	Longer	Shorter		
	9	00:01:13.894	00:01:13.706		00:00:00.188	
	11	00:01:14.479	00:01:14.235		00:00:00.244	
	13	00:01:15.116	00:01:14.849		00:00:00.267	
	14	00:01:15.250	00:01:15.129		00:00:00.121	
	15	00:01:13.562	00:01:13.342		00:00:00.220	
	17	00:01:14.954	00:01:14.821		00:00:00.133	
	18	00:01:15.619	00:01:15.351		00:00:00.268	
	19	00:01:16.385	00:01:16.169		00:00:00.216	
	20	00:01:15.982	00:01:15.880		00:00:00.102	
	21	00:01:17.368	00:01:17.207		00:00:00.161	
					00:00:01.920	
		/10		0.192 Replacement		Actual A time
Missing	22		1:16.155	-0.109	<b>1:16.347</b>	<b>1:16.264</b> <b>0.08</b>
	23		1:15.685	-0.206	<b>1:15.877</b>	<b>1:15.891</b> <b>-0.02</b>
	24		1:17.798	-0.277	<b>1:17.990</b>	<b>1:18.075</b> <b>-0.08</b>

## NEW METHOD MISSED START

	Bib	Primary	Replacement	Difference		
	9	07:54:43.212	07:54:43.428	00:00:00.216		
	11	07:56:03.823	07:56:04.091	00:00:00.268		
	13	07:57:22.177	07:57:22.365	00:00:00.188		
	14	07:58:03.194	07:58:03.331	00:00:00.137		
	15	07:58:45.128	07:58:45.323	00:00:00.195		
	17	08:10:43.241	08:10:43.445	00:00:00.204		
	18	08:11:23.305	08:11:23.555	00:00:00.250		
	19	08:12:02.485	08:12:02.708	00:00:00.223		
	20	08:12:42.751	08:12:42.889	00:00:00.138		
	21	08:13:22.047	08:13:22.263	00:00:00.216		
			TOTAL	00:00:02.035		
			/10	00:00:00.204		
Missing	22	08:14:02.193	08:14:02.326	0.133	08:14:02.122	-0.071
	23	08:15:22.720	08:15:22.970	0.250	08:15:22.766	0.046
	24	08:16:02.822	08:16:03.052	0.230	08:16:02.848	0.026
		Primary Finish	Replace Start	Replacement	Actual	Difference
Corrected	22	08:15:18.457	08:14:02.122	<b>1:16.335</b>	<b>1:16.264</b>	<b>0.07</b>
	23	08:16:38.611	08:15:22.766	<b>1:15.845</b>	<b>1:15.891</b>	<b>-0.05</b>
	24	08:17:20.897	08:16:02.848	<b>1:18.049</b>	<b>1:18.075</b>	<b>-0.03</b>





## WHAT ABOUT MISSING BOTH

- Lets look at the replacement TOD math again

Replacement Fin	Replace Start	NET	NET Replacement
08:15:18.469	08:14:02.122	00:01:16.347	00:01:16.347
08:16:38.643	08:15:22.766	00:01:15.877	00:01:15.877
08:17:20.838	08:16:02.848	00:01:17.990	00:01:17.990

- Calculate with NET TIMES or calculate replacement TODs (do two replacements for one athlete)
- Comes out exactly the same both ways

## NEW METHOD MISSED FINISH – NO SYNC

- In a perfect world, all alternate systems would be sync'd with the primary
- We don't live there... but
- Calculation still works with non synchronized systems!

## NEW METHOD MISSED START – NO SYNC

	Bib	Primary	Replacement	Difference		
	9	07:54:43.212	00:52:30.083		07:02:13.129	
	11	07:56:03.823	00:53:50.746		07:02:13.077	

Subtract the electronic time from the time taken by hand for Calculate the difference between the times taken by hand and the electronic times of the 10 5 competitors starting before the missing time and the 5 starting after or if necessary, the 10 nearest competitors. If there are not 10 times before, complete the calculation with the remaining times after the missed time.

			TOTAL			
				00:00:00.000	22:22:11.415	1320
			/10	07:02:13.142		
Missing	22	08:14:02.193	01:11:48.981		08:14:02.123	-0.071
	23	08:15:22.720	01:13:09.625		08:15:22.766	0.046
	24	08:16:02.822	01:13:49.707		08:16:02.849	0.027
				Replacement	Actual	Difference
Corrected	22	08:15:18.457	08:14:02.123	<b>1:16.335</b>	<b>1:16.264</b>	<b>0.07</b>
	23	08:16:38.611	08:15:22.766	<b>1:15.844</b>	<b>1:15.891</b>	<b>-0.05</b>
	24	08:17:20.897	08:16:02.849	<b>1:18.049</b>	<b>1:18.075</b>	<b>-0.03</b>

## NEW METHOD MISSED START – NO SYNC

	Bib	Primary	Replacement	Difference		
	9	07:54:43.212	10:52:30.083	02:57:46.871		
	11	07:56:03.823	10:53:50.746	02:57:46.923		
	13	07:57:22.177	10:55:09.020	02:57:46.843		
	14	07:58:03.194	10:55:49.986	02:57:46.792		
	15	07:58:45.128	10:56:31.978	02:57:46.850		
	17	08:10:43.241	11:08:30.100	02:57:46.859		
	18	08:11:23.305	11:09:10.210	02:57:46.905		
	19	08:12:02.485	11:09:49.363	02:57:46.878		
	20	08:12:42.751	11:10:29.544	02:57:46.793		
	21	08:13:22.047	11:11:08.918	02:57:46.871		
			TOTAL	29:37:48.585		
			/10	02:57:46.859		
Missing	22	08:14:02.193	11:11:48.981		08:14:02.123	-0.071
	23	08:15:22.720	11:13:09.625		08:15:22.766	0.046
	24	08:16:02.822	11:13:49.707		08:16:02.849	0.027
		Primary Finish	Replacement Start	<b>Replacement</b>	<b>Actual</b>	<b>Difference</b>
Corrected	22	08:15:18.457	08:14:02.123	<b>1:16.335</b>	<b>1:16.264</b>	<b>0.07</b>
	23	08:16:38.611	08:15:22.766	<b>1:15.844</b>	<b>1:15.891</b>	<b>-0.05</b>
	24	08:17:20.897	08:16:02.849	<b>1:18.049</b>	<b>1:18.075</b>	<b>-0.03</b>

# COMPARISON

TOD replacement offers slightly closer to actual, most of the time

	NET		Start TOD		Finish TOD		Actual
22	1:16.347	0.08	1:16.335	0.07	1:16.276	0.01	1:16.264
23	1:15.877	-0.02	1:15.845	-0.05	1:15.923	0.03	1:15.891
24	1:17.990	-0.08	1:18.049	-0.03	1:18.016	-0.06	1:18.075

## WHERE THE ERROR LIES

- Start has greater variation
  - An object going into motion is harder to consistently track than an object in motion
- Finish speed
  - Slalom is slower and will produce greater variation than Downhill for both electric and manual systems
- Photocell width
  - wider separation produces greater variation for electric finish TODs

## TIME AND DISTANCE

- At 25 mph – SL speed
- .01 sec = 4.4 inches or 11.2 cm
  
- At 50 mph - DH/SG finish speed
- .01 sec = 8.8 inches or 22.4 cm
  
- An arm reach can be worth
- .02 - .05 depending on speed

## WHAT ABOUT PRECISION

Precision offers a clearer representation of the athletes effort, especially in a time trial format with TOD timing. This is a benefit to the athlete.

Precision is good		Finish	Start	Net
.001 precision		50.003	10.004	39.999
.01 precision		50.00	10.00	40.00



## WHAT ABOUT PRECISION

Loss of precision (truncation) from the start TOD provides dis-service to the athlete (in some cases)

		Finish	Start	Net
Precision loss at start		50.003	10.004	39.999
Loss for athlete		50.003	10.00	40.003

## WHAT ABOUT PRECISION

Loss of precision at the finish TOD provides a benefit to the athlete (in some cases)

		Finish	Start	Net
Precision loss at finish		50.003	10.002	40.001
Benefit athlete		50.00	10.002	39.998

But other times, it makes no difference...

		Finish	Start	Net
Precision loss at finish		50.003	10.005	39.998
Benefit athlete		50.00	10.005	39.995

## WHAT ABOUT PRECISION

Devices offer different precision, what should we do?

System A - .001 or greater

System B - .001 or greater

Hand Timing - .01

Work in .001 precision (or greater)

System A – truncated usually

System B – truncated usually

Hand Timing – expanded to .001 (add a zero)

# WHAT ABOUT PRECISION

.001 primary and .01 replacement system (hand timing)				
	Bib	Sys A TOD Fin	HT Finish TOD	
	27	08:19:18.019	08:19:17.880	0.139
	30	08:21:20.141	08:21:19.920	0.221
	31	08:27:20.215	08:27:20.140	0.075
	32	08:28:01.178	08:28:01.130	0.048
	33	08:28:40.759	08:28:40.580	0.179
	34	08:29:21.983	08:29:21.940	0.043
	35	08:30:03.018	08:30:02.860	0.158
	36	08:30:38.179	08:30:38.030	0.149
	38	08:31:20.619	08:31:20.520	0.099
	39	08:32:01.521	08:32:01.430	0.091
Missing	40		08:32:43.890	1.202
			<b>/10</b>	<b>0.120</b>
			Replacement Finish	Primary Start
			08:32:44.010	08:31:24.489
				<b>00:01:19.521</b>

## WHAT ABOUT PRECISION

Primary truncated				
Bib	Sys A	TOD Fin	HT Finish	TOD
27	08:19:18.01		08:19:17.88	0.13
30	08:21:20.14		08:21:19.92	0.22
31	08:27:20.21		08:27:20.14	0.07
32	08:28:01.17		08:28:01.13	0.04
33	08:28:40.75		08:28:40.58	0.17
34	08:29:21.98		08:29:21.94	0.04
35	08:30:03.01		08:30:02.86	0.15
36	08:30:38.17		08:30:38.03	0.14
38	08:31:20.61		08:31:20.52	0.09
39	08:32:01.52		08:32:01.43	0.09
Missing	40		08:32:43.89	1.14
		/10		<b>0.11</b>
		Replacement Finish	Primary Start	
		08:32:44.000	08:31:24.489	<b>00:01:19.511</b>

## WHAT ABOUT PRECISION

If truncation is done before calculation on Replacement Finish TOD  
Adjustment factor and final result is .01 less, in some cases

If truncation is done before calculation on Replacement Start TOD  
Adjustment factor .01 less, in some cases, but at the start, this makes  
the result .01 more

1/1000 precision offers middle ground between manual and electric  
systems and a more accurate result for replacement calculation over  
1/100 truncated calculations

## SUMMARY

- TOD Replacement produces better result, most of the time
- TOD replacement works with or without synchronization
- Math can be done either way, alternate minus primary or primary minus alternate
- For athletes missing both start and finish time, NET Time calculations (old method) produces exact same result as doing the math with a replaced TOD start and replaced TOD finish
- Replacement calculations should be done to the .001 precision
- **Look for and use electric system B whenever possible, no matter how you do the math, electric gives a much better result!**