

Controlling an Electronic Punching System: SI System

Decisions to be Taken Before the Event

Punching start or timed start? (Major events require timed starts.)

Punching finish or timed finish?

Back-up pin punch or not? An alternative to a pin punch is a three-letter code word (DOG, GUN, HAT etc) written on the control unit.

Mount boxes on stakes or place on the ground?

Checking the SI units

This can be done by the planner: the controller must simply be convinced that it has been done.

All the boxes must be checked before they go out to make sure that

they are working

they are time-synchronised

they are performing the correct function

i.e. clear, check, start, finish or control with the correct code

their back-up memory has been cleared (this is essential for start, finish and clear boxes otherwise your check for missing competitors may throw up names of competitors from a previous event)

their batteries will not go flat during the event (battery life is supposed to be 3-7 years)

[in addition, each box's 'stay active time' needs to be set long enough so that, when the box is punched to switch it on by the person checking it on the morning of the event, it is still on when the first competitor gets to it. This is because the first punch takes 1s longer than normal, and you don't want the first starter to be delayed at each control. However, this will probably have been done when the box was first used for an event]

Time synchronisation should be done in the last couple of days before the event (clocks can drift by 1s per day; for very short legs in e.g. urban races this could result in negative leg times). All boxes (including start and finish) must be synchronised in the same session and from the same computer or time master unit to ensure that the clocks all agree with each other. Beware the computer wizz-kids who refuse to believe that there is a risk of two computers, both set from the same internet time source, disagreeing with each other

If a timed start is to be used, ask for a spare, synchronised control box to be taken to the start and the start clock to be set to the time on the box. That way, even if the boxes are running fast or slow the start will be out by the same amount and so elapsed times will be correct. Be careful if your event is on the day 'the clocks go back / forward' for summertime: the boxes were synchronised earlier!

If a punching start is used, all clocks will agree with each other anyway.

To check the boxes, line all of them up in numerical order, punch them with an SI card then download the SI card to check that all the codes appear as expected and that the times are in sequence.

At the Event

All control sites need visiting on the competition day to ensure they are still in position and intact, and all boxes need punching to check that they are switched on and working. Remember to have a card with a large enough memory for all of the controls, or carry more than one card: once a card is full it will not make a box 'beep' when punched. A failed box can be replaced with a spare, configured one: cover up the code and tell the download people the control code and the code of the replacement box - they can then change the code in the software so that no-one is disqualified.

The finish should have more than one box (in case one fails); double check that each reads the same time (turn the box over: there is a display underneath).

Points for Safety Check for Missing Competitors

Start, finish and clear boxes must have their back-up memory cleared before the event: otherwise your check for missing competitors may throw up names of competitors from a previous event.

The start officials must be made aware of the importance of checking all competitors and then returning the check boxes speedily to download: those boxes provide the record of who started.

Towards the end of the event, an unused spare finish box can be swapped in as a lone box when the stream of finishers becomes a trickle. The other finish boxes can then be read out. This will allow download to check for competitors listed as 'missing' who finished but didn't come to download.

The safety check depends on being able to read data from a computer. The download team must then be able to guarantee power for at least one lap-top at the end of the event, even if e.g. the generator has broken down.

Control units

All SI units can be configured as Clear, Check, Start, Control or Finish. The 'Stay Active' time can also be configured (the default is 2 hours). This configuration is done by connecting a unit to a computer via a 'Master' station.

The units are generally in Stand-by mode. However, when a unit is punched (and that first punch takes a relatively long time – 1 second), the unit switches to Active mode. The unit then operates normally until the limit of the Stay Active time is reached. But any further punches reset that countdown, so the unit only switches back to Stand-by mode 2 hours (or whatever the Stay Active Time has been set to) after the last person punched it.

The internal clock is accurate to about 1 second per day. A special 'Time Master' station can be used to synchronise the clocks in the control units, or they can also be synchronised when the control units are connected to the computer.

There are two types control unit currently being manufactured, BSF-8 and BSF-7:

BSF-8



This is the newer smaller size 101x51x19 mm weighing 62 g. The lithium battery typically lasts 3-5 years. The back-up memory holds 21802 punches and when full, the oldest data is

overwritten. There is a display on the underside showing station type and code (clear, check, control 138 etc) and clock time. Using the Service-Off card to activate the unit causes other information to be displayed such as battery voltage, firmware version etc. The batteries can be changed by SportIdent.

BSF-7

This is the 'classic' larger size 115x62x32 mm weighing 148 g. It is functionally exactly the same as the BSF-8 except that the lithium battery has twice the capacity, typically 4-7 years.



BSF-6 and earlier versions had much shorter battery lives but the three-cell battery could be changed by the user. They don't have a display. However, not all clubs have yet upgraded (because upgrading costs about £50 per box). Looks like BSF-7.

The punching process

The following are the stages of the punching process:

- (i) Competitor inserts card into the hole in the unit
- (ii) The unit reads the competitor's card (this is very quick)
- (iii) The unit writes the control code and time into the competitor's card (this is the 'longest' process)
- (iv) The unit reads the competitor's card to verify that it has been written correctly
- (v) The unit beeps and flashes and writes the card number and time into its back-up memory.
- (vi) Competitor withdraws card

Decisions to be made in advance

Punching start or timed start. A punching start is more flexible. Note that if a start time exists in the card, then the results programmes will use it. So it is possible to use a timed start for most, but allow those who need flexibility (e.g. officials, split starters etc) to use a punching start. Some results software (such as Auto-Download) has an option which controls whether a punching start overrides the allocated start time.

Punching finish or timed finish. A punching finish is the only practical solution for large numbers of competitors.

Back-up pin punch or not. The rules say a back-up pin punch 'should' be provided in case of unit failure. It does add one more thing for the planner to manage, but it is very annoying for a competitor if the unit won't work and they have no way of proving they've been at the control. If no pin punch is provided, then the organiser has no choice but to believe competitors who claim that the box didn't work when they got there. An alternative to a pin punch is a three-letter code word (DOG, GUN, HAT etc) written on the SI unit.

Mount boxes on stakes or place on the ground. For major events, proper stakes should normally be used, but for events where access is difficult (e.g. high fells) it is acceptable to just hang a flag on a cane and put the box on the ground underneath. Boxes on the ground should be tethered and within 1 metre of the flag.

Checking the control sites

In many areas, stakes can be put out a few days in advance, perhaps with the flag collapsed on the ground. The controller can then check the position of most of the stakes in advance of the competition day.

On the day, the planner and helpers take the boxes out to the control sites. There is then no need for the controller to visit sites on the day, except for those few vulnerable ones which could not be placed in advance.

Checking the SI units

The planner must carefully check all the boxes before they go out to make sure

- they are working
- they are time-synchronised
- they are performing the correct function (i.e. clear, check, start, finish or control with the correct code).

One way to do this is to read the display on the back (if they are BSF7/8 boxes) but that is relatively time-consuming. A faster way is to punch each box and then read out the SI-card used. A SportIdent mini-printer is very useful for this. It is really annoying for competitors if any controls do not have the correct time as it messes up their splits, and it is a pain for the organiser to correct. It can be disastrous if one of the controls on the course is actually a clear station and this has now happened several times at UK events.

The controller must ensure that this check has been properly carried out – either by supervising it personally or seeing a copy of the print-out.

The people placing the boxes should also have a cleared e-card and should punch them once they are in position as a final check that the boxes have not been damaged in transit.

Remember that control units will not beep when punched by a full SI card. So the planner and helpers must have sufficient cleared SI cards. The 'classic' mistake is for the planner or controller to declare that some units are not working, when in fact it was just that their SI-card was full.

A full SI-Card will actually switch BSF-7/8 stations from Stand-by to Active mode but there is no beep and there is no punching record in the SI-Card.

Spare units

The planner should have a few spare time-synchronised boxes to hand. They should have the code with which they have been programmed written on very unobtrusively so that if one has to be used to replace a faulty unit, competitors are not confused. Note that the software will allow a

replacement control code to be entered to cater for such eventualities. Spare clear, check and start units should also be prepared and available at the start, and a spare finish unit at the finish.

Control unit preparation

Before the event, the back-up memory of all the control units should be cleared. (That can be done with a special SI-card or via a pc).

The voltage of all units should be checked to make sure that the batteries are OK. On BSF-7 and BSF-8 units, this can be seen on the display on the back.

For older units (BSF-6 and earlier), the estimated voltage (based on usage since the last battery change) can be seen when the unit is connected to a computer. However, there is a tendency for one cell of the three to suddenly go 'flat', so the only way to be sure about the voltage is to unscrew the box and check the voltage with a voltmeter.

It is vital that units are time synchronised. That can be achieved using a computer or by using the time master. Use of the time master avoids bothering with a pc (except to synchronise the time master itself to radio time).

The synchronisation steps are

- a) the start clock (if used) must be synchronised exactly to non-digital radio time pips. Note that digital radio time pips are delayed by several seconds.
- b) the time on a computer must be synchronised to non-digital radio time pips or internet time. (Beware of introducing unsynchronised times if a unit has to be re-programmed in an emergency, and the computer used is not itself synchronised)
- c) the time master is synchronised to the computer
- d) the time master is used to synchronise all the control units (or else all the control units are synchronised to the computer, but that is more work).

For a timed start and punching finish, all the above steps must be carried out.

For a punching start and punching finish only step d) is required.

When used in "Extended" mode, the time master not only synchronises the time but also clears the back-up memory and sets the Stay Active time to the same as the time master.

It is very important that for competitive events (district or higher level) 'real' competitors do not find the controls in Stand-by mode. The controller, planner or pre-runners must punch all the controls in the morning, and the Stay Active Time must be set so that the controls are still active when the first real competitor visits. (The default 2 hours is normally insufficient and should be

adjusted; 6 hours will normally be adequate. Note, this adjustment only needs to be made once; it does not have to be repeated for each event).

In any case, all control sites need visiting on the competition day to ensure they are in position and intact, and all boxes need punching to check that they are working.

The Start

Spare SI cards should be available at the start, especially if the start is a long way from assembly.

An official should hold the check box in their hand and check all competitors' cards individually. A competitor who fails to clear his card will also probably not know what to do with the check box. The check box will only beep if it can read the card and the card is cleared. Note that the start unit will also not beep unless the card is cleared.

If a mix of BSF-7/8 and older (BSF-6 or earlier) units is used, then an older unit must be used as the check box in order to screen out any SICard-9s (which won't work with older units).

The start officials must be made aware of the importance of checking all competitors and returning the check boxes speedily to the results processing.

If a punching start is used, great care must be taken to ensure that all competitors punch the start box – beginners may not realise that they have to do that.

Late starters

If competitors are supposed to start at their given start time, then a clear procedure must be decided for late starters. This procedure should take into account how the results software handles a punching start.

The competitor should be sent off as soon as possible; if they are only a few minutes late at the pre-start, it may be they can be advanced to the right line and can start at their right time (In the rush, the official mustn't forget to use the check station). If a competitor has definitely missed their time, they should be set off as soon as possible – not kept waiting for a free slot. That may mean setting them off on the half minute. A competitor hanging around is a drain on organisational resources (and is getting cold). Normally, if the lateness is their own fault, then the competitor's time is from when they should have started. If the lateness is the fault of the organiser (e.g. the minibus taking competitors to the start got lost) then the competitor's start time should be adjusted. The late start official should generally not try to arbitrate. If it is clear that the lateness is the fault of the organiser, then the competitor should be given a new start time. Otherwise, the

competitor's actual start time should be noted down, and the competitor can be left to complain to the organiser if he/she feels that the actual start time should be used.

The Finish

If a punching finish is used, particular care should be taken to ensure that the finish units are synchronised. The finish banner should be placed in line with the finish boxes and a control flag must be placed on each stake to make the finish units visible to a fast-finishing runner.

In the case of a major relay, the finish units should be placed just beyond the finish line, and the results of close finishes (at least for the podium places) should be determined by judges. That may mean a little editing of the finish times is required to get the order right.

Towards the end of the event, an unused spare finish box can be swapped in as a lone box when the stream of finishers becomes a trickle. The other finish boxes can then be read out. This can help to get the missing competitor procedure underway as early as possible and avoid searching the forest for competitors who finished but didn't come to download.

Results

There are a number of different results-software providers. The results team must be very familiar with the software being used and know how to manage all the issues that arise during a competition. It is generally best to quickly move all "problem" competitors at download onto a separate troubleshooting desk staffed by an expert, allowing normal downloading to continue.

If a competitor has a missing punch, the first thing to check is whether there is an extra punch on their splits around the appropriate time with an asterisk. That indicates that they went to the wrong control. (Or if it happens with an early finishing competitor, it may mean the course has been entered wrongly to the computer and needs correcting, or a box has the wrong code programmed into it in which case the replacement control function can be used.)

If there is no punch in the competitors card for the correct control, and there is evidence that the control unit is functioning properly (e.g. most other people punched OK there), then the competitor must be disqualified.

Note that other evidence of being at the control is not acceptable, because the competitor must both visit the control and punch properly. In the case of SportIdent, punching properly means putting the SI-card in the hole and getting the feedback (bleep/light). If the back-up memory of the unit is subsequently read-out, it may well show that the competitor was at the control. But normally in such cases, it merely confirms that the competitor punched too fast. If the punching process has not been completed, the back-up memory will contain the card number plus an error code to indicate that the punching process did not complete. The competitor must not be reinstated on that evidence. The relevant rule states:

6.5.4 In the exceptional circumstances of it being established with certainty that the missing or unidentifiable punch was not the competitor's fault, other evidence may be used to prove that the competitor visited the control, such as evidence from control officials or cameras or read-out from the control unit. In all other circumstances, such evidence is not acceptable.

If there is a problem with a control (misplaced or stolen) to such an extent that no acceptable result can be produced for the competition, then the course must be declared void. It is tempting to try to 'correct' the problem by removing the splits either side of the relevant control, but this means that competitors are not being measured over the planned course and introduces distortions such as unfairly benefiting runners who lost time on the subsequent control. IOF rule 24.15 says The results must be based on competitors' times for the whole course. No changes may be made to these times on the basis of split times.

Identifying Missing Runners

For a purely on-the day entry event where the entries are typed in, then you may be able to assume that all entrants will start and anyone not finished is still out on the course. However, for pre-entry events, or if Auto-download software is used, then the check stations must be delivered to the results processing after the last start so that their back-up memory can be downloaded and the software can then know who really started. Note that it is very important that the back-up memory of the check boxes was cleared before the event. Once the check boxes have been downloaded, lists of missing runners can easily be produced.

It is worthwhile being careful about the combination of check station version, master station version and software as some combinations work better than others. It is important to test the download method in advance, to avoid delays on the day.