

Advice for Event Advisers and Controllers – How to control SPORTident

This paper is intended to equip an Event Adviser or Controller with sufficient information to be able to check that the organiser is using the SPORTident system effectively.

The document includes information about the “traditional” SPORTident system and the newer Air+ system.

Technical information about SPORTident Equipment

(see also <http://www.sportident.com>)

Competitor cards:

SI-Card 5 The ‘classic’ SI-card. Can hold 30 punches with code and time, 6 more with code only (but the order of visiting is known) plus start, finish and check times. Punching time 0.33 seconds. Card nos 1 - 499999

SI-Card 6 Can hold 64 punches with code and time plus start, finish, clear and check times. Punching time 0.13 seconds. Card nos 500000 to 999999

SI-Card 8 Can hold 30 punches with code and time plus start, finish and clear times. Punching time 0.115 seconds. Card nos 2000000 – 2999999
Many clubs have these as their hire stock. 30 punches is often not enough for longer urban courses.

SI-Card 9 Can hold 50 punches with code and time plus start, finish and clear times. Punching time 0.115 seconds. Card nos 1000000 – 1999999

SI-Card 10 Can hold 128 punches with code and time plus start, finish, check and clear times. The **ComCard** (which is integrated into a thumb compass) contains an SI-Card 10 chip. Punching time 0.060 seconds. Card nos 7000001 – 7999999

SI-Card 11 Can hold 128 punches with code and time plus start, finish, check and clear times. Punching time 0.060 seconds. Card nos 9000001 – 9999999 The SI-Card 11 has an LED which flashes for about 7 seconds when the card is successfully punched at an SI-Control. When, the battery eventually runs down, the card still provides the same functionality as an SI-Card 10. **During the time that the card is flashing, a further punch cannot be achieved. This means that the card is not suitable for some activities such as use by the planner to rapidly punch all the boxes on a table to see if they are working.**

ComCard Pro. This is a combined compass and SI-card 10.

ComCard Up. This is a combined compass and SI-card 8.

SIAC (AC stands for “Active Card”) Can hold 128 punches with code and time plus start, finish, check and clear times. Punching time 0.060 seconds. Card nos 8000001 – 8999999. This card is designed for use with SI-beacon units which allows punching at a distance from the control. The tip of the card flashes quite brightly when a punch has been recorded and the card emits an audible beep. The flashing continues while the card is in the field of the control and then for 2.5 seconds. It can also be used in the traditional way with SI-Stations 7/8 on at least firmware V5.74. The battery life is expected to be about 4 years. A SIAC is turned on by the Check Unit and turned off by the Finish or at Download. It can also be turned off by a SIAC Off unit. If, for any reason, it is not turned off, it will stay on for about 20 hours. While it is turned on, a faint green LED in the tip of a SIAC flashes every few seconds. The Battery in a SIAC may last several years, but failures have occurred when the battery is more than three years old. Replacing the battery is recommended after three years.

All of the above cards, except for SI-Card 11 and SIAC, are ‘passive’; they have no battery in them and their lifetime is therefore almost unlimited.

Control units

All SI control units can be configured as Clear, Check, Start, Control or Finish. The ‘Stay Active’ time can also be configured. This configuration is done by connecting a unit to a computer via a ‘Master’ station and using the SI Config+ program.

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.

There are a couple of ‘special’ SI cards that come with the kit. One is a purple ‘Service-Off’ card that will manually switch a unit into Stand-by mode or into Service mode. There is also a purple ‘Clear Back-up memory’ card.

The internal clock is temperature-compensated and 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.

The control units have internal software to control them, known as **firmware**. From time to time, new versions of firmware are released to correct bugs or to handle new types of SI card. The firmware can be downloaded from the SPORTident website and applied to the control units using a program SI Config+.

The types of control unit are:

BSF-9 This is an updated version of the BSF-8 (see below). It has a display on the upper side, better feedback LEDs and mounting holes making it simpler to secure.

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-8 units can be set to operate in “beacon” mode for the SPORTident Air+ system using SIAC cards with a punching range of about 30 cm.

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-7 units can also be set to operate in “beacon” mode for the SPORTident Air+ system using SIAC cards with a punching range of about 30 cm.

BS11 control units are solely designed to be used in “beacon” mode with the SIAC cards. The units use rechargeable batteries:

BS11-BS blue punching range up to 120 cm – intended particularly for MTBO

BS11-BL punching range up to 3 m –usually used in pairs to create a finish line.

The BSF-7, BSF-8 and BSF-9 control units bleep and flash when a competitor punches correctly by inserting their SI card in the hole (or, for Com Cards, placing the compass on top of the hole. Competitors who are hard of hearing (and all competitors when there is other noise) may need to rely on the flash to confirm correct punching, so it is important that the small flashing light is not covered by stickers.

BSF-7, BSF-8 and BSF-9 SI Control units can alternatively be programmed as **SIAC Test**, **Battery Test** or **SIAC Off** units (instead of Clear, Check, Start, Control or Finish).

To conserve battery, all control units should be switched off using the Service Off stick once they've been collected in, rather than letting them turn off naturally when the Stay Active time expires. There is no need to check if any are already turned off; if a unit is already in standby mode, punching with the service off key puts it into Service mode and it will then go into standby mode after a just few minutes.

The traditional punching process

The following are the stages of the traditional punching process:

1. Competitor inserts card into the hole in the unit
2. The unit reads the competitor's card (this is very quick)
3. The unit writes the control code and time into the competitor's card (this is the 'longest' process)
4. The unit reads the competitor's card to verify that it has been written correctly
5. The unit beeps and flashes and writes the card number and time into its back-up memory.
6. Competitor withdraws card

Air+ punching

With the Air+ system, the SIAC card acts simply as a receiver to record the punch. There is no record of the punch in the control unit **and the punch does not restart the Stay Active countdown.**

The control unit can be configured so that its signal tells the card to transmit the current punch details along with the SI card number, or even all the punches in the card along with the SI number. These details can be collected and processed (e.g. radioed to the arena) by a computer with a dongle in the vicinity of the control. That information can be used by the speaker and/or can be useful to the organiser to monitor the progress of competitors for safety purposes.

Decisions to be made in advance

Punching start or timed start. A punching start is more flexible but is not appropriate for top-level competitions. Note that if a start time exists in the card, then the results programmes will generally 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 has an option which controls whether a punching start overrides the allocated start time.

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

If contactless punching is in use, the competitors can punch the finish by passing close to it as with other controls.

Sometimes, although contactless punching is being used, the organiser may require all competitors to directly punch the finish unit in order to record the

competitor's finish in the unit's back-up memory. This is not recommended. The competitors must be informed about this in advance supplemented by notices at the finish.

For smaller numbers (e.g. a World Cup) the SI light beam unit system can be used but that requires very careful management to correctly associate the time that the beam was broken with the competitor, especially if competitors' bodies overlap on the finish line.

Finish timing can also be done using a Sportident beacon station with loop antenna and „timing mode” (time registered when RF field is at its maximum). This is easy to use but needs careful set-up and testing.

Back-up pin punch. The rules say (Appendix 4) “With respect to the *SPORTident* system, a backup needle punch must be present at each control. It is the competitor's responsibility to ensure that the electronic punch is in the e-card by not removing the e-card until the feedback signal has been received. If, and only if, no feedback signal is received, the competitor must use the backup punch.”

How to secure the control unit

In urban settings, it may be necessary to secure the control unit to minimise the chance of it being stolen. Common practice is to pass a wire through the hole in the control unit and fasten the wire to an immovable object such as a fence, lamp post or drain pipe using a “grippler” to secure the wire. Such a wire interferes with the electromagnetic field and makes it more difficult for a competitor to insert their SI card in the hole, especially newer SI cards which have thicker ends. It is better to obtain base plates to which the control unit can be fixed, and any wire can then be attached to a hole in the base plate. If passing a wire through the hole in the SI unit, it is best to use the smallest gripplers which take the thinnest wire.

Number of control units. Multiple units should be provided in the following circumstances:

- At the last control
- At the finish if a punching finish is used
- At early controls on a relay
- If a control site is heavily used (say more than 6 competitors per minute)
- When the standard of competitors using a control varies greatly so that some slower users (e.g. very young children, the elderly) may be impede more elite competitors

If contactless punching is being used, only one control unit will normally be required.

Only one control flag must be used at the control site, even though there may be multiple stakes (though at a punching finish, each stake must have a control flag).

Use contactless punching or only traditional punching

In FootO, SPORTident Air+. was particularly intended for use in urban Sprint Relays where a whole group may arrive at a control together and there may be little space to place multiple punching units. It is now standard for all orienteering races.

In SkiO and MTBO, it is a little awkward for competitors to use traditional punching and it is easier for them to use contactless punching.

Competitors may well enjoy using contactless punching and those who own SIACs will appreciate the chance to use them in contactless mode. Note that if contactless punching is being used, then at all but the most insignificant events, competitors who do not own a SIAC must be given the opportunity to borrow or hire one if they wish.

Controls in Beacon mode do use rather more power (and therefore run down their batteries slightly faster) than when they are used in traditional mode.

Procedures

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.

The planner should punch all the boxes before they go out to make sure they are working. And the planner must then read out the SI-card, to check that the controls are correctly time synchronised. 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 nuisance for the organiser to correct.

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. However the Active state of the unit can be checked by looking at the LED display which will be on, displaying the control number and the time.

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 unobtrusively (e.g. on the underside) 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.

Daylight saving change

If the event is on the Sunday of the weekend when the clocks change, then special care must be taken. The control units will not know about the hour change!

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, via a pc using SI Config+ or with the Time Master in Extended Mode. The Time Master is put into Extended Mode by punching it three times in succession with the Service-Off card.

The **voltage of all units should be checked** to make sure that the batteries are OK. On BSF-7, BSF-8 and BSF-9 units, this can be seen on the display on the back and should be in the range 3.10 V to 4.6V. The battery voltage can also be seen via the SI Config+ software if the station is connected to the computer through a master station.

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 using SI Config+
- 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 but units in Beacon Mode are set to 12 hours.

If **contactless punching** is enabled, the controls must be programmed in **Beacon mode**.

It is **very important that for competitive events ‘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. (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).

Controls in Beacon mode need punching in the traditional manner to turn them on. Contactless punching does not reset the Stay Active Time so it needs to be set long enough to last for the whole event. There is now a possibility that every runner visiting a control will be using a SIAC.

In any case, **all control sites generally 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. For international events, it is always advisable to use pre-runners as a final check. With contactless punching, the controls should not only be turned on, but they should also be “punched” contactlessly with a SIAC to ensure they are indeed functioning correctly.

If, due to logistical reasons, it is not possible to put all controls into active mode before the first competitor arrives, those first competitors must be warned that they might need to dib some of the controls, even though they have a SIAC. Ideally, the first competitors will be less-competitive members of the organising club who are having an early start in order to get back to help.

The Start

Spare SI cards should be available at the start, especially if the start is a long way from assembly. It is often helpful to have the clear stations at the exit from assembly which will reduce the number who will forget their cards. Of course a further clear station must also be available at the start to deal with anyone who has not cleared correctly.

Note that SI Card 11s and SIACs cannot punch again while the card is flashing. So the Clear station should be sufficiently separated from the Check station to ensure that cards are not still flashing from the Clear station when the competitor comes to the Check station. (If the Clear station is programmed with a code of 1 then the SI-Card 11 / SIAC does not flash and they can be dipped in Check stations straight away.)

An official should hold the check box in their hand and check all competitors’ cards individually. A competitor who fails to clear their card will also probably not know what to do with the check box. The check box will only bleep 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 contactless punching is being used it is essential that all SIACs are turned on successfully by the Check unit. Experience shows that a small proportion always slip through without being turned on. Therefore, a **Pre-Start TEST BEACON CONTROL**, programmed in Test Mode between the CLEAR / CHECK process and the start line should be used. As they pass the test control, the competitor can check that their SIAC is beeping and flashing. This proves that the SIAC is working in contactless mode. If the SIAC doesn't beep and flash when it gets close to the Pre-Start TEST BEACON, the competitor should CLEAR, CHECK and try again. The start officials must be made aware of the importance of checking all competitors and returning the start and check boxes speedily to the results processing after the last starter has departed.

If controls are (for some reason) not being used in Beacon mode, competitors carrying SIACs will be using up their SIAC batteries as they run for no purpose. Therefore, at these events, it is good practice to place a **SIAC Off** box in the start lanes after the Check box to allow competitors with SIACs to switch their cards off. Once turned off, the SIAC will still be able to perform traditional punching.

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

For a timed start, late starters must be set off according to IOF rule 22.9.

Competitors who are late for their start time shall be permitted to start. Their new start time must be recorded.

- *In a mass or chasing start, the competitor shall be started as soon as possible.*
- *In an interval start, if the competitor is at the start line less than half the start interval after their start time they shall start immediately.*
- *If the competitor is at the start line more than half the start interval after their start time they shall start at the next available half start interval.*

The question of whether the lateness is the organiser's fault (and therefore whether their start time can be adjusted) should be dealt with at the finish.

The competitor's actual start time must be recorded, for example by punching a "dummy" control box (e.g. with code 11), and the competitor can be left to complain to the organiser if he/she feels that the actual start time should be used. If all the late starters were the organiser's fault (e.g. the minibus got lost) then the back-up memory of the dummy control can be used to identify and correct the times of affected runners.

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, a single finish unit 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. The exit from the finish line to the finish punch should be narrow enough to ensure that finish officials can maintain the finish order from the finish line to the finish control. For close finishes, the judge's decision will be final, and so that may mean a little editing of the finish times is required to get the order right.

Competitors should be encouraged to go directly to download.

SIACs are turned off by a Finish punch received from a Finish control in beacon mode, or by directly punching a Finish unit. If, for any reason, a competitor with a SIAC goes to Download without visiting the Finish (for example if they retired), a SIAC Off unit can be used to turn off their SIAC.

Contactless punching checklist

It is very important to ensure that

- a) competitors are informed in the initial details whether controls will be in beacon mode; many people now have both a SIAC and an older card and will use the older card if controls are not in beacon mode
- b) competitors are informed in the final details and on the start line whether they need to punch (dib) the start and finish or whether they can punch them contactlessly
- c) all competitors have the opportunity to use a SIAC if they wish
- d) all control units are correctly programmed and have sufficient battery life (BSF7/8) or are charged up (BS11)
- e) all competitor SIAC cards have sufficient battery life for the race. The special SIAC **Battery Test** unit should be easily available, which gives a warning signal if the SIAC battery is low.
- f) all competitors **check** their SIAC because that turns the SIAC on
- g) a **Pre Start Test Beacon** is used to ensure that SIACs have indeed been turned on
- h) there is no chance for runners to go near the finish during their run, because passing the finish turns the card off
- i) the control placements are suitable, for example there should be no chance to punch from the wrong side of an uncrossable fence
- j) the **controls are sufficiently far apart**; if a competitor deliberately or accidentally punches a control, a further control cannot be punched while the card flashes and bleeps for 3 seconds. A fast competitor could feasibly

- run at 8 metres/second so control separations and a finish run-in length of at least 25 metres are required.
- k) the control units have been turned on by being punched directly (BSF7/8) or using a magnet (BS11)
 - l) the Stay Active time is sufficient for the whole duration of the event. Allow at least an hour extra!
 - m) the controls are operating correctly – it should be possible to record a punch from a distance of about 30 cm.

Tip: Once the hire SIACs have all been collected in, bring a Finish Beacon to the box of SIACs and any that are still on will flash and turn themselves off.

SIAC Battery Test notice

- The Station beeps and 'OK' is displayed on the LCD screen – SIAC has sufficient voltage
- The Station gives 5 beeps – the battery has limited life but should last for the current event unless a lot of data is being collected from the chip for live timing
- The Station doesn't beep and LCD displays 'LOW' – SIAC has insufficient voltage to be used contactlessly but can be used as a traditional SI-Card 10

Decisions need to be made whether to have the **start and finish units in beacon mode or not.**

If a punching start is being used then the start unit can be in beacon mode. But there are three reasons why this may sometimes be inadvisable:

- If some competitors have SIACs and others do not, it can be easier to manage if all do the same thing (dib) at the start
- If a competitor with a SIAC accidentally gets too near the start box in beacon mode, the competitor can record a start punch before he/she or the start official wanted
- Sometimes the start unit is wired as a radio control and that may only record a competitor if they dib.

Similarly the finish can be in beacon mode and if competitors have been contactless punching at controls they will expect to do the same at the finish. However

- Using a non-beacon finish reduces the chance of a competitor passing nearby and accidentally turning off their SIAC
- If the backup memory of the finish box is being used as a safety record of those who finished, it will not contain a record of those who punched contactlessly. If the organiser is very keen to be able to have the possibility to record everyone who has reached the finish (in the case of a missing competitor), a safety punch (just an ordinary control box) is often placed just after the contactless finish with an instruction to all finishers to additionally insert their card into it.
- Sometimes the finish unit is wired as a radio control and that may only record a competitor if they dib

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 competitor’s 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 (but see “Rare SI bug” below).

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 traditional SPORTident, punching properly means putting the SI-card in the hole and getting the feedback (bleep/light). **It is allowed to read the back-up memory of control units.** 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 the evidence of an error punch.

In the case of contactless punching, the competitor must check that the SIAC gives the feedback by checking the light or sound.

IOF Rule 20.5 states: *A competitor with a control punch missing or unidentifiable shall not be placed unless it can be established with certainty that the punch missing or unidentifiable is not the competitor’s fault. In this exceptional circumstance, 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 and the competitor must be disqualified. In the case of SPORTident, this rule means that:*

- *If one unit is not working, a competitor must use the backup provided and will be disqualified if no punch is recorded*
- *If a competitor punches too fast and fails to receive the feedback signals, the card will not contain the punch and the competitor must be disqualified (even though the control unit may have recorded the competitor’s card number)*

Rare SI bug

Bugs do occur occasionally, even in the best software. There was a bug which very occasionally (perhaps 1 in 100000 punches) meant that the control unit thinks it has written to the SI card correctly and therefore gives the feedback (bleep and light) as well as writing a non-error punch to its backup memory. But in fact, the card itself does not contain the punch record. Therefore, if a competitor insists that they punched the correct control and did receive the feedback, the backup memory of the control unit should be read out when convenient; usually once the controls have been collected in. If the backup memory just has an error punch for the competitor, he/she must remain disqualified. If the backup memory has a full (non-error) punch, then that is evidence that the competitor visited the control and punched properly and the competitor must be reinstated. SPORTident (and copy to me) should be informed of such instances giving the card number and the firmware version in the control unit. This is not relevant for a competitor punching contactlessly with a SIAC because no record is stored in the control's back-up memory.

Splits removal

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. It is forbidden to eliminate sections of the course on the basis of split times unless the section has been specified in advance (e.g. a short section containing a busy road crossing).*

The British rules do allow splits removal for lower-level events.

Identifying missing runners

The start and 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 start and check boxes was cleared before the event. Once the 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.*

Results publication

Results should be available in the arena in some form. Paper results displays are now not recommended. Rolling results can be displayed on several display screens. Even better, and increasingly common, is to upload the results to the internet every few minutes so that competitors can see them on their smartphones. A QR code on the splits print-out can provide the results url.

On the afternoon/evening after the event, the split times should be uploaded to sites such as:

- WinSplits
- Route Gadget (or similar) allowing competitors to draw or upload their routes

Splits comparisons are very interesting in the few hours and days after the event, but interest declines rapidly with time.

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Latest update with advice from Robin Strain

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I would be pleased to receive suggestions for improving/updating this document.

Changes since the last version – August 2018.

- Safety punch option after the finish and other minor changes
- SIAC flashes and beeps for 2.5 secs
- BSF-9 units added and references to BSF-6 units removed.
- Updated advice about SIACS, reflecting the fact that they are now very widely used
- Advice about on-site results added
- Advice for if it is not possible to put all controls into active mode before the first competitor arrives