Advice for Event Advisers and Controllers
How to control Emit Touch-Free system

This paper is intended to equip a Controller with sufficient information to be able to check that the organiser is using the Emit Touch-Free system effectively.

Technical information about Emit Equipment is available at http://www.emit.no

Successful application of electronic punching is a function of the electronic punching system itself, the computer software that may be used, the reliability of the computing systems and the knowledge and skill of the team involved in handling all aspects of the electronic punching and computing systems. This typically includes entry secretaries, planners, organisers and the results computing team.

A Controller should be satisfied that all of these groups have communicated adequately and have a sufficient understanding of the systems they are using.

Principles of operation
Emit Touch-Free Pro (TFP) control units and emiTag control cards are both battery powered. A "punch" is registered when an emiTag is closer than about 75 cm from the TFP control unit. The emiTag must be within the field of the TFP control unit for at least 0.07 seconds, so when a competitor is moving at high speed, the emiTag needs to be much closer than 75 cm in order to record a punch. The TFP transmits its code to the emiTag and it is stored in the emiTag internal memory along with the time of the punch. On receipt of a punch, the emiTag flashes.

The emiTags are downloaded onto a reader after the finish to verify the punch sequence and provide time data which may be either printed directly or passed to a computer system.

Start units, control units and finish units come pre-programmed and so are not interchangeable. They require no programming or set-up.

Touch-Free (TFP) Emit Controls
The TFP controls are all pre-allocated a number between 100 and 199. The number, which is shown on the bottom of the control, is set at manufacture and cannot change. TFP's are about the same size as a panel on a conventional control kite. Obviously with these controls there is no automatic back-up pin-punch. To provide a back-up punch system, a conventional pin punch can be hung from the kite.

The 2016 version of the TFP control units have a lifetime of approximately 5000 hours, after which they have to be replaced. The TFP is operated using a single button - located under the emit-logo at the front of the unit. Turn the TFP on by pressing this button for a minimum of 3 seconds. The LED located under the button flashes rapidly for 2 seconds, to confirm that the unit is on. Once turned on, the TFP will stay active for 36 hours, if it is not turned off manually. To reactivate the TFP for another 36 hours, press the button briefly and wait for the LED to flash rapidly for 2 seconds - just as it did when it was turned on originally.

To turn the TFP off, press and hold the button for 10 seconds before you let go. TFP's LED flashes slowly to confirm. The TFP also flashes rapidly when punching with a traditional e-card at the designated area on front of the unit.

An eLink or an ETS1 station should be used to check whether the TFP control units are reaching their 5000 hour lifetime, and also the voltage of the TFP control unit. This is done by setting the code for the eLink/ETS1 to the same, as the code for TFP: Turn on the TFP and the eLink/ETS1. Check that the code on the eLink/ETS1 corresponds to the code of the TFP, and wait for the TFP to transmit a status message. This happens every 512 seconds (8 minutes and 32 seconds) after turning it on. The status message looks like this:
   C116   349v   7m #23
C116 = code 116   349v = battery voltage 3.49 volt   7m = produced 7 months ago   #23 = used for 23 hours

Note that it is vital that all TFP controls are turned off before transportation and storage. This not only conserves the life of the battery but, even more importantly, prevents any emiTags which might be in range from continuously registering a punch and draining the emiTag battery.

eLine Controls
There are additionally "eline" controls which allow a competitor to record a punch at much longer ranges. The control units are quite large boxes. The range depends on the antenna used. eLine controls are sometimes used at the start or finish.

TFP Start
A TFP Start unit looks similar to standard TFP control units, but has START written on the bottom of the control and has code 0. It performs the function of clearing the memory of an emiTag and resetting the clock. The internal clock is set to zero when the emiTag is within range (75 cm) of the start unit, and starts timing as the emiTag leaves the range of the TFP Start.

Sometimes an eLine (long-distance) control unit is used as the start/clear unit. In such cases, there must be no chance that the competitor might come back near it during the race.

TFP Finish

Finish units look similar to standard TFP control units, but has FINISH written on the bottom of the control, instead of a number between 100 and 199. It performs as a standard TFP control unit, except it has a special code (90) used for the last control in a course. The range is the same as for standard TFP control units.

ECB1 Finish station / ETS1 Time station

If a "run-though" finish is used, an ECB1/ETS1 with two eLine loops connected, registers the emiTags as they pass the finish-line. It is important that the software used is configured to use the first finish-line registration as the finish time, in case some competitors pass the finish-line afterwards for a second time.

eLink or ETS1 stations for intermediate times

The eLink and ETS1 are communication stations that forward all information they receive (from emiTags) to Emit's internet server, via GSM/GPRS. If used together with a standard TFP control unit, all emiTags punching at this control will be received by eLink/ETS1 and forwarded to Emit's internet server. eTiming, or any other suitable software, can be used to download these intermediate times. The eLink/ETS1 can be programmed to any code from 0 (Start) to 249 (Finish), *and must always be set to the same code as the TFP control unit.*

ECU Tagreader

The ECU tagreader looks almost like an USB-pen and connects to an available USB-port on a computer. It is used for downloading the card data to a computer after the finish. It may also be used for checking emiTags for production date, voltage and other parameters. In addition it may be used for allocating special numbers for the emiTags in events where it is important that the emiTag number equals the start number.

Maxi Time Recorder MTR5

Maxi Time Recorder MTR5 is a multi-functional timing device, which reads emiTags (and e-cards!), prints split-times and control codes for all controls visited on the built-in thermal printer, and transfers all downloaded data to a computer. It can be connected to a computer by RS-232, RS-485 or USB. All data is stored in its internal memory, and may be downloaded to a computer after the event, if no computer is available in the finish-area.

eScan

eScan is Emit's newest reader that reads all kinds of e-cards and emiTags. The content of the e-cards/emiTags is transferred wireless by bluetooth to the EPR3-printer, and by usb to a PC with suitable software. eScan is shaped like a barcode reader, with a "pistol-grip"-button, which is pressed when reading e-cards/emiTags. A small display at the top of eScan shows the running time and id-number of the e-card/emiTag. eScan also has a built-in led and vibrator that indicates when it has finished reading. eScan has built-in rechargeable batteries, that are charged by the supplied usb-cable.

emiTags
emiTags are used for "touch-free" punching with the TFP control units. They have no display, but instead there is a bright led which flashes for 5 seconds when a punch has been recorded. (emiTags produced before 2016 flash for 10 seconds.) The emiTag can store up to 500 punches. The battery is estimated to last for at least five years, and *should be replaced when this limit has been reached*. The production date of emiTags can be checked using an ECU tagreader or an Emit Timer ET6. A Velcro band is used to strap the emiTag to the hand or wrist.

The start process for emiTags
Competitors place their emiTag next to the TFP start unit. This clears the emiTag memory and takes less than one second. The bright LED on the emiTag will flash brightly (for 5/10 seconds). The internal clock of the emiTag starts as it leaves the range of the TFP Start.

On events with pre-allocated start times where punching starts are not required, competitors need not punch on the start line. (However, they must punch a TFP Start before the start line in order to clear the card and start the clock). The start time is based on the allocated start, and not a start punch. In this case it is important to ensure that the computer clocks on the download system are synchronised to race time, to get accurate and consistent timing.

Punching at TFP controls with emiTags
The emiTag will start to flash brightly (for 5/10 seconds) when it is within range of a TFP control unit. The competitor can check that the emiTag is flashing, and keep on running to the next control, without stopping.

It is the competitors' responsibility to ensure the emiTag has registered the TFP control unit. In case no flashing occurs the competitor must use the traditional pin-punch device to get a back-up punch.

Decisions to be made in advance

Punching start or timed start. A punching start is more flexible but is not suitable for high-level events. If the start times have been input into the software, then the results programmes can use it. 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.

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

Back-up
The Controller should be satisfied that the team have adequate plans in place for dealing with unwanted events. In particular, no system involving electronics is totally fault-proof so, at high-level events, adequate backup measures should be

in place to separately record start and finish times. Where start times are pre-allocated this may be as simple as ticking runners' names on a start list. Finish times can be secured by recording the finish with a video or web camera providing that the camera's clock has been synchronised to race time.

Mount TFP control units on stakes
For all foot-orienteering events, proper stakes should be used, and the TFP control unit should be mounted horizontally on top of the stakes, with numbering and kite consistent with IOF rules. For ski- and mountain bike-orienteering it is acceptable to mount the TFP control unit vertically.

Computers
Consider whether the event requires computer-based entries and results. The ideal approach depends on the scale of the event, and smaller training events can be run without computers, as long as a eScan is used at the finish to download emiTags and print split-times.

Procedures

Final Details
Where Final details are provided the following statement should be included: "It is the competitor's responsibility to check that their emiTag has been correctly activated at the start and a correct punch obtained at each control, by checking that the emiTag flashes. There will only be reinstatement for a missing electronic record of visiting a control if the competitor has used the traditional pin-punching device."

The computer team should check the Final Details before they are published.

Checking the controls
The Planner/Forest Team MUST check that ALL controls are giving the correct electronic code before they are placed in the forest. This confirms they are working and that they have been labelled correctly in the factory.

Spare units
The planner should have a few control units available in case any are unofficially removed from the correct site. It is possible that a control cannot be replaced with the same control number as the lost control and so a different number is used. In this case, the control should be clearly labelled with the correct number. The results software can allow the alternate control code to be accepted as a correct punch.

Hour change
Emit control units are not affected by changes of daylight saving time.

The Start
Spare emiTags should be available at the start, especially if the start is a long way from assembly. If emiTags are substituted, a record of the exchange needs to be kept to maintain the integrity of the safety procedures.

An eLink unit can be used in combination with a TFP Start at the start block to record those who start, and to transfer this information online to the finish area. This is particularly useful for events with pre-entries.   This can be used to verify correct functioning of the emiTag and provide a back-up start time for competitors who fail to start their emiTag properly on the start line.

If a punching start is used, great care must be taken to ensure that all competitors punch the TFP Start – 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 unit, and the competitor can be left to complain to the organiser if he/she feels that the actual start time should be used.
When dealing with late starters, the official must not forget to use the MTR unit to clear and start the competitor's ecard.

Course planning considerations

- It is important to check that the control placements are suitable for Touch-Free punching. For example there should be no chance to punch from the wrong side of an uncrossable fence.
- Sometimes an e-line (long-distance) control unit is used as the start/clear unit. In such cases, there must be no chance that the competitor might come back near it during the race.
- The competitor will glance at the emiTag when they are near the control to see that the emiTag is flashing; that confirms they have punched successfully. Therefore, there must be no possibility that the emiTag is actually still flashing from a previous control. That previous control may be one that the competitor deliberately punched, or one that the competitor

inadvertently punched by passing near it. Therefore, if emiTags with a flash time of 10 seconds are being used, the minimum separation of controls must be 50 metres because a runner moving at 3.5 min/km covers 48 metres in 10 seconds. For 2016 emiTags which only flash for 5 seconds, a minimum separation of 25 metres is sufficient.

- If a "run-though" finish is used, competitors must not be allowed back near the finish line afterwards as they may record a second finish punch which might be taken as their actual finish.

The finish

If TFP finish units are used, the finish banner should be placed in line with the TFPs and a control flag *must* be placed on each stake to make the TFP finish units visible to a fast-finishing runner.

If a "run-though" finish is used, an ECB1/ETS1 with two eLine loops connected, registers the emiTags as they pass the finish-line. It is important that the software used is configured to use the first finish-line registration as the finish time, in case some competitors pass the finish-line afterwards for a second time.

In the case of a major relay, a "run-though" finish is used, 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.

Timing

For a high-level event with a timed start, it is important that the timing for each competitor's run is based on the event clocks (i.e. the start clock and the finish computer's clock), rather than the individual clocks inside each card. Therefore, the running time for a competitor must be calculated by subtracting the competitor's known start time from the download time and then further subtracting the time from finish to download. The Emit eTiming software will handle this automatically once configured for this start mode.

Note that the time from finish to download can only be based on the potentially slightly inaccurate clock inside the card. Therefore, in a high-level event where correct one-second timing must be guaranteed, it is recommended that there is only a short distance from the finish to download which will mean that any inaccuracies are insignificant. It would not be sensible to have a half-hour walk from finish to download!

Results
The exact procedure for dealing with incorrect punching will be dependent on the results software being used, if any. Typically the computer software will indicate controls missing or visited in the wrong order. At small events, where no computer is in use, the emiTag will be downloaded onto an MTR box (or eScan), and this will print a set of splits for the competitor. A second set must be printed and retained for the results. In this case, the splits need to be inspected to ensure that all the controls are present in the correct order. The competitor's emiTag number and time is also on the print.

If a competitor has a missing electronic punch (and no pin punch) the competitor should 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**. The relevant rule states:
20.5: *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…..*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 should normally 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).*

Identifying missing runners
For small events, results should be transferred onto the entry sheet as downloaded, to ensure that all runners have completed. For an event taking entries only on-the day and where the entries are typed into a computer system, 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 an eLink unit should be used in the pre-start and downloaded into the results software which may be able to identify starters who have yet to download.

Results publication
On the afternoon/evening after the event, the split times may be uploaded to:
- WinSplits and SplitsBrowser
- Route Gadget, Livelox or similar
Splits comparisons are very interesting in the few hours and days after the event, but interest declines rapidly with time.

David Rosen
Chair IOF Rules Commission

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Latest changes: Separate document for Touch Free Punching with updated information.

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