TESS – The Electronic Start System

User Guide

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Tero Services Limited

Tel: 01200 423552

Email: chris@teroservices.co.uk

TESS – The Electronic Start System

The TESS Electronic Start System is designed to provide the correct signals to start and, if necessary, recall athletics track events.

The system will provide: -

- A flash which should be clearly visible to timekeepers.
- Audible start signals from the sounder units for the athletes.
- A “repeated beep” recall signal from the sounder units to be used in the event of a false start.
- Connectivity to other technology – Photo Finish and SIS.

The system uses a radio microphone system to convey the starter’s voice commands to the speakers, be they the TESS Sounder Units or a connected public address (PA) system. The “start” and “recall” sounds are triggered using a wireless link to the remote units. The Sounder Units can be appropriately placed to facilitate the best experience for the athletes and officials.

Additional Sounder Units may be placed to ensure that spectators can also hear the signals for events at the far side of the arena.

The system is easy to set up and use by a single person but has connectivity to allow a further two "recall starters” to use additional recall actuators.

The main elements of the system are: -

- A TESS Control Unit – this locates next to the starter and provides the “flash”, the connectivity to other technology (Photo Finish and SIS), the wireless link to the remote Sounder Units and the wireless link to the recall actuators.
- One or several TESS Sounder Units – these receive commands from the Control Unit and output a “start” or “recall” tone. If used with a radio microphone link the starters commands are also available. They also provide an output to trigger a remote flash if required.
- Optionally a Remote Flash unit can be placed close to the timekeepers to provide an alternative to the starter’s flash – this can be useful on a bright or sunny day.

There are several accessories: -

- Start actuator and flash wand
- Wireless recall actuators
- Battery chargers

The system comes in a soft pull along carry bag. A trolley is recommended on which to place the control unit for ease of movement around the stadium. This also ensures the best radio signal conditions.

The system also features connectivity to associated technology with connecton to trigger both electronic timing / photo finish and start information systems (FSE).

The latency between the “flash” and the PhotoFinish (and SIS) switch operating is bench set to 100µS, which is well within the IAAF horizon of 1mS for a Zero Control Test.

Use is made of wireless technology to transmit instruction signals to the Sounder Units and the recall signals sent to the control unit from the recall actuators. Avoiding the use of cables where possible adds to the flexibility of the system and facilitates setting up and moving the system.

Additional Sounder Units can be employed to provide signals at all start points thus removing the need to move equipment during the programme of events. When trolley mounted the Control Unit is easily moved between start positions.

Important Note Regarding Compatibility and Serial Number

During 2023 we were advised by our digital radio suppliers that the chip we were using was being discontinued and existing stocks were being run down. This chip was custom enhanced to meet our functional requirements.

A replacement chip is available but tests have shown that we cannot support backward compatibility.

This means that TESS units with serial numbers 1400 and later cannot be paired with units serial number 1399 or earlier.

Control Unit

Open the lid of the control unit to see the control panel

The various control, switches and sockets are as follows:-

Power/ON – this is the main on/off switch. To the right of the switch is an indicator light to show when the unit is on If the battery charge falls then the green light will change to a warning red. If the battery level then falls below a critical level the unit will automatically switch off and the light will be extinguished. **Note that if the unit is left on when stored this will eventually drain and damage the battery as it is not "off" but in a quiescent state**.

Bang/Beep – two start signal sounds are available. Beep is a 400Hz square wave tone, Bang is a synthesizeded gun sound.

Learn – this button is used to "pair" with the recall actuators. See later for an explanation on how to "pair". Not that for later models this will be green not red.

Control Connections

On the left hand side of the control unit there are three XLR connections:-


Control Unit - Left Hand Side

Black – for Start/Flash – a five pin XLR connector. The plug on the Start/Flash actuator connects to this socket.

Yellow for P/F – a three pin XLR connector. This provides a normally open or normally closed zero volt trigger for photo finish systems.

Green for SIS – a three pin XLR connector. This provides a normally open or normally closed zero volt trigger for start information (FSE) systems.

There is also a domed antenna. This sends command signals to the Sounder Units.

On the right hand side of the control unit there is a single XLR connection:-

Red for Charger – a three pin XLR connector. The plug on the battery charger goes to this socket.

The “bump” toward the back is an antenna to receive signals from the recall actuators.

Note, on later models the charger socket and antenna are transposed.

TESS Sounder Unit

The sounder unit is housed in a rugged case similar to the control unit. Inside are the wireless and sound generation electronics and battery. Mounted on the top a horn speaker delivers a directional high intensity tone to indicate “start” or “recall”. The unit also incorporates a radio microphone receiver to provide integrated voice commands.

On the left hand side of the unit (looking from the horn “mouth”) are a number of connections and controls. To the extreme left is a three pin XLR connector with a RED base. This is to connect to the battery charger which also has a RED XLR connector. Next to the battery charger socket is a BLUE based XLR socket which is for the connection of a Remote Flash Unit.

In the middle section is the On/Off switch and at the top left of the switch is the indicator LED to show the unit is switched on. This normally shows green, if the battery level is low this will change to red to indicate a charge is required.

In the right hand section, at the right hand end is another LED and a green push button switch.

The LED is the “pairing indicator” and is used in conjunction with the green button which is the “Pairing Control”. The system is supplied with Sounder Units already paired to the Control Unit so this button is not normally required. Note - if pressed and held for longer than ten seconds the sounder will lose its association with the control unit. See later in this document for pairing instructions.

To the left of the pairing LED is a control knob with a white dot. This is the volume control for the integrated radio microphone. A “dot position” of around 11 o’clock is a good setting to start, then adjust as needed.

Also on the top of the unit is a dome antenna for receiving signals from the TESS Control Unit. Whenever possible the dome (or puck) antenna should be able to “see” the Control Unit as wireless links work best when in “line of sight”.

A single Control Unit can trigger as many Sounder Units as required. It is therefore possible to deploy a system with Sounder Units at the 400m start (suggest 4), 200m start (suggest 3), 100m start (suggest 3) and have a mobile unit on the trolley to move to other start positions – 1500m, 3K S/C etc.

Remote Flash Unit

This is a high intensity flash unit mounded on a tripod. It is intended that this is placed near the finish line in line of sight for the timekeepers. On a bright day they then have visibility of the start signal in close proximity. The flash on the remote unit is synchronised with the flash held by the starter.

The remote flash takes its trigger pulse from a TESS Sounder Unit. The XLR connector on the remote flash plugs into the BLUE connector on the Sounder Unit.

Radio Microphone

There are two types of radio microphones supplied with TESS. The key difference is the operating frequency, which differs. Thus the two types are not compatible. Global supply chain issues have led to us having to phase out the original RC8860 model.

RC2401

This model is currently supplied (July 2022 onwards) and operates in the 2.4GHz frequency band and supports up to 50 channels.

On the back of the blue transmitter unit will be a label showing Model No. RC240n (the 'n' can vary). There is also a stub aerial.

Turn on using the slide switch on the right hand side of the unit. Slide down for 'on'. The display will then activate.

Look at the display on the Blue unit.

Across the top – to the left is an aerial symbol (like a fork), this shows that a signal is present. Next to the aerial is a signal strength indicator (series of "steps"). To the right is a battery level indicator. These are all similar to the symbols on a mobile 'phone.

As supplied the microphone transmitter is set to channel "01" and the recievers built into the TESS Horn Sounders ar also set to "01".

If you need to change the Channel setting then follow these steps:-

- Make sure all the TESS Horn Sounders are turned ON.
- On the blue transmitter press and release the "SET" button – the word "SET" will flash at the top between the signal strength and battery level indicators
- Adjust the channel with the "<VOL-" and "VOL+>" buttons
- When the required channel is displayed press and release the "FUN" (or "CONF") button.
- The "SET" indicator will stop flashing and go out.
- The new setting will be retained when the unit is turned off.
- To tell all the receivers in the Horn Sounders that you have changed channels press the "FUN" button on the blue unit. The signal strength "staircase" at the top of the display will go out. When it does release the "FUN" button.
- IMPORTANT – this action will change all Receiver units turned on and in range to this channel. If a receiver (Horn Sounder) is not turned on then it will not pick up the new channel.
- The transmitter can only send to a receiver on the same channel. If a TESS Horn Sounder does not pick up the microphone commands then check the channel is set to the same as the Blue transmitter by the above action.

The radio microphone transmitter comes in a carry case with the the microphone headset. The headset allows hands free operation. The transmitter unit has a lanyard to allow it to be looped around the neck. Each transmitter comes with a battery charger.


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Transmitter

Start Actuator and Recall Actuator

This has a button which initiates the “start” tone and flash. The flash source is built into the hand held unit. There is an XLR plug which connects to the control unit (black) XLR.

The system comes with one or more recall actuators. These are linked by wireless to the control unit. These small pocket sized units come with a belt clip and cord. The have a range up to approx 100m, line of sight. The recall actuators are paired with the Control Unit. This is done at the factory. If pairing is lost it can be reestablished as in instructions later.

TESS Trolley

The TESS system has an optional a trolley which can be supplied at additional cost. The main purpose of this item is as a mounting for the Control Unit. However another important factor is that this elevates the Control Unit above the ground. This is vital for wireless linked technology. In simple terms the higher above the ground the transmitter can be placed then the greater the reliable range of the transmission.

The trolley will fold flat for ease of transport and storage.

Battery Chargers

The TESS Control Unit, Tess Sounder Units and radio microphones require a battery charger, one is provided for each.

Charging The Batteries

It is important to ensure that all the internal batteries are fully charged before using the system. Batteries with low charge will cause the system to either be unstable or not operable.

The TESS Control Unit and TESS Sounder Units use the same type of charger, one should be supplied for each TESS unit. The charger indicates if the unit is charging or is charged. The TESS units connect to the chargers using the XLR sockets with the RED surround.

TESS Unit battery charger

The TESS batteries have the capcity to allow use for the longest normal day of athletics. We have run tests of 300 starts over a 15 hour period and the batteries are still well charged. The batteries should be charged after each day of usage and will benefit from a regular (monthly) top up if left in storage

for several months. A top up before each use is also a good plan. **ALWAYS ENSURE THAT ALL UNITS ARE TURNED OFF WHEN PUT AWAY. The onboard electronics will shut down as the battery voltage drops but any electronics left "On" will eventually discharge the battery to a point from which it cannot recover.**

The radio microphone units have their own chargers housed in the carry case.

The chargers connect to the transmitter/receiver units using the jack socket at the BOTTOM of the unit, this is labelled as shown below.

Be VERY CAREFUL not to plug the audio connection into the charger socket, or vice versa. This will almost certainly result in mechanical damage to the unit which would render the unit unservicable.

Recall Actuator

1xCR2032 battery. Access the case by removing the two cross head retaining screws. These are very small so take care that they do not get lost. The battery is exposed and can be removed by carefully prising it upwards with a small screwdriver. Note the polarity before removing. Replace the battery observing polarity (+ facing upwards) and reassemble. Tip - Take a picture before removing the battery!

Setting Up The System

Do NOT switch on the units until assembled.

Control Unit

- Connect the Start/Flash actuator to the matching (black) 5-pin XLR socket on the left hand side of the control unit.
- If using Photo Finish and/or SIS then connect to the appropriate sockets. Yellow for Photo Finish and Green for SIS.
- Select “Bang” or “Beep”

Radio Microphone – Transmitter (Blue)

- Connect the headset microphone with the jack plug into the TOP of the transmitter, labelled “MIC”, or a picture of a microphone.
- The on/off switch is on the side of the case

Radio Microphone - Feedback

As with all PA systems if the microphone is too close to the speaker and the volume control is set too high then there is the danger of feedback, or “howl around”.

This can be avoided by the correct sequence of powering on the Horn Sounder and Blue microphone transmitters.

Leave the Blue transmitter turned OFF. Leave the Blue transmitter with the Control Unit.

Turn ON the TESS Horn Sounders. Check and if necessary adjust the volume control on the side (with white dot) to a setting of apporximatelt 11 o’clock.

Return to the Blue transmitter. Turn this on. Test by speaking clearly into the microphone.

If it is too loud or there is still some feedback then reduce the volume settings on the Horn Sounder.

This may seem a chore but you will become used to the process quickly and will understand the best settings in your environment.

TESS Sounder Unit

- Positon where required. It is important that the dome antenna is in line of sight with the TESS control unit.
- Stand facing the mouth of the horn speaker
- The On/Off switch is on the left hand side in the mid section. It is labelled label O/I

- Press the I to turn On. The power LED will light and turn green. If it stays red or does not light then the battery needs to be charged
- A slight hiss/white noise should be heard from the horn speaker
- Unit is ready for operation

Remote Flash

The remote flash should be located close to the finish line in line of sight for the timekeepers. It takes a feed from a TESS Sounder Unit.

- Connect the XLR on the lead from the remote flash to the BLUE socket on the TESS unit
- Turn On the Tess unit and the remote flash is ready

Note that if using a TESS Sounder Unit and remote flash at the start/finish line then the line of sight range to the furthermost start point (150m, 600m) may be impeded by earthed objects that will reduce the range. If necessary place the TESS Sounder unit on a chair or small table. Raising the antenna off the gound helps to improve the effective range.

Testing The System

- Return to the TESS Control Unit and turn on system
- On the radio microphone transmitter slide the on/off switch to “On”. Speak in a normal voice and this should be heard from the TESS Sounder Units.
- Press the button on the start actuator. The start signal (bang or beep) should be heard from the TESS Sounder Units. The start actuator will also flash. **Do NOT look directly at the flash, it is very bright!**
- If a Remote Flash is in use this should flash in sync with the start actuator
- If a Sounder Unit does not respond (bang or recall) then it may need re-pairing, see below.

Recall Actuators

- These need no connection as they link by wireless
- Press any recall button.
- The recall “beeps” should sound for 2 seconds and then stop.

The system is then ready to use.

NOTE – when the system is turned ON the start and recall actuators are always ARMED, be careful not to activate accidently. As with all PA systems be aware of an open microphone.

Repeat the connection steps for any additional TESS Sounder Units.

It is good practice to place the TESS Sounders on the track as required, turn on and test, turn off and move to the next sounder. The control unit on the trolley makes this quite an easy task.

Zero Control Test

If using Photo Finish then a Zero Control Test can be conducted in the normal manner. Locate the control unit near to the finish line. Ensure the TESS control unit is connected to Photo Finish in place of the transducer.

Hold the start actuator/flash above and across the finish line as you would a gun.

A black background will be a help in getting a good image. Also on a sunny day it is a good idea to shade the flash head.

Press the “Start” button and Photo Finish should capture the flash .

Note that with electronic start systems there is no timing lag due to “pre-burn”. The timing circuit is closed when the button is pressed and the first light of the flash is visible on the image.

Pairing – TESS Sounder Units

The sounder units work on a coded signal such that they only respond to one control unit To pair a sounder unit to the control unit:-

- Set the Bang/Beep switch on the Control Unit to “Beep”
- Connect the start actuator to the Control Unit
- Make sure the Control Unit and Horn Sounder unit are turned on
- Locate the green Horn Sounder “Learn” button on the left hand side as you face the horn speaker.
- Press the green “learn” button on the Horn Sounder Unit for 2 seconds, then release.
- The LED next to the “Learn” button on the Horn Sounder will flash once
- Wait 5 seconds
- LED on Horn Sounder will flash twice
- Press the start actuator – the learn LED on the Horn Sounder unit will flash
- The pairing is complete
- Press the start actuator and a start beep should be heard from the Horn Sounder unit
- Repeat for each Sounder Unit to be used

Pairing – Recall Actuators

The recall actuators work on a coded signal such that only one control unit will respond. To pair an actuator to the control unit:-

- Make sure the Control Unit is turned on.
- Press “Learn” button on Control Unit for 2 seconds and release.
- The LED to the right of the Learn button will flash once
- Wait 5 seconds
- The LED to the right of the Learn button will flash twice
- Press and release the button on the actuator
- The LED to the right of the Learn button will flash twice
- The pairing is complete
- Press the actuator button and the recall beeps should be heard
- Repeat for each recall actuator to be used

Note – you need to pair the Sounder Units to the Control Unit first.

Warning and Precautions

Do NOT attempt to use the system powered from the mains. When on charge the units should be switched off and not used.

Do NOT charge the unit out of doors.

Always switch the units OFF before connecting any of the peripherals – start actuator, microphone transmitter, chargers, remote flash.

There are no user serviceable parts inside the cases. Do NOT attempt to open any of the units as damage may result to the electronics.

Technical Information

Flash – the duration of the flash is approx 100mS

PF Interface – provides N/O (pins 1-3) and N/C (pins 2-3) voltage free for 200mS

SIS Interface – provides N/O (pins 1-3) and N/C (pins 2-3) voltage free for 200mS

Flash-Photo Finish Latency – the PF contacts operate with a latency of approx 0.0001 seconds

Start Tone – square wave of approx 400Hz or synthetic “bang”. Switch selectable

Recall Tone – repeated beeps as for start tone, 2 seconds duration.

Recall Fob Actuator Batteries – 1xCR2032 battery. Access the case by removing the two cross head retaining screws. These are very small so take care that they do not get lost. The battery is exposed and can be removed by carefully prising it upwards with a small screwdriver. Note the polarity before removing. Replace the battery observing polarity (+ facing upwards) and reassemble. Tip - Take a picture before removing the battery!

Radio Microphone Battery – the transmitter has an internal battery. A charger is required for each unit. The Radio Microphone operates in the licence free 2.4GHz frequency band.

Range – wireless communication always depends on local conditions and enviroment. It is important that the control unit antenna and the antennae on the TESS Sounder Units are “line of sight”, that is they can “see” each other. It is also strongly recommended that the control unit is placed on an elevated surface to raise the antenna away from earth. Having the control unit antenna close to earth will have a significant impact on the range of transmission. A trolley is ideal to transport the system and this provides a suitable working height.

The Recall Fob Actuators should work up to 80/100 metres.

Contact For Support

Tero Services Limited

Tel: 01200 423552

Mobile: 07711 404101

Email: chris@teroservices.co.uk