

ACROSPORT CO. LTD.

TIME MEASUREMENT DEVICE (TMD-3)

DATASHEET AND INSTRUCTIONS

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1. Introduction

The Time Measurement Device (TMD-3) is a sports equipment that aids in athlete training and performing competitions in single and synchronized trampolining.

The TMD-3 is based on a set of infrared pair modules. Each pair consists of emitter and receiver and detects interruption of infrared light ray from emitter to receiver.

Measurement results are displayed and stored by an application that runs on desktop or laptop computer, tablet computer or smartphone.

Note: There are device versions with external routers. These are described in the Appendix.

2. Kit contents

The package contains:

- Main unit – 1 piece.
- Magnet-mounted infrared pair modules – 12 pieces (6 pairs).
- Connections cables (standard Twisted Pair Cat.5e) – 12 cables of different length.

3. Specifications

Default skills number in routine	10
Time measurement precision.....	0.005 s
Minimum in air time.....	0.600 s
Power supply rating	AC 220V 50/60 Hz
Power consumption	approx. 20 W
Infrared pairs supply voltage	12 V

4. System Installation

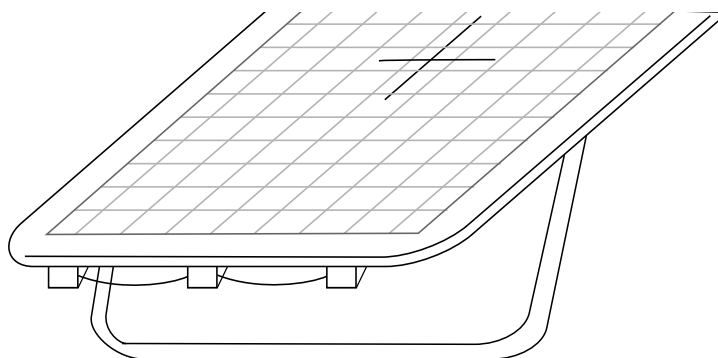


Fig. 1 Placement of infrared modules on the trampoline

Each infrared pair consists of two modules: receivers and emitters. The modules are placed on the bottom side of the trampoline frame using magnetic mounting. They are connected to each other and to the main unit using the cables supplied.

One of the emitters is combined with the interface unit. Each module (except interface unit) has two 8P8C (RJ-45) sockets, an interface unit has three. All receivers and all emitters (except interface unit) are interchangeable, but must be connected in direction specified.

- An emitter is distinguished by a big LED, and is marked with red label «**Emitter**».
- A receiver possesses an aperture and a small green indication LED on the other side, and is marked with green label «**Receiver**».

Receivers and emitters are installed and connected in accordance with the chart (Fig. 2). Precision in placement is not substantial; it is important that each receiver is positioned opposing the corresponding emitter, and they face each other. The interface unit is connected to the main unit (Fig. 3). The main unit is connected to the power, and the system is switched on with the ON/OFF button.

Note: it is important to connect cables strictly according to the chart.

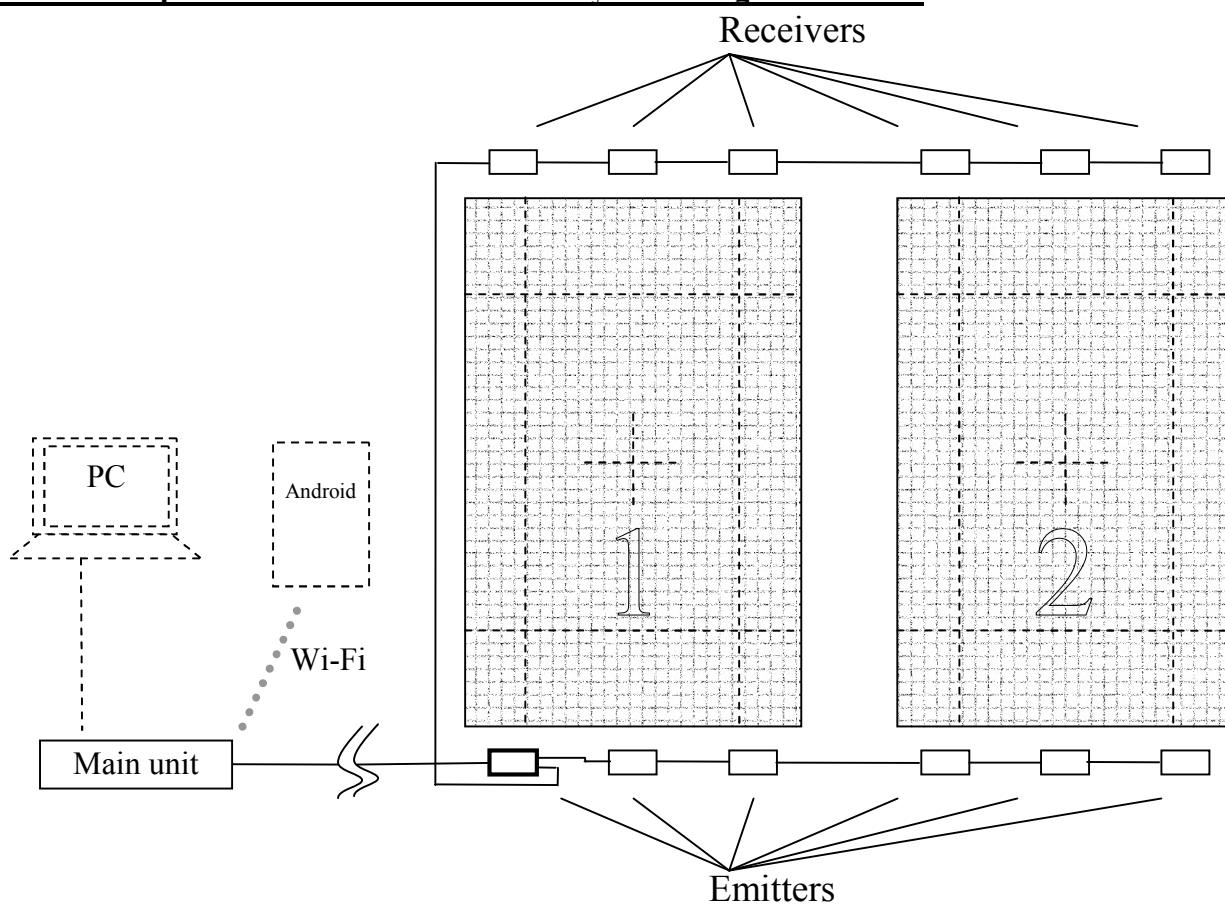


Fig. 2 Connection chart

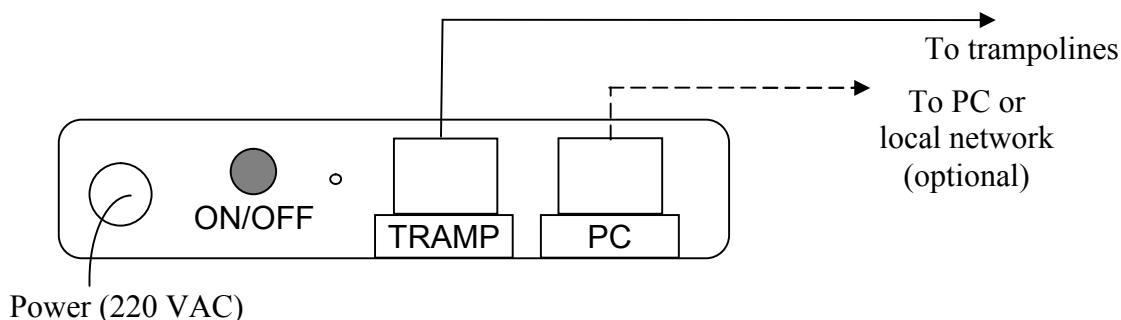


Fig. 3 Connection of the main unit

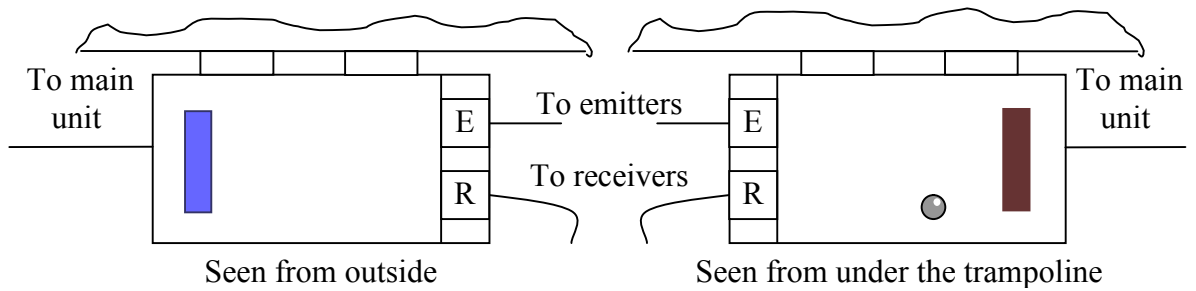


Fig. 4 Interface unit/emitter placement

To the interface unit, both receivers and other emitters are connected (Fig. 4). Sockets for connecting emitters and receivers are situated side-by-side. On the opposite side, there is a socket for connecting to the main unit.

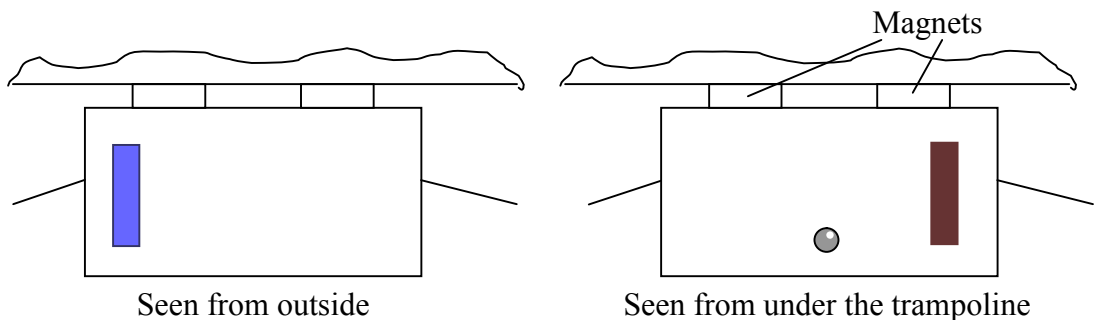


Fig. 5 Emitters placement

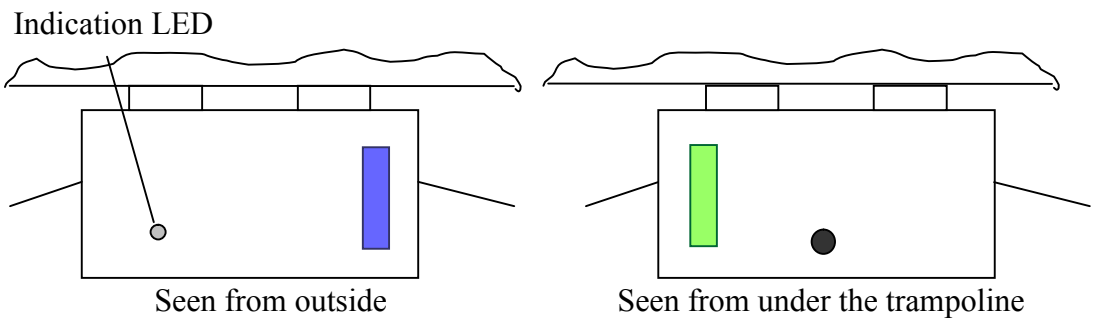


Fig. 6 Receivers placement

In case two TMD-3 sets are installed in the same room, it is recommended to place them in a way so that one set's emitters' signal does not affect the other set's receivers (Fig. 7).

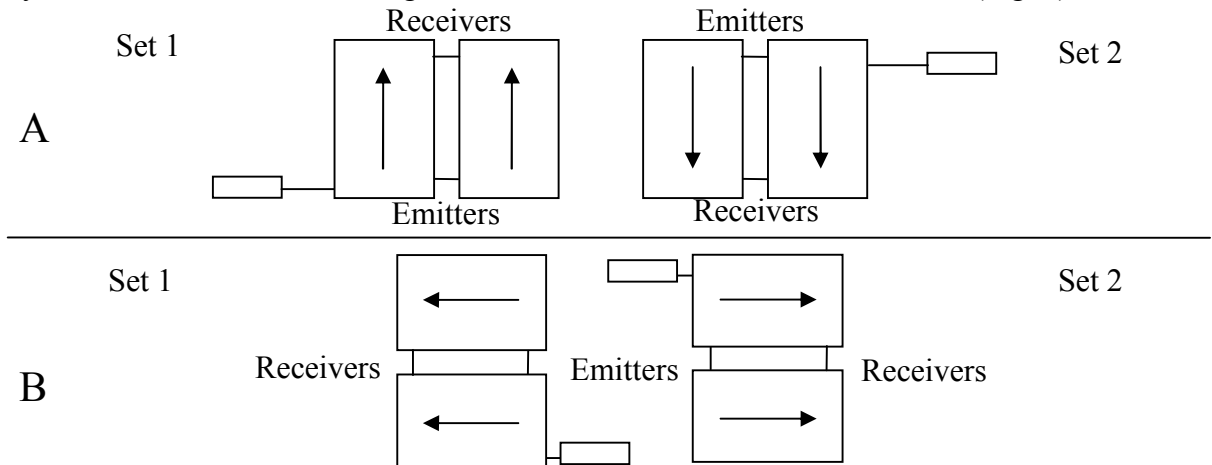


Fig. 7 Recommended placement of two TMD-3 sets in one room

In case only one trampoline is available or desired, it is enough to connect three infrared pairs.

5. Network and software setup

The TMD-3 works in conjunction with the software that is installed on Android-based tablet or phone or desktop/laptop PC running Microsoft Windows.

Latest version of the application can be downloaded from the official site: <http://tmd.acrosport.ru>. To install the application to the tablet, download the **TrampSyncNN.apk** file or transfer previously downloaded file by USB connection. Install the package by running the file. You might have to enable installation of applications from external sources in your tablet settings.

Windows application is distributed as either ZIP archive or installer. From the archive, extract its contents to a folder on your hard disk, and run “**TrampSync.exe**” to start application.

The device acts as a Wi-Fi access point. Connect your tablet or PC to the network using these settings:

- Wireless network name (SSID): “**Tramp**” or “**TrampNN**”, where *NN* is a number.
- Network key, if present: see sticker on unit bottom.
- IP configuration: DHCP (this setting is default on most computers).

Alternatively, you can use wired connection of TMD-3. To do that, connect the “PC” socket on the main unit with the LAN port of your PC. The wired connection settings on the computer must be set to the following values:

- Static IP
- IP address: 192.168.0.32 (or other address belonging to this subnet)
- Subnet mask: 255.255.255.0

Also, you can incorporate TMD-3 in your local network, provided its parameters (IP: 192.168.0.230, subnet mask: 255.255.255.0) are compatible with your network settings.

If wireless functionality is not required in current setup, the Wi-Fi module can be switched off using the **Setup** button on the main unit’s rear panel (see Indication and control).

6. Indication and control

The main unit has status indication LEDs on the front panel.

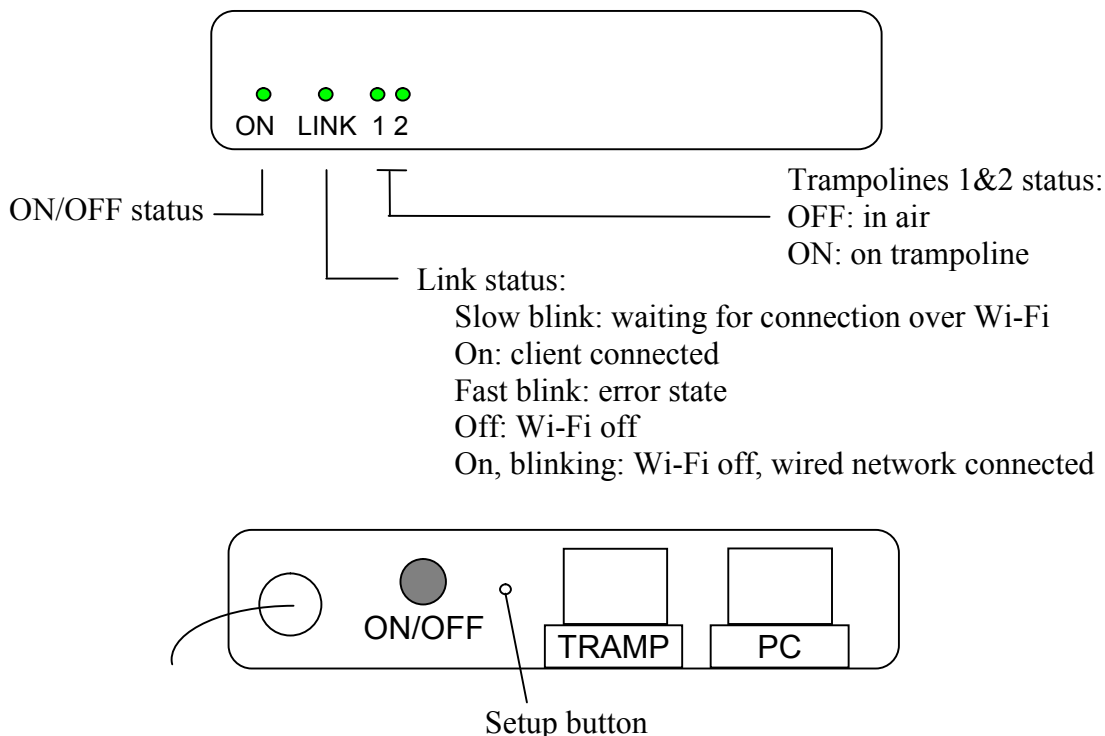


Fig. 8 Main unit indications and controls

On the rear panel there is a hidden **Setup** button (you'll need a pin to press it). Double press on the button switches Wi-Fi functionality on and off. When Wi-Fi is off, device can only be accessed via Ethernet interface. Switching Wi-Fi off and on cycles through possible wireless channels, so it is advised to switch Wi-Fi off and on in case of unreliable link caused by interference with other wireless devices.

7. Preparation for use

To switch on the device, connect it to the AC outlet and power it on using the **ON/OFF** button. A number of diagnostic steps is advised to perform, whenever possible, to test the fitness of the device.

1. The indication LED on receiver module is lit when the receiver detects infrared signal. In case of lack of indication on any receiver, check that connections are correct, or adjust the emitters and receivers positions. Check that the light goes off if the receiver's aperture is being obscured.
2. Start the application and check that it can establish connection to the device. Enter **Test mode** and check individual pairs by interrupting them in order.
3. Perform a jumping routine to check that measurements succeed, and results are displayed.

8. Application interface and usage

Display and storage of measurements results is handled by the application. At startup, the program application automatically tries to connect to the TMD-3. When connected, button "**Start**" or "**Prepare**" becomes available.

To evaluate system capabilities without connecting to real device, enable demonstration mode in the application main menu.

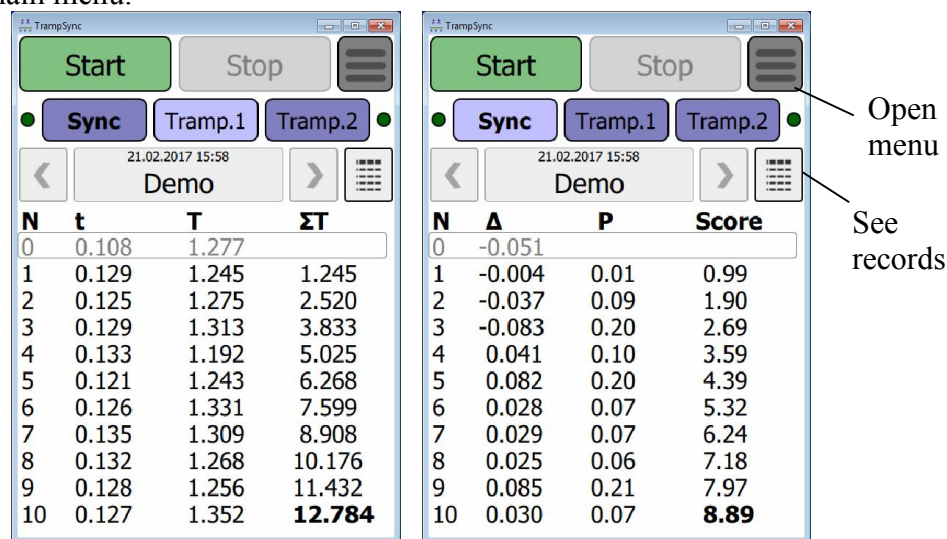


Fig. 9 Application interface

8.1. Measurements

The application can work in two modes:

- Synchronized trampolining
- Time-of-Flight measurement on single trampoline

Modes are selected by three buttons: "**Sync**", "**Tramp.1**" and "**Tramp.2**", which select synchronized mode or Time-of-Flight on first or second trampoline, respectively.

The trainer watches the athlete performing skills, and when the routine starts, presses the "**Start**" button. Then application begins to record the data and calculate score. The process stops automatically after 10 skills performed. The results are stored in the database and can be accessed later. For synchronized trampolining, the parameters are following:

- Δ – asynchrony (difference in landing time, unit is second)
- **P** – penalty for current skill
- **Score** – score calculated

The penalty can be 0.00 (synchronous landing) to 1.00 (400 ms difference). The score is calculated by standard rules from total asynchrony. If difference exceeds 500 ms, the routine is halted.

Please note that the **P** value is not used in score calculation and is given for reference.

The parameters for Time-of-Flight measurement are (unit is second):

- **t** – time on trampoline
- **T** – time of flight
- ΣT – total time of flight

It is recommended to press “**Start**” while an athlete is in air. The jump during which the process is started (or just after the landing) is considered the first jump (1). The previous jump is number 0, its parameters are displayed for reference and are not included in the score.

During the routine or before the next, athlete’s name may be entered. To do that, click/touch the “<Enter name>” entry and type a name then press “**OK**” or select a name from the list.

8.2. View records

On the main application page (Fig. 9) “<” and “>” buttons let the user to review today’s routines.

Press the “☰” button to view recorded routines results in a table.

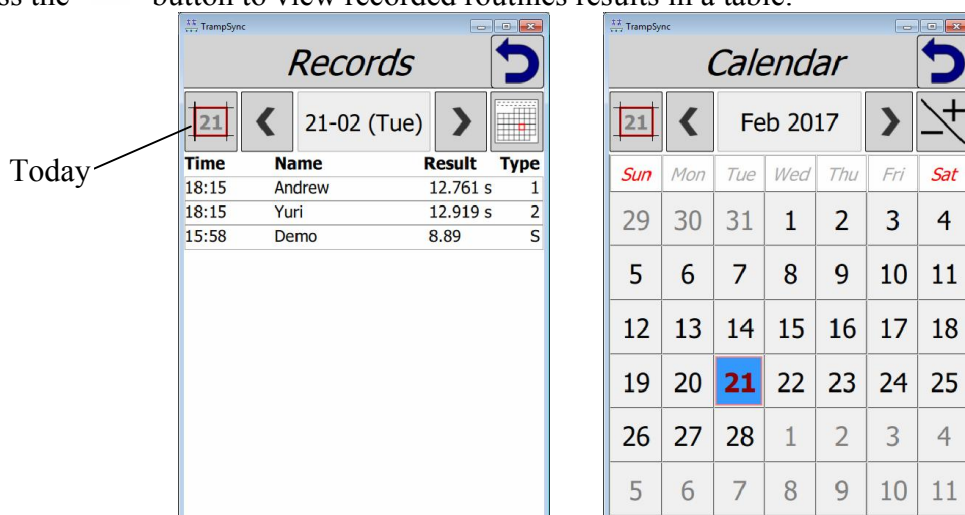


Fig. 10 Browsing records

The table contains routines results for selected date. Start time, athlete name and score are shown for every routine. Type is “1” and “2” for single jumps and “S” for synchronized trampolining. User can choose a day with “<” and “>” buttons, or open a calendar to select other days.

8.3. Menu and settings

Application menu is invoked by clicking «≡» button. The main menu contains following items:

- **Settings** – open settings page
- **Test** – open test mode
- **Help** – show on-screen help
- Language selector
- Demonstration mode switch

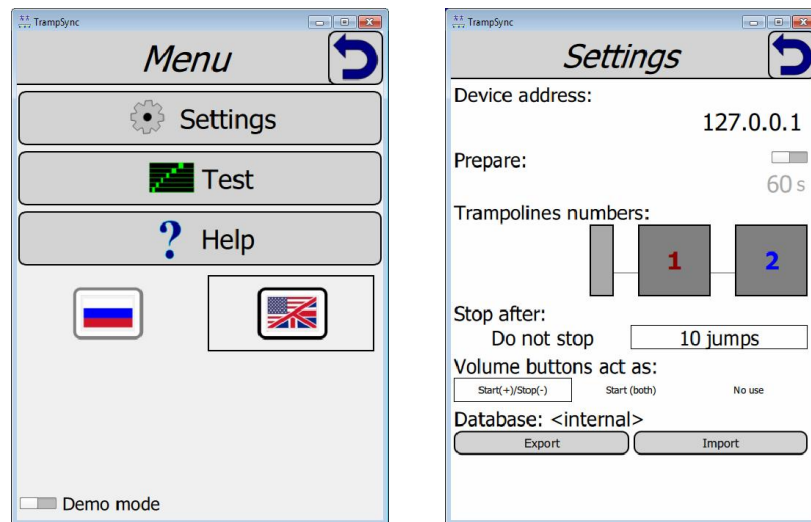


Fig. 11 Main menu and settings

Application settings include:

- **Device address** – TMD-3 IP address, default is 192.168.0.230 in both LAN and Wi-Fi mode.
- **Prepare** – helps the trainer to measure prepare time (See “Measuring prepare time”). Prepare time limit can be adjusted (60 seconds by default).
- **Trampolines numbers** – swap trampolines. By default, trampoline 1 is on which the interface module is placed.
- **Stop after** – whether to stop measurements after 10 skills automatically.
- **Volume buttons act as** – use tablet/phone volume control buttons to start/stop routine
- **Database** – export database to file or load exported database

8.4. Measuring prepare time

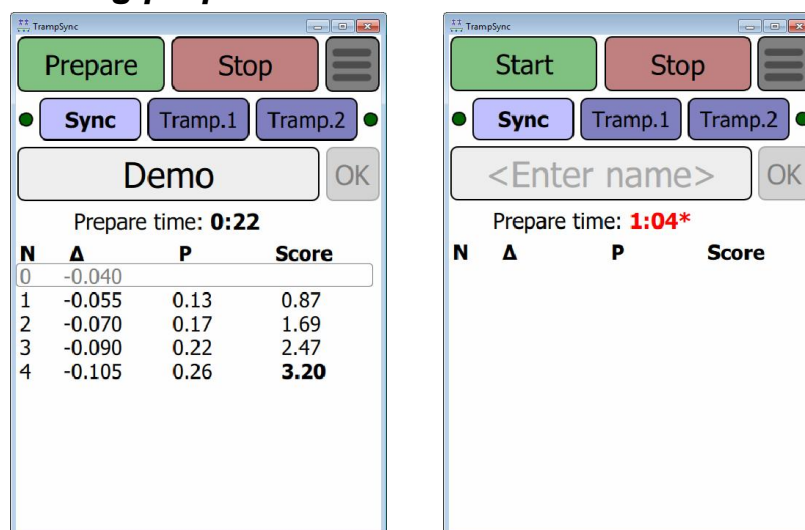


Fig. 12 Measuring prepare time

This option lets a trainer check that an athlete starts the routine in time limit specified. The option can be enabled in application settings. If it is on, the “**Start**” button is replaced by “**Prepare**”.

Press “**Prepare**” when an athlete begins the routine. Time counter starts to measure time taken for preparation. Press “**Start**” when a first jump is being performed. Further measuring is made as usual. If time limit is exceeded, the value is marked by red color and an asterisk.

8.5. Test mode

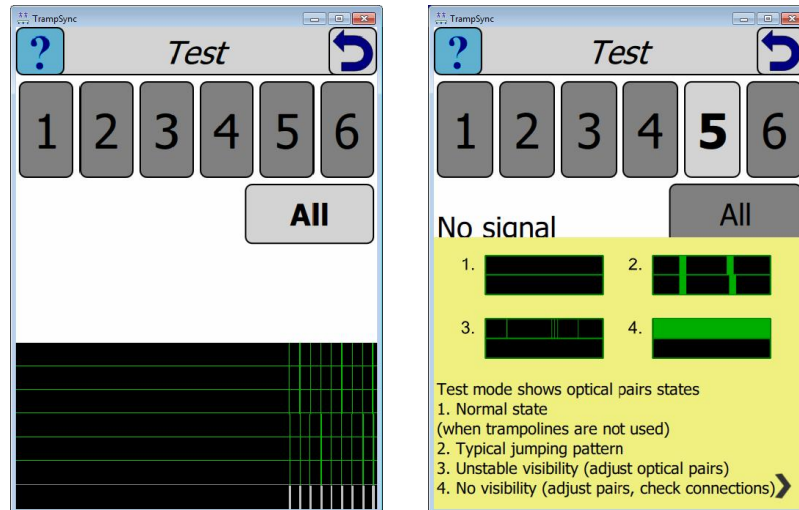


Fig. 13 Test mode

Test mode permits to monitor infrared pairs performance. Graphs show status of pairs 1 to 6, top to bottom: black is open state, green is interrupted. Pairs are numbered starting from the interface unit (unless trampolines are swapped in settings).

Buttons “1”-“6” enable only corresponding infrared pair while the rest are switched off. Button “All” enables all pairs.

In initial state, all graphs must show open (black). Interruption of an infrared pair is shown on the corresponding graph. The 7th band (white) shows jumping events (jump and landing).

9. Troubleshooting

Symptoms	Possible actions
Main unit is off (no LEDs are lit)	Check that the main unit is plugged to the power source and the on/off button is in ON state.
Indication LED is not lit on one or several receivers	Check that receivers and emitters are positioned and connected according to the chart.
Application cannot connect to the device	Press “ Connect ” on the main screen. Check that your tablet/computer is connected to the appropriate wireless network, or that the cable is plugged and wired network parameters are correct. If possible, test connectivity by pinging the device address (default 192.168.0.230). Check the “Device address” option in application settings. Try switching Wi-Fi off and on using Setup button to change Wi-Fi channel. Switch the main unit off and on.
<i>When application connects to the device, it shows the “Start” or “Prepare” button.</i>	
Test mode: no signal	Check that the application can connect to the device. Check the cable connecting the main unit and trampolines.
Test mode: signal from one or several pairs is unstable or invalid	Check that receivers and emitters are positioned and connected according to the chart. Check that receivers and emitters are properly aligned and oriented towards each other. If using two TMD-3’s in same room: check the placement

	recommendations.
	<i>Note: Emitters can be checked using a usual digital camera, because most matrices are sensitive to infrared light (though some cameras and phones are equipped with an IR filter).</i>
Measurements are not performed or are incorrect	Check infrared pairs according to the preparation procedure. Check the “Swap trampolines” option in application settings.

Appendix: device version with external router

The kit contents for this version is:

- Magnet-mounted infrared pair modules – 12 pieces (6 pairs).
- Connections cables (standard Twisted Pair Cat.5e) – 12 cables of different length.
- Power adaptor with PoE injector
- Wi-Fi router with own power adaptor

Sensors installation is performed according to the procedure described in System Installation. The device is powered by a scheme similar to Power-over-Ethernet with the usage of an injector (Fig. 14).

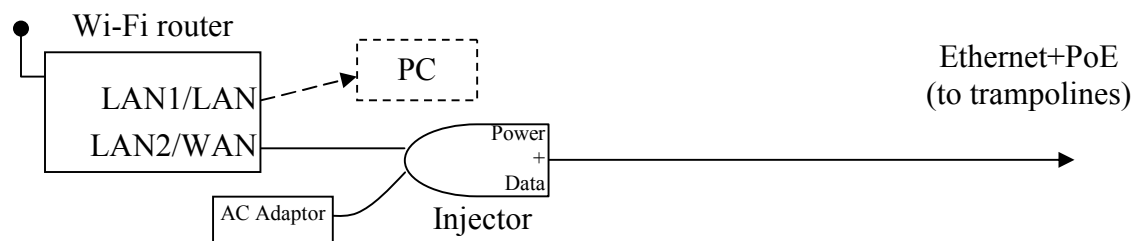


Fig. 14 Device connection

TMD-3 is connected through the injector to the router’s port depending on its model:

- Model with several LAN ports – any LAN port.
- Model with one LAN port – WAN port.

For wireless devices the router has been setup as an access point with SSID «**Tramp**». To connect a computer using wired connection use the router’s LAN port. The PC’s network adapter should be configured to obtain the IP-address by DHCP (usually the default).

It is also possible to connect the device to an existing network, discarding the supplied router, provided that the device address (192.168.0.230 by default) is compatible with the network’s settings.