



Wireless Pyro Solutions LTD

# WIRELESS FIRING SYSTEM USER GUIDE 2.5



## WPS tiny

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## 1. INTRODUCTION

Thank you for purchasing Wireless Pyro Solutions LTD wireless firing system. Our system is a safe, reliable and user friendly, designed for wide range of applications and different skill sets.

WPS wireless ignition system allows bidirectional communication between the transmitter and receiver, limiting the guesswork involved determining cue continuity for every single receiver. All needed information for the show can be accessed directly from your hand-held WPS mote hundreds of meters away.

For large professional shows, connect your WPS mote to your laptop through USB and have a full control over your show on the computer screen. With the free Pyro Ignition software create your own scripted shows and musicals in matter of minutes.

### 1.1. Glossary

**Channel** – radio communication is divided into different channels, so that each channel can have its own information transmitted without interference. WPS wireless firing system has 99 unique channels, represented with numbers 1-99.

**Cue** – the smallest unit of the system. Each cue has its own two terminals to connect the e-match to. There is no polarity on the e-match, so the two e-match' wires can be connected either way. WPS hobby has 24 individual cues and WPS pro has 144 individual cues (12 x 12cues on each WPS slot). WPS tiny – 12 individual cues.

**Bank** – every 12 cues are grouped together and represent one "Bank". Each Bank is identified by a capital letter A-L. WPS hobby has 2 Banks, WPS pro has 12 Banks, WPS tiny has 1 Bank.

### 1.2. Disclaimer

The manufacturer(s), distributor(s) and / or seller(s) accept no responsibility whatsoever for any damage, injury or loss, financial or otherwise, resulting directly or indirectly from the use, misuse, **function** or malfunction of this device.

**By purchasing and using this device you understand and accept this disclaimer.**

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## 2. INTERFACE AND NOTIFICATIONS



WPS tiny has got a one button interface with two colour LEDs, SIGNAL being in blue and BATTERY in red. The interface is very simple and then most common functions are printed on the front panel of the unit. It has an RJ45 connector to interface it with a 12 cue WPS slat. The unit can be powered up by the side switch. Once powered it follows a self-test sequence and if no errors are found, the BATTERY LED will turn on for 1 second. In case of errors, the corresponding error code is displayed by the SIGNAL LED turning on X times, where X is the error code. Dimensions: L100mm W65mm H35mm (excluding antenna).

WPS tiny has two radio modules – one for communicating with RF12CH (315/433MHz) and one for communicating with WPS mote (868/915Mhz). The external SMA antenna is only used for communications with WPS mote, for communications with RF12CH there is a spiral antenna inside the case. To extend the range for RF12CH remote bend the antenna outside the case as shown in Section 3.3.

### 2.1. Batteries

The unit uses two standard 9V batteries (PP3), the first battery being explicitly used for running the logic and second to deliver the current for igniters.

In case the first battery's voltage goes below the threshold of 7.2V, the BATTERY LED will fade in and out at 5 second intervals. Furthermore, in case the second battery's voltage goes below the threshold of 7.2V, the BATTERY LED will fade in and out followed by short flash of SIGNAL LED.

The logic's stand-by current is 30mA (around 14-hour battery life when using Alkaline PP3).

**Note:** The second battery's voltage will only be checked if at least one cue has continuity.

### 2.2. Continuity test

While the unit is powered on, press the button once. The BATTERY LED will blink once for each cue (12 times in total). If the corresponding cue has got continuity, the SIGNAL LED will turn on as well. If all 12 cues have got continuity, both LEDs will turn on for 2 seconds.

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### 3. INTERFACING WITH RF12CH REMOTE

WPS tiny supports 315/433MHz communication with RF12CH remote. Only remotes purchased from WPS are guaranteed to work and are tested. 3<sup>rd</sup> party RF12CH or alternatives might work, but are not guaranteed.



*RF12CH remote*

#### 3.1. Synchronization

Power up WPS tiny, wait for the BATTERY LED to turn on for 1 second indicating a successful boot sequence. Hold down the button for at least 2 seconds. Both LEDs will flash 3 times, indicating that Sync mode is active. Press any button on RF12CH remote, both LEDs will flash 3 times indicating a successful synchronization. Only one RF12CH remote can be synchronized to one WPS tiny unit at any given time, however, you can synchronize many WPS tiny units to the same RF12CH, firing them in parallel.

**Note:** For safety reasons, the synchronization session will end in 10 seconds. The Session end is indicated by both LEDs flashing once.

**Un-sync:** In order to un-sync module from RF12CH remote, turn the WPS tiny unit off, hold the button while turning module on. Both LEDs will turn on briefly, then press any button on RF12CH remote to un-sync.

#### 3.2. Firing

Press buttons 1-12 on RF12CH remote, the corresponding cue on WPS tiny will light up. At long ranges, pressing and holding the button on RF12CH might be necessary.

**Warning:** WPS tiny is armed as soon as RF12CH remote is synchronized to WPS tiny and unit is turned on.

#### 3.3. Range and antenna configuration



*External antenna configuration*



*Internal antenna configuration*

Using RF antenna inside the case allows up to 50m line of sight (LOS). Bending antenna outside the case, extends the range to up to 150m+ LOS. Position module such that top-left corner is facing the remote for better range. For more detailed information about antenna orientations see <http://wirelesspyro.co.uk/antenna>

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## 4. INTERFACING WITH WPS mote - SYNCHRONIZATION

Power up WPS tiny, wait for the BATTERY LED to turn on for 1 second indicating a successful boot sequence. Hold down the button for at least 2 seconds. Both LEDs will flash 3 times, indicating that Sync mode is active. Enter Sync mode in WPS mote and select Channel 1 by pressing →.

```
TINY SETTINGS
▶Channel      1
Bank         A
Pulse time   1.0
```

New screen with WPS tiny settings will be displayed. From here, you can select WPS tiny's Channel (1-99), Bank (A-L) and Pulse time (0.1sec – 2sec), default is 1 second. Press → to confirm setting selection. Press ← to save all settings and finish synchronization process.

If synchronization is successful, a confirmation message is displayed on WPS mote screen:

```
Sync successful!
CH:1  ID:a
```

CH – the channel receiver will now listen to.

ID – unique identification letter for each receiver module on the same channel.

**Note:** The synchronization session is started only when WPS mote is in Channel 1, however testing/firing is defined by user settings at synchronization. To change settings, re-sync again.

**Un-sync:** In order to un-sync module from WPS mote, navigate to **Sync** and then select the channel 1. Once the channel is selected, press and hold → to un-sync.

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## 5. INTERFACING WITH WPS mote - TEST

Similarly to WPS pro and WPS hobby modules, WPS tiny can be synchronized and used with WPS mote controller, allowing bi-directional communication with 868/915MHz radio. Furthermore, it supports local and remote continuity check, signal strength and battery level check as well as script and manual firing, free wireless software updates via WPS mote.

### 5.1. Remote test

*WPS mote*: Navigate to **Test mode**.

**Note**: WPS mote will communicate only to the modules that it has been synchronized to.

**Advanced**: The number of times WPS mote tries to communicate to every single receiver before timeout can be modified at **Settings -> Advanced -> ACK retries**. By default, it will take 5 attempts before timeout. Increase this number for longer range or busy channels.

#### 5.1.1. Test overview

In test overview, you can see all active receiver modules on every active channel. The number in brackets represent # of active modules on that channel. In this instance, there are two receiver modules on Channel 2 and single receiver module on Channel 4.

```
TEST
▶Channel 2 (2)
Channel 4 (1)
```

#### 5.1.2. Single channel battery and signal strength test

To check the signal strength and battery levels for each individual module, choose the channel in *Test overview* by pressing ↓ or ↑ and then hold → to enter. The same can be achieved by pressing and holding buttons 1-12 for the corresponding channel. You can refresh the test by pressing →.

```
TEST  CH:1
a 102 -28 T
b 11.5V! -38 P
e 12.4V -38 H
```

*First* column represents the module ID.

*Second* column represents the battery voltage. In case of WPS tiny, 1 – battery for logic, 2 - battery for firing.

*Third* column represents the signal strength between the receiver module and WPS mote.

*Fourth* column represents the receiver module type (P – WPS pro, H – WPS hobby, T – WPS tiny).

**Signal strength**: Signal strength measures the quality of the communication between WPS mote and the receiver units. Measured between 0 and -100 dBm, 0 being the best signal strength and -100 – the worst. If you experience low signal strength even in close range, try changing the channel and/or elevating the receiver module above the ground.

#### Warnings:

- Low signal strength – if signal strength between the receiver module and *WPS mote* is below the user set threshold an exclamation mark (!) will be displayed next to the signal strength. Signal strength threshold can be set manually in *WPS mote* by navigating **Settings -> Advanced -> RSSI thresh**. By default low RSSI threshold is set to -80 dBm.

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### 5.1.3. Single channel cue test

To test cues for a single channel, choose the channel to be tested in *Test overview* by pressing ↓ or ↑ and then → to enter. The same can be achieved by pressing buttons 1-12 for the corresponding channel.

You can refresh the test by pressing → and change the Bank being tested by pressing ↓ or ↑.



Empty square – NO continuity

Filled square – OK continuity

Half-filled square – partial continuity, which means that at least one module in the selected channel for the specific cue does not have continuity and at least one does.

Blinking empty square – cue has been programmed in the script but is not present.

Blinking filled square – cue has not been programmed in the script but is present.

Blinking half-filled square – partial continuity, but cue has been programmed in the script.

**Note:** You can switch between active channels quickly by pressing and holding ↓ or ↑.

**Note:** By pressing 1-12 you can check the banks quicker. (1-A, 2-B ... 12-L).

**Note:** If WPS pro and WPS hobby/WPS tiny are used on the same channel, banks that are not defined in the WPS hobby/WPS tiny will not count as “NO continuity”, only the banks that are defined will be tested.

### 5.1.4. Individual cue test

In case of partial continuity, you might want to find out which specific cues do not have continuity. This can easily be done by pressing and holding buttons 1-12 to test the corresponding cue. Press ← to return to *Single channel cue test*.



In this example Cue A7 has got continuity on module with ID “a”, but no continuity on module with ID “b”.

## 5.2. Scripted musical shows and computer control

Connect your WPS mote with USB cable to the computer whilst on. All necessary drivers should be downloaded automatically. Navigate to **PC Control**. Open PyroIgnationControl software and follow further instructions.

**Note:** In order to fire cues from the computer software, key switch must be in “Fire” position.

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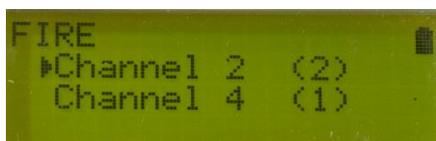
## 6. INTERFACING WITH WPS mote - FIRING

### 6.1. Arming the system

All receiver modules are armed when WPS mote is entered in **Fire mode**. Fire mode can be only accessed if the key switch is in "Fire" position. Once the system is armed all of the receivers will wake up and display the option to exit the Fire mode. At this point, if any button is pressed on the receiver, it will automatically disarm itself. You can disarm the system from the WPS mote by either turning the key switch back to Test position or by returning to the main menu.

### 6.2. Firing cues remotely

To fire a channel, choose the channel by pressing ↓ or ↑ and then → to enter. The same can be achieved by pressing buttons 1-12 for the corresponding channel.



#### 6.2.1. Manual firing

Fire individual cues by pressing buttons 1-12. Once the button is pressed all modules on the selected channel will fire. The last fired cue on each channel will be shown with an underscore. You can press buttons in any order you like. Change the active firing bank by pressing ↓ or ↑.



**Note:** If button 1-12 is held down a continuous pulse is sent to the receivers until the button is released.

**Note:** Switch between active channels quickly by pressing and holding ↓ or ↑.

**Note:** Switching between channels will not lose the firing history. However, re-arming the system will create a new firing session with its own firing history.

**Advanced:** When firing a cue by pressing a button, a fixed number of duplicate pulses are sent to the transmitter, the number of pulses can be changed at **Settings -> Advanced -> Contin fire**. By default it is set to 3 pulses. The higher the number of pulses – higher the probability that at least one packet will arrive to the receivers, but limits how fast two sequential cues can be fired. For reliable transmissions, set Contin fire to AC (0), this will ask for an acknowledgment from each receiver, but will decrease the accuracy and firing speed.

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### 6.2.1.1. Step firing

Step through all cues by pressing →. This will fire all cues one by one on every press of →. First press will always be the first cue on the channel. Every next cue will be the cue on the right from the last cue. Once the last cue on the channel is reached, the next press will automatically switch to the next active channel.

In this example, once L12 is fired on Channel 2, A1 on Channel 4 will be next, since there is no active receiver module on Channel 3, it will be skipped.

By default, every → press will fire the next cue and it does not matter if it is empty or full, but there is an option available to skip empty cues and step only on partial/full cues.

This option can be set by navigating to **Settings -> Firing -> Skip empty**.

### 6.2.1.2. Sequence firing

Automatically fire cues with fixed time delay of 0.1 – 60 seconds. This mode can be activated by pressing and holding → for 3 second. To stop the automatic sequence firing, press → again. The default time delay can be set by navigating to **Settings -> Firing -> Sequence**.

However, once sequence firing is active, you can adjust the speed by either pressing buttons 1-12 (represents delay in seconds), or by pressing ↓ or ↑ to decrease or increase the delay whilst the sequence firing is still active. Similarly to the step fire, once all cues on the selected channel are fired the next active channel is selected. Skipping empty cue option is also available.

### 6.2.1.3. Timer

The on-screen timer can be enabled by navigating to **Settings -> Firing -> Timer**. Timer will start counting as soon as first cue is fired. In order to pause the timer, press and hold ← once in Fire channel view. Timer will continue as soon as any cue is fired.

## 6.2.2. Firing from a script

Once you enter Fire mode a summary of available receivers and their cues is displayed. If script is downloaded on the WPSmote you will also see script summary.

```
FIRE - OVERVIEW
1 module on 1 ch
13 cues, 10 scrip
Script: 90% match
```

As you can see from the image above, 13 cues are found, but only 10 are scripted. Because one of the scripted cues are not present on the receiver, script is matching by 90%. This is particularly useful as a final test before starting a large show with multiple receivers on multiple channels.

```
FIRE
#Manual
Full-auto script
Semi-auto script
```

If script is present, by pressing → a Fire menu is displayed. From here, you can either select Manual firing (section 6.2.1.), Full-auto script or Semi-auto script.

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### 6.2.2.1. Full-auto script

Full-auto script allows to fire a fully automatically. In order to fire in this mode a script must be present on both WPS mote and all receiving modules. Script is being transferred to the receivers just before entering this mode.

```
FIRE 00:06 4/10 █
CH:1 B5 in 00:03:5
CH:1 B6 in 00:04:5
      Start
```

This mode can be accessed by navigating to **Fire -> Full-auto script**. You can start/pause show by pressing →. At the top of display, current elapsed time is displayed. Next to it, how many cues have been already fired out of all. In the middle you can see next two scripted entries and the time till those cues fires. You can fire the next cue without waiting for the countdown by pressing ↓.

**Note:** Pressing ← will not stop the script, this feature allows to fire manually while script is running. In order to fully stop the script, either exit the fire mode completely or turn the key-switch back to Test position.

**Note:** In this mode, script is fired from within receivers, allowing higher timing resolution. Accuracy up to 1ms (1/1000 second). WPS mote only acts as a start/pause controller.

**Note:** In case WPS mote stops responding, script will automatically pause.

### 6.2.2.2. Semi-auto script

This mode can be accessed by navigating to **Fire -> Semi-auto script**. This mode works similarly to step-mode, but follows programmed script pattern instead of incremental. By pressing → you can activate the countdown, once that cue is fired, timer will stop. By pressing → again, it will fire next cue and so on until all cues in the script have been fired. Pressing ← will restart the script back to the beginning. If the countdown has not reached 0, you can press → to fast forward and fire the next cue without waiting.

You can skip the pausing by holding down → (It will follow the script just like full-auto mode until you release →).

**Note:** In this mode, script is fired from the WPS mote. Timing accuracy is up to 100ms (1/10 second).

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## 7. SCRIPT TRANSFER

### 7.1. PC to WPS mote transfer

#### Transfer via PyroIgnitionControl software:

Connect your WPS mote with a USB cable to the computer. All necessary drivers should be downloaded automatically, if not locate the driver folder and run the executable file. Navigate to **PC Control**. Connect to the Pyro Ignition Control software:

- 1) Settings -> Options -> Ignition system and select necessary ComPort (usually the last one).
- 2) Then confirm the ComPort by going Settings -> Connect. WPS mote should now display "Connected!".
- 3) Window -> Ignitionsystem or press F7 -> Transfer show. If successful, you should see a confirmation message.

#### Transfer via WPS uploader (<http://wirelesspyro.co.uk/wps-uploader>):

Connect your WPS mote with a USB cable to the computer. All necessary drivers should be downloaded automatically, if not locate the driver folder and run the executable file. Navigate to **PC Control**. Open WPS uploader and select the COM port (usually the last one). Follow further instructions:

<http://wirelesspyro.co.uk/notes/using-wpsuploader>

WPS mote: You can now view the script on by going **Script -> View script**.

```
SCRIPT 1-3/10
CH:1 B1 00:01:000
CH:1 B2 00:02:000
CH:1 B3 00:05:000
```

Check that script is accurate and without errors. You can scroll through the script by pressing ↓ or ↑.

### 7.2. WPS mote to receiver transfer

In order to transfer the show to the receivers – navigate to **Script -> Transfer script**. All receivers for all channels should be turned on. If show was transferred successfully, you will see a confirmation message with 100%.

```
SCRIPT
Transfer finished!
Transferred: 100%
```

### 7.3. Disable banks

Navigate to **Script -> Disable banks**. You can scroll through all enabled banks in your script by pressing ↓ or ↑. If you want to disable a specific Bank press → and change it to either ON or OFF position. Press ← or → to save your current configuration.

### 7.4. Delete script

WPS mote: Navigate to **Script -> Delete**.

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## 8. SOFTWARE UPDATES

WPS mote: Connect your WPS mote with USB cable to the computer whilst on. All necessary drivers should be downloaded automatically, if not locate the driver folder and run the executable file. Navigate to **PC Control**. Follow further computer instructions (<http://wirelesspyro.co.uk/notes/how-wps-update-manager-works>)

**Note**: Current software version can be seen by navigating to **About**.

New versions are free to download on our website at <http://wirelesspyro.co.uk/updates>.

## 9. ERROR CODES

WPS mote: 1 – EEPROM write cycles reached limit; 2 – flash write cycled reached limit; 3 – radio initialization failed; 4 – flash initialization failed; 5 – keypad button stuck.

WPS tiny: In case of any errors during self-test on power-up, SIG LED will blink an error code. Each blink correspond for error code. 4 blinks = Error code 4. 3 – radio initialization failed; 4 – flash initialization failed; 2 - sensors are not calibrated; 6 – mosfet check has failed. In case of Error 6 please **proceed with caution**, as one of the firing mosfets have likely failed closed, please get in touch for more information.

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