Wireless Network Interface

PYRODIGITAL CONSULTANTS
AUTHORIZED INTERFACE

MANUFACTURED BY
PYROSTUDIOS ASIA

USERS GUIDE

Wireless Network Interface

Specifications:

- Frequency range: 902-928 MHz (North America, Australia, Israel)
  2.4000-2.4835 GHz (international)

- Transmit power: 1 W (900 MHz)
  50 mW (2.4 GHz)

- Receiver sensitivity: -110dBm (900 MHz)
  -102dBm (2.4 GHz)

- Transmit current: 750mA

- Receive current: 80mA

- Spread Spectrum: Frequency Hopping, Wide band FM modulator

- Network Topology: Point-to-Multipoint

- Channel Capacity: 7 hop sequences share 25 frequencies

- Antenna: 5dBi Omni directional, RP-SMA connector

- Certification: FCC Part 15.247, Industry Canada (IC), CE(!)

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Quick Start Guide

Pyro Studios Asia's wireless network interface allows you to easily create a wireless communication network between a Pyrodigital pyrotechnic controller and remote locations. The wireless network interface acts as a "virtual XLR cable" and can work in configurations as simple as a single base transceiver and a single remote transceiver, all the way up to 7 base transceivers and 896 remote transceivers operating on 7 different channels and in distances of up to 1.5 km between locations using the supplied 5dbi omni directional antennas.

Pyro Studios Asia's wireless transceivers operate in a frequency hopping mode in the license-free 915 MHz ISM band. 7 channels are available, allowing you to setup totally independent networks in close proximity to each other.

Each unit is shipped with a high gain, 5dbi omni directional antenna. Under normal conditions (line-of-sight between antennas), these antennas will give the system a range of 1.5 km outdoors (up to 2 km in extremely favorable conditions), and up to 500 m indoors. Higher gain, directional Yagi antennas and amplifiers can also be used for extreme range (up to 25 km), please contact us for a list of authorized directional Yagi antennas and amplifiers.

Pyro Studios Asia's wireless transceivers have been pre-programmed with a unique customer ID number for each customer. This number is an integral part of the addressing scheme and it ensures that your wireless transceivers will only communicate amongst themselves, and WILL NOT communicate with other wireless transceivers sold by Pyro Studio Asia to other customers. This is an important safety feature preventing two different operators in nearby locations from triggering each other's firing modules.

If your company is using more than one system, in locations less than 50 km apart, YOU MUST use different channels for each location. Failure to do so might result in unexpected results, and possible accidents, as one network may trigger ignitions in another network a few km away. Each transceiver has 7 available channels, so 7 different networks may co-exist in close proximity at any given time without any interference.

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System components

Base Wireless Transceiver

The base wireless transceivers can be connected at any point in the Pyrodigital firing system network. They can be connected directly to the firing controller, or they can be connected downstream in the network. Each base wireless transceiver can communicate with a maximum of 128 remote transceivers, provided they share the same channel. A typical wireless network would consist of a single base transceiver, at the front-of-house, and one or many remote transceivers, in the field. There is no power switch on the base wireless transceiver, it is automatically switched on and begins transmitting as soon as power is applied to the digital network.

Remote Wireless Transceiver

The remote wireless transceivers are the receiving end of the wireless link. Each remote wireless transceiver can be connected to a maximum of 128 firing modules. The remote transceiver must share the same channel as the base transceiver in order to communicate. More than one remote transceiver can communicate with a base transceiver. For instance, for a setup with three remote locations, the network configuration would consist of one base transceiver and three remote transceivers, all on the same channel.

When configuring a network, it helps to keep in mind the idea of the wireless link being a "virtual cable". The same rules that apply when setting up a cabled network still apply when setting up a wireless network. For instance, if there are two firing modules with the same address on two separate remote transceivers, they will both fire when a corresponding cue is issued, however, status check will be impossible as both firing modules will "answer" the status check request from the pyrotechnic controller at the same time and this cross-talk will disrupt the communication.

Battery pack

The battery pack is used to power the remote transceiver. It is connected to the transceiver with a Speakon ™ cable. To turn on the remote transceiver, simply rotate the safety cut off switch until it pops up.
The battery pack is recharged by plugging it in an AC outlet with the provided power supply. Recharging time is 24 hours. The built-in battery charger is current-limited and cannot over-charge the batteries.
The battery pack has a built in thermal cutoff circuit breaker. This breaker will trip at a current of three Amperes. The circuit breaker's function is to protect your equipment in case of a short circuit in the downstream network. It is recommended to always monitor the "short" LED on the remote wireless transceiver when powering up the battery pack. If the "short" LED lights up, the battery pack should be powered down immediately and the source of the short circuit should be identified and repaired.

System components

Amplifiers

Pyro Studios Asia offers a series of amplifiers to increase the range of your wireless link. These amplifiers are installed in-line, between the antenna output of your transceiver and the antenna itself. They are pre-packaged and totally "plug and play".

In order to make our products truly global, we had to restrict the output power of our wireless interface to the lowest common denominator. However, many countries will allow a higher transmitted power than our units produce, without a license. Our selection of amplifiers will allow you to always use the maximum power available, wherever you deploy the system.

Pyro Studios Asia offers a complete line of plug and play amplifiers, ranging up to 25 watts. It is up to end user to get the proper licenses should he/she decide to use an amplifier exceeding the allowable maximum transmit power for his/her country.
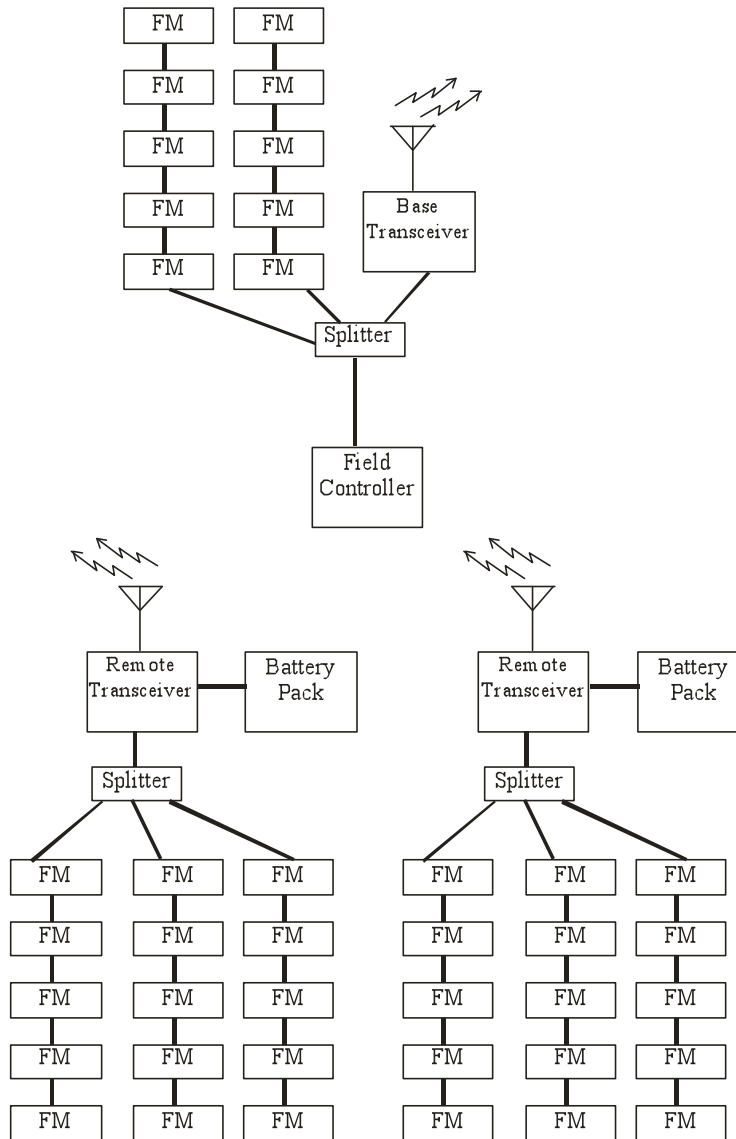
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Network Configuration

Typical network example 1
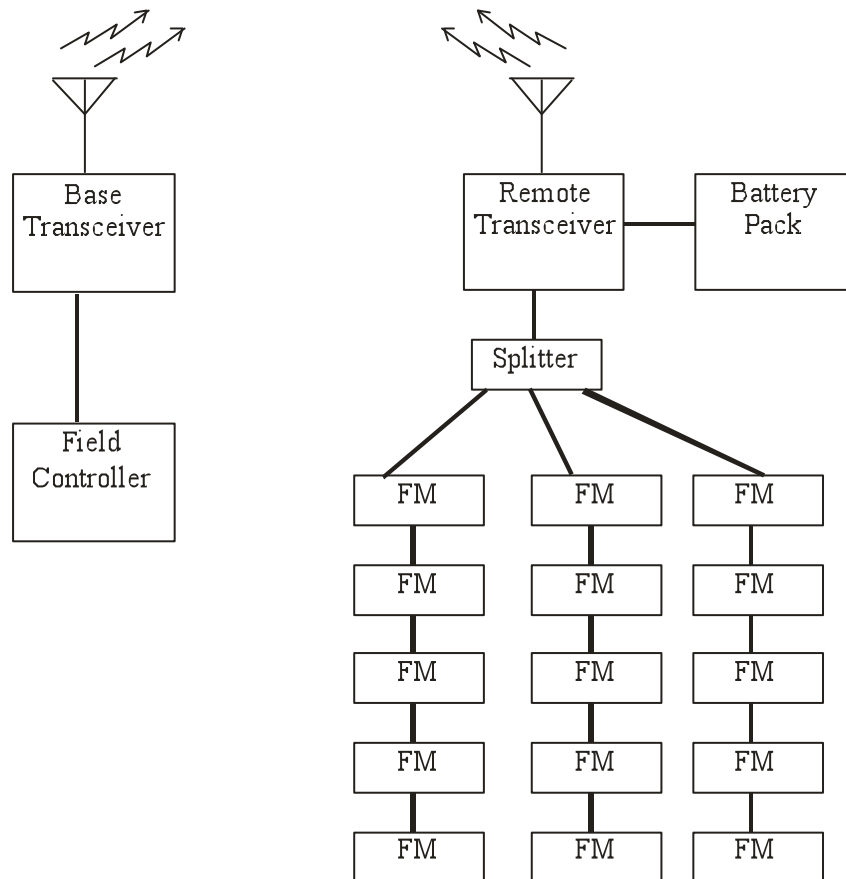
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Network Configuration

Typical network example 2

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Site survey

Prior to installation, a site survey should be conducted to ensure the proposed wireless transceiver installation location will provide the required site coverage. This is done using one base transceiver and one remote transceiver.

1- Connect the base transceiver to the pyrotechnic controller.

2- Power up the pyrotechnic controller and set it to perform check status on firing module number "01".

3- At the remote location, connect a remote transceiver to the battery pack and to a firing module.

4- Set the firing module address to "01" and power up the battery pack. This will initiate a bi-directional communication between the base transceiver and the remote transceiver as the pyrotechnic controller continuously polls the firing module and the firing module continuously responds.

5- Note the number of signal strength LED that are lit on both the base and the remote transceiver; a signal strength of 50% or more is required for a reliable link.

6- Move the remote transceiver unit 1 meter or so around the proposed mounting location to locate the area that provides the greatest signal strength and to ensure the proposed mounting location is not a fringe location.

7- Repeat steps 3 through 6 for each proposed remote location.

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Signal strength LEDs

The signal strength LEDs indicate the relative strength of the last message received. If no message is received for more than 1 second, the signal strength indicator will show "0".

As such, the signal strength indicator will perform differently during status check and firing. During status check, the pyrotechnic controller continuously sends polling requests. All the remote transceivers in range will receive these requests and will all indicate the strength of the signal coming from the base transceiver. At the same time, all the remote transceiver in range will have their "rx" LED blink briefly every time a message is received.

However, only one remote transceiver will reply to the request issued by the pyrotechnic controller, as only one remote transceiver will have the corresponding firing module connected to it. So, the signal strength indicator on the base transceiver will indicate the strength of the signal coming from that particular remote transceiver.

The pyrotechnic controller operator can monitor the signal strength of multiple remote locations by polling specific firing modules that are at each location.

During the firing of the show, the signal strength LEDs on the remote transceivers will light up for one second every time a message (cue) is received. The signal strength LEDs on the base transceiver will not light up during the firing of a show, as the base transceiver is not receiving any messages during a show. (The base transceiver is only receiving messages during status check, when the firing modules "answer" the requests sent by the pyrotechnic controller).

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Signal latency

The wireless network interface will add latency to the messages being broadcasted. This is especially noticeable when performing status check. There is a delay of about 0.5 seconds when performing status check through the wireless interface. As the operator scrolls through the firing modules during status check, he will notice that information being displayed on the screen takes 0.5 seconds to update. This is within normal operating parameters and the operator must adjust by scrolling through each firing module at a pace that allows the information on the screen to be properly updated before scrolling to the next firing module. Unfortunately, this latency prevents the use of the "auto check" feature when using the wireless interface.

This half-second latency is only present during status check and is the result of the buffering of data in the remote transceivers to avoid data collision and to respect the timing requirements of the pyrotechnic controller.

During the actual firing of the show, the effective latency of the wireless interface is 0.025 seconds, or less than one frame (at 30 fps).