

Led wristband radio

RB4941 Transmitter system description and user manual

This equipment transmits messages to operate the wristband “Xyloband” receivers

Important notice on FCC Compliance and operation

The transmitter is certified to FCC rules part 15.247 and operates in the 902-928MHz license-free radio band.

The wristband receivers are compliant with FCC part 15 class B limits.

The interface unit is an off-the-shelf data converter that is compliant with FCC part 15 class B limits for a digital device

The user should note that:

Operation is subject to the following two conditions

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation

There are no user controls inside the enclosure.

Please note that the equipment must only be connected and used in the way specified.

Unauthorised changes or modifications to the equipment may void the user's authority to operate this equipment.

This equipment is intended for indoor use only.

The radio system is made by
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Introduction

The transmitter system comprises of two parts, the transmitter itself and a data interface connecting to a computer. The computer is used to send commands to light the LEDs on the wristbands receivers.

It is intended that the transmitter will be mounted remotely in a position to give good radio coverage to the operating area. It is connected back to the interface which will be mounted close to the computer.

Interface

This is a unit that has a standard USB input from a computer and an RS-422 (two way full-duplex) output that communicates with the transmitter.

It is powered from the USB port and requires no other power supply.

The unit houses a bought-in converter which has its DIP switches for RS422 and termination set to ON, and the other two switches are set to OFF.

The converter requires the correct drivers to be installed on the computer and these are for the FTDI FT232RL chipset. Different drivers are available for different operating systems and must be chosen accordingly. They are available for download from the FTDI web-site

<http://www.ftdichip.com/FTDrivers.htm>

The output connector is a 5-pin XLR female type, and the pin connections are the same as given in the DMX-512 standard.

Pin 1 common

Pin 2 Data 1-

Pin 3 Data 1+ Where Data 1 is the primary data link (sends to the transmitter)

Pin 4 Data 2-

Pin 5 Data 2+ Where Data 2 is the secondary data link (receives from the transmitter)

The common is connected to the box ground which is also connected to the USB ground.

Note that although the unit employs standard DMX512 cable and the physical interface, this unit has a proprietary data system so it should not be connected to a DMX512 system.

Transmitter

This is the device that sends radio commands to the wristband receivers. It is controlled entirely from the serial data input and has no controls on it for a user to operate.

The data input has a 5-pin XLR male connector and the receiving pair has a terminating resistor permanently attached.

It has a DC input of 8.5V to 10V from an external power supply.

There is also a LED to show that the transmitter is powered. It is operated from the micro-controller and indicates that the mains supply and the 5V regulated supply are functional.

The transmitter has a reverse polarity SMA socket for the antenna which must only be a quarter wave type. A "gain" antenna should not be used as this may cause the transmitter to radiate at above the regulatory limits.

It is not recommended to operate the transmitter without an antenna or other suitable RF load on the output connector.

Setting up

The computer should be connected to the interface via the USB cable.

If not already set up a suitable serial COM port should be chosen for the interface and the serial port settings adjusted to 9600, 8 data bits, no parity, 1 stop bit (9600 8-N-1) with the flow control set to XON / XOFF.

The connection to the transmitter is via a 2-pair data cable using 5 pin XLR connectors. The cable is connected in the same pin configuration as a 2-pair DMX-512 cable so standard off-the-shelf cables may be used.

The transmitter should be mounted so that the antenna is as clear as possible from nearby metalwork. It should not be mounted above heat sources (lamps etc.). This is important to maintain the frequency stability of the radio.

Commands are sent from the computer via a terminal emulator software application.

This must be set to the correct COM port number and serial port settings as above.

Commands are typed into the terminal and they are echoed from the transmitter to show that it is connected and powered. There is no local echo, so if nothing is seen on the screen while typing there is a problem somewhere in the system.

After each command is typed the "enter" key must be pressed for the instruction to be sent.

Typing help (and enter) will show a list of commands.

Apart from typing commands in manually it is possible to upload via the "send text file" menu item a complete pre-prepared script which will run through automatically. This is a standard text file which may be written in any text editor (e.g. Windows Notepad).

A separate document describes the commands available in more detail.

IMPORTANT NOTE

The wristband receivers after having their battery isolating tabs pulled out will go to "sleep" after a minute.

Before use a WAKE transmission must be sent. This is a special long transmission, and on hearing it the receivers will flash once and then stay awake for up to 2 hours (the single flash will be at random times depending on the receivers wake-up "sniff" time).

This is done by sending WAKE

It should be noted that the receivers wake up briefly to see if there is a valid transmission. If commands are sent by the transmitter it is possible to wake up a receiver if they coincidentally wake up while the transmitter is on. If some test transmissions are made it is likely that some receivers if they are in range may wake, so after any tests a SLEEP command should be sent. This will put any receivers in range back into sleep mode.

It is recommended that the WAKE transmission is sent 2 or 3 times.

Basic Operation

Typing HELP should show the following menu on the screen.

help

Available commands:-

<i>A-X</i>	<i>Preset LED sequences A-X</i>
<i>BITPATT</i>	<i>On/Off bit pattern</i>
<i>CYCLE</i>	<i>Simple LED flash cycle</i>
<i>DEFAULTS</i>	<i>Set the default presets</i>
<i>DELETE</i>	<i>Delete preset command(s)</i>
<i>ERASE</i>	<i>Completely erase all presets</i>
<i>FLASH</i>	<i>Flash the LEDs once</i>
<i>OFF</i>	<i>Turn off the LEDs</i>
<i>PRESETS</i>	<i>List stored preset commands</i>
<i>PROMPT</i>	<i>Reset the prompt timer</i>
<i>RANDOM</i>	<i>Random LED flash sequence</i>
<i>RWAIT</i>	<i>Relative time delay</i>
<i>SEQUENCE</i>	<i>Variable time on/off sequence</i>
<i>SLEEP</i>	<i>Put receivers to sleep</i>
<i>TEST</i>	<i>Repeated transmission test</i>
<i>UNDELETE</i>	<i>Undelete preset command(s)</i>
<i>WAIT</i>	<i>Absolute time delay</i>
<i>WAKE</i>	<i>Wake up receivers</i>
<i>Z</i>	<i>Turn off the LEDs</i>

If this menu is displayed it shows the system is connected together correctly.

Some of these instructions are not likely to be used on their own (BITPATT, RWAIT, PROMPT, SEQUENCE, and WAIT), but some are useful for testing.

The TEST command sends a transmission at regular intervals to flash the LED on a receiver. This transmission does not cause the receiver to wake up (and a test receiver must be specifically made awake) but this command is very useful for range testing as the LED will stop flashing when it is going out of range of the transmitter.

Note that to stop the test the Control and C keys must be pressed (or Shift-control-C on some terminal programs).

WAKE and SLEEP commands have been discussed above.

On receivers that are awake CYCLE will flash the LEDs on and off. FLASH will cause the LEDs to flash twice.

If CYCLE or other continuous command are running use OFF to end the sequence and turn the LEDs off.

Some pre-set defaults by typing DEFAULTS may be loaded (and yes when asked). At present these are A to E for simple on/off flashing at increasing rates, and F and G are random flashing. Note that the A to E presets will flash the receiver zones at slightly later intervals between the zones to give a "walking" effect.

In general use a text script will be used which will have a whole sequence of commands to run through a complete song.

Use the "send text file" menu item on the terminal program (wording may vary). Select the file to send and pressing enter will begin the sequence. It will be seen to progress through the script in small stages until the end is reached.

Writing a script allows a lot of flexibility in the type of LED flashing sequences that can occur, although by loading suitable pre-sets a song sequence could be carried out manually.

A note on the receivers

It is important to understand how the receivers work to explain what may be considered random behaviour under certain circumstances.

The receivers wake up for 1 minute after the battery isolating tab has been pulled out (and the LEDs flash once).

During this first minute if the receiver hears a valid transmission (a normal command to flash the LEDs, but excluding TEST) it will remain awake for up to 2 hours after which it will return to sleep mode unless other messages have been heard.

Sleep mode is intended to increase the life of the battery and wakes the receiver for about 80ms every 9 seconds. Therefore if a receiver hears a transmission during this time it may flash but not wake up fully or it may be woken depending on the message that it hears.

The correct sequence for “normal” operation is to send the WAKE command before operating the wristbands.

Step by step guide with the laptop computer

1. Connect USB cable to the interface
2. Start TeraTerm (or Hyperterminal etc.)
3. Power up transmitter
4. Ensure the correct COM port is selected and ensure the port settings are 9600, 8, N, 1 with Xon/Xoff handshaking.
5. If all has been set correctly on powering the transmitter a message “LED Band Controller ” should be seen.
6. Type help (and enter) – a menu list as on page 3 should be seen.
7. To wake up the receivers type Wake (and enter)
8. To load a script select from the menu bar “File”, then go down to “send file...”
9. Select the appropriate file and press open
10. Send file will send the message in stages and the script will start on the screen and gradually work through until then end
11. Although the message “Ctrl-C to abort” comes up this applies to typed in messages and not a loading script so if it is needed to stop close the program and restart

Transmitter system details

Operating frequency	909.2MHz
Modulation	Wide-band GFSK
Output power	+17dBm
Compliant with CFR47 part 15.247	

Input data	RS422 full duplex
Baud rate etc.	9600 bd, 8 data bits, No parity, 1 stop bit, Xon / Xoff handshaking

Power	8.5VDC input at up to 800mA
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