Xtreme Power Systems

XIO+
CHANNEL EXPANDER

Installation And Usage Manual

**Supports: XtremeLink® RFU and Nano receivers
Futaba SBUS and SBUS2 receivers
Spektrum DSM2/DSMX satellite receivers
JR DMSS X-BUS receivers in Mode A or Mode B**

Firmware v2.0

Manual v1.8

Revision Data: September 12, 2016

Introduction and Overview

Thank you for purchasing the X10+ Channel Expander (know as just *X10+* throughout this manual). This device uses a serial data link from several types of modern receivers, and drives up to 11 servo outputs. Dual receiver support is also possible driving up to 10 servo outputs. The X10+ monitors the input voltage and alerts you of a low power condition! Programmable input mode, channel mapping, failsafe mapping, failsafe time, failsafe override, and aux port functionality are all possible using the push button programming option. More advanced features including servo reversing, servo offsets (matching), and firmware upgrade are all possible using the XPS Serial Link USB device (sold separately).

Power to the X10+ can be provided through any of the servo ports, or through the heavy duty power input pads. Up to 12awg wires can be pushed through the holes in the pads and soldered. This provides the absolute best current supply for your servos. The X10+ runs from 1.8v to 16v, making it ideal for use with any power system. **WARNING!! THE INPUT VOLTAGE IS PASSED THROUGH ALL OF THE SERVO PORTS AND TO THE SERIAL RECEIVER CONNECTION! MAKE SURE YOUR SERVOS AND RECEIVER ARE RATED TO HANDLE THE INPUT VOLTAGE THAT YOU POWER THE X10+WITH!**

Installation Requirements

The installation of the X10+ is simple! Attached one end of a JR female to female cable (sold separately) to the X10+'s serial input, and the other end of the JR female to female cable to the serial output on your receiver. Now, just plug power into any open servo port, or through the high current inputs and you are ready to go!

Warranty Information

The X10+ Channel Expander carries a limited lifetime warranty. Units subject to improper installation (including reversed power), misuse, abuse, or unauthorized modifications will not be covered under this warranty.

Xtreme Power Systems may at its discretion either repair or replace the unit covered under warranty. The customer will pay all freight charges to and from Xtreme Power Systems. Xtreme Power Systems must be contacted to obtain a return authorization. Any product returned without authorization will be returned without repair or replacement.

Liability

You understand that by using this product, you agree to hold Xtreme Power Systems free from any type of liability either directly or indirectly while using this product.


Legal Information

The 'look and feel' and functionality of this product are protected by U.S. copyright laws. Various terminology and feature names may be protected under U.S. trademark laws.

XPS acknowledges that Futaba, Spektrum, Hitec, and other names used throughout this manual may be trademarks or registered trademarks of their respective companies. XtremeLink® is a registered trademark of Xtreme Power Systems.

SECTION 1 – X10+ INFORMATION

Board Details

The X10+ consists of a high speed computer with voltage monitoring capabilities, a push button switch, a multi-colored LED (known as just LED throughout this manual), 1 serial data stream input, and 11 servo plugs. 10 of the 11 servo plugs are dedicated to servo outputs. Output Ports are ordered 10 through 1 (left to right). The right most servo plug is the auxiliary port and can be either an 11th servo output (default), or and input for a second receiver to provide RF redundancy. The small push button switch has multiple functions, described throughout this manual. The LED is a "RGB" type, allowing for virtually any color to be displayed. Different colors and flashes are used to indicate different status and programming conditions. See Figure 1 for details.
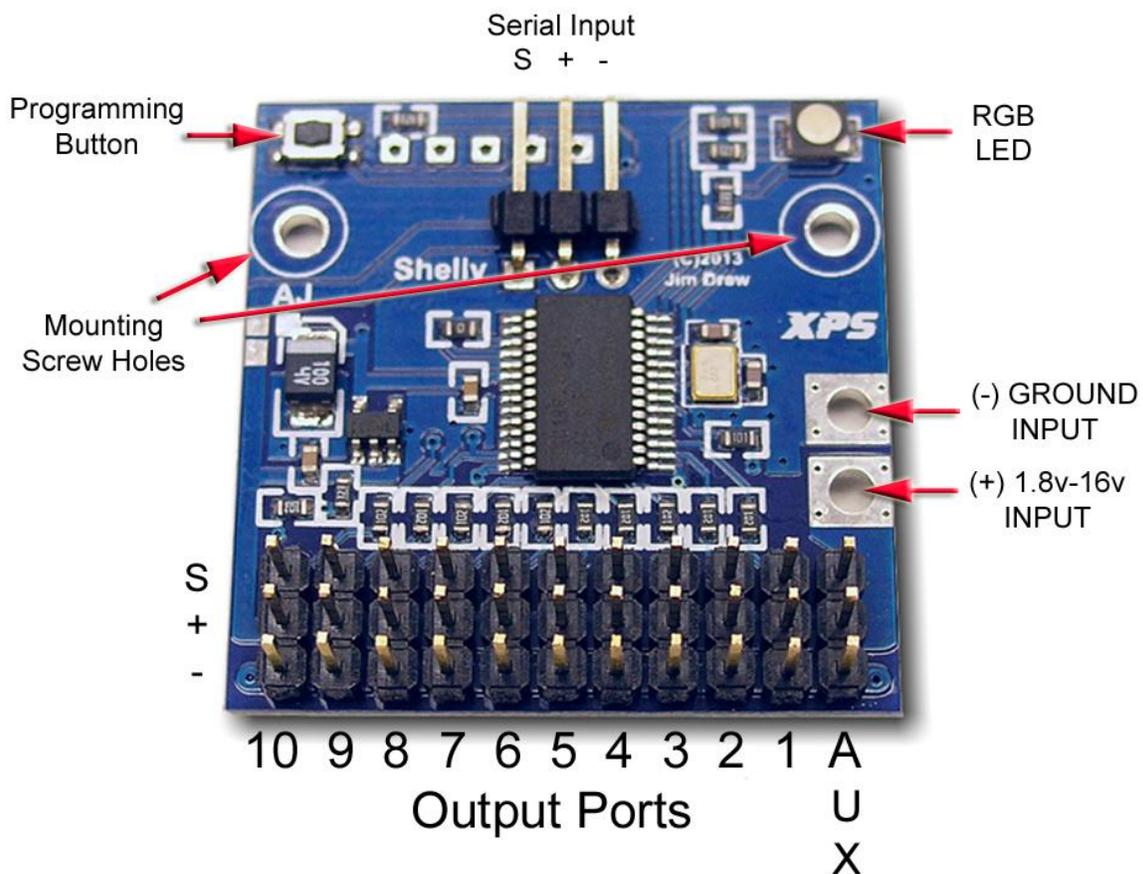
Figure 1 – 10+ details

Why No Case?

We asked our customers about making a case for this device, and the overwhelming response was they didn't think there was a need for one. At some point, we may make a case available, but that actually makes mounting the unit much more difficult.

Note that the top side of the board is covered with a conformal coating. This prevents moisture from causing problems with the electronics. So, it is normal for the board to look a bit glossy with possibly a wavy surface.

SECTION 2 – INSTALLATION

Powering the X10+

There are two ways to power the X10+. The first is by plugging power into **any** of the servo ports, just as you would with any standard receiver. Keep in mind that standard servo pins are only rated to 5A of current. This means that if you provide a single power input, then all of your servos will be sharing that same 5A current source. A single Hitec HS-55 servos draws about .75A while in a stalled condition. Now consider what larger servos draw and you can see that just a few servos can easily exceed the nominal current handling of just one servo port being used as the sole power input.

A simple trick to provide higher current when powering the X10+ from a power source (such as a ESC/BEC combination) is to use a special Y-cable. One end plugs into the ESC's throttle connection, and the other two ends are plugged into the X10+ with 1st connected to the Output Port for the throttle channel, and the 2nd connected to the last open Output Port on the X10+'s servo bus. Make sure to remove the signal wire from the 2nd connection, clipping it so that just + and – are being fed into the bus. This will double the current available for all of the servos.

The best way to power the X10+ is of course by using the available heavy duty power inputs! These input pads were designed to accept up to 12awg wires stuffed and soldered into the holes. Of course, any size wire will work but keep in mind the current requirements when selecting your wire size. You could have wires soldered to the X10+ coming out vertically or horizontally from the pads. To allow easy flat mounting of the X10+ with vertical wires, trim any excess wire as close to the circuit board as possible. See Figures 2 for details.

We always recommend to our customers to never use a switch in your power system. A switch is the most common failure point in an R/C system. Switches are mechanical devices and are prone to wearing out and becoming intermittently functional due to vibration. We recommend using EC3, EC5, 5mm bullet, Multiplex, Anderson Power Pole, or some other type of high current connectors between your X10+ and the power source as your "switch". Simply plugging in the connection powers up the system.

NOTE!   WHEN SOLDERING WIRES FOR POWER, PAY CLOSE ATTENTION TO THE POLARITY! REVERSING POLARITY CAN NOT ONLY DAMAGE THE X10+, IT CAN DESTROY RECEIVERS AND SERVOS!
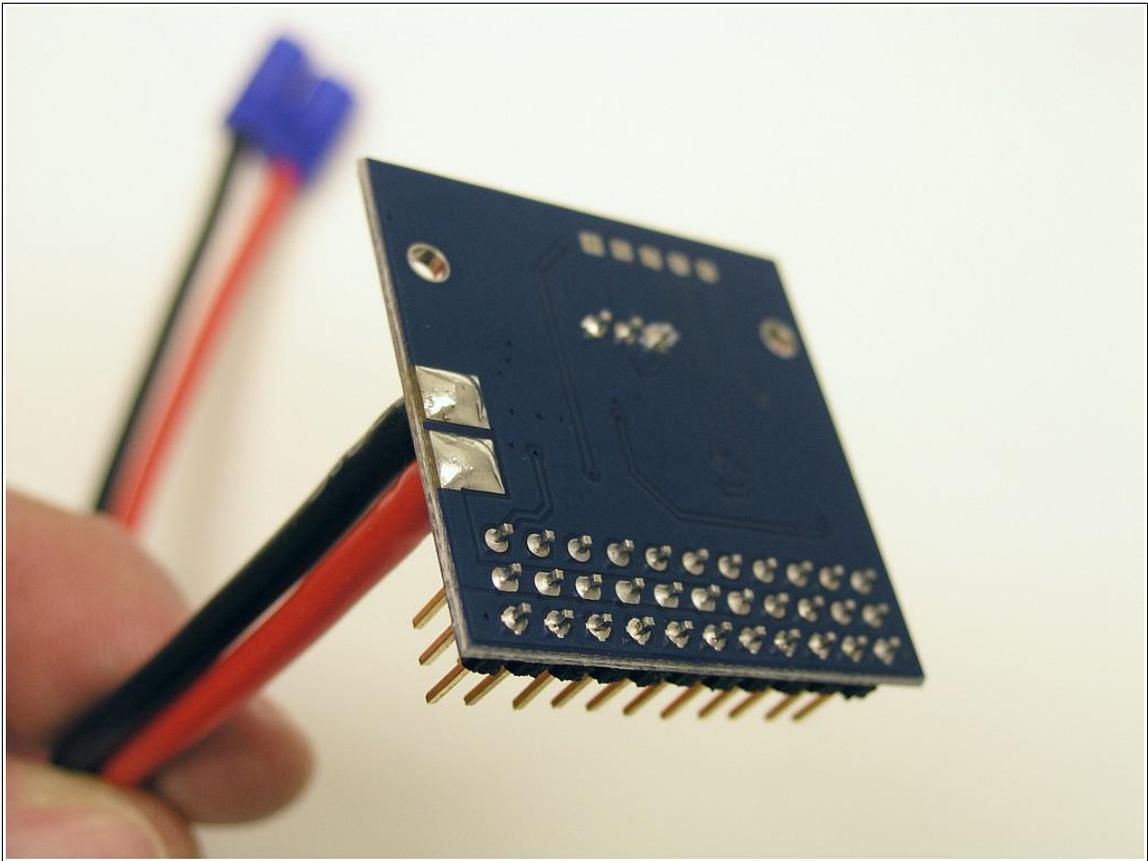
Figure 2 – Wires soldered and trimmed close to the board

Mounting the X10+

There are two holes provided in the X10+ board for mounting screws. The mounting holes will accommodate standard servo mounting screws with a flanged base. You could also use appropriately sized washers with a normal screw. If you are going to mount the X10+ using the two screws, you must use the spacers (provided with your X10+) underneath each screw hole. This prevents damage to the board when tightening the screws. Place the X10+ in the location you want to mount it and then mark and drill holes for the screws. Put a drop of CA in each screw hole to stiffen the wood. Place a spacer over each of the holes. See Figure 3 for details. Place the X10+ board over the spacers, insert the mounting screws and tighten the screws. You could also use Velcro or double-sided tape to mount the X10+, but make sure there is sufficient holding force so that the X10+ does not move around or come loose. If the X10+ makes contact with anything metal, a short circuit can result!
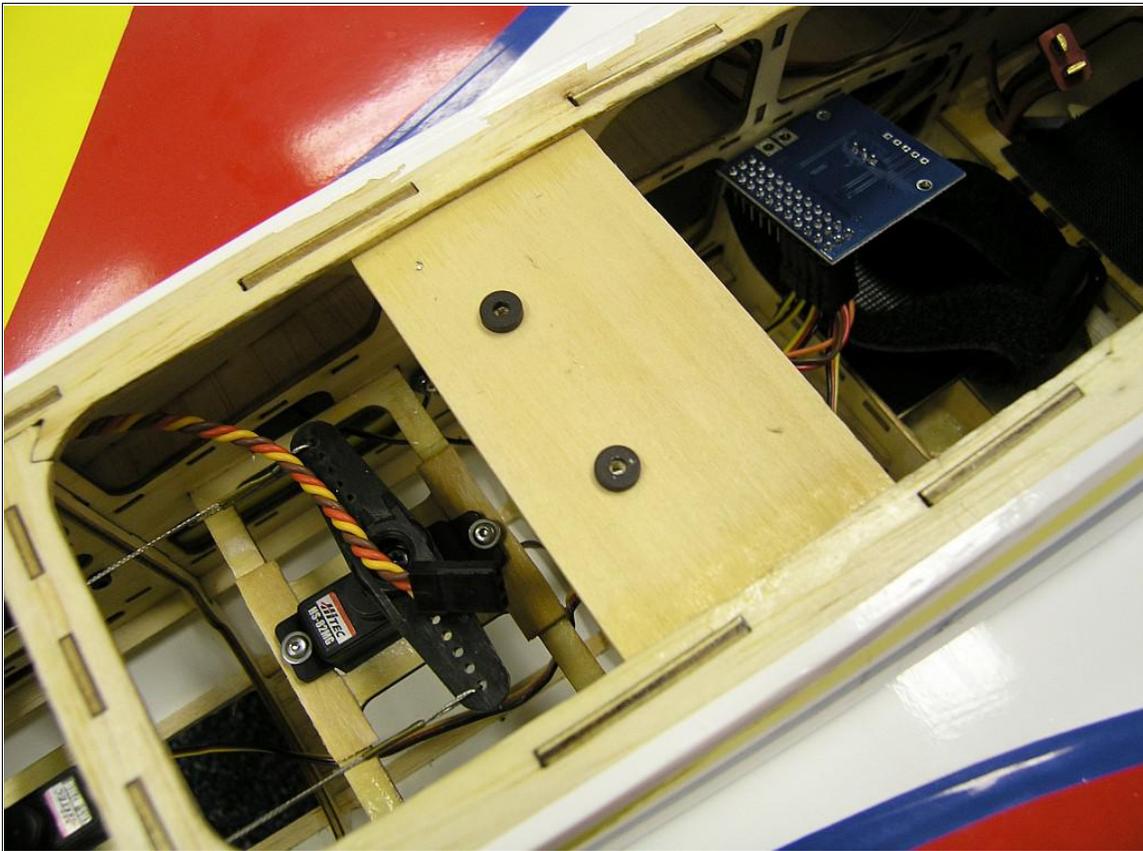
Figure 3 – Required spacers

Connecting the X10+

The X10+ requires a serial data stream for it's information. This can be supplied from an XtremeLink® Nano, Nano II, or RFU, any Futaba SBUS or compatible receiver, any Spektrum or compatible satellite receiver, any JR DMSS XBUS receiver, or a PPM data stream. The connection between any of these receivers and the X10+ requires a JR female to female type cable. This is different from a standard servo extension that has both male and female connectors.

Plug one end of the JR female to female cable into the X10+'s serial port. Note the polarity of the connection. Reversing the connection may damage the X10+ and/or receiver. Plug the other end of the JR female to female cable into the receiver's serial data port (see the receiver manufacturer's documentation for details on where this port is located).

Plug your servos into the X10+. Note the polarity of the servos. The negative (-) lead will be nearest to the edge of the X10+ board. Note: any type of servo can be used with the X10+. SBUS servos are not required, even though you might be using a SBUS receiver. See Figure 4 for a typical setup using power supplied through a ESC. The Output Ports shown in Figure 1 are the same as your transmitter's channels 1 through 11, unless changed using the channel mapping feature.

WARNING!! IT IS POSSIBLE TO APPLY POWER BACKWARDS TO THE X10+ AND HAVE IT POWER UP AND APPEAR TO WORK. ANY USE WITH THE POWER PLUGGED IN BACKWARDS WILL DAMAGE THE X10+, AND WILL LIKELY DAMAGE ANY RECEIVER OR SERVOS CONNECTED! MAKE SURE YOUR POWER POLARITY IS CORRECT!

Power being applied to the X10+ is passed to the servos and to the receiver. MAKE SURE that your servos and receiver can handle the input voltage! If you intend to power the X10+ with a 2S Lipo setup, make sure that the receiver is a 'HV' type. Most receivers have a maximum input voltage of 6 volts. Please consult the information included with your receiver to check the maximum input voltage.   All XPS receivers have a maximum input voltage of 16v-25v, depending on the model.   Likewise, there are many types of servos that can not handle more than a 5 volt input voltage, so please check to make sure your servos will work with the input voltage you intend to use! DON'T EXPERIMENT! What appears to work initially could fail if you are exceeding the manufacturer's specifications!

Making sure your transmitter is OFF, apply power to the X10+ and check to see that the LED flashes bright red. It should be extremely bright. If not, check to see if the power is plugged in backwards (which would result in a 'normal' brightness LED flashing). The receiver's power LED (if present) should also light up.
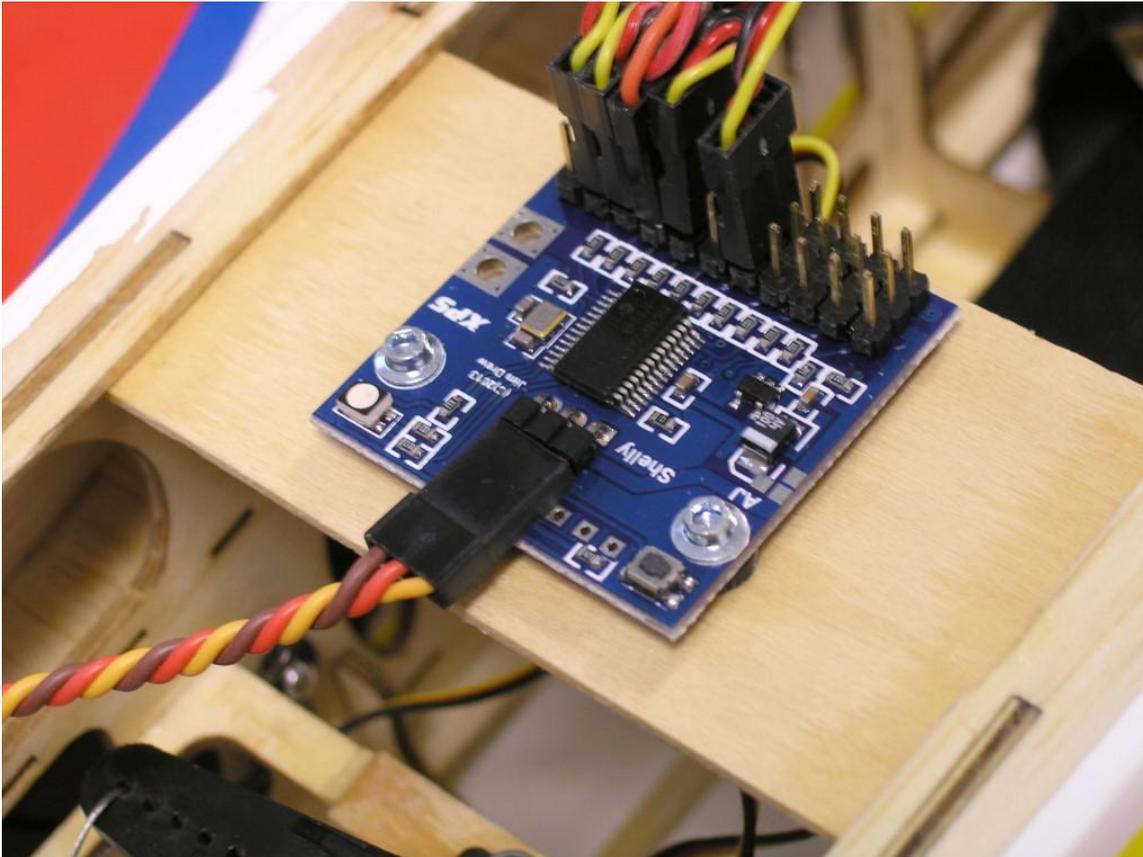
Figure 4 – Typical installation with ESC power

SECTION 3 – USAGE

General Information

Enable power to the X10+. The LED will flash bright red. At this point you can enter push button programming mode by pressing and holding the programming button until the LED turns solid red. See Section 4 for programming options. To exit programming mode, you must power off the X10+.

When the LED is flashing red, the X10+ is waiting for a serial signal to appear at its serial port(s). Turning on your transmitter will make the receiver connect, and the LED on the X10+ will change to a solid green (connected). The LED will always be solid green until powered off unless there is a problem with the system.

If the LED 'flickers' green, there is frame loss (signal loss) occurring. You can demonstrate this by switching off your transmitter after it has been connected to the receiver. The LED will flicker green and then after the failsafe timeout time (default of 2 seconds), the LED will turn solid red. Solid red means that the system is in failsafe mode. Turning on the transmitter will restore signal and the LED will turn green again. When an XtremeLink® receiver loses power after connection with the transmitter, the X10+'s LED will slowly flash to let know a reboot has occurred.

Voltage Monitoring

The X10+ will monitor voltages between 3.50v and 16.0v. When voltage drops to predefined thresholds, the LED color will change. The LED color will hold that color (indicating the lowest drop in voltage) until the voltage monitor is deliberately reset by briefly pressing and releasing the X10+'s push button, or removing the power to the X10+. The threshold levels and the corresponding colors are as follows:

LED COLOR	VOLTAGE THRESHOLD
Green	4.51v – 16.0v
Yellow	4.01v – 4.50v
Blue	3.51v – 4.00v
Purple	<---- 3.50v

NOTE: If the input voltage drops to 4.50v (or lower) causing the LED to change from green to any other color, then you do in fact have a power problem with your system... no exceptions! Do NOT ignore this warning! This device does not lie! Many 2.4GHz systems do not tolerate low voltage conditions well, resulting in brown outs and reboots. Please resolve any voltage issues you might have before attempting to operate your radio controlled device!

Failsafe Configuration

The X10+ always controls the failsafe when there is a loss of signal in the connection between the receiver to the X10+. The X10+ can also control the failsafe when there is a loss of signal between the receiver and the transmitter. This is called 'failsafe override', and is turned ON by default. It is possible to turn the failsafe override OFF and have the receiver control what happens during a failsafe condition. Unless you are using a XtremeLink® receiver, it is not recommended to disable failsafe override.

Futaba and Spektrum users: for the first time you can have the ability to set a different failsafe function for every single channel. Failsafe for each channel can make the servos HOLD last position, move to a USER DEFINED position, or even turn OFF the servo output pulse (something required by many auto pilots and flight stabilizers to indicate a failsafe has occurred).

The default mode for all channels is USER DEFINED. However, until the positions are actually defined (using our exclusive *Live Active Failsafe)*, servos will HOLD their last position when a failsafe occurs. The Live Active Failsafe allows you to set the positions of the servos while the transmitter and receiver are connected, allowing you to physically see and move the surfaces to positions you want them to be at should a failsafe occur.

To set the failsafe positions (Live Active Failsafe), make sure that you can move the servos with your transmitter and then press and hold the programming button on the X10+ until the LED turns off and then starts flashing alternately red and green, and then release the button. The LED will continue to alternately flash red and green for approximately 7 seconds. During this time, use your transmitter to move the servos to where you want them to be when during a failsafe condition. When the LED stops flashing and returns back to solid green, the positions are locked into memory and the failsafe positions are permanently stored. Only repeating this procedure or performing a factory reset will change the failsafe position settings.

Serial Link Mode

The X10+ can be programmed using a computer (Windows 95 through Windows 10 is supported) with the XPS Serial Link USB device and software. The Serial Link is not included with the X10+. It can be ordered from XPS. In order to use the Serial Link, the X10+ must be put into a special mode, with the Serial Link's cable connected to the X10+'s serial port (in place of normal receiver connection). To put the X10+ into Serial Link programming mode, press and HOLD the programming button and then apply power to the X10+ until the LED turns solid yellow, and then release the programming button. The X10+ is ready for Serial Link programming.

Factory Reset

The X10+'s various settings can be reset to the factory defaults. This is handy when you have made a lot of changes and want to start over or when moving the X10+ to a new model. To cause a factory reset, press and HOLD the programming button and then apply power to the X10+. The LED will turn solid yellow, but do not release the programming button until the LED starts flashing red. Once the LED is done flashing red, remove the power. The reset has been performed.
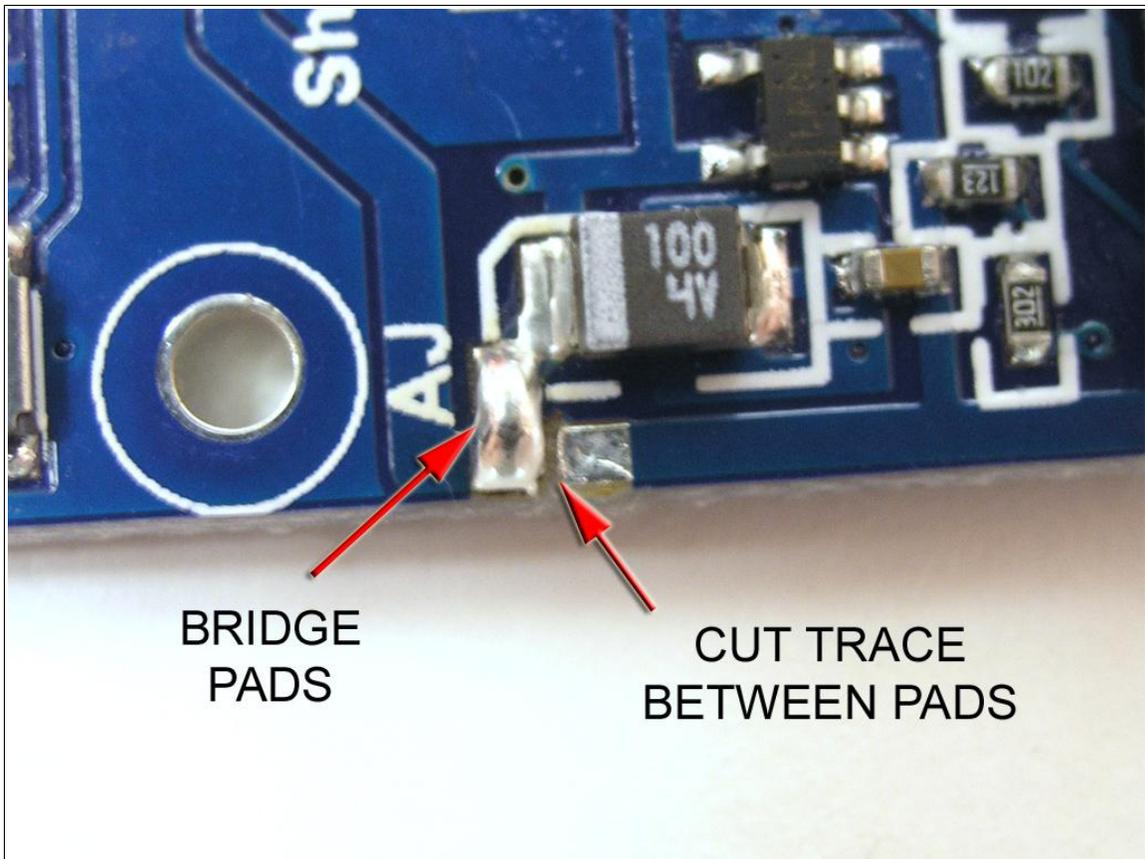
Spektrum Satellite Usage

The X10+ can power a **single** Spektrum (and compatible) satellite receiver at 3.3v by making a simple change the X10+ circuit board. Cutting a trace between two pads, and soldering a bridge between two pads is all that is required. When this modification is made to the X10+, the serial port will output +3.3v instead of the voltage that is on the X10+'s servo bus. This flexibility eliminates the need for a special adapter cable between the X10+ and the Spektrum receiver to convert the voltage from +5v to 3.3v. See Figure 5 for details. This process is reversible by de-soldering the added bridge and re-bridging the pads on each side of the cut trace. You <u>must</u> reverse this modification before the Serial Link programmer is used, or damage to the X10+ can occur!

XPS sells a power adapter that allows you to plug a satellite receiver into either the main or AUX port without having to modify your X10+ board.

NOTE: If you are using dual receivers, you MUST use a 5v to 3.3v adapter for the receiver plugged into the AUX port. There is no way to change the voltage on this port.

You can put the Spektrum receiver(s) into its binding mode using a special procedure. To put the Spektrum receiver(s) into binding mode, press and HOLD the programming button and then apply power to the X10+. If any Spektrum receivers are connected to the X10+, they will enter binding mode.   After binding with the transmitter has been completed, power off the X10+ and the transmitter. They are then ready to use. Note that you can choose which type of binding method is used (see Function 7 in the Programming Options for details).

Figure 5 – Spektrum satellite receiver power modification

SECTION 4 – PROGRAMMING OPTIONS

There are 7 programming options available. To enter programming mode, apply power to the X10+ and wait for the LED to start flashing red. Now, press and hold the push button until the LED turns off, and then turns solid red. The X10+ is now in push button programming mode.

Briefly pressing and releasing the push button will change the color of the LED. The color of the LED and its associated function are listed below:

LED COLOR	PROGRAMMING MODE
Red	1 - Set Input Mode
Green	2 - Set Channel Map
Yellow	3 - Set Failsafe Map
Blue	4 - Set Failsafe Timeout
Purple	5 - Set Failsafe Override
Teal	6 - Set Aux Port
White	7 - Set Spektrum bind mode

Press and release the push button until you have selected the color (function) you want to change.

FUNCTION 1 – SET INPUT MODE

Range: 1 to 8 (Default: 1)

The X10+ needs to know what type of serial data it is suppose to be using. With the LED solid red (programming mode 1), press and hold the push button for ~2 seconds (until the LED turns OFF), and then immediately release the push button. The LED will now flash green the number of times equal to the current Input Mode (for example, 2 flashes is equal to Futaba SBUS Input Mode).

After the green flashing stops you have five seconds to change the Input Mode. Press and release the programming button the number of times equal to the new Input Mode you want.

With every press and release of the push button, the LED will turn red so you can visually see when the button press is detected.

If you do not press the push button within five seconds, or if the value you enter exceeds what is allowed, the LED will alternately flash red and blue (error condition occurred) and no change will be made.

If you do make a change, the LED will blink green/red/blue in rapid succession to let you know that the change was successful.

The table below shows the possible serial inputs that the X10+ understands and can use.

SERIAL INPUT MODE	DATA TYPE
1 FLASH	1 - Xtreme (Fast)
2 FLASHES	2 - Futaba SBUS
3 FLASHES	3 - Spektrum Satellite
4 FLASHES	4 – XBUS (Mode A)
5 FLASHES	5 – XBUS (Mode B)
6 FLASHES	6 – Xtreme (Slow)
7 FLASHES	7 – Graupner HoTT/SUMD
8 FLASHES	8 – Futaba SBUS (inverted polarity on primary input only, AUX input requires normal polarity SBUS input)

FUNCTION 2 - SET CHANNEL MAP

Range: 1 to 11

Channel mapping is a handy feature when you have a transmitter with limited functionality, you just want assign channels to different output pins to make wire routing neater, or if you need to duplicate channels. The default channel map is 1:1. This means that Output Port 1 will be controlling the servo assigned to the transmitter's channel 1 function. Think of this as setting each Output Port to whatever transmitter channel you want to appear on that port. One common use for this feature is assigning two throttle outputs. Instead of using a "Y-cable" to tie the servo outputs together (which is something that is not recommended for digital servos), you can just assign two throttle outputs. You could use the normal throttle channel (channel 1 for most JR) for Output Port 1, and also assign channel 1 to be on some other Output Port, like Output Port 10. There is no limit to what channel is assigned to which Output Port. You could make all Output Ports be channel 5 if you wanted to! The outputs occur at the exact same time, completely eliminating any type of "lag" that is common when using individual channels for duplicating outputs. The last thing you want are controls with any amount of latency between their movements!

With the LED solid green (programming mode 2), press and hold the push button for ~2 seconds (until the LED turns OFF), and then immediately release the push button. This enters channel mapping mode.

The LED will now flash yellow the number of times equal to the current channel map position (the Output Port number), followed by a one second pause. Every time you press and release the programming button, the channel map position will advance by one. The channel map position begins at 1 (one flash) and ends with 11 (eleven flashes). **Remember, the channel map position represents the Output Port number - <u>not</u> the actual transmitter channel. Refer to Figure 1 for the Output Port locations.**

To change the channel number associated with the currently selected Output Port, press and hold the programming button until the LED turns off and begins flashing green. The LED will flash green the number of times equal to the transmitter channel number assigned to that Output Port. For example, the default value for Output Port 1 is channel 1, so there would be just one green flash. If there were 3 green flashes for Output Port 1, it would mean that Output Port 1 has been mapped to the transmitter's channel 3.
After the LED is done flashing green, you have five seconds to enter a new channel number value.

You do this by pressing and releasing the programming button the number of times equal to the channel number you want that Output Port to be. NOTE - It is possible to set the channel number to be any value from 1 to 16. This allows you to assign a channel number higher than the number of outputs on the X10+ (11 total). If you were using dual X10+'s in your aircraft, you could setup the channel mapping to have all 16 channels available between the two X10+'s.

If you do not press the programming button within five seconds, or if the value you enter exceeds what is allowed, the LED will alternately flash red and blue (error condition occurred) and no change will be made. At this point, you are back at the channel map position selection (LED flashing yellow the current Output Port) and you can try changing the channel number again, or advance to the next Output Port. There is no way to get back to the programming mode start with this feature other than by powering off the X10+ and re-entering the programming mode again.

If you do make a change, the LED will blink green/red/blue in rapid succession to let you know that the change was successful.

FUNCTION 3 - SET FAILSAFE MAP

Range: 1 to 16

It is possible to set the failsafe control for each channel individually. In the event of a failsafe you can set each channel to either HOLD last position, go to a USER DEFINED position, or turn OFF the channel output completely. NOTE - The default for ALL outputs is USED DEFINED position. The reason why **channels** and <u>not</u> Output Ports are changed with this programming option is that you want all Output Ports associated with the same channel to perform the same failsafe function. If your failsafe was low throttle and you had two engines with two throttle outputs mapped to the throttle channel, you definitely want both of those Output Ports reacting the same! If you needed the throttle failsafes to react differently, then you would need to setup your transmitter to use two separate channels.

With the LED solid yellow (programming mode 3), press and hold the push button for ~2 seconds (until the LED turns OFF), and then immediately release the push button. This enters failsafe mapping mode.

The LED will now flash yellow the number of times equal to the current channel number, followed by a one second pause. Every time you press and release the programming button, the channel number will advance by one. The failsafe map position begins at channel 1 (one flash) and ends with 16 (sixteen flashes).

To change the failsafe control for that channel number, press and hold the programming button until the LED turns off and begins to flash green. The LED will flash either one time (HOLD), two times (USER DEFINED), or three times (OFF). After the LED is done flashing green, you have five seconds to enter a new failsafe control value. You do this by pressing and releasing the programming button either one time for **hold last position,** two times for **user defined position**, or three times for **channel off**.

If you do not press the programming button within five seconds, or if the value you enter exceeds what is allowed, the LED will alternately flash red and blue (error condition occurred) and no change will be made. At this point, you are back at the failsafe map position where you can advance to the next channel. There is no way to get back to the programming mode start with this feature other than by powering off the X10+ and re-entering the programming mode.

If you do make a change, the LED will blink green/red/blue in rapid succession to let you know that the change was successful.

FUNCTION 4 - SET FAILSAFE TIMEOUT

Range: 1 to 5 seconds (Default: 2)

A failsafe condition occurs when either no data or invalid data is received by the X10+ for some period of time. This time can be set from one to five seconds.

With the LED blue (programming mode 4), press and hold the programming button until the LED turns off. The LED will now flash green the number of times equal to the current failsafe time (in seconds). For example, if the failsafe time is set to two the LED will flash two times, indicating a failsafe period of two seconds.

After the flashing stops you have five seconds to change the failsafe time. To change the failsafe time, press and release the programming button one time for each second you would like the failsafe time to be. For example, if you wanted the failsafe time to be 1 second, you would press and release the programming button once. If you wanted the failsafe time to be 3 seconds, you would press and release the button 3 times.

If you do not press the programming button within 5 seconds, or if the value you enter exceeds what is allowed, the LED will alternately flash red and blue (error condition occurred) and no change will be made. At this point, you are back at the programming mode start.

If you do make a change, the LED will blink green/red/blue in rapid succession to let you know that the change was successful.

FUNCTION 5 - SET FAILSAFE OVERRIDE

Range: 1 or 2 (Default: 2)

If there is a loss of signal between the X10+ and the receiver, the X10+ will enter its failsafe routine. This means that the LED will flicker green until the failsafe timeout has expired, at which point the LED will turn red and the system will enter failsafe mode.

By default, if there is a loss of data between the receiver and the transmitter, the X10+ will handle the failsafe function just like there was a loss of signal between the X10+ and the receiver.

There might be some cases where you want the receiver to handle the failsafe condition, passing the channel outputs to the X10+ like normal channel data – even though there is a failsafe condition occurring.

With the LED purple (programming mode 5), press and hold the programming button until the LED turns off. The LED will now flash green the number of times equal to the current failsafe override value (either one or two flashes).

After the flashing stops you have five seconds to change the failsafe override value. To change the failsafe override value, press and release the programming button either one time for disabling the failsafe override, or two times to enable the failsafe override.

If you do not press the programming button within 5 seconds, or if the value you enter exceeds what is allowed, the LED will alternately flash red and blue (error condition occurred) and no change will be made. At this point, you are back at the programming mode start.

If you do make a change, the LED will blink green/red/blue in rapid succession to let you know that the change was successful.

FUNCTION 6 - SET AUX PORT

Range: 1-2 (Default: 1)

Refer to Figure 1 and locate the Output Port labeled AUX. This port can be either an extra servo output (default), or an input for a second (redundant) receiver.

With the LED teal (programming mode 6), press and hold the programming button until the LED turns off. The LED will now flash green the number of times equal to the current AUX port value.

After the flashing stops you have five seconds to change the failsafe override value. To change the AUX port value, press and release the programming button the number of times you want to set the AUX port function to, once for Output Port 11, or two times for redundant receiver.

If you do not press the programming button within 5 seconds, or if the value you enter exceeds what is allowed, the LED will alternately flash red and blue (error condition occurred) and no change will be made. At this point, you are back at the programming mode start.

If you do make a change, the LED will blink green/red/blue in rapid succession to let you know that the change was successful.

Plugging a 2nd receiver into the aux port gives you receiver redundancy. Please consult the manual for your radio system on information about binding two receivers to be used together.

FUNCTION 7 - SET SPEKTRUM BIND MODE

Range: 1-4 (Default: 4)

If you have set the Input Mode to 3 flashes (Spektrum), you will need to use a satellite receiver that has been bound to a transmitter. This can be done either by using a Spektrum main receiver connected to the satellite receiver and doing the normal binding process, or by initiating the binding process for the satellite receiver using the X10+ itself (as described in Section 3).

There are 4 different possible modes that can be used for binding the satellite receiver from the X10+. The table below represents the different binding modes that are available. Note that some modes are not available with all Spektrum transmitters.

BINDING MODE	BINDING DATA
1 FLASH	1 – DSM2/22ms
2 FLASHES	2 – DSM2/11ms
3 FLASHES	3 – DSMX/22ms
4 FLASHES	4 – DSMX/11ms

With the LED white (programming mode 7), press and hold the programming button until the LED turns off. The LED will now flash green the number of times equal to the current binding mode value.

After the flashing stops you have five seconds to change the binding mode value. To change the binding mode value, press and release the programming button one time the number of times equal to the binding mode you want to select. For example, if you wanted the binding mode to be DSM2/11ms, you would press and release the programming button two times.

If you do not press the programming button within 5 seconds, or if the value you enter exceeds what is allowed, the LED will alternately flash red and blue (error condition occurred) and no change will be made. At this point, you are back at the programming mode start.

If you do make a change, the LED will blink green/red/blue in rapid succession to let you know that the change was successful.