



Falcon Controllers

www.PixelController.com

F-TEST

PIXEL TESTER/DATA ANALYZER OWNERS MANUAL



The F-Test is a small, handheld all-purpose tester/analyzer to help troubleshoot and diagnose problems in animated lighting shows. The F-Test can help you isolate the problem to a specific component by being able to not only send test data to pixels, receivers, etc. but to also analyze incoming WS281x, Differential data, DMX and other common data types used in animated lighting shows.

There are many more things this hardware is capable of but has not been included in the first release because we are unsure of demand for those features. If you have something that you would like to have the tester do and we get enough support for the idea (or it is trivial to implement) then it may well be included in a firmware update. Please visit <https://github.com/Pixelcontroller/f-test/issues> to lodge your request.

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Introduction

With the F-Test you can:

- Test Pixels- up to 1400.
- Send test data to Differential Receivers (Smart/Dumb Remotes typically Falcon, FPP, Genius, HinksPix and compatible receivers)
- Send test data to DMX devices
- Send test data to Renard/Basic LOR devices (Renard devices require an adapter cable, refer to the [Reference](#) section of F-Test)
- Evaluate and monitor the differential data coming from a “Long Range” type controller (Falcon, FPP, Genius, HinksPix, Advatek, some Alphapix and other compatible type controllers)
- Evaluate and monitor incoming WS281x and compatible pixel data.
- Evaluate and monitor incoming DMX, Renard, and basic LOR data.
- Save log info to an SD card for more detailed analysis or to review trend data.

The F-Test has a visual display that can show relevant data such as:

- Line Voltage on pixel lines
- Line Amperage on pixel lines
- Connected Pixel counts
- DMX/Renard/LOR values for all 512 channels
- Frame rate and number of pixels that data is received.
- Graphical representation of pixel data received to include the colors.
- Basic oscilloscope to evaluate data signals and voltage differences on the data line.
- Common wiring diagram for Ray Wu and xConnect pigtailed.
- Adapter Cable wiring diagrams.

When the F-Test is connected with both Pixel input data and to pixel strings, it will act as an F-Amp and clean the signal. This can be useful to determine if an F-Amp would help in your situation.

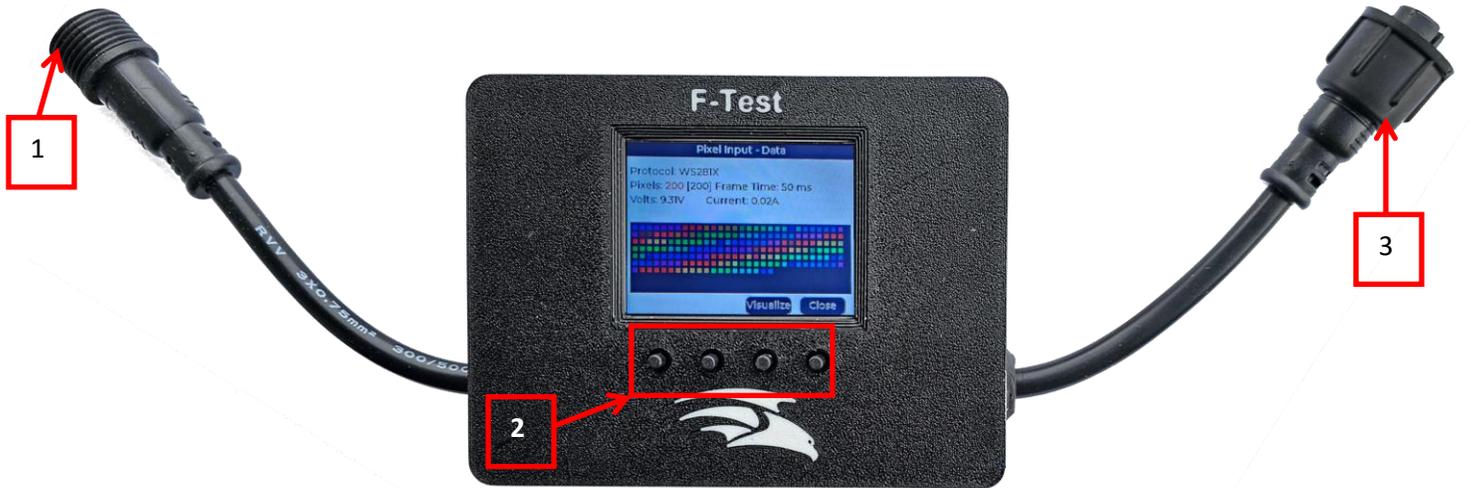
Note: This does not apply when you are in the Pixel Output mode.

F-Test Modes

The F-Test has two operational modes, a Testing Mode to output test patterns and a Monitoring Mode to evaluate incoming data signals.

F-Test Overview

Front View



1. xConnect Pixel Data Input
2. Navigation Buttons (function will vary depending on the active screen)
3. xConnect Pixel Data output

Back View



Side One



1. USB Power jack. The F-Test requires some sort of power. If connected to an energized pixel string, this will supply the power needed. If you do not have an energized pixel string connected to the F-Test, then you can supply power through the USB port.

Side Two



1. Smart Remote Input port. This port is used to monitor the Smart Remote data that a controller is sending to the remote receivers. If using HinksPix controllers, you will need an adapter cable, refer to the [References](#) section.
2. DMX Input Port. This port is used to monitor DMX Signals that a controller is sending to your DMX devices. If using Renard controllers, you will need an adapter cable, refer to the [References](#) section.

Side Three



1. Micro SD Card slot. This is used for firmware updates when needed and for logging if selected.

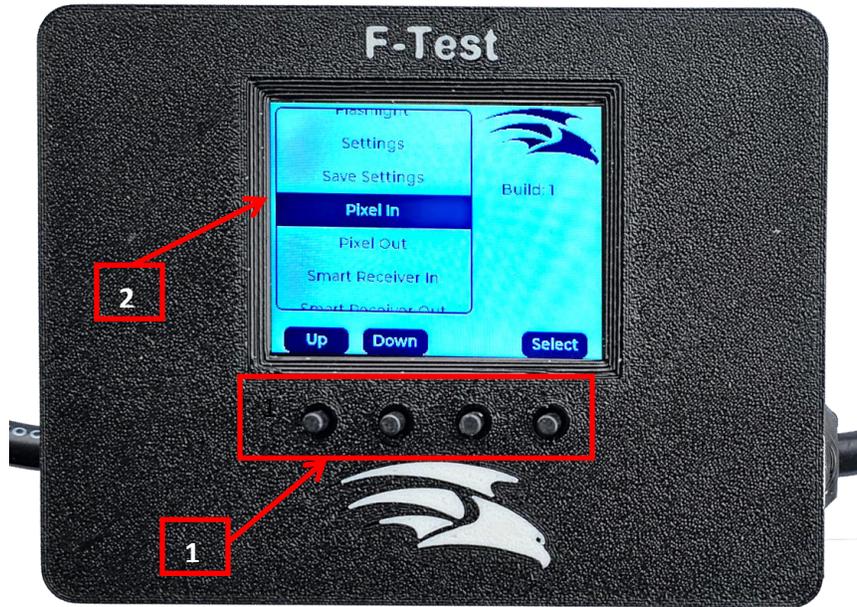
Side Four



1. Smart Remote Output port. This port is used to output Smart Remote data to Smart Remote to see if they are functioning correctly. If using HinksPix receivers, you will need an adapter cable, refer to the [References](#) section.
2. DMX Input Port. This port is used to output DMX Signals to test your DMX devices. If using Renard controllers, you will need an adapter cable, refer to the [References](#) section.

Main Menu

When the F-Test is powered on, it will boot up to the Main Menu unless you have configured it to default to another menu Item



1. Navigation Buttons- These buttons are used to navigate through the different menu items. The function of each button is labeled above the button. The up and down buttons will scroll through all of the different menu items. Pressing the Select button will take you to the Highlighted option.
2. Main Menu. This is a listing of all of the sub menu items. The Main Menu consists of the following sub menus:
 - Settings
 - Save Settings
 - Pixel In
 - Pixel Out
 - Smart Receiver In
 - Smart Receiver Out
 - DMX In
 - DMX Out
 - Reference
 - Flashlight

Settings Page

The settings page is used to configure your F-Test.



Pressing the Up and Down buttons will navigate through the available options in the highlighted menu item. The Next button will move the highlighted selection to the next item in the Menu. The close button will take you back to the Main Menu.

The F-Test has the following settings:

- Startup - This is the default mode you want the tester to enter when you power it on. If you always use your tester for one purpose then set it here. Your options are:
 - Pixel In
 - Pixel Out
 - Smart Receiver In
 - Smart Receiver Out
 - DMX In
 - DMX Out
- Frame - This is where you select whether the tester should display frame times in Milliseconds or Frames Per Second ... e.g. 50ms or 20fps
- Logging - In input modes when an SD card is inserted, the tester can log data to a CSV file on the SD card. This options are:
 - Off- turns the logging off
 - Summary. This typically logs things like voltages, current and average brightness only
 - Detail level. This also logs all the pixel data being received.
- Effect - This allows you to choose the effect which is used when outputting pixel data using the effect test mode. (See the [Pixel Output section](#)). The options are:
 - Twinkle
 - Twinkle Random
 - Twinkle Fade
 - Twinkle Fade Random
 - Sparkle
 - Flash Sparkle
 - Hyper Sparkle
 - Strobe
 - Strobe Rainbow

- Multi Strobe
 - Blink Rainbow
 - Chase White
 - Chase Color
 - Chase Random
 - Chase Rainbow
 - Chase Flash
 - Chase Flash Random
 - Chase Rainbow White
 - Chase Blackout
 - Chase Blackout Rainbow
 - Color Sweep Random
 - Running Color
 - Running Red Blue
 - Running Random
 - Larson Scanner
 - Comet
 - Fireworks
 - Fireworks Random
 - Merry Christmas
 - Fire Flicker
 - Fire Flicker Soft
 - Fire Flicker Intense
 - Circus Combustus
 - Halloween
 - Bicolor chase
 - Tricolor Chase
 - TwinkleFox
 - Static
 - Blink
 - Breath
 - Color Wipe
 - Color Wipe Inverse
 - Color Wipe Reverse
 - Color Wipe Reverse Inverse
 - Color Wipe Random
 - Random Color
 - Single Dynamic
 - Multi Dynamic
 - Rainbow
 - Rainbow Cycle
 - Scan
 - Dual Scan
 - Fade
 - Theater Chase
 - Theater Chase Rainbow
 - Running Lights
- Palette - Some effects use a color from the palette and this option allows you to select that palette of colors.
 - Brightness Floor - This is the minimum brightness colors should display at on the UI. By setting this you ensure when non-zero colors are at least displayed as this value. This is necessary because the LCD screen can be very

dim for dark colors along with not being a full 24 bit color screen (its 16 bit). Typically a value around 50 gives the best results.

Note: After you make changes to the Settings, you need to close this menu and then select the Save Settings option in the Main Menu in order for your settings to be saved.

Save Settings Page

When you save your settings, F-Test does not just save the settings on the settings page, it also saves all the settings on all the pages to be the default settings when those pages open. For example ... if you want to set a default test pattern when testing pixels then go to pixel out, choose your test pattern then go back and select save settings. Next time you start the F-Test and open pixel out that will be the initial test mode.

Testing Modes

Pixel Out

The Pixel Out page is used to output data to pixels connected to the Pixel Output cable. This is useful for testing pixels or displaying a selected pattern. It will also count the number of functioning pixels that are connected. Only WS2811 and compatible pixels are supported at this time. There is limited support for 4 channel versions of these pixels with some test patterns working with them.

Note: You have to supply sufficient power (~5V to ~24V) through the Pixel Input cable that is appropriate for the pixels being tested. This can be via an energized pixel cable, an appropriate power supply connected to the Pixel Input or sufficiently sized battery connected to the Pixel Input.



Pressing the Up and Down buttons will navigate through the available options in the highlighted menu item. The Next button will move the highlighted selection to the next item in the Menu. The close button will take you back to the Main Menu.

When you first enter the pixel output page the tester will attempt to count the number of pixels attached to the output. It does this by turning on select pixels and measuring the current draw. It will perform the test several times to ensure

the count is accurate. This only works if the pixels being tested have no power injection. If you have power injection your results will be much more problematic (if you are “power balancing” where you are just connecting the power that is coming into the prop to other sections of the prop, it will work. In other words, all of the power has to be passing through the F-Test).

If the F-Test is receiving data while in this mode, the tester will suppress that pixel data and override it with the selected test pattern. When outputting data, the tester sends data for the number of pixels you configured in the Pixel Output page, regardless of how many are attached. There is limited support for 4 channel versions of these pixels with some test patterns working with them.

Note: The F-Test assumes the pixels are in RGB color order. If your color order is different it will still work but the colors will vary.

The screen displays the following data:

- Protocol- This displays the protocol that the F-Test will output for the pixel testing. At this point only WS281x is available. Future firmware updates might include more options.
- Pixel Count- This displays the number of pixels that the F-Test has detected when this page was opened.
- Volts- This displays the voltage present on the power input line.
- Current- This displays the current draw that the attached pixels are using.
- Pattern- This item allows you to select what output test pattern you want to use.
- Brightness- This item allows you to select what output brightness you want to use for your test patterns.
- Count- You can configure how many pixels you want to output up to 1400. If you are using shorter strings this can make some patterns display better.

You can select the test pattern that the F-Test will output from these options:

- Alternate- Lights up alternate channels. On RGB pixels this results in alternating Green/Magenta pixels.
- RGB- Lights all pixels up red, green then blue.
- RGBW- Lights all pixels up red, green, blue then white.
- RGBWB- Lights all pixels up red, green, blue, white then black.
- Red Ramp- Ramps the pixels from black to fully red then back down again over a couple of seconds – great for verifying color order.
- Green Ramp- Ramps the pixels from black to fully green then back down again over a couple of seconds - great for verifying color order.
- Blue Ramp- Ramps the pixels from black to fully blue then back down again over a couple of seconds - great for verifying color order.
- White Ramp- Ramps the pixels from black to fully white then back down again over a couple of seconds.
- Full White- Turns all the pixels on fully white (this respects the brightness setting).
- Dim White - Turns all the pixels on at 25% white (plus applying the brightness setting).
- Colorwash- Washes through the colors red, green and blue slowly transitioning from one to another
- Chase- Displays a red, green, blue, white chase along the pixel string.
- Fill- This will fill in the pixels in red, then green then blue from 1 to the number set in the count value. If you have only a few pixels attached then it will fill them and appear to hold while it fills in all the unattached pixels.
- Groups of 10- This will lights up the pixels in groups of 10 pixels, each group will be a different color for easy counting.
- Groups of 50- This will light up the pixels in groups of 50 pixels, each group will be a different color for easy counting.
- Groups of 100- This will light up the pixels in groups of 100 pixels, each group will be a different color for easy counting.
- Effect- This will runs the effect that has been selected in the settings page.
- Count 3ch- This will repeatedly count the number of pixels attached to the tester.
- Count 4ch- This will repeatedly counts the number of 4 channel pixels attached to the tester.

- RGBW 4ch - runs the same RGBW pattern but outputs to 4 channel pixels.

Smart Receiver Out

The Smart Receiver Out page is used to output signals to smart (and normal or “dumb” receivers). If you have incoming Smart Receiver data, this data will be ignored while in this page and output the selected receiver output. Receiver protocols are very similar to each other in many circumstances. Because of this, seeing pixels light up does not guarantee you have the matching protocol chosen for the receiver.

Note: The F-Test will have to have a power supply attached, either through the USB port or the Pixel Input.



Pressing the Up and Down buttons will navigate through the available options in the highlighted menu item. The Next button will move the highlighted selection to the next item in the Menu. The close button will take you back to the Main Menu.

The screen displays the following data:

- Brand- this is the type of smart receiver protocol you are sending out. It determines how many receivers there are in the chain and the protocol used. You can select the following options:
 - Dumb- This works with pretty much every receiver on the market. Only one receiver can be attached and it will test up to 1400 pixels on that receiver.
 - Falcon V3- (Typically red or white boards.) This will send 100 pixels of data to each of the 3 receivers.
 - Falcon V4- (Typically blue boards.) This will send 100 pixels of data to each of the 6 receivers. This also works with Genius receivers.
 - FPP V1- (Typically black boards.) This is actually identical to Falcon V3.
 - FPP V2 - (Typically black boards.) This will send 100 pixels of data to each of the 6 receivers.
 - Hinkspix- This will send 30 pixels of data to each of the 16 receivers. The receivers are configured every few seconds and given the nature of the Hinkspix protocol, once you stop testing them and reconnect them to your controller, you will need to reset the controller to reset the receiver configuration.
- Receiver- This selection is used to identify which receivers you want to receive the data. All sends the data to all receivers in the chain. If you select a specific receiver then only that receiver will receive the test pattern. All the other receivers will be sent "off" pixel data.
- Pattern- This item allows you to select what output test pattern you want to use. The patterns are the same as the [Pixel Out section](#) with the exception that the Count patterns are not available and a Number pattern is an additional option. The Number pattern uses the first four pixels on the string to indicate what port they are connected to and the remainder to indicate which receiver in the chain. For example, let's assume BBB V2 Smart

receivers, and the F-Test will connect to the first receiver and have the dial set to A and the terminators all off. This is then connected to the second receiver and the Dial set to B with the terminators all on. Set the F-Test Brand to FPP V2 and then the Receiver to All and then Pattern to A. The pixels connected to port 1 of the first receiver in the chain (receiver A) will have the first pixel lit up white (designating port 1) and then the 5th pixel lit up red (designating the first receiver.) Pixels connected to port 3 of the second receiver will have the first 3 pixels lit up white (designating port 3) and then the 5th and 6th pixels lit up red (two pixels, the second receiver)

- Brightness- This item allows you to select what output brightness you want to use for your test patterns.

DMX Out

The DMX Out page is used to send 512 channels of DMX or other test data to your DMX/LOR/Renard devices.

Note: The F-Test will need to have a power supply attached, either through the USB port or the Pixel Input.

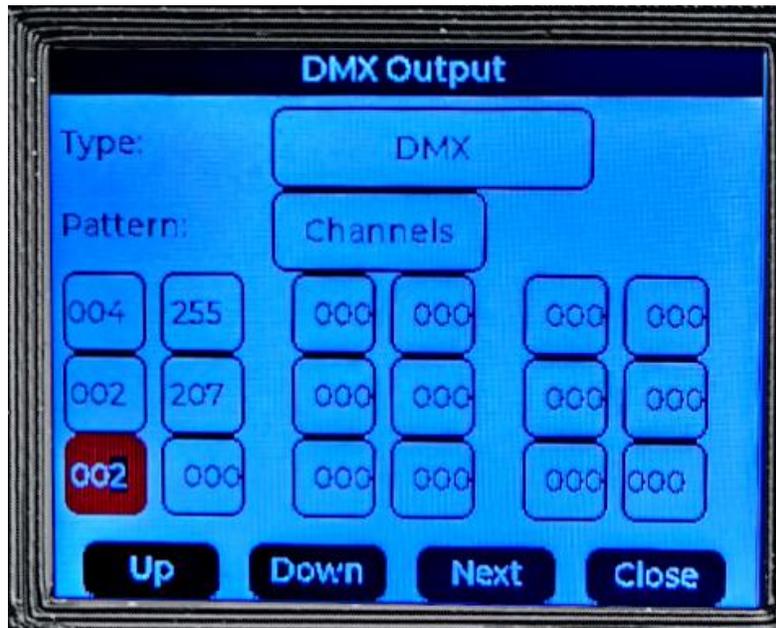


Pressing the Up and Down buttons will navigate through the available options in the highlighted menu item. The Next button will move the highlighted selection to the next item in the Menu. The close button will take you back to the Main Menu.

The screen displays the following data:

- Type- This is where you select the type of test output you want to send via the DMX Out port. The options are:
 - DMX- This will output DMX Data
 - LOR- This will output Light-O-Rama data. You will need to select the correct output speed.
 - Renard- This will output Renard data. You will need to select the correct output speed. **Note: You will need an adapter cable and it is described in the [Reference](#) section of the F-Test.**
- Pattern- This is where you will select the output test pattern. This is a limited set of patterns suited for single channel controllers.
 - Alternate- This will turn on and off the channels in an alternating fashion.
 - Chase- This will lights up every 16th channel and then moves that lit channel through the next 16 channels.
 - Ramp- This will ramp up and down all of the channels.
 - Fill- This will progressively turn on each channel in blocks of 16 channels.

- Channels- This will allow you to output up to 9 channels of data anywhere in the 512 channel range. This is useful for testing very specific channels and values. The box in the left side of the group is for the channel number and the box on the right of the group is for the value. If you enter duplicate channel numbers, the channel number will be highlighted in red.



Monitoring Mode

Pixel In

The Pixel In page is used to monitor several different attributes to help you determine if you are receiving the signals/data that you anticipated. In this mode, the pixel data is read from the input but also passed through to the output allowing you to both monitor the pixel data and see the lights behavior. Pixel input mode assumes the pixel data is 3 channel and in RGB color order. If it isn't it may display different colors or look quite different to the actual pixels. In this mode, the F-Test will also act like an F-Amp and could be helpful in determining if an F-Amp would be beneficial.



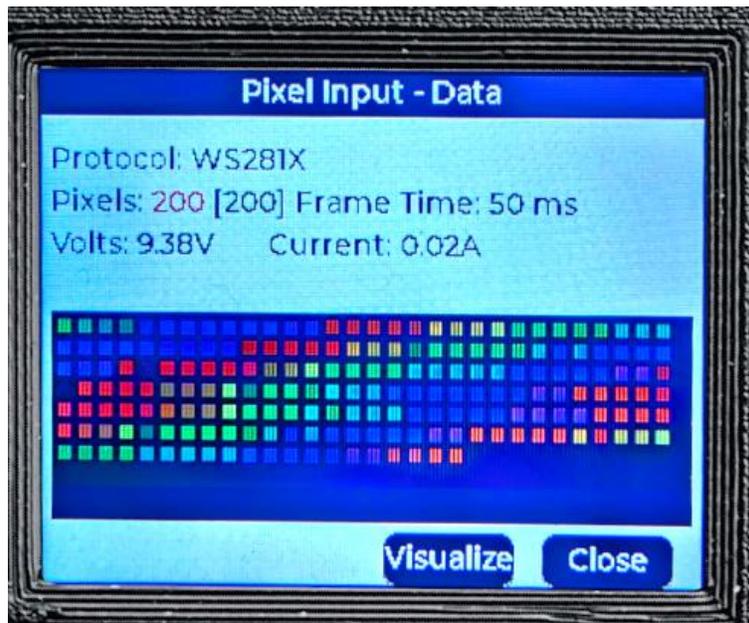
Pressing the Visualize button will navigate through the various view options. The close button will take you back to the Main Menu.

The screen displays the following data:

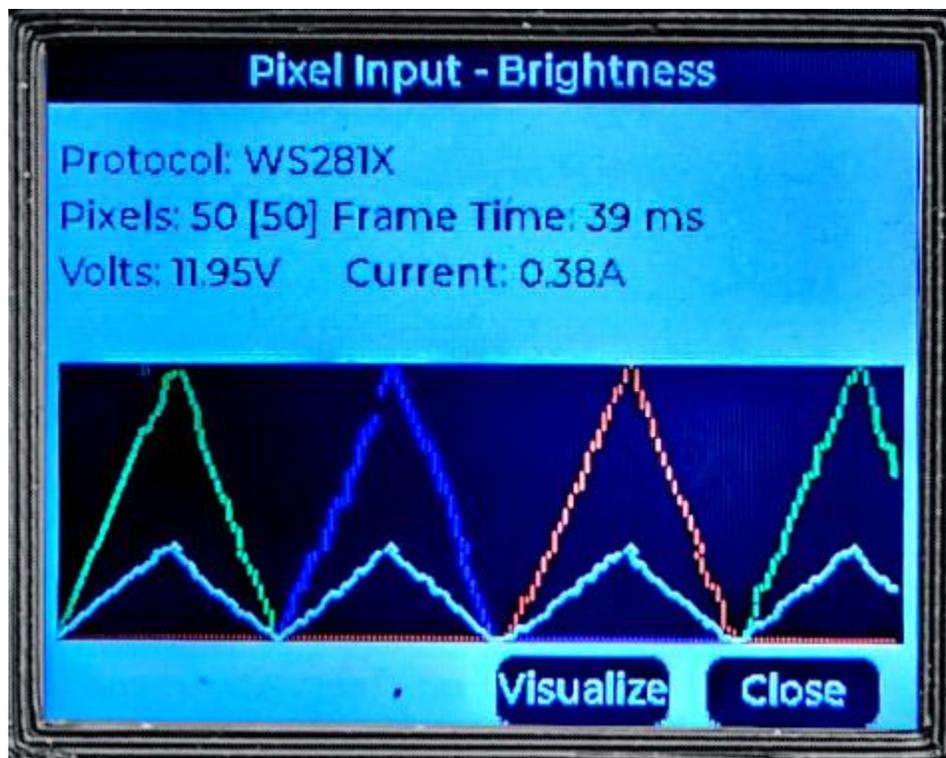
- Protocol- Only WS2811 and compatible pixels are supported.
- Pixels - There are 2 numbers displayed for each port. The first is the number of pixels worth of data the tester is receiving on the data line. The second number in square brackets is the total number of pixels of “color” data that the tester is receiving, which is a method to estimate the actual number of pixels this port is configured for. This is because some controllers will send excess “blank” data to your pixel strings knowing that it is just ignored by them. When controllers do this, they typically send black to the excess pixels. To try to compensate for this, the second number is calculated by reducing the first number by the number of end “blank” pixels from the count. This leads to the second number sometimes being inconsistent with what you might expect. This happens if the last pixels on your prop are turned black. The tester will also indicate if it suspects torn frames by displaying the pixel count in red. This should be ignored most of the time but if you are running color fades and the like it can tell you if the controller is keeping up with your data stream.
- Frame Time- This is the time in milliseconds between pixel data frames (or the frames per second if you chose that option in settings). This tells you how often your controller is actually sending data to the pixels.
- Volts - This is the voltage on the pixel input side.
- Current - This is the amount of current being drawn by any pixels attached to the pixel output.

There are four viewing modes in the Pixel In page that monitors different data. Pressing the Visualize button will scroll through the various options and the data will display in the lower half of the screen.

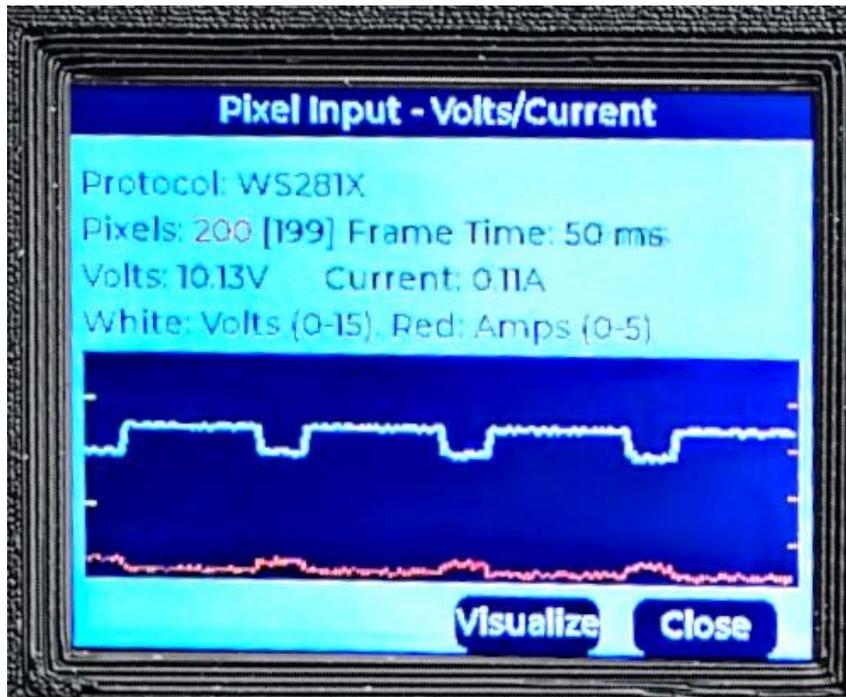
- **Data**- This will give you a graphical representation of the number of pixels that are being sent data and the colors they are supposed to be (this is assuming that your pixels are RGB order). There are 30 pixels per row in the display.



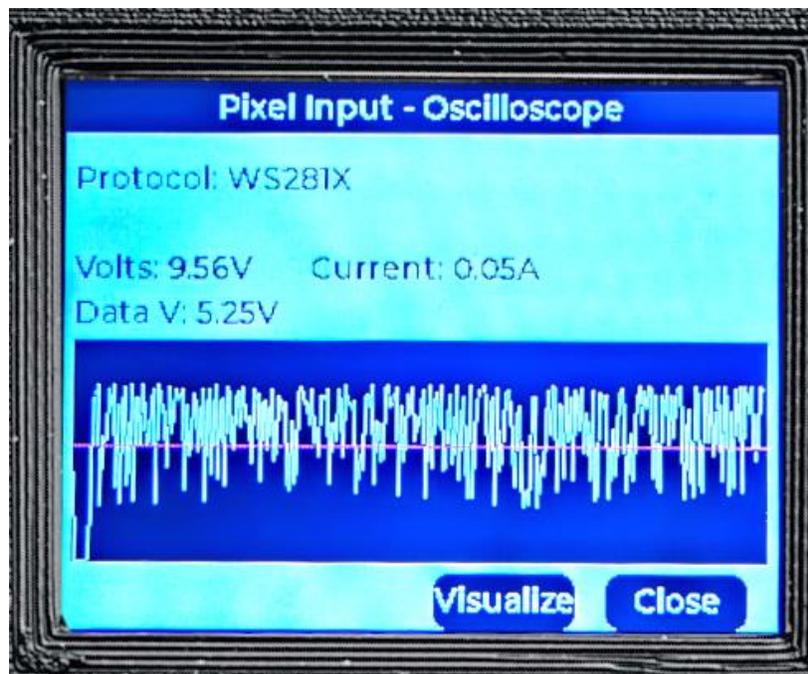
- **Brightness**- This will give you a graphical representation of the overall brightness of your pixels averaged over time by RGB color order.



- **Volts/Current**- This plots over time the input voltage on a scale of 0-15V and the output current draw on a scale of 0-5 Amps. The white line indicates the voltage and the red line the current draw.



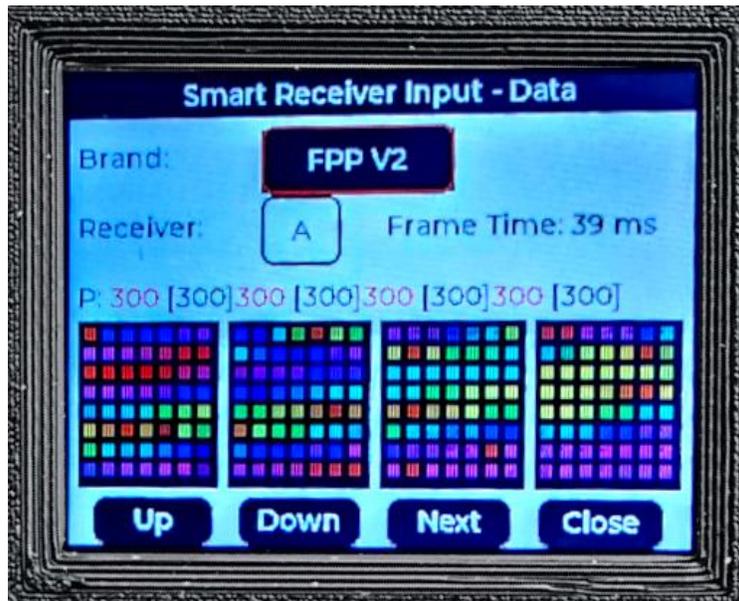
- Oscilloscope**- This screen is useful to both see that a data signal is present but also see that data voltage. The pink line shows the typical minimum voltage required for a pixel to interpret the data. If the waveform displayed is not displaying above this pink line, then you probably have a weak signal that will need to be remedied. Unfortunately the chip used on the tester is not fast enough to fully visualize the pixel data waveform but it can be used to compare the data to ground voltage.



Smart Receiver In

The Smart Receiver In page is used to monitor the incoming differential data so that you can monitor/evaluate the data to help you determine if you are receiving the data that you anticipated. In this mode, the differential data is read from the input but also passed through to the output allowing you to both monitor the data and see the receiver's behavior.

Note: The F-Test will need to have a power supply attached, either through the USB port or the Pixel Input.



Pressing the Up and Down buttons will navigate through the available options in the highlighted menu item. The Next button will move the highlighted selection to the next item in the Menu. If you are on the Receiver option, the Next Button will toggle to the next display screen. The close button will take you back to the Main Menu.

Receiver protocols are very similar to each other in some circumstances. Because of this, seeing data arrive does not guarantee you have the correct protocol chosen for the data being received. Pressing and holding the Up/Down buttons until the screen title turns orange will initiate a probe mode where the tester will monitor the receiver data and suggest the type of data being received. If it is unsure, it will always suggest dumb data. This probe mode will not work with Hinkspix controllers due to the nature of how it is sent out.

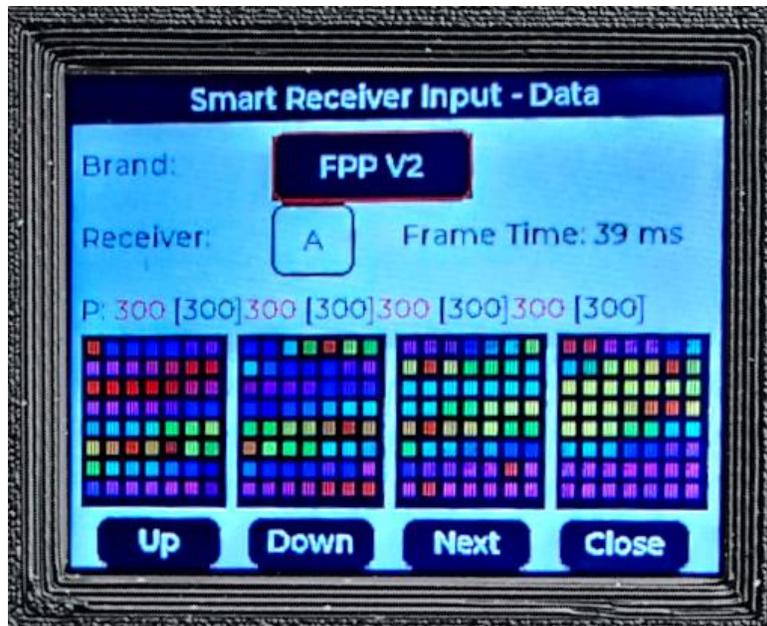
The screen displays the following data:

- Brand- In this option, select the type of Receiver data you are expecting to receive, the options are:
 - Dumb
 - Falcon V3
 - FPP V1 - identical to Falcon V3
 - FPP V2
 - Falcon V4 (also works with Genius controllers)
 - Hinkspix - when using this mode you must reset the controller after you attach the tester as the controller only configures receivers during the reset/boot process.
- Receiver- This option allows you to select which receiver in the chain that you want to monitor.
- Frame Time- This shows you what frame rate the tester is receiving the data.
- P- There are four frames, one for each port of the receiver. There are 2 numbers displayed for each port. The first is the number of pixels worth of data the tester is receiving on the data line. The second number in square brackets is the total number of pixels of "color" data that the tester is receiving, which is a method to estimate the actual number of pixels this port is configured for. This is because some controllers will send excess "blank" data to your pixel strings knowing that it is just ignored by them. When controllers do this, they typically send black to the excess pixels. To try to compensate for this, the second number is calculated by reducing the first number by the number of end "blank" pixels from the count. This leads to the second number sometimes being

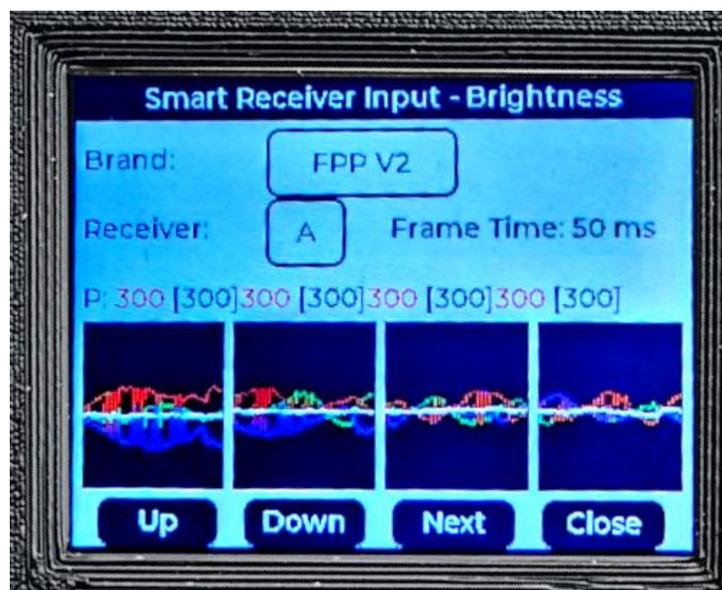
inconsistent with what you might expect. This happens if the last pixels on your prop are turned black. The tester will also indicate if it suspects torn frames by displaying the pixel count in red. This should be ignored most of the time but if you are running color fades and the like it can tell you if the controller is keeping up with your data stream.

There are two viewing modes in the Smart Receiver Input page that monitors different data. Pressing the Next button while the Receiver option is selected will progress to the next viewing mode.

Data- This will give you a graphical representation of the number of pixels that are being sent data and the colors they are supposed to be (this is assuming that your pixels are RGB order). There are four frames representing each port on the Receiver with 7 pixels per row in the display.



Brightness- This will give you a graphical representation of the overall brightness of your pixels averaged over time by RGB color order.



DMX In

The DMX In page is used to monitor the incoming DMX data so that you can monitor/evaluate the data to help you determine if you are receiving the data that you anticipated. In this mode, the DMX data is read from the input but also passed through to the output allowing you to both monitor the data and see the DMX device's behavior.

Note: The F-Test will need to have a power supply attached, either through the USB port or the Pixel Input.

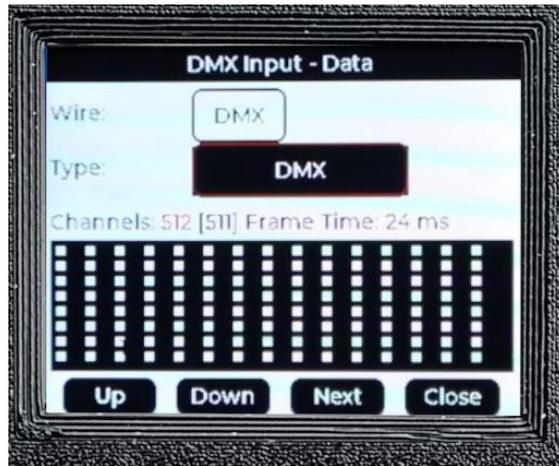


Pressing the Up and Down buttons will navigate through the available options in the highlighted menu item. The Next button will move the highlighted selection to the next item in the Menu. If you are on the Type option, the Next Button will toggle to the next display screen. The close button will take you back to the Main Menu.

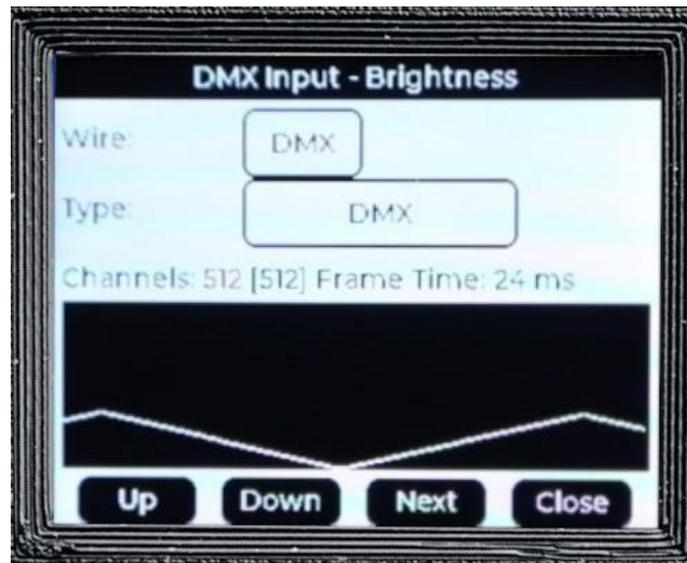
The screen displays the following data:

- Wire- this allows you to select which wires on the input RJ45 the tester monitors. This allows you to switch between standard DMX and LOR without having to fiddle with jumpers.
- Type- This is the type of RS485 protocol you are expecting to receive. The tester is also able to monitor and detect the appropriate protocol/speed with reasonable but not perfect accuracy. To do this, press and hold the Up/Down buttons until the page title turns orange and then wait for the scan to complete.
- Channels- This is the number of channels that are being received. The number in square brackets is the number of channels up to the last channel with a non zero value. This is useful because many devices just send 512 channels even when much fewer are in use. The tester will also indicate if it suspects torn frames by displaying the pixel count in red. This should be ignored most of the time but if you are running color fades and the like it can tell you if the controller is keeping up with your data stream.
- Frame time shows you how often data is being sent to the DMX device. In some protocols this can be highly variable.
- There are four viewing modes in DMX Input page that monitors different data. Pressing the Next button while the Type option is selected will progress to the next viewing mode.

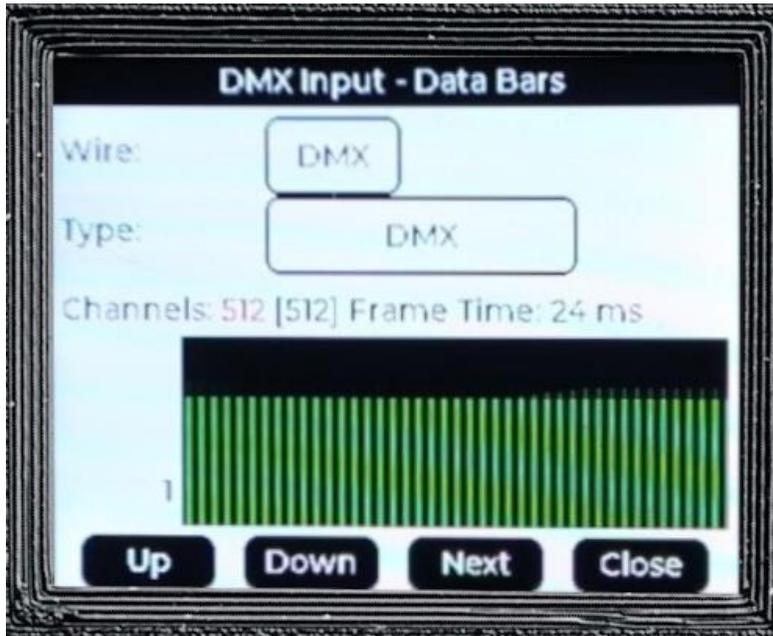
Data- The black box at the bottom of the screen shows the data being received with each square representing a channel starting from top left and going across the screen.



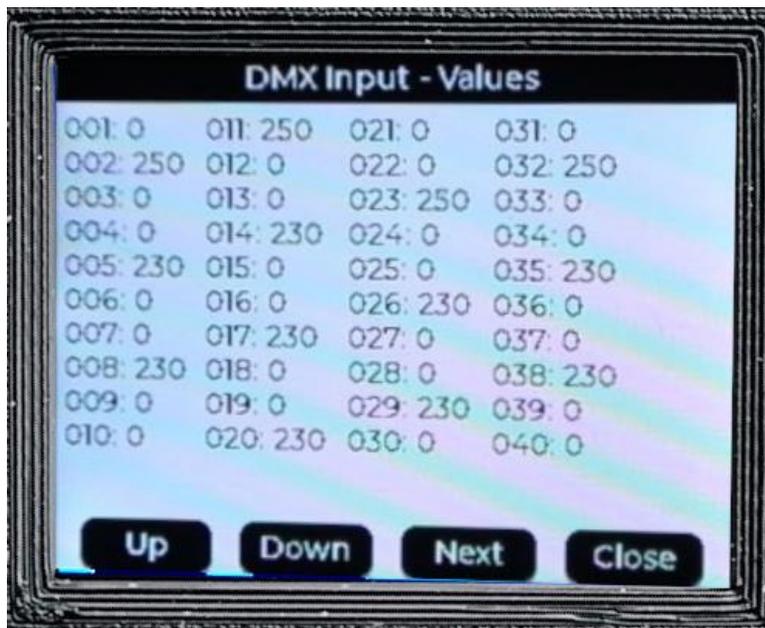
Brightness- This shows the average of all channels over time.



Data Bars- This view shows the channel data over several pages (use up/down to move between them) as a column chart where the height of the column represents the channel value. The number to the bottom left of the chart is the number of the first channel being displayed on this page. There are 128 columns.



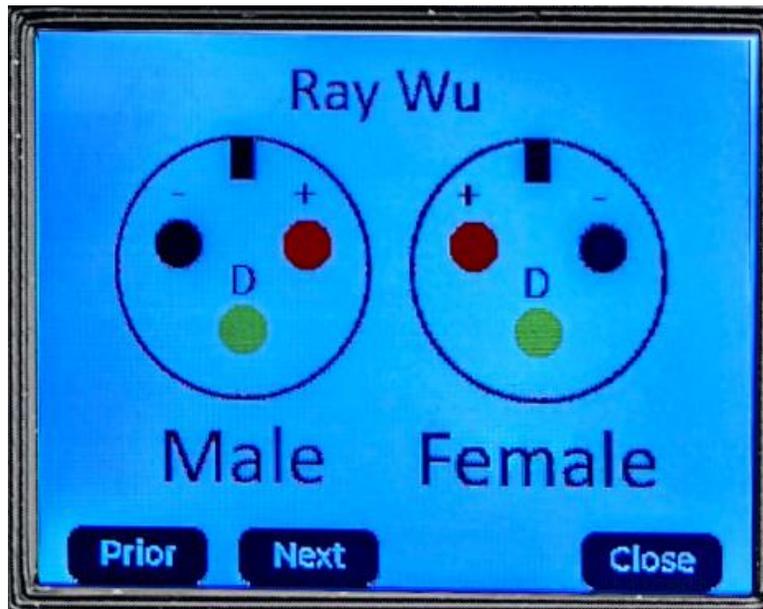
Values- This view shows the actual channel values over several pages (use up/down to move between them). If this page is blank it is because no data is being received.



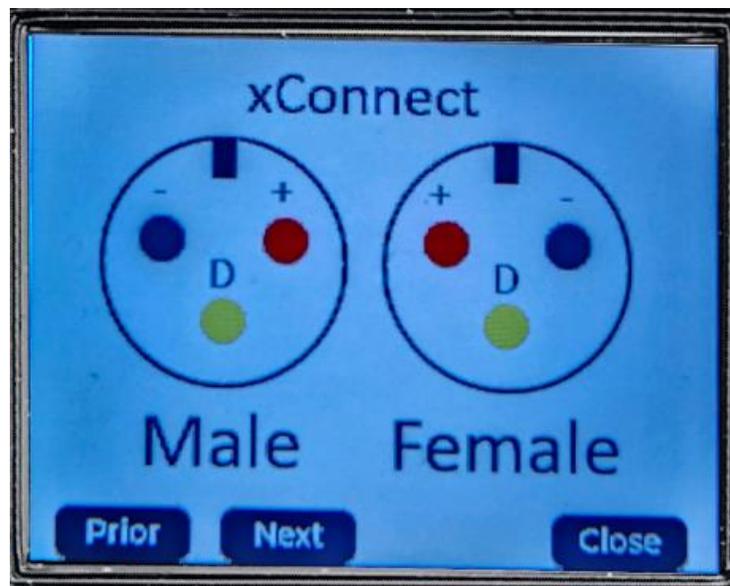
Reference

The reference page provides diagrams of Pinout diagrams for several different connectors:

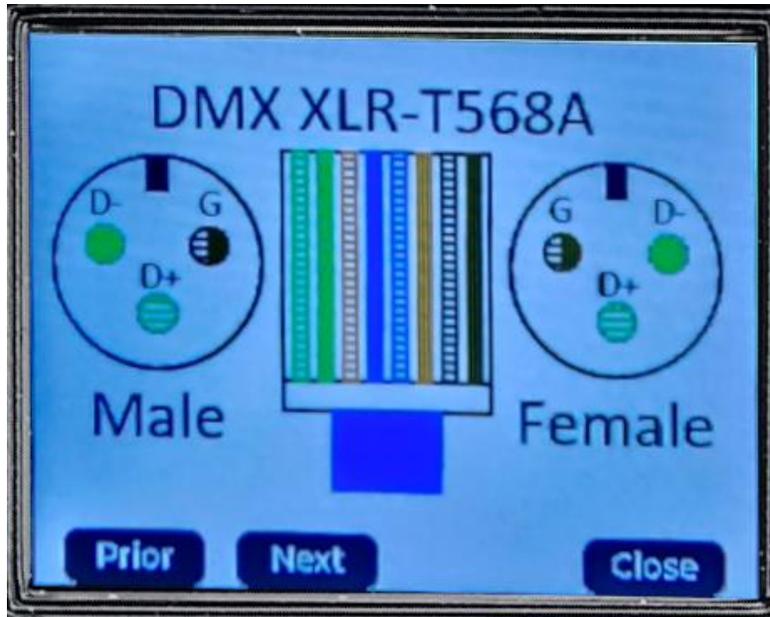
- Ray Wu- This shows the typical male and female pinouts of an Ray Wu pigtail.



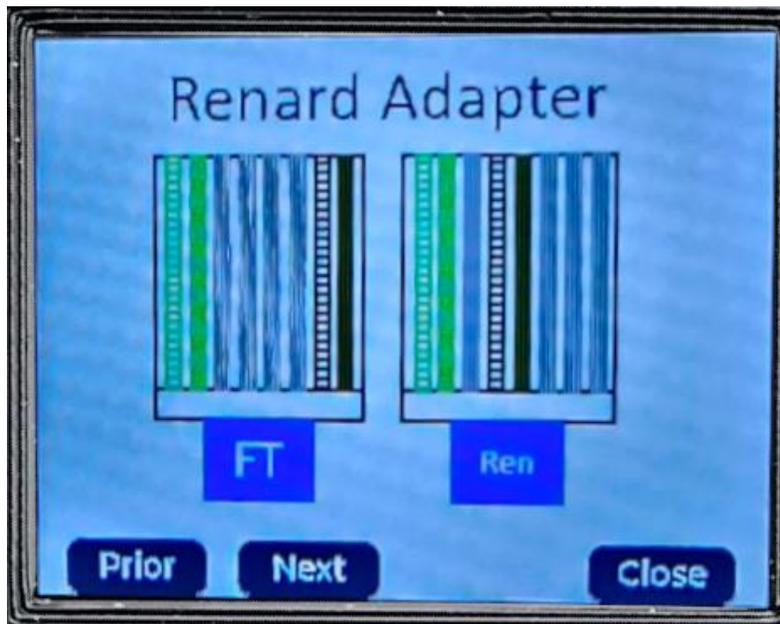
- xConnect- This shows the typical male and female pinouts of an xConnect pigtail.



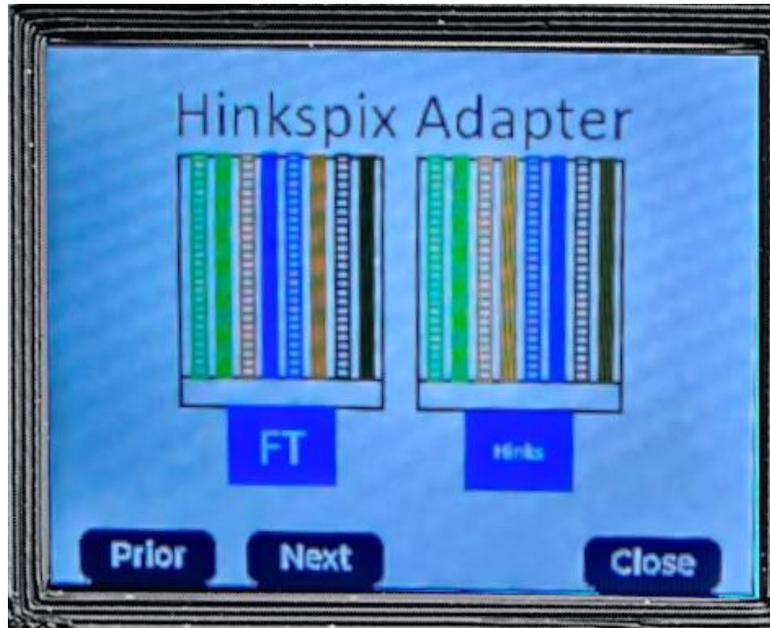
- DMX XLR-T568A- This shows the wiring to connect a RJ45 jack that would connect into a controller to a DMX fixture using a SLR male or female plug.



- Renard Adapter- This shows the cat-5 cable that you need to connect a Renard controller to a falcons DMX RJ45 connector.



- Hinkspix Adapter- This shows the adapter you will need to connect a HinksPix smart receiver to the tester due to the wiring layout of the HinksPix.



Troubleshooting Practices

When you are trying to troubleshoot problems with your show, you should test only one item at a time and that is where the F-Test comes in handy since you only need the one tester to test about every component.

It is recommended to start at the pixels and move backwards through every component to isolate your problem. For example, connect the F-test in between the controller and the pixels. Use the Pixel Output tester function to test the pixels, if they work, then the problem is either the controller or something before that, or the connection itself. With the F-Test still connected, go to the Pixel Input function and see if you are getting data there, if you are, then you know the problem is on the connector itself. If not, then you move on to testing the controller/receiver etc. eliminating one thing at a time until you find your problem.