PMag Electronic Ignition Controller

(Analog Outputs & Wi-Fi edition)

User's & Installation guide

INTRODUCTION

Engine Bridge Electronic Ignition Controller for PMags interacts with single or dual PMags installations (4 Cylinders engine Series 113 & 114) and allows monitoring and adjusting of any PMag configuration.
EI Controller uses PIN 2 & PIN 3 of each PMag for communication and is able to show all configuration and running parameters (on ground and in-flight) of PMag operation over its Wi-Fi interface system. Any WIFI-capable device with a browser such as iPhones, Android Phones, Tablets, iPads and Laptop/PCs can access the Controller and view/edit these settings.

Additionally, the Analog Output edition provides up to 4 Analog Outputs per PMag. These analog outputs can be connected to Glass Panels with EMS/Sensor modules that are capable of accepting custom-defined Analog Input Sensors. Glass Panels with EMS such as Dynon, GARMIN G3X, MGL/RDAC are all capable of accepting custom Analog Input Sensors for display on the Panel.
Controller uses the Analog Outputs to show Advance Angle, Temperature & Dwell time of each PMag. Not all Analog Outputs need to be connected. One can select just the Advance Angle to be displayed on the Glass Panel if Analog Inputs are limited. For installations without Glass Panels & EMS/Sensors modules, the Wi-Fi interface can be viewed in-flight and settings can also be changed to suit the flight mission.

INSTALLATION

EI Controller is a lightweight 2.5 oz (70g) unit and measures 5” x 2”. It can be attached to a bundle of wires behind the panel or Velcro to the EMS unit or any other surface. Mounting holes within the case are also available.

This unit is not suitable for installation inside the engine bay. It's also best to mount the unit as close as possible to the EMS unit to minimize any voltage losses for the Analog Outputs wires.

Note if the unit is Zip tied to a bundle of wires, that these wires are not carrying large current (for motors, Strobe lights or Battery).

Shielded wires are recommended on all wires, more importantly on Communication wires attached to each PMag. Use a Shielded (AWG 22/24) 2-Conductor wire to connect to each PMag. The shield needs to be connected to PMag GND from one end and to the Controller GND from the other end. This eliminates any ground-loop and directly attaches both GND of PMag & Controller together. If the Controller GND is directly connected to the GND wire of the PMag, the shield can be installed only on either end. Sharing the GND eliminates any voltage-potential present and allows proper and correct reading of communication lines.

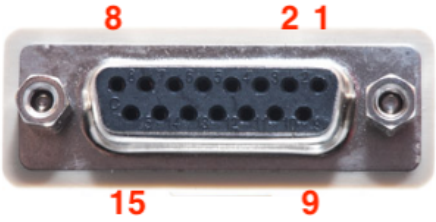
CONNECTIONS

EI Controller comes with a DB15 (15-Pin) Female Connector. A Crimp type DB15 Male connector along with housing & contact pins are provided for connection. Refer to the following photos/tables for PIN layout and connections.

Alternatively, a pre-made DB15 Male Cable (not provided) as shown in the photo can also be used if desired.

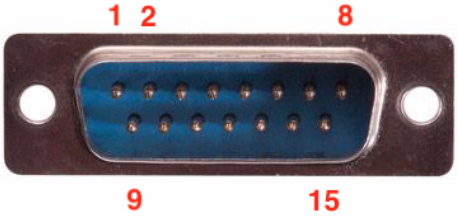
Note that such cable may not be used all the way to the engine bay for PMag connections so its best to extend this type of cable with a proper cable for engine bay usage and to limit the usage of such cable to behind the panel only.

DB15 (15-PIN Female) Connector is shown while looking at the Controller.



Looking at Controller Connector

DB15 (15-PIN Male) Connector is shown while looking at the connector.



Looking at DB15 Male Plug/Socket

Use the following tables to identify each pin.

If using a pre-made DB15 Male Cable, use an ohmmeter to determine which pin is which wire within the cable to allow for correct connection to the PMag/EMS and Power supply.

DB15 Connections

PIN	DESCRIPTION
1	+12V
2	Analog Output Channel (A)
3	Analog Output Channel (C)
4	Analog Output Channel (D)
5	Analog Output Channel (E)
6	Analog Output Channel (G)
7	Left PMag Unit Pin 3. **(Sometimes marked TX on E-Mag Plug)**
8	Left PMag Unit Pin 2. **(Sometimes marked RX on E-Mag Plug)**
9	GND
10	Analog Output Channel (B)
11	Right PMag Unit Pin 2. **(Sometimes marked RX on E-Mag Plug)**
12	Right PMag Unit Pin 3. **(Sometimes marked TX on E-Mag Plug)**
13	Analog Output Channel (F)
14	Analog Output Channel (H)
15	Reserved - Do not connect

Analog Output Channels

CHANNEL	DESCRIPTION
A	0-5V Analog Output - **Right PMag Advance Angle**
B	0-5V Analog Output - **Right PMag Reported Temperature**
C	0-5V Analog Output - **Right PMag Coil dwell 1**
D	0-5V Analog Output - **Right PMag Coil dwell 2**
E	0-5V Analog Output - **Left PMag Coil dwell 1**
F	0-5V Analog Output - **Left PMag Advance Angle**
G	0-5V Analog Output - **Left PMag Coil dwell 2**
H	0-5V Analog Output - **Left PMag Reported Temperature**

Note:
Channels A,B,C,D are for the Right PMag.
Channels E,F,G,H are for the Left PMag

Not all Analog Outputs need to be connected. Make sure the unused Analog Output wires are either not connected at the DB15 socket or cut and heat shrink as these wires will still carry Analog 0-5V signals.

If you have only one PMag installed, use the correct side pins where you installed it on the engine. All reports use Left/Right names based on which Pins are being used.

So if you have a single PMag installation that is actually installed on your Left Side of the Engine, then connect that to the Pins assigned for Left PMag. It will work OK if it was connected to the Pins assigned for the Right PMag but all reports will be shown with the name Right PMag which may be confusing. Connect a single installation PMag to the same pins assigned to the same side.

ANALOG OUTPUTS

There are 4 Analog output channels per PMag. These are divided as:

- One Channel for PMag Advance Angle
- One Channel for PMag Temperature
- Two Channels for PMsg Coil Dwell time.

Depending on each installation or Glass Panel type/Analog range, the Controller can be customized and re-programmed using the Wi-Fi interface with a file sent via email.

All Analog Outputs are 0-5V and default sensor input definitions for the EMS module are:
For Advance Angle (Channels A & F):
Min: 18.0 (single digit decimal such as 26.6)
Max: 48.0 (single digit decimal such as 26.6)
If your Glass Panel allows custom output, add ° to the display so the values are shown in degrees such as:

For PMag Temperature (Channels B & H):
Min: 0 (Integer. No decimal point)
Max: 255 (Integer. No decimal point)
Value in Fahrenheit.

For Coil Dwell time (Channels C, D, E & G)
Min: 0 (Integer. No decimal point)
Max: 20 (Integer. No decimal point)
Values are in milliseconds.

Note that PMag Advance Angle is reported in 1.4° steps that starts with 19.6° and ends with 46.2°. On some installations, the exact value (for example 26.6°) may be displayed as 26.4° or 26.8° as there are losses and slight voltage variations within the Analog

Signal conversion at both ends. Though any error will be less than 1.4°. Max value can be slightly adjusted to offset the small error with the decimal point.

POWER-UP SEQUENCE

On system power-up, each Analog output will be set to MAX level (5V) for 2 seconds, then gradually decreased from 5V to 0V in a 3 seconds period. Then each individual channel will be set to MAX (5V) for half a second then back to 0V in a sequence.

This procedure allows for testing and verification of the status and output of each Channel and can be used to see these outputs on the Glass Panel.

At the end of the above Analog Output sequence; the EI Controller initiates communication with both PMags to retrieve the settings. On dual PMag installations, with correct wiring, this takes just a few seconds for both PMags.

If one or both PMags are not found, the system retries for 1 minute, during this time, the Wi-Fi System is unavailable. Wi-Fi System will be enabled and fully operational once the controller determines which PMag is installed and found. This data is passed on to the Wi-Fi System and is used to display the data based on if none, one or both PMags are found.

If the Wi-Fi System displays N/A on one of the PMags, check the wiring of the Communications pins, in many cases, they could be swapped.

In all cases, expect the Wi-Fi System to be operational 1 minute after power-up.

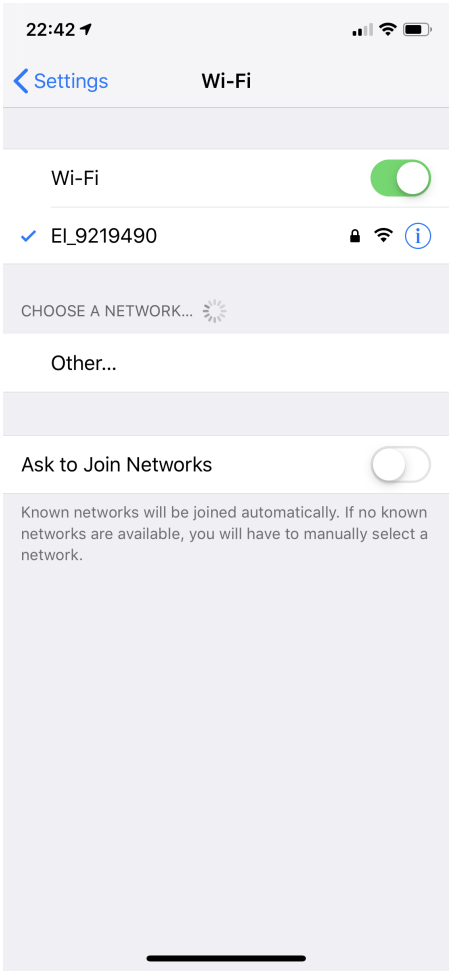
Wi-Fi SYSTEM

Use your device Wi-Fi Search and look for EI_xxxxxx

The default SSID (Wi-Fi Access Point) is: EI_xxxxxx
The default Wi-Fi Password: 44661970

The _xxxxxx is the unique serial number of the unit.

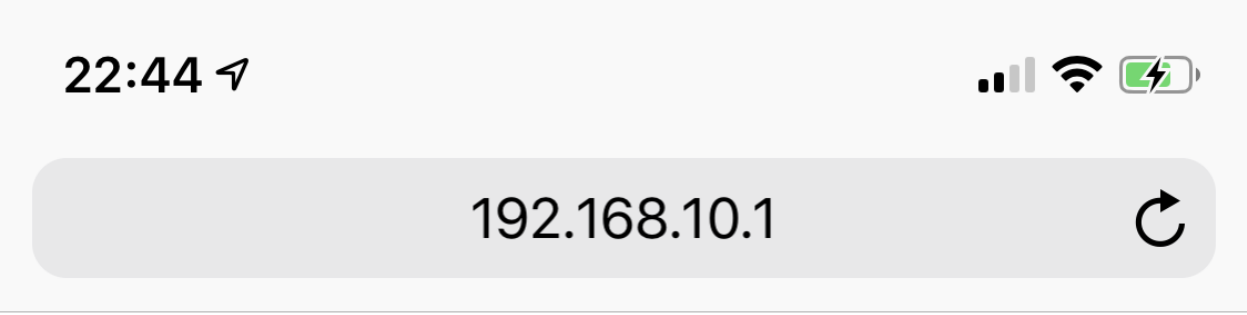
The Wi-Fi System is designed for Phone screen, but can be used with PCs and Tablets such as iPads. Multiple devices can connect at the same time if required.



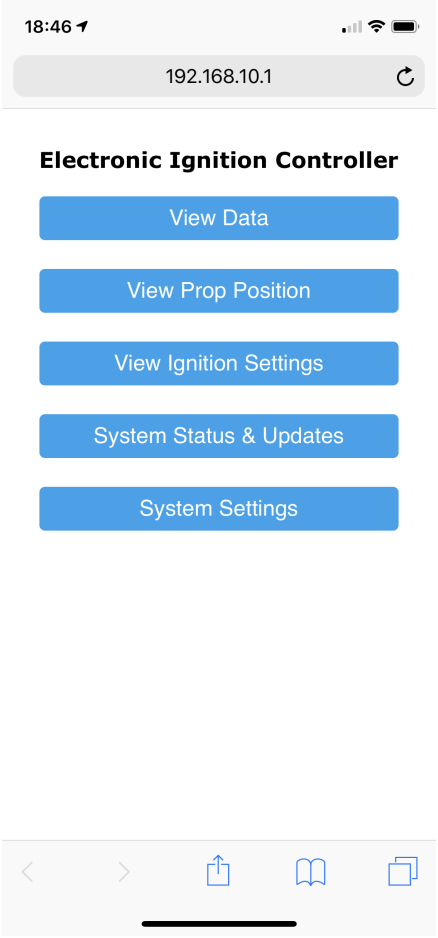
Once connected, use your device Browser (Safari / Chrome / others) to connect to the Controller.

Use 192.168.10.1 as the IP in the Browser page. However, if it's easier, any .com or .net can be used. As the Controller is not connected to the internet and it will respond with its own pages on any domain name.

Though its preferred to use the IP above and press Done or Go and Save the page into your Browser Bookmarks for easy access later on.



Connecting to the system shows the first page.

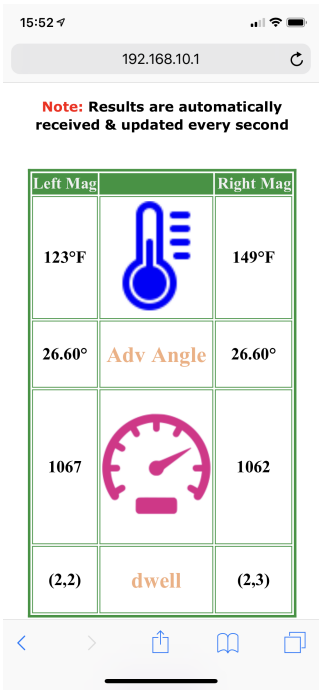


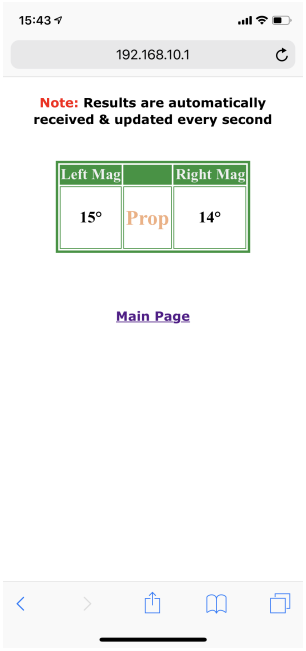
View Data: Show live data stream from PMags. This page automatically updates every second. No need to refresh the page.

View Prop Position: Retrieves the internal PMag Shaft position reference to TDC when initially. This page automatically updates every second. No need to refresh the page. This page is best used when the engine is not running.

Service Bulletin: Do not use the "Prop Position" feature while the engine is running, older firmware can cause the E-Mag units to skip while servicing the request. During this event, either leaving the Prop Position page or powering down the controller resolves this issue. Newer firmware checks RPM before sending any Prop Position request.

Unavailable PMag shows N/A.





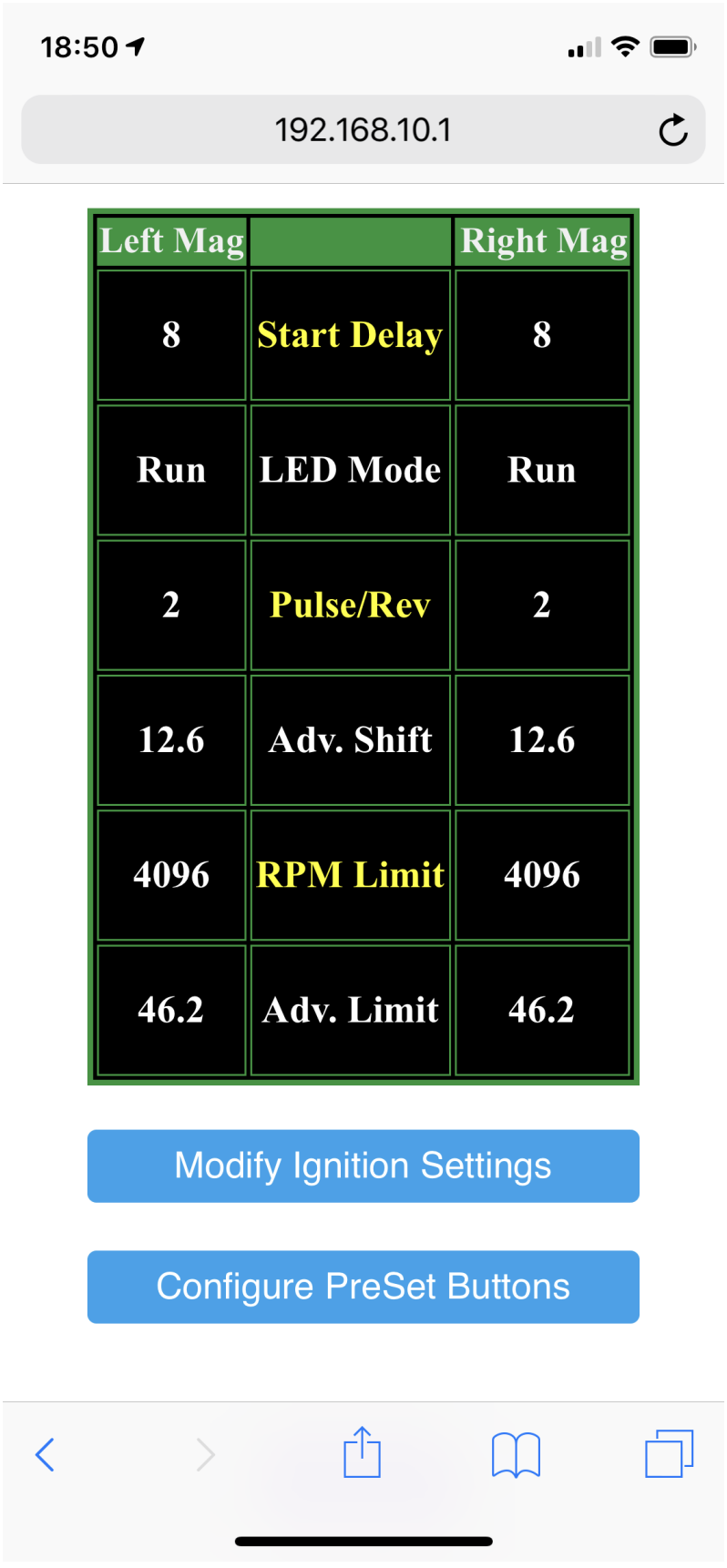
View Ignition Settings shows each PMag settings/configuration currently running.

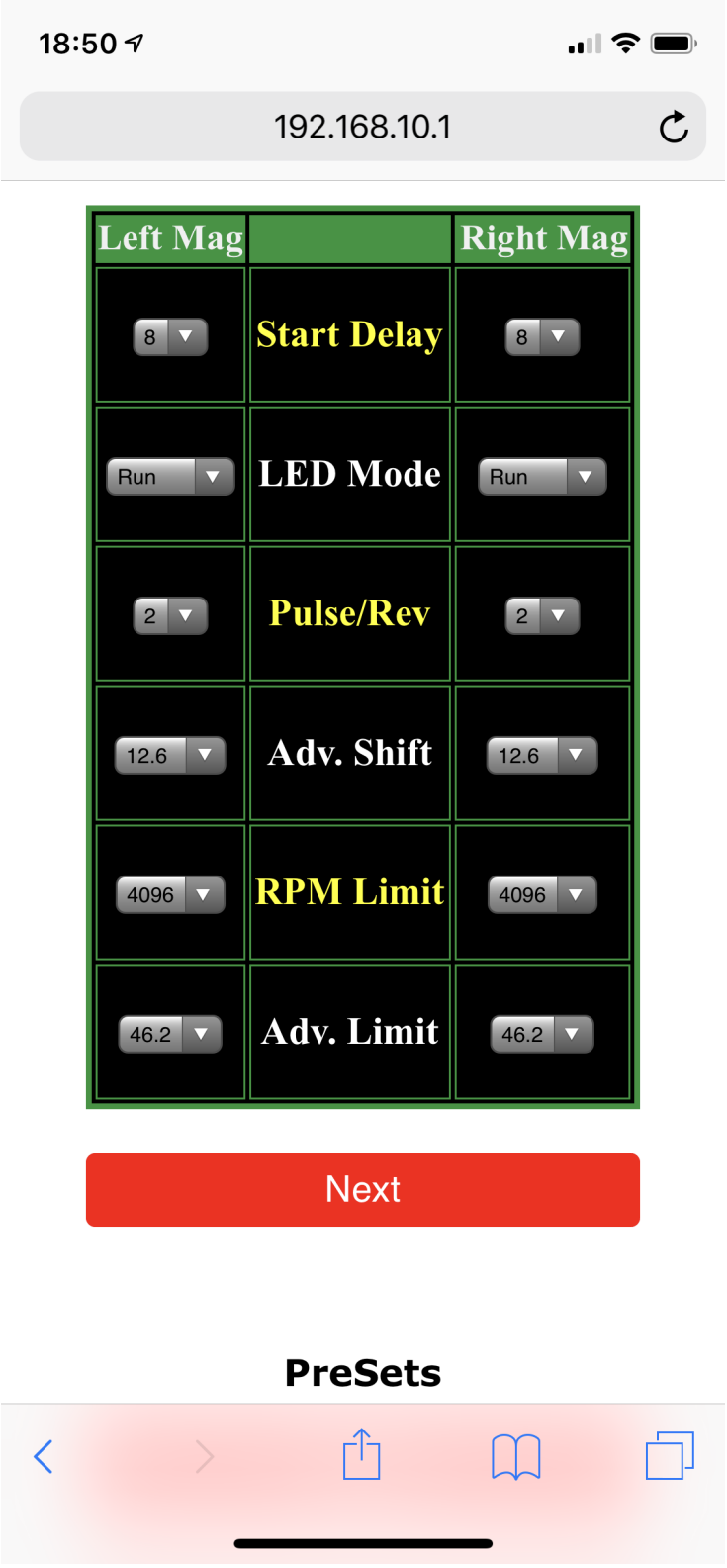
Note that the values shown in this example are for testing purposes and do not reflect any advice to use such settings the PMag

From this page, **Modify Ignition Settings** opens up another page to edit the values.

PreSets can be configured using **Configure PreSet Buttons** to allow saving different settings depending on the flight mission. PreSet will load the previously saved values. A confirmation page is always shown which indicates which settings will be changed before sending the request to each PMag.

Note when changing settings in PMag, it is recommended to do so on the ground (with or without the engine running). A slight engine “miss” may be noticeable while the PMag is saving the data as during the few milliseconds the PMags need to save the new settings to its internal memory; the coils are not firing.





The system only allows changing values that are acceptable for the PMag operation for each Setting. Changing any setting to a different arbitrary value is not possible.

A drop-down list for each Setting shows the possible values to choose. Clicking Next shows a list of changes requested for each PMag.

The PreSets list is shown below the NEXT button (if configured). Clicking any Configured PreSet loads the previously saved values and advances the page to show the list of changes that are going to be made for confirmation.

Remember to modify the PreSets if the system started with a single PMag installation then another PMag is installed. If the PreSet is not updated to reflect the new PMag, the 'newly' installed PMag will receive default settings (first selection of each Setting). This will be shown on the confirmation page.

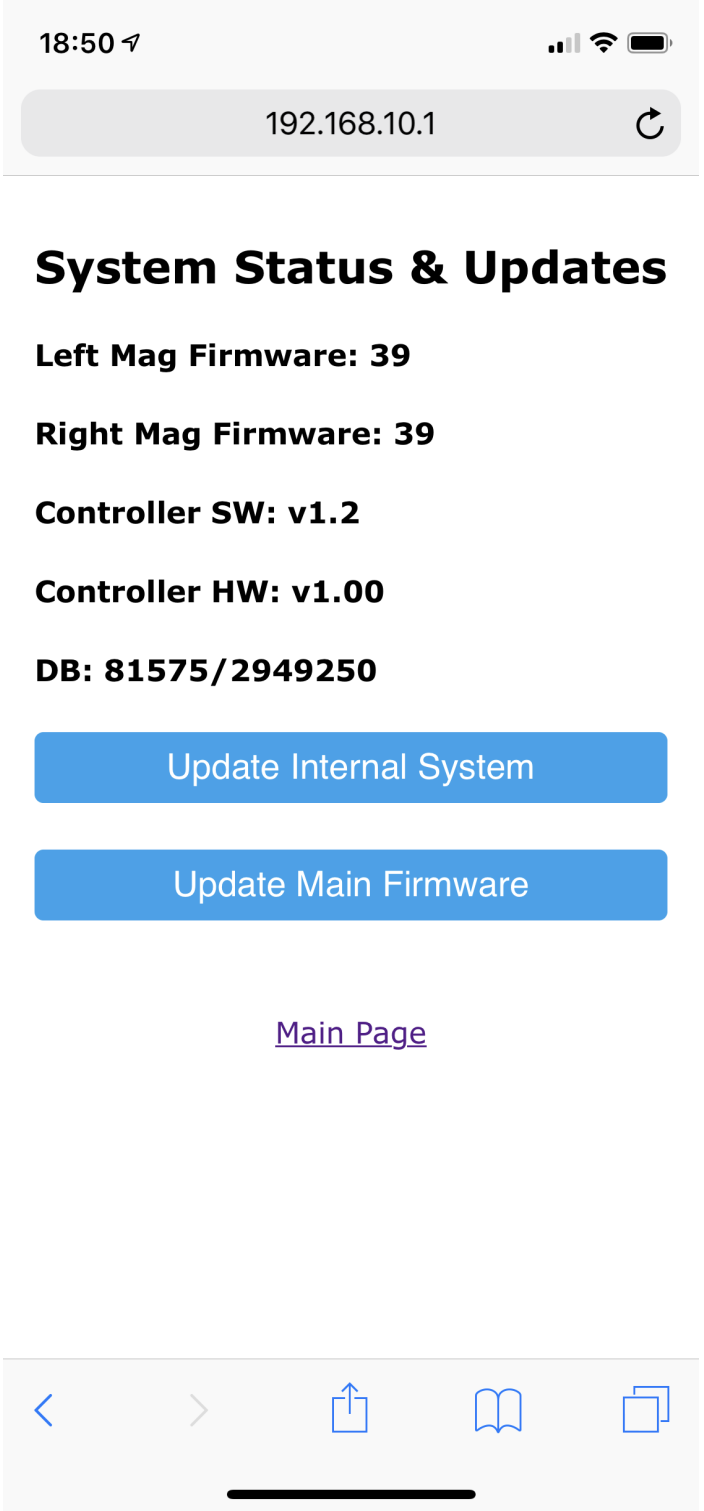
Configure PreSet Buttons uses the same drop-down list. Change all values needed and edit the default name of the PreSet and click Save. Such as: Takeoff. Or Race_1. The name selected will be shown on the PreSets list.

System Status & Updates page shows all firmware installed within the system. It also retrieves each PMag's reversion.

Updating the Wi-Fi and Controller HW firmware can be done from this page. It is recommended using a PC or Laptop to update the firmware if needed. Even though it is possible to do the update from a phone, this may require having an application that saves the file on your phone itself.

Once the phone is connected to the Controller there will be no internet connection hence using a shared or cloud storage is not possible unless the file can be locally available in the phone or iPad without internet. This can be done on an iPhone using a program (paid on Apple Store) called GoodReader. It allows moving a file received from an email to its storage within the phone and then it can be picked up for the update.

Using a PC is straightforward as the file can be saved in a local folder on a PC and picked up when connected to the Controller WIFI network.



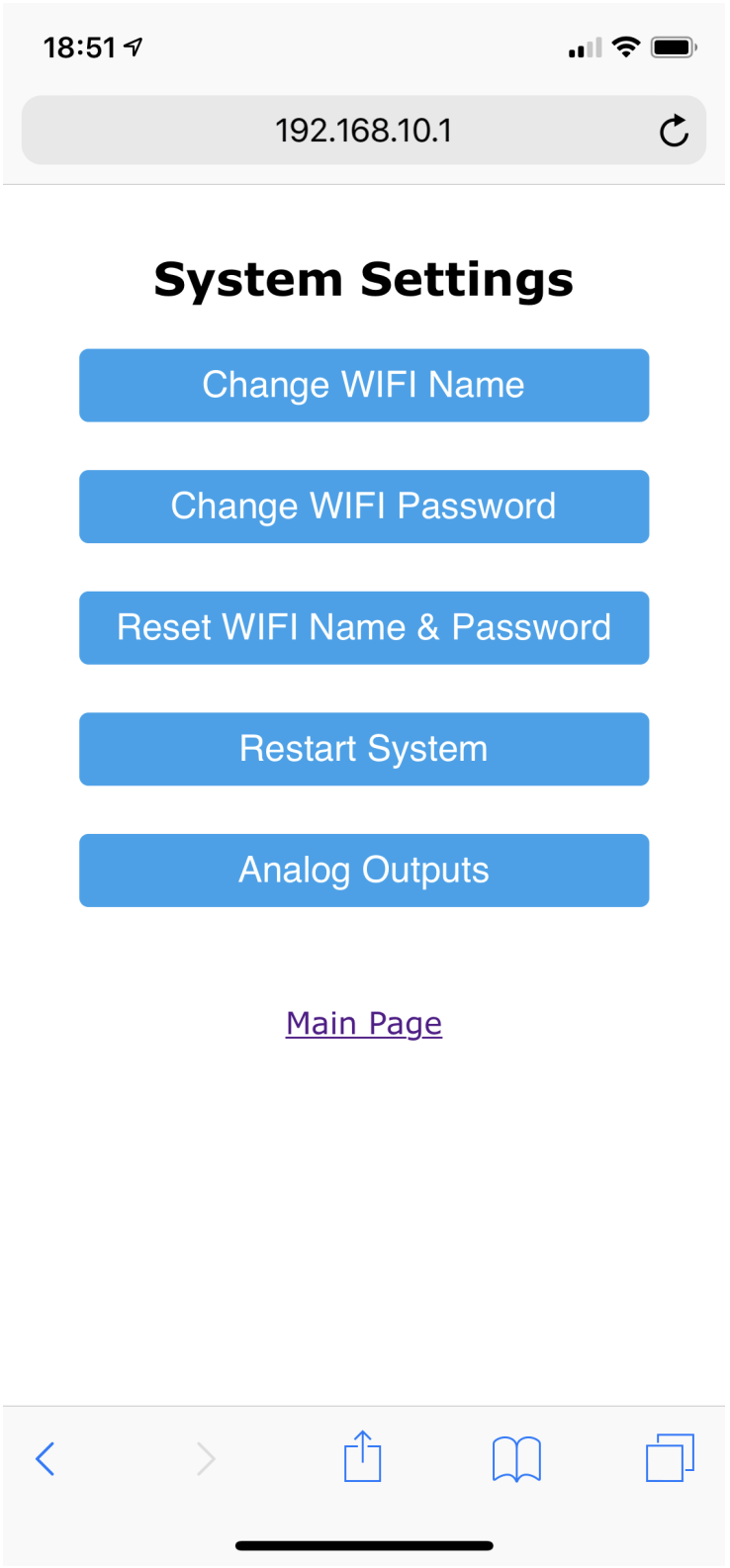
System Settings offers various options such as changing the WIFI network name & Wi-Fi Password.

You can change the default EI_xxxxxxx Controller network name with any other name such as your Tail-Number. When changed, the system will restart, look for the new name.

Note this is case-sensitive.

When changing the password, please make sure at least one of your devices (phone or iPad) saves the new password and can connect to the unit again without asking for the password. If you forget the new password, the only way to reset it is either by using a device (phone or iPad) that saved the password and reset using this page or by returning the unit back for firmware re-programming.

We have no way of knowing your new password if you are unable to connect to the unit and forgot the password

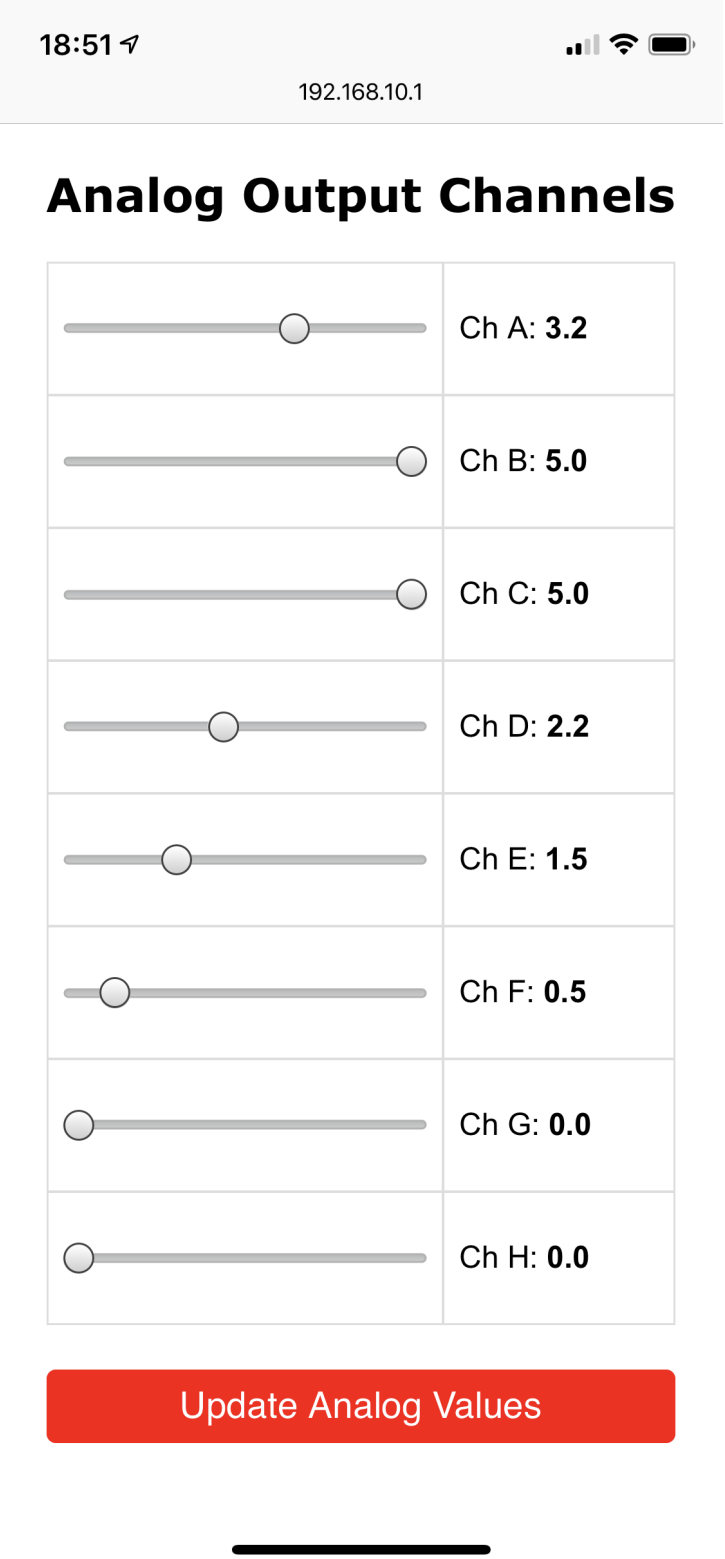


Analog Outputs allows testing all channels and can be used to calibrate the Min/Max values to indicate the correct voltage on some Glass Panels/EMS modules.

When this page is loaded, actual PMag Analog Output is stopped.

The values shown are DC voltage output. Slide one or more channels to the desired output and click Update Analog Values. The system outputs the value shown on the Analog Output pins.

This can be used to verify the outputs and also to adjust the Min/Max value set on the EMS module to correctly match 0V, 1V, 2V and so on to the range. The range is linear. For example, the range for PMag temperature is 0 to 255. This is linear with 0-5V range as well. Voltage losses and Analog conversion errors can be seen and adjusted within the Glass Panel display range setting to compensate for the small errors if needed,



Notes & Tips

- If you need to reset the PMag Prop TDC position by using the “blow in the tube” method, you need to either disconnect the Controller by removing the DB15 connector or pull the circuit breaker for the Controller power before applying power to the PMag. The Controller moves the PMag from Setup mode to Run mode once powered so it can retrieve the PMag data.

- Only Crimp the needed pins. It's best to leave unused Analog Output pins without connection as these will still carry 0-5V potential.

- When using the Wi-Fi pages, certain pages will disable the Analog Output, you will see 0V on these pins. Such as Prop Page, as the Controller is continuously monitoring the Prop angle while this page is loaded. It's recommended to always go back to the Main page (or View Running data page) as this puts the Controller back into retrieving live PMag running data.

- Analog Output Page allows confirmation of the voltage being sent from the Controller to the EFIS. This method also shows if there is huge loss in voltage being sent and voltage level received in the EFIS. Even though shielded cables are not generally required for these Analog Outputs, depending on the length and nearby wires, you may need to use a larger gauge wire and shield (connected from one end to ground) to eliminate any large voltage losses seen using the Analog Output Wi-Fi Page.

- PMag reports Advance Angle in 1.4 degrees increment. It is expected to have a +/- 0.2 degree difference when viewing this value on EFIS due to Analog conversion and wire voltage losses. For example, if the Adv Angle is 26.6, you may see 26.5 which is normal. The Wi-Fi page will show the exact correct figure.

- For Dual PMag installation, it takes a few seconds only for the Controller to retrieve all data and enable Wi-Fi server. Providing the TX/RX pins are wires correctly. For Single PMag installation or if the controller is unable to talk to any PMag, it will take 60 seconds before Wi-Fi is enabled while the controller is trying to communicate and find the PMag. The Wi-Fi page will show N/A on the PMag side that is undetected or missing.