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## Installation Guide for the “Header Tank Automatic Fill Relay” (Model: HTAF2)

Thank you for purchasing the “Header Tank Automatic Fill Relay” (model: HTAF2) manufactured by Aircraft Extras, Inc. The HTAF2 is a “Smart” Header Tank Pump Relay. This device automatically keeps the aircraft header tank full without over stressing any fuel pumps. The HTAF2 may be operated with one or two optical fuel sensors that will be mounted in the header tank. It can also be operated without any fuel sensors mounted in the header tank as well.

**Two Sensor Operation** - When low fuel is detected in the header fuel tank by the lowest sensor, the HTAF2 will pump fuel into the header tank until the highest sensor detects a full level. It will then, quit pumping.

**One Sensor Operation** - When low fuel is detected in the header fuel tank by the lowest sensor, the HTAF2 will pump fuel into the header tank for a customer specified time period. It will then, quit pumping.

**NO Sensor Operation** - The HTAF2 is normally used with very reliable optical fuel level sensors mounted in the header tank. If the user is not able to install any fuel level sensors in the header fuel tank, the HTAF2 can be set up so the pilot may manually activate the HTAF2. It will then pump for a customer specified time, then quit.

The unit also has two relay outputs that can be used for a remote or light indication. One is a low fuel indication. The low fuel relay output is damped so that it does not falsely indicate low fuel in the case of sloshing fuel. This relay output is also used to indicate system errors if connected to an indicator light, it flashes the light with different timing to indicate what failure occurred. The other output is when the fuel pump is active.

The system can be powered by +12V or +24V electrical systems.

## SAFETY

**(PLEASE READ THIS SECTION CAREFULLY BEFORE PROCEEDING!)**

Installing the HTAF2 is easy and safe as long as you make sure that you do it properly. Please follow these recommended guidelines.

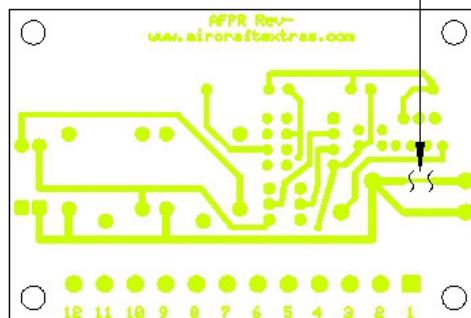
- 1.) Consult your local aviation expert. Discuss the safety aspects of installing anything into or around aircraft fuel tanks.
- 2.) Take precautions to prevent any of the wiring of this system to come in direct contact with the aircraft fuel, even in the event of a fuel tank leak.
- 3.) After the sensor has been installed, seal around the outside and inside of the sensor & tank with Proseal or equivalent fuel tank sealant in order to guarantee no leaks. If a metal sensor nut is utilized, cover it with sealant to prevent corrosion contaminating the tank.

- 4.) Route the wiring immediately exiting the sensor “up” and then out of the fuel area, and into a safe area. This will prevent the fuel (if a fuel leak should occur) from migrating down the inside of the sensor wiring cable.
- 5.) Seal around the sensor and the sensor exiting cable to guarantee no fuel migrates into the cable in case of a fuel leak.
- 6.) If you are installing this system into a fuel tank that has already contained fuel, consult your local aviation expert on the precautions you should take to prevent a fire or possible explosion during installation.
- 7.) Avoid using tools that will generate sparks or high heat during installation if your fuel tanks have previously contained fuel.
- 8.) Make sure the cable exiting the sensor is brought out, and well away from the fuel tank area before terminating the wires or installing a “quick disconnect” connector of any sort.
- 9.) Make sure that your installation does not leave any debris inside the fuel tank or clog the fuel intake.
- 10.) Install the electronics enclosure well away from any area that may become soaked in fuel. This area should be vented and free of any fuel vapor.
- 11.) Use recommended fusing for the electronics. Refer to all appropriate system wiring & assembly diagrams.
- 12.) Keep any fusing or circuit breakers away from any area that may contain fuel or fuel vapor.
- 13.) It will be left up to the installer to determine whether this system is tested and operating properly for the aircraft it is installed.

## **IMPORTANT for +24V OPERATION**

The HTAF2 can be operated with **+24V system power**. In order to do this, a foil on the back of the PC Board ***MUST BE CUT***. Remove the foil section in between these two cuts. If this is not accomplished, it could damage the unit when power is applied. After this is accomplished, you can wire per the connection diagram. The lamp and fuel pump should be designed for 24V operation.

CUT FOIL JUMPER ON BACK OF BOARD HERE FOR +24V OPERATION



### **FUEL SENSOR INSTALLATION**

**WARNING:** The installation instructions for installing the Low Fuel Sensors were written for tanks that have not yet had fuel in them. The fuel sensor installation may be a bit tricky if you have already had fuel in your tanks! You should consult your local A&P for safe methods in order to accomplish this. Please read our SAFETY tips!

### **FUEL SENSOR POSITION**

The location of the start and finish fuel sensors should be located in a part of the tank where they can positively indicate a low and high fuel value. The sensor must also be mounted relatively horizontal. The reason for this is; if the sensor is mounted in other orientations, a drop of fluid may remain on the sensor tip not allowing the sensor to detect a “no fuel” condition. It must be mounted so that the fuel drains off of the sensor tip. It can be mounted horizontally in a “T” connector in a fuel line if properly done.

### **FUEL SENSOR MOUNTING**

The sensor is mounted or screwed into a 1/4NPT fitting. You will need to install a female threaded 1/4NPT bung on the inside or the outside of the tank in your selected sensor position. Make sure you seal the

attachment points with "ProSeal" or equivalent fuel tank sealant. Using a "small amount" of "Fuel Lube" on the threads ONLY, it is to be screwed into a 1/4 NPT female fitting. "Fuel Lube" should guarantee no leaks. Sensor will malfunction if "Fuel Lube" is contacting the sensor tip. **DO NOT over torque!!** 13.26 in.-lbs. (1.5Nm) max. It is NOT important that the sensor hex nut bottom out on the female fitting. After installing the sensor, we recommend using a small amount of "Pro-Seal" or another brand of fuel tank sealant to help secure the sensor in place. Applying a small bead around the outside of the sensor should guarantee it won't back out, and may also inhibit future leaks from forming. This suggestion is just a bit of extra insurance. Wire the sensor leads to the electronics. If the wires are not long enough, solder on a longer length of wire. Be sure to electrically insulate the wire junctions and keep them away from any fuel.

## **NOT ABLE TO INSTALL ANY FUEL SENSORS IN THE HEADER TANK**

If the user is not able to install a fuel sensor in the header fuel tank, you have two options.

### **Option #1**

If you have a fuel sight tube available or you can fabricate one, you might be able to install the sensors in the lines going to or from the sight tube.

### **Option #2**

If you do not have a fuel sight tube or cannot install one, there is another option. You may implement a manual start of the fuel pump and a user specified timed pump finish. The HTAF2 can also be set up so the pilot may manually activate the HTAF2. This can be accomplished with a normally open switch (NO) connected between terminals 4 and 1 (common). Pressing this switch once simulates a low fuel condition starting the HTAF2. This switch can be installed on the instrument panel. If you choose to use option #2, it will operate exactly like the one sensor connection. The only change is that the operator will have to initiate the pumping instead of relying on a low fuel sensor.

## **ELECTRONICS ENCLOSURE INSTALLATION**

The electronics enclosure was designed to mount almost anywhere. Mounting it near the sensor or fuel pump eliminates the need for running long wires but NOT recommended in an area of possible fuel or fuel vapor spill. Keep the enclosure away from extremely high temperatures, areas of excessive vibration.

## **SYSTEM WIRING & FUSING**

Please follow the wiring diagram provided. We recommend that you size the power wiring to the HTAF2 for your maximum current of the fuel pump. All other wiring can be #18 to #24AWG. For fusing, you should use a circuit breaker or a time delay fuse that is proper for your fuel pump load.

## **NO SENSOR or ONE SENSOR OPERATION - SELECTING A PUMPING TIME**

If the HTAF2 system does not utilize any sensors, or only the start sensor, you may manually select a pumping time. This can be accomplished by installing a permanent resistor (or variable potentiometer) across input terminal 2 to common. The “approximate” resistance value should be selected from the following table. You may have to vary it a bit to get an exact time if you desire. To ensure that you have selected and installed the proper resistance value, you may measure the voltage at terminal 2 to common and compare it with the table below.

<b>Terminal 2 Volts</b>	<b>Delay in Seconds</b>	<b>Delay in Minutes</b>	<b>Resistance (Ohms)</b>
0.5	0	0.00	554
0.6	15	0.25	680
0.7	30	0.50	812
0.8	45	0.75	950
0.9	60	1.00	1095
1	75	1.25	1248
1.1	90	1.50	1407
1.2	105	1.75	1576
1.3	120	2.00	1753
1.4	135	2.25	1941
1.5	150	2.50	2139
1.6	165	2.75	2348
1.7	180	3.00	2571
1.8	195	3.25	2807
1.9	210	3.50	3058
2	225	3.75	3327
2.1	240	4.00	3613
2.2	255	4.25	3921
2.3	270	4.50	4251
2.4	285	4.75	4606
2.5	300	5.00	4990
2.6	315	5.25	5406
2.7	330	5.50	5858
2.8	345	5.75	6351
2.9	360	6.00	6891
3	375	6.25	7485
3.1	390	6.50	8142
3.2	405	6.75	8871
3.3	420	7.00	9686
3.4	435	7.25	10604
3.5	450	7.50	11643
3.6	465	7.75	12831
3.7	480	8.00	14202
3.8	495	8.25	15802
3.9	510	8.50	17692
4	525	8.75	19960
4.1	540	9.00	22732
4.2	555	9.25	26198
4.3	570	9.50	30653
4.4	585	9.75	36593
4.5	600	10.00	44910

## **MALFUNCTION WARNING ALARM**

The HTAF2 has two built-in malfunction alarm features. They are both indicated by a toggling or flashing of the Fuel Detect Relay output. If you want to view this indication, you should connect a light or LED indicator to this relay output and install it in the cockpit. Please refer to the wiring diagram.

### **Condition FAST FLASH (every 0.5 seconds)**

It condition indicates when:

The Start Sensor goes high (+5V) indicating that the unit should start pumping  
AND

The Finish Sensor is already low (zero volts) indicating that the tank is already full. This condition indicates that one or both sensors are not functioning properly. There may be several causes of this condition and is left up to the user to troubleshoot it.

### **Condition SLOW FLASH (every 2 seconds)**

It condition indicates when:

The Start Sensor goes high (+5V) indicating that the unit should start pumping  
AND

The the pump has been pumping for 30 seconds.

This condition indicates that one or both sensors are not functioning properly. It might also mean that the fuel pump is not pumping an adequately volume to get the fuel level above the start sensor. There may be several causes of this condition and is left up to the user to troubleshoot it.

## **PRODUCT UPDATES and SAFETY INFORMATION**

It is up to the user to PLEASE check our web sight from time to time for changing product information, important safety information software updates and/or manual updates.

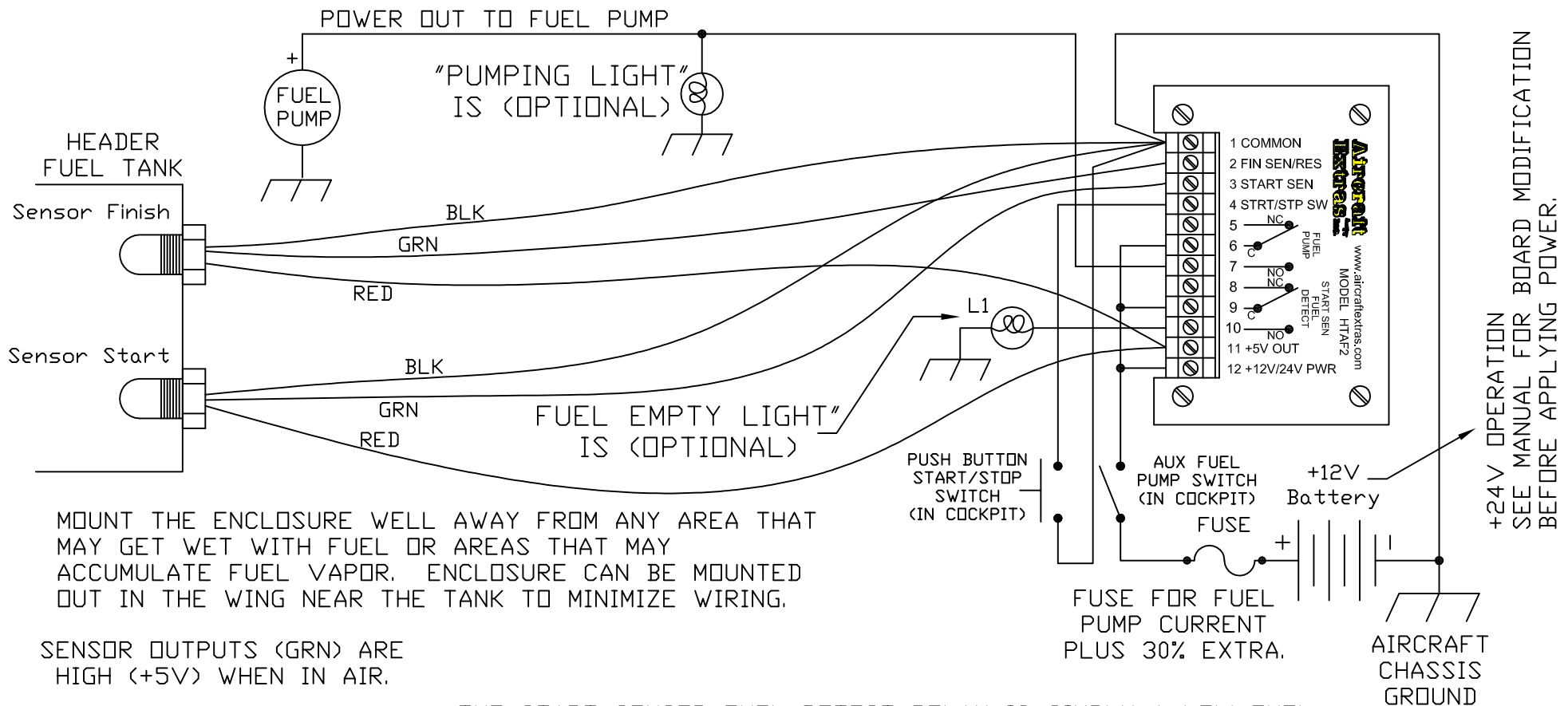
All information can be found here: [www.aircraftextras.com/Manuals.htm](http://www.aircraftextras.com/Manuals.htm).

PLEASE have fun and always fly safe!

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### Two Sensor Diagram



MOUNT THE ENCLOSURE WELL AWAY FROM ANY AREA THAT MAY GET WET WITH FUEL OR AREAS THAT MAY ACCUMULATE FUEL VAPOR. ENCLOSURE CAN BE MOUNTED OUT IN THE WING NEAR THE TANK TO MINIMIZE WIRING.

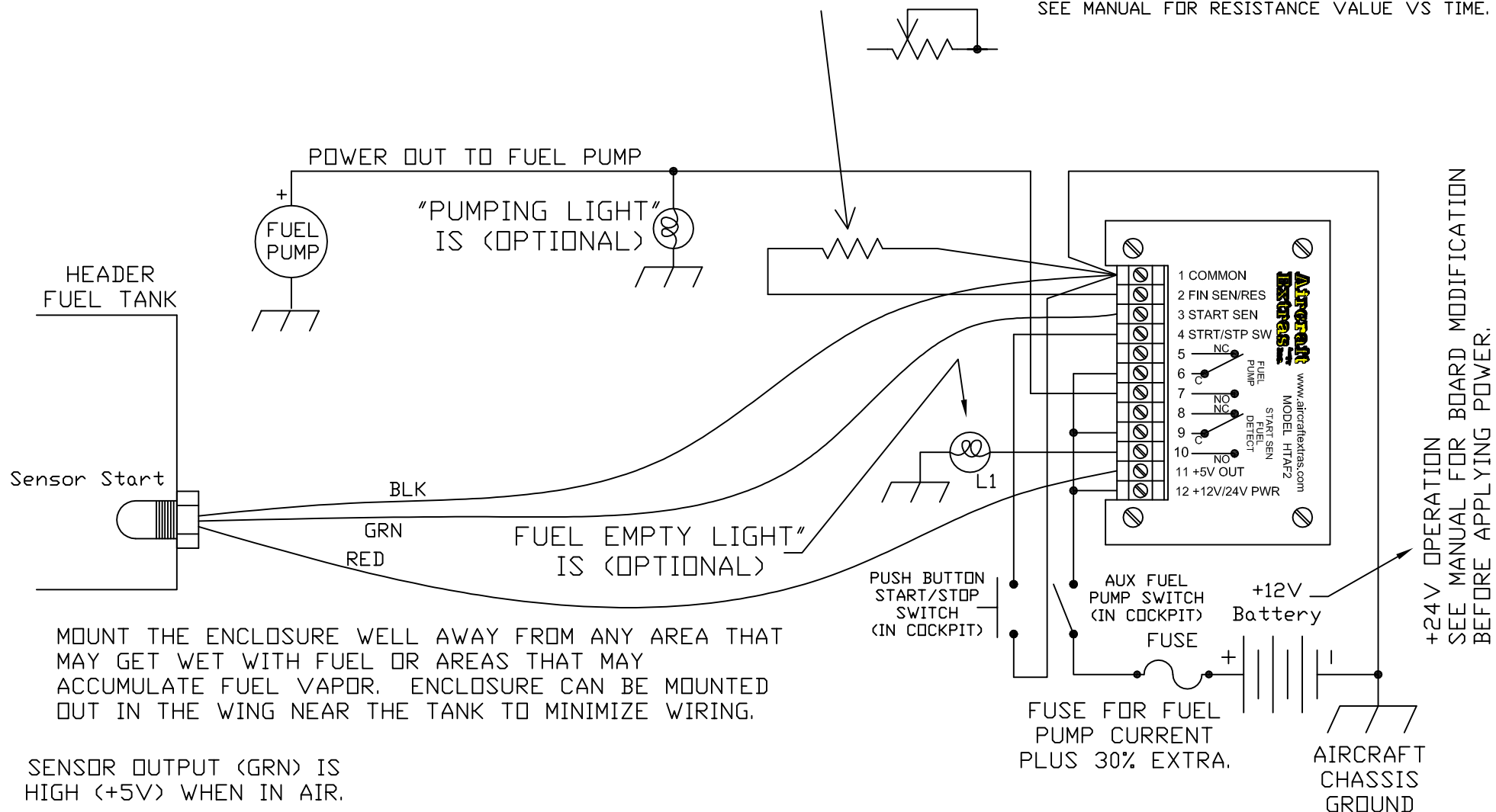
SENSOR OUTPUTS (GRN) ARE HIGH (+5V) WHEN IN AIR.

AIRCRAFT EXTRAS, INC.  
www.aircraftextras.com  
HEADER TANK AUTOMATIC FILL RELAY WIRING DIAG.  
HTAF (TWO SENSOR) 1/9/20, Rev-A

THE START SENSOR FUEL DETECT RELAY IS SIMPLY A LOW FUEL INDICATOR THAT YOU CAN USE TO DRIVE ANYTHING YOU DESIRE. THE RELAY OUTPUT IS DEBOUNCED AS NOT TO ALLOW THE DETECTION OF SLOSHING FUEL IN THE TANK.

### One Fuel Sensor Diagram

(OPTIONAL: IF YOU DO NOT HAVE A FINISH SENSOR INSTALLED) YOU MAY SELECT PUMP TIME BY INSTALLING A RESISTOR IN PLACE OF THE FINISH SENSOR. YOU MAY ALSO USE A VARIABLE POTENTIOMETER IF YOU WISH. SEE MANUAL FOR RESISTANCE VALUE VS TIME.



MOUNT THE ENCLOSURE WELL AWAY FROM ANY AREA THAT MAY GET WET WITH FUEL OR AREAS THAT MAY ACCUMULATE FUEL VAPOR. ENCLOSURE CAN BE MOUNTED OUT IN THE WING NEAR THE TANK TO MINIMIZE WIRING.

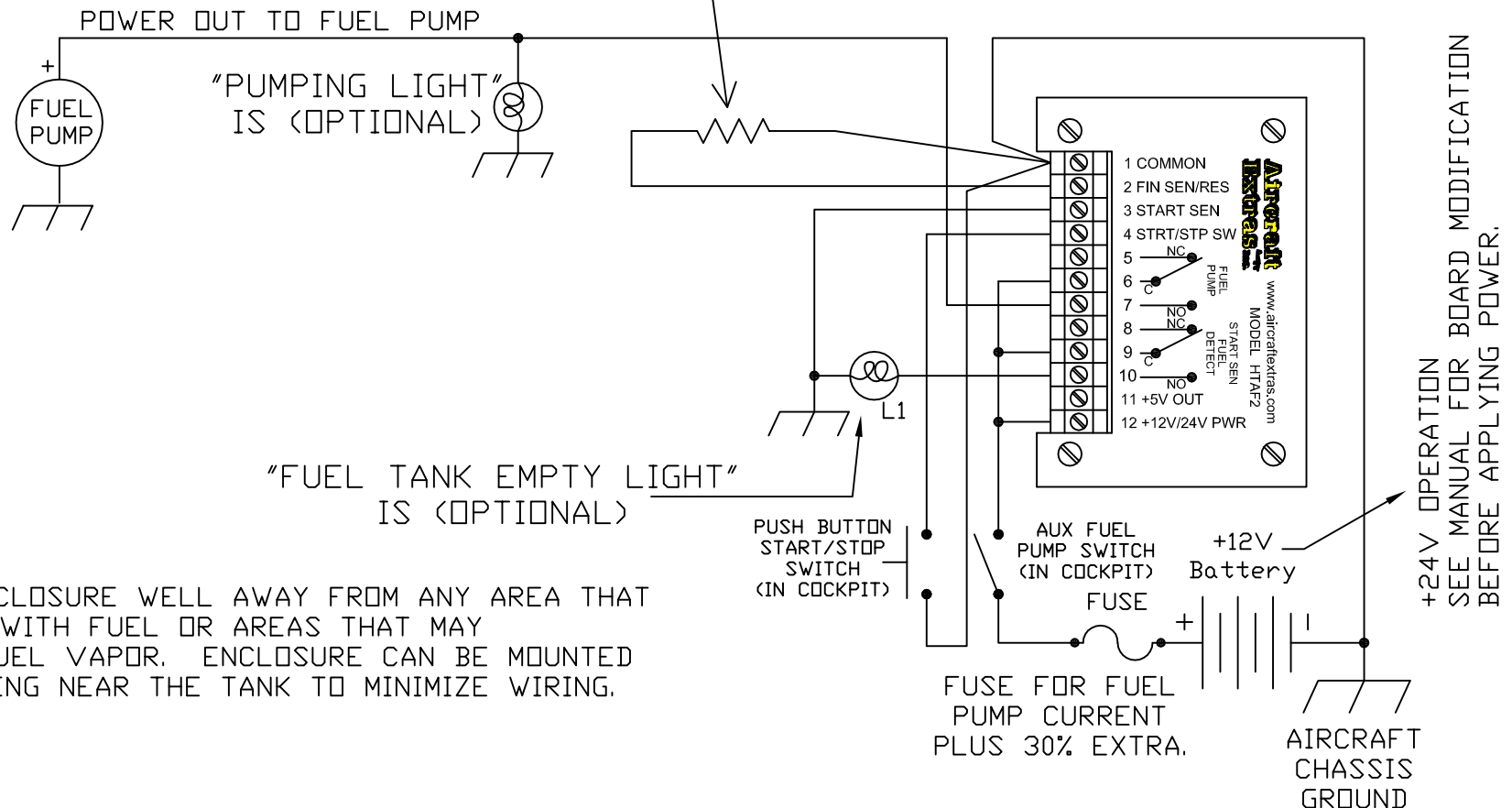
SENSOR OUTPUT (GRN) IS HIGH (+5V) WHEN IN AIR.

THE FUEL DETECT RELAY IS SIMPLY A LOW FUEL INDICATOR THAT YOU CAN USE TO DRIVE ANYTHING YOU DESIRE. THE RELAY OUTPUT IS DEBOUNCED AS NOT TO ALLOW THE DETECTION OF SLOSHING FUEL IN THE TANK.

### NO Fuel Sensor Diagram

MANUAL OPERATION: IF YOU CANNOT INSTALL ANY SENSORS IN THE FUEL TANK, YOU MAY SIMULATE THE START SENSOR WITH A SWITCH AND START THE PUMPING MANUALLY. THIS SWITCH CAN BE CONNECTED FROM PIN 4 TO COMMON. THE SWITCH SHOULD BE A PUSH BUTTON (NORMALLY OPEN). SEE THE MANUAL FOR MORE DETAILS.

A RESISTOR IS NEEDED TO SELECT A PUMPING TIME. INSTALL A RESISTOR IN PLACE OF THE FINISH SENSOR. YOU MAY ALSO USE A VARIABLE POTENTIOMETER IF YOU WISH. SEE MANUAL FOR RESISTANCE VALUE VS TIME.



MOUNT THE ENCLOSURE WELL AWAY FROM ANY AREA THAT MAY GET WET WITH FUEL OR AREAS THAT MAY ACCUMULATE FUEL VAPOR. ENCLOSURE CAN BE MOUNTED OUT IN THE WING NEAR THE TANK TO MINIMIZE WIRING.

+24V OPERATION  
SEE MANUAL FOR BOARD MODIFICATION  
BEFORE APPLYING POWER.

THE FUEL DETECT RELAY IS SIMPLY A LOW FUEL INDICATOR THAT YOU CAN USE TO DRIVE ANYTHING YOU DESIRE. THE RELAY OUTPUT IS DEBOUNCED AS NOT TO ALLOW THE DETECTION OF SLOSHING FUEL IN THE TANK.