User manual rev1.

- EFIE v1.3 tuner board + LCD controller display
- HHO PWM 55A/150A + LCD controller display
- HHO PWM 55A/150A + EIFE v1.3 tuner board +LCD controller display

Please note this is an universal datasheet for the the produkt above the list. Depending on your KIT configuration some of the information in the user manula is unnecessary for your istallation. If you have only the EFIE tuner board ignore the PWM controller informations. If you does not have EFIE tuner board only the HHO PWM controller than you dont have to bother the settings in the **EFIE Settings menu**.

LDC display menu structure:

1. **PWM Settings**
   - **1.1 Set PWM current**
   - **1.2 Set OFF voltage**
   - **1.3 Set ON voltage**
   - **1.4 Set MAP level**
   - **1.5 Set MAP gain**
   - **1.6 Water level sensor ON/OFF**
   - **1.6 Voltage level sensor ON/OFF**
   - **1.7 MAP correction ON/FF**
   - **1.8 Back**

2. **EFIE Settings**
   - **2.1 O2 sensor Narrow 1**
   - **2.2 O2 sensor Narrow 2**
   - **2.3 O2 sensor Wide 1**
   - **2.4 O2 sensor Wide 2**
   - **2.5 MAP/MAF sensor 1**
   - **2.6 MAP/MAF sensor 2**
   - **2.7 IAT snesor**
   - **2.8 CTS sensor**
   - **2.9 Freq MAP sensor**
   - **2.10 Back**

3. **SAVE Settings**
   - **3.1 Save LCD settings**
   - **3.2 Save into EFIE board**
   - **3.3 Save into PWM board**
   - **3.4 Back**
4. **EXIT**

Enreting the menu you need to press the button long. Selecting each parameter on the right side with press the button the adjustable parameter starting to blink. This is when you can increas or decrease the needed parameter. When you are done press the button again. The Left side data shows the specific sensor input voltage. This can help tune the sensor signal. With some sensors like O2 narrow /wide and MAP sensor you might notice that even if you change the tuning parameter in the + or - direction the input sensor voltage remains the same. This is happening because the the engine sensors are working mainly in closed loop feedback system so even if you modify the signal it may look like it remains the same. Dont worry about this.

In the most parameters the the setting are looking like this:
On the **left side** there are the related sensor information:

PWM Settings:

- *<u>PWM current settings:</u>* ***Peak curren*** *which shows the available maximal current with the actual HHO cell. Measuting the Peak current you need to set a minimal current.*
- *<u>Set OFF/ON voltages:</u>* ***Battery voltage*** *it shows the measured battery voltage on the voltage sensing input.*

Using the **Right side** parameters you can set Current and Voltage levels how much current do you want in your HHO cell and where do you want the controller to switch the relay driver output ON/OFF.

Very important note for the voltage sensing: Many users hardly can understand an important fact how the voltage drops on the wires and how this effects the the relay output and sensing the voltage on the battery. With bad wiring of the voltage sensing cable the relay will turn on-off like an oscillator. You need to bypass the power wire and connect the voltage sensing wire to the battery or the key switch.It this is not okey than a small voltage drop on the sensing input may turn ON/OFF the relay output. Follow the wiring diagram and connect the voltage sensing cable directly to the battery + pole or the key switch.

Turning ON/OFF the votlage level sensor you can set the desired mode how you want to use the PWM. Do you want to use the sensing voltage to turn on the PWM with running engine or you

want to use it from the switched realy. For the safety reason the relay running from the keyswitch like you can see on the wring diagram is highly recommended.
Turning ON/OFF the water level sensor you can set what do you want when the water level sensor is open. If you set ON than the HHO production will stop and the display shows a warning message with LOW water. If it is OFF than only the Warning message will blink on the display but the production won't stop.

It is possible to use the MAP sensor input on the PWM controller to gain the HHO cell gas production as the engine MAP sensor reading higher air flow and higher hidrogen volume may needed. MAP sensor level sets the voltage level where the production gain will turn on and the MAP gain level sets the how strongly will react the PWM controller the MAP voltage changing.
If you dont need this function just turn it off with the MAP correction ON/OFF menu.

IMPORTANT:
These settings only available when the controller and the LCD display is ON. When you restart the unit the settings will be lost. You need to save the settings in the 3.1 Saving menu.

It may happen when the display shows No Device... message. If you see this you need to check the the two communication wire between the PWM and the LCD display.

EIFE Settings:

- *<u>O2 sensors Narrow 1/2:</u>* ***O2 sensor voltage*** *which is measured on the EFIE O2 Narrow band sensor inputs .*
- *<u>O2 sensors Wide 1/2:</u>* ***O2 sensor voltage****which is measuere on the EFIE O2 wide inputs.*
- *<u>MAP sensor 1/2:</u>* ***MAP/MAF sensor voltage*** *measured on the EFIE MAP inputs.*
- *<u>IAT/CTS sensor:</u>* ***IAT/CTS sensor voltage*** *measured on the IAT CTS sensor line.*

*Using the **Right side** parameters with pressing the button you can set the modification values what can be positive or even negative value.*

You can set the signals with the following resolution:

- **O2 narrow band sensor: +/-300mV with 1mV resolution**
- **O2 wide band sensor +/-1mA with 1uA resolution**
- **MAP/MAF sensors +/-2V with 5mV resolution**
- **IAT/CTS sensors has a tuner value when you are set these you need to follow the voltage changes on the sensor inputs.**

IMPORTANT:
These settings only available when the controller and the LCD display is ON. When you restart the unit the settings will be lost. You need to save the settings in the 3.1 Saving menu or it you are ready final EFIE settings and you want to finally remove the LCD (working the EFIE board in stand alone mode) you need to save the settings in the EFIE board with the 3.2 menu.

When you are starting the tuning process you can choose between two options how you do the engine tuning:

1, Use a ODB reader to follow the engine Fuel injection and temperature parameters.

2, If you dont have ODB reader follow how the engine reacts to the modified parameters and how the engine power starting to change. Finding the optimum is more difficoult but starting from the zero settings it is also possible.

Regarding there is many kind of cars and engines models with different number and kind of sensors and your HHO or other fuel setup may be different we can not give separated tuning proess and exact tuner voltages and currents for every car and model but you can use a kind of universal process which is similar on every car.

First of all you need to discover what kind of sensors does your car have.

LOCATE SENSOR WIRE:

If none of these options are available, you'll need to locate the oxygen senor and then locate the signal wire by testing. The sensor can have 2, 3 or 4 wires (some can have 5 or 6- these are rare), and you have to know which one is the signal wire. The most common configuration for modern cars is 4 wires.

If you have 4 wires they will be:
" Heater 12 Volts +
" Heater ground
" Oxygen sensor signal +
" Oxygen sensor signal ground

If you have 2 or 3 wires, then you can have a common ground, or no heater wires etc. The simplest setup is a single wire, which is the signal wire and the sensor get's it's ground from the exhaust pipe.

You can use the following procedure to narrow down which wire is which:

1. Stick straight pins into the sensor's wires and measure them to ground with the engine running. One of these will show 12 volts, and this will be power for the heater.
2. Next find any wires that produce 0 volts. These will be ground wires.
3. The remaining wire should be your signal wire.Measure the signal wire to ground with the engine running. The voltage on this wire will vary from nearly 0 to about 1 volt. Since your meter will not be fast enough to see the lows and highs, it will average them out to about 0.2 to about 0.8 volts. The fluctuations will be so fast you have a hard time reading the numbers. Note, that you have to let the engine warm up a bit before you will get these voltages from the sensor.

NOTE: The engine must be at operating temperature to perform this check. Many O2 sensors do not produce a signal until the sensor is warmed up. If you can not find a signal wire with fluctuations between 0-1 volt, there is a possibility that you have Wideband sensors.
The narrow band oxygen sensor gives a voltage signal between 0.1-0.9V

If you have narrow band sensor:

To modify the signal you have to cut the wire which is comming from the sensor and goint to the ECU. Turning on the EFIE tuner board with 0mV O2 narrow band settings the zero modification when you measure near 0mV between the input output terminals. Leaning the fuel you need to add 0-100mV to the signal. It is depending how the engine reacts to the changes.

If you have wide band oxygen sensor:

The wide band oxygen sensor sinks a proportional current and the ECU converts it a measurable voltage. It is usually changing between 2-3V . To modify the signal don't have to cut the wire. Use the wiring diagram and connect to the Wide O2 input. Leaning the fuel you need to add 0-500uA to the signal. It is depending how the engine reacts to the changes. When you do this the input signal voltage should remain the same.

About the IAT and CTS sensor:

CTS SENSOR MOD- The goal is to add about 10 degrees to your coolant temperature sensor reading. It's important to note that the actual coolant temperature will remain the same as it normally would be. We are merely fooling the ECU into "seeing" it 10 degree’s hotter. A seemingly warmer engine promotes less fuel usage and unlocks leaner mixtures for the ECU, which it can now run because the HOD is protecting the engine by keeping it cool, as well as burning smaller amounts of gasoline more efficiently

They are a NTC based temperature sensors and they are responsible for the fuel injection. They can be independent sensors but they are often together with the MAP sensor and easy to find. You have

to looking for 2 wire. First is connected to the GND so it is common and the second is the signal wire. You can measure 2-10kOhm resistance between the GND and CTS; IAT sensor's legs. If the engine is running they have 1-3V depending on the temperature. If you find them you have to connect them following the wiring diagram. Modify the IAT and CTS sensor turn the knob that you read lower voltages. On each CTS ad IAT sensor lower voltage means higher temperature and that is what we need.

IAT (Intake Air Temperature) SENSOR MOD Once again we need to fool the ECU into thinking it's sensors are in agreement about the current conditions. If you have the CTS tweaked but not the IAT, the ECU is not likely to comply with leaning out of the fuel trim. You must unlock more tables in the ECU by doing this mod. This mod also changes the ignition timing curve. THIS IS A MUST TO GET THE BEST MILEAGE YOU CAN FROM USING HHO. Do not skip this step!

For the tuning good to use ODB ECU data reader to supervise the measured temperature and set the sensors precisely.

The IAT has a big effect on engine ignition timing. When it comes to improving combustion efficiency ignition timing is everything. Raising the temp retards the timing and lowering it advances it. With a hydroxy system we are actually looking to retard the timing because of the flame propagation speed increase within the combustion chamber using the system. It's important to add that the next modification of the MAP or MAF sensor will advance the timing, so you're looking to adjust the IAT temp a little over the mark for timing so that our final MAP/MAF adjustment brings the timing in perfectly. 80-100 degrees above ambient sounds dramatic, but is typically a good starting point.. This mod is also switched automatically after the engine warms up. This mod is sweet in that it allows me to "dial" in the correct value for the IAT, and find the optimal setting for economy. I adjust IAT for max power. NOTE: A scan tool is a MUST for this mod. You need to know what the IAT reading that the ECU sees is, to make the mod.

RE-ADJUST THE EFIE- ok, the CTS and IAT sensors are in agreement for a slightly leaner mixture, so time to adjust the O2 sensors as well with the EFIE. Now that you have effectively "lowered your lean limits" to the ECU, we can increase more voltage on the EFIE and get away with it. No check engine light or trouble codes to worry about, just don't get carried away. Go a little bit higher, maybe 50-150mv at your test points more then you have previously set.

MAP/MAF sensor:

The last mod, (probably the most important) is your load sensor mod. These sensors give the engine an indication of load by measuring the volume of air coming into the intake. Higher pressures(and higher voltage) mean more gas is needed, lower pressures (and lower voltage) mean less gas is needed. Simply put these sensors translate the need for x amount of fuel into voltages which are sent to the ECU. With hydroxy we don't need as much fuel as we did for everything before the system, even under load, so we can safely reduce some of this fuel. Even better, with the CTS, IAT and O2 sensors now in agreement for a leaner mixture, tweaking the MAP/MAF should be a piece of cake.

Generally speaking, you must find a way to reduce the air volume the ECU sees through either the MAP or the MAF sensor. You can do this electronically or mechanically. One of the biggest mistakes people make is they use their MAP or MAF enhancer as a fuel leaning device, and believe that no EFIE is needed if they use a MAP/MAF enhancer. This is completely wrong! Yes, it is true that lowering the MAP/MAF readings will reduce the amount of fuel the injectors are sending. However, the fuel you are taking away with the enhancer can easily be detected with the O2 sensors. The O2 sensor readings go lean because there's less hydrocarbons coming out after you take away fuel with the MAP/MAF enhancer. The result is your long and short term fuel trims will actually go positive and ADD more fuel to compensate! This is why many experimenters report losing mileage or going full circle with gains and then losses using only a MAP/MAF enhancer. You MUST address both the load sensors and the oxygen sensors. If both are in agreement about less fuel being needed, you will then see a fuel economy increase.

Find the analoge MAP sensor signal you have to looking for a wire changing the voltage between 2-4V depending on tha gas. This voltage raises when you have low pressure (high air flow) in the air sensor. Playing with the gas pedal helps to find the signal wire.

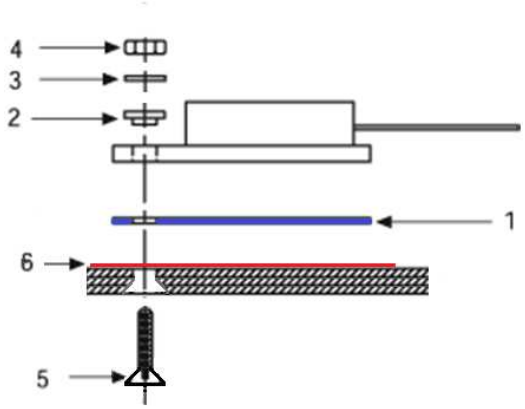
When you have signal wire you have to cut and connect to the EFIE board the diagram shows.

Istructions for the heatsink if you have PCB version HHO PWM 55A/150A controller:

The PCB version of the controller needs an additional heatsink or aluminium case to cool the power transistors. The dimensions of the heatsink can change depending on output current and of course the ambient temperature and the convection. Normally use a 100mmx100mm (4"x4") aluminium plate or equivalent aluminium case.

Step by step:
1. In the right positions drill M3 holes for the power transistors and for the fastening screws.
2. The hole's edges needs top be clear and burr free (small burr under the transistors can harm and penetrate the isolators causing short between the transistors and the heatsink).
3. Place heat conductor paste (6) under the isolator.Quantity is not important it need to be only a thin layer.
4. Place the silicone isolators in place. (1)
5. Make sure all the transistors flags are parallel with the heatsink. Having gap under the transistors flags can cause bad thermal contact overheating and damage.
5. Place the board and the transistors on the heatsink and fix it with the screws (5). Use the small white plastic isolator rings (2) under the screws to avoid the short between the metal flags and the screws.
6. Make sure all the screws are tight enough to have the best thermal contact.
7. Check the isolation between the transistors flags and the heatsink with digital ohm meter

<u>Fixing from down side:</u>



These are the possible signals comming from the engine sensors. Don't have to find all these sensors in your car. It is depending on the car and engine model which ones does it have.

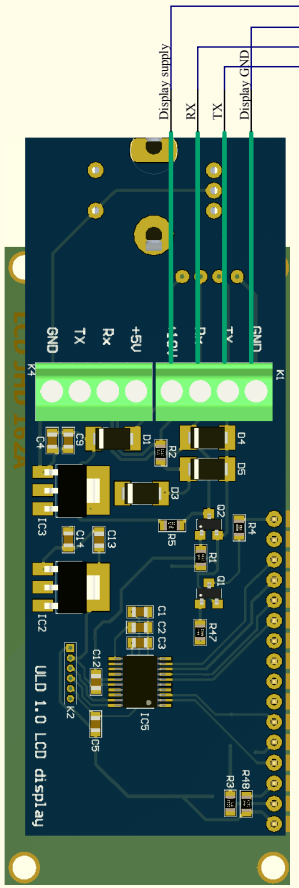
Cut!

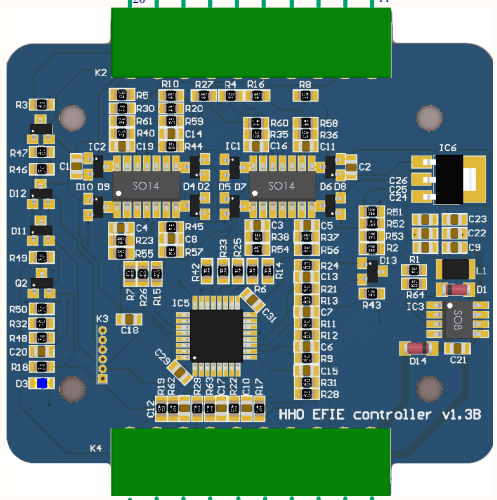
O2 narrow band sensor 2
O2 narrow band sensor 1
O2 wide band sensor 1
O2 wide band sensor 2

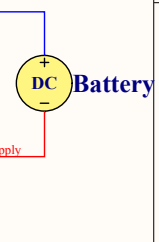
IAT temperature sensor
CTS temperature sensor
MAP/MAF analoge sensor 2
MAP/MAF analoge sensor 1

These are the possible modified signals going to the ECU computer

After the programming and saving the settings in the EFIE board the LCD is removable.







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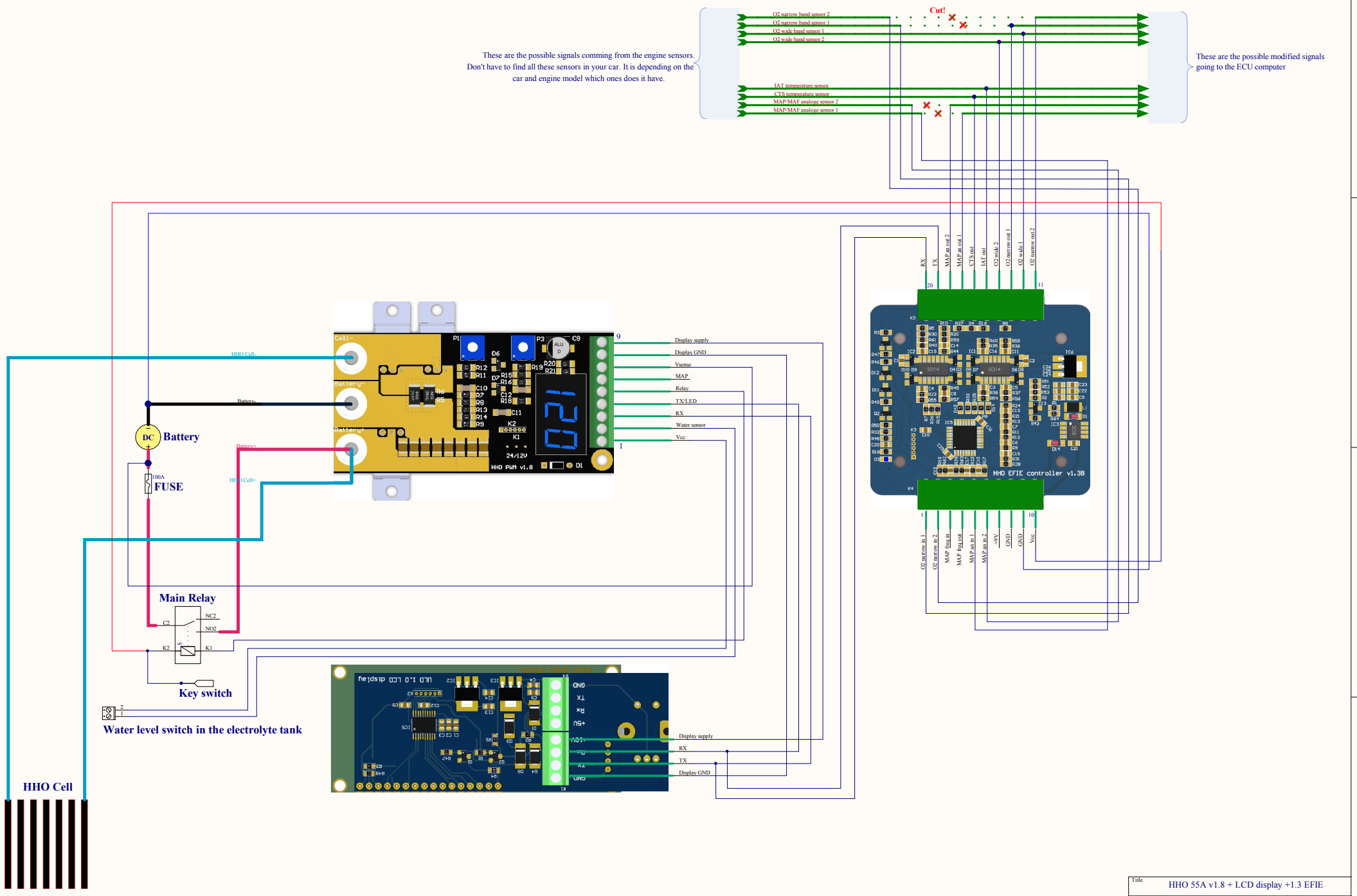

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