

MAIANA™ Assembly and Installation Manual

Basic breakout - Revision 1

October 24, 2021

Kit Contents

The kit will arrive with all of these parts in a 36" mailing tube. These are:



1. The main PCBA (in ESD envelope)
2. The breakout board (in ESD envelope)
3. The antenna tube
4. The antenna core (coiled wire with SMA male on one end)
5. The main case (high-UV resistance PVC)
6. Four 1.5" 2:1 heat shrink tubes, black
7. Two $\frac{3}{4}$ " 4:1 heat shrink tube, black

What you will need

To complete the breakout board, you will need a soldering iron. The board is supplied with unsoldered “breakaway” pin headers. You will need to mount those in the desired configuration (facing up or down).

You will also need a heat gun for the heat shrink tubing. You will need this both on your workbench for the initial assembly, as well as on your boat for the final installation:



The unit is designed for mounting on 1” OD steel railing or a similar diameter fiberglass mast. This is the preferred way to install it. You may, of course, use your own mechanism, but then you’re responsible for sealing the (bottom) cable end from moisture.

Finally, you will need to furnish your own Cat5 cable for connecting the main unit to the breakout board in the cabin. Pick one with appropriate length and flexibility to suit your installation. The exact configuration of the cable (568A or 568B) is not important.

Assemble the antenna

Simply attach the transponder board to the SMA female end of the pre-assembled antenna core as shown here: Make sure you tighten it adequately so it doesn't come loose. Use *hand tightening* only, no wrench. The board is already sprayed with silicone conformal coating, so it will resist moisture even if water seeps in (very unlikely if you follow these instructions).



Now push the entire lower assembly into the housing tube. It may be a tight fit, and it may even be necessary to sand the inside of the tube for the two ends to mate comfortably. This is by design, as the joint between the PVC and the polyolefin tubing forms a secondary water seal.



With the lower assembly completed, feed the end of the antenna cable through the tube and push the tube until it stops. It should be a little tight.



This is a good time to practice connecting the transponder end of the Cat5 cable. You should be able to simply push the cable into the jack until it latches:



To release the cable, simply insert your index finger or a long flat screwdriver into the bottom of the tube to push the latching tab. This may work better if your cable does not have a rubber boot. Practice doing this until you're comfortable. You will have to repeat this step during final installation on your boat.

Seal the antenna

Place one of the 1.5" heat shrink tubes as shown here, and use the heat gun to shrink it until the entire tube has taken the shape of the housing. It's best if you start at the bottom and work your way up, while rotating the unit with one hand.



For a strong bond, apply extra heat **near the bottom** of the seal until you see it glaze. Avoid overheating the upper portion at this stage.

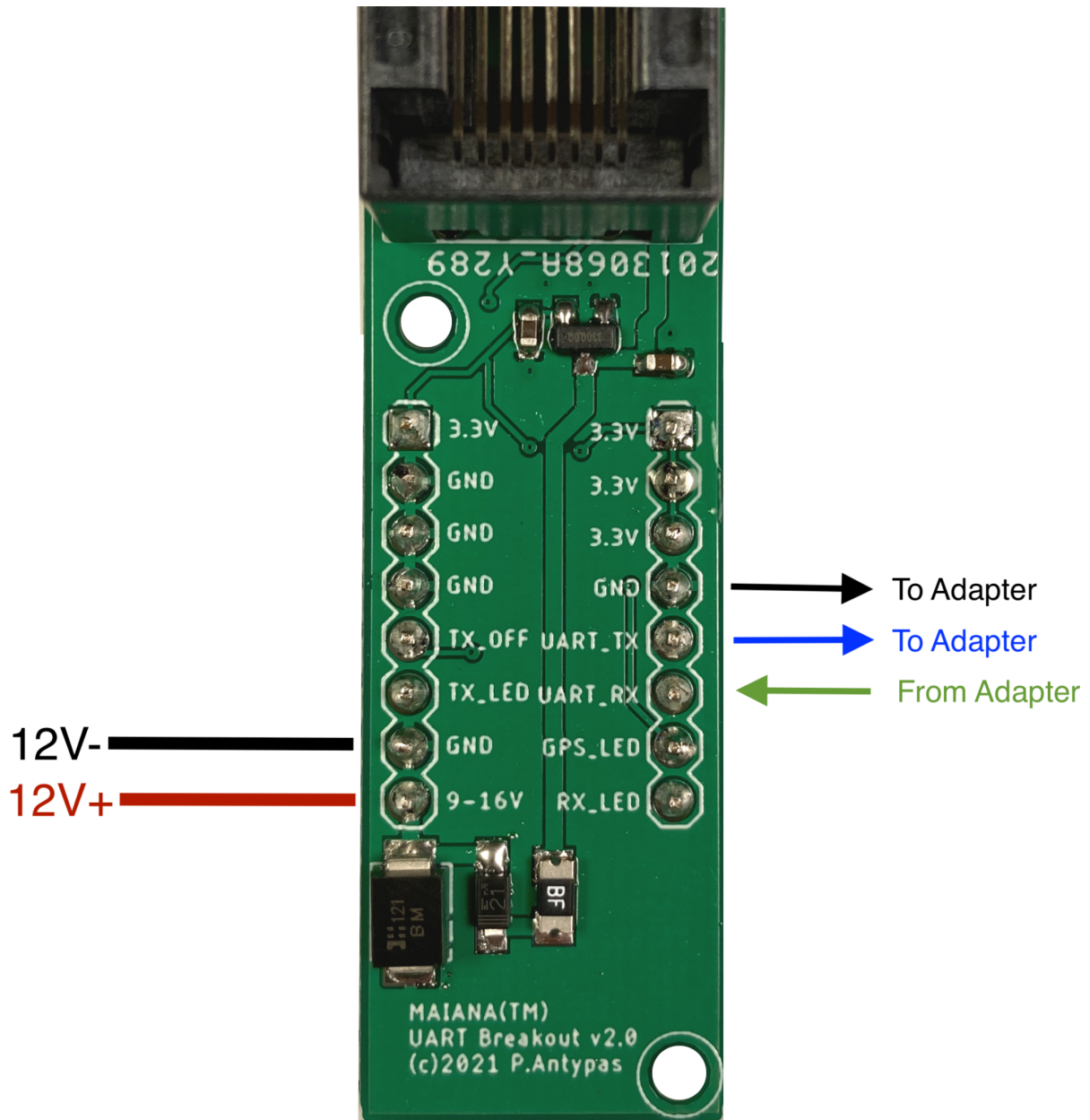
Insert the $\frac{3}{4}$ " tube over the cap as shown, and shrink it quickly without overheating and deforming the assembly.

Allow the assembly to cool for a bit. You should be able to lift the entire unit from the antenna tube. Use one hand to hold and suspend the unit from the tube and the other hand to heat the center of the heatshrink area, while rotating the assembly continuously. Do this for about 30 seconds and you will notice the material softening, elongating and straightening. This forms your primary water seal. The main unit is now ready for installation on the boat.



Test and provision the system

Now that both subassemblies are ready, it's a good time to wire them together and test them. Place the main unit near a window if possible, connect the two boards with a Cat5 cable, and wire the breakout box as shown below. You will need a minimum of 4 wires: 12V power (input), GND, UART_TX and UART_RX.



For this step, you will also need to wire the UART signals from the breakout to a PC or laptop with a serial terminal application. This will require a UART to USB bridge that will create a virtual COM port. Configure the COM port for 38400 bps, 8 bit data, no parity, one stop bit. Attach the serial terminal to this port and power up the system. You should see a continuous feed of NMEA0183 sentences.

To interact with the unit using commands, configure your serial terminal application for line input with CRLF ('\r\n') termination. Then send the *cli* command (you may need to send it more than once). The unit should reboot and respond with this output:

```
CLI mode. Send the 'reboot' command or cycle power to exit.
```

With the terminal really quiet now, it's a lot easier to send the *station* command for provisioning. This command has eight comma-separated arguments with no quotes or spaces in between. It must be sent in one line like this:

```
station mmsi,name,callsign,type,len,beam,portoffset,bowoffset
```

The arguments are:

- MMSI (you should have one for your boat already)
- Boat name (up to 20 alphanumeric characters, no punctuation. Use all caps)
- Call sign (may be empty if you don't have one)
- Type (this is the numeric type of the vessel, see below)
- Length in meters (integer only)
- Beam (width) in meters (integer only)
- Port offset (meters from the port side where the unit is located).
- Bow offset (meters from the bow where the unit is located).

For vessel type, here are some numeric values that apply to class B transponders:

- 30 - Fishing
- 34 - Diving
- 36 - Sailing
- 37 - Pleasure craft

Choose whichever you think is appropriate.

When you send the command, the unit will program the data into its EEPROM and respond with the \$PAISTN proprietary sentence. Here is an (invalid vessel) command example:

```
station 987654321,NAUT,,37,0,0,0,0
```

response:

```
$PAISTN,987654321,NAUT,,37,0,0,0,0*2A
```

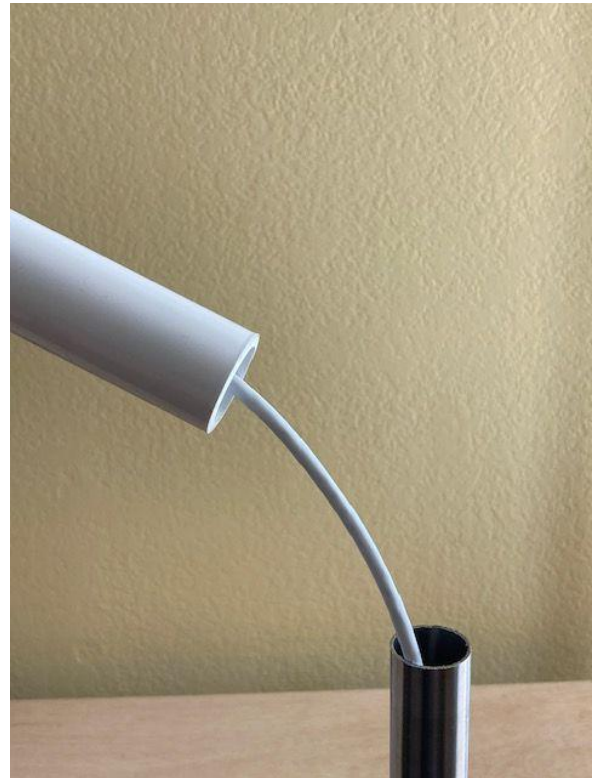
If you made a mistake, you can always send the *station* command again. If this looks like it worked, issue the *reboot* command to restart the unit.

Final installation

Exterior Unit

The antenna housing is designed for mounting on 1" OD railing, which is fairly standard for boats. It can also work with 1" OD fiberglass masts.

Feed the Cat5 cable through the railing and make sure there is at least 20cm of slack where the unit will mount, then place a 1.5" wide heat shrink tube at the edge of the railing. Now snap the R45 into the transponder board like you practiced before, and feed the transponder case through the tube (you may need to twist to coil the cable into it).



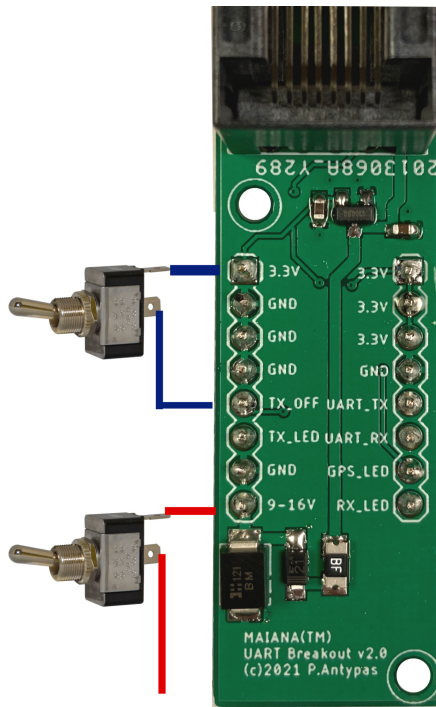
Once the casing is fully seated, you can bring the heat shrink tube up to cover the joint:



Finally, use the heat gun to shrink the tube.
Apply heat generously, until the material glazes.
That should be all for the exterior unit!

Breakout

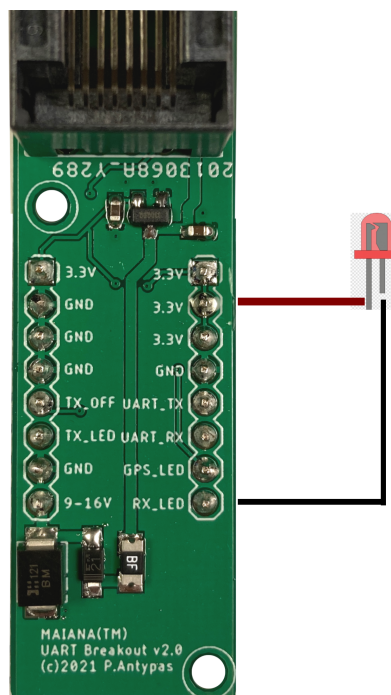
The breakout board should be mounted below deck, somewhere where it's going to be protected from the elements. How and where it is fitted is entirely your choice.



If you want a power and/or TX switch, you can use simple rocker switches as shown here.

A 1A-rated SPST can simply interrupt the main 12V supply.

If you want a hardware switch for “silent mode”, you need to remember that transmission is disabled if the TX_OFF signal is driven to a logic “high” (above 2V), so wire it as shown here.



If you intend to wire LEDs, this is the correct way. The LED signals are *open drain* outputs. Rather than supplying a voltage, they pull the cathode of the LED to GND via a built-in 100 Ohm resistor. The voltage you apply to the anode is flexible (up to 30V tolerated), but the breakout supplies 3.3V so take advantage. That said, some LEDs may still draw too much current and will need an extra resistor added in series. You can wire that on either the anode or the cathode side.

If you run into trouble, email maiana.kits@gmail.com

Enjoy!