Foucault Pendulum Electronics Kit.

D10_Assembly Instructions.

www.foucaultpendulum.nl

Document version	2026-05-25
Relates to PCB version	All
Related Documents	D12_Parts list Schema BobCtl PCB Schema Receivers PCB Schema PMS-Base PCB Schema PreAmplifiers

Tools needed / suggested
Solder Iron with sharp tip. Temperature adjustable 380 .. 400 °C.
Solder tin. Can be leaded: PbSn or lead free e.g: SnAg. (The PCB's are not lead-free)
Desoldering braid.
Small side cutters.
Tool for bending the wires of the components to the proper pitch.
2-component glue.
Piece of flat foam material.
Looking glass to inspect solder joints.
Multimeter to check resistor values.
M3 25mm mounting studs + nut.

The Bob Control PCB
The BobContol PCB is designed to have the MEGA below the PCB and the ETHernet shield above the PCB as piggy-backs. The board should be mounted on M3 studs of at least 20mm long.

The tricky thing here is to mount the long pinned headers such that the Mega and the ETH shield can be plugged on in an easy way. I suggest the following working order:
Put the PCB over the MEGA, and put the headers through the PCB into the receptors on the MEGA. Turn over, push the PCB flat on the headers, lift the Mega a few mm and solder only the end pins of each header to the PCB. You will need a solder iron with a sharp tip. Then check that the EthernetShield also fits and no pins end up aside of the headers. Check repeatedly that all headers sit flat on the PCB. After this take off the Mega and solder the remaining pins. Be sure that no solder blobs can hinder the pins to go as deep as possible into the Arduino sockets (see document Known Problems) Check frequently that the Mega and the Ethernet Shield can be plugged on easily without pins missing their socket.
The last one to mount is the 2x3 header for the SPI feedtrough. Put it together with the Ethernet shield on the PCB, solder 2 diagonal corner pins, check that the MEGA also fits neatly, then solder the remaining pins. It is important that this socket does not prevent the other arduino pins to go as deep as posible into the sockets. If in doubt, check with a multimeter that all Arduino pins make contact with the corresponding pin.

In this phase you could already test the working of the Ethernet connection if you have the software installed and compiled. Upload the firmware into the Arduino, connect to the network and see if the arduino can be PING'ed and if the GUI communication works.

From here on it is convenient to have 4 M3 studs of say 25 mm length in the mounting holes. Then place the 3 2x2 headers 5..16, the 2x4 header OPT 1-1 and the 1x7 female header for the DDS. Press them to the PCB with a piece of soft foam plastic, turn over and solder the corner pins. Check that they are flat on the PCB and then solder the remaining pins.
Do the same with the IC sockets DIL14 and DIL 6, and the boxed headers 2x10 and 2x4. Mind the orientation of the notch on the pin 1 side.

Then mount the flat-on-the board components like resistors. Check the schema for the correct values. Most resistors are from the E24 range, which means that they have 4 significant

colored rings. 1,2,3 and #of zeroes. When In doubt check with a multimeter. Preferably mount the resistors such that they can be read in the same direction, e.g. left-to right and bottom to top.
Do not yet mount R32 and R35, as experimenting with the value may be needed. See Description of the electronics.
After that the capacitors, trimpots, and transistors can be mounted.

The RCA connector needs to be connected with short wires. From P1 to the central pin, and from P2 to the housing via the GND-tab. For the wires you can use cut-offs from the resistors.

The hole marked GND is to mount the long M3 screw + nut. This is very convenient during testing, to connect the GND cables of the oscilloscope probes to.

Important Modification when using Magnetic Center and / or RimPass detection.
This modification mitigates the problem that large signals due to induction from the DriveCoil cause a DC-shift in combination with the limiting diodes in the Arduino and the timeconstant with C23, C24.
- Replace C23 and C24 by resistors of 4k7.
- R46 and R48 become 4k7.
- R47 and R49 are not mounted.

Modification to suppress oscillations of the Drive Current circuit.
Across the pins of the DriveCoil connector one should connect the series circuit of a capacitor 100nF Ceramic and a resistor of 100 Ohm. This snubber circuit will suppress HF oscillations in the driver circuit, which otherwise might disturb the fuctioning elsewhere.

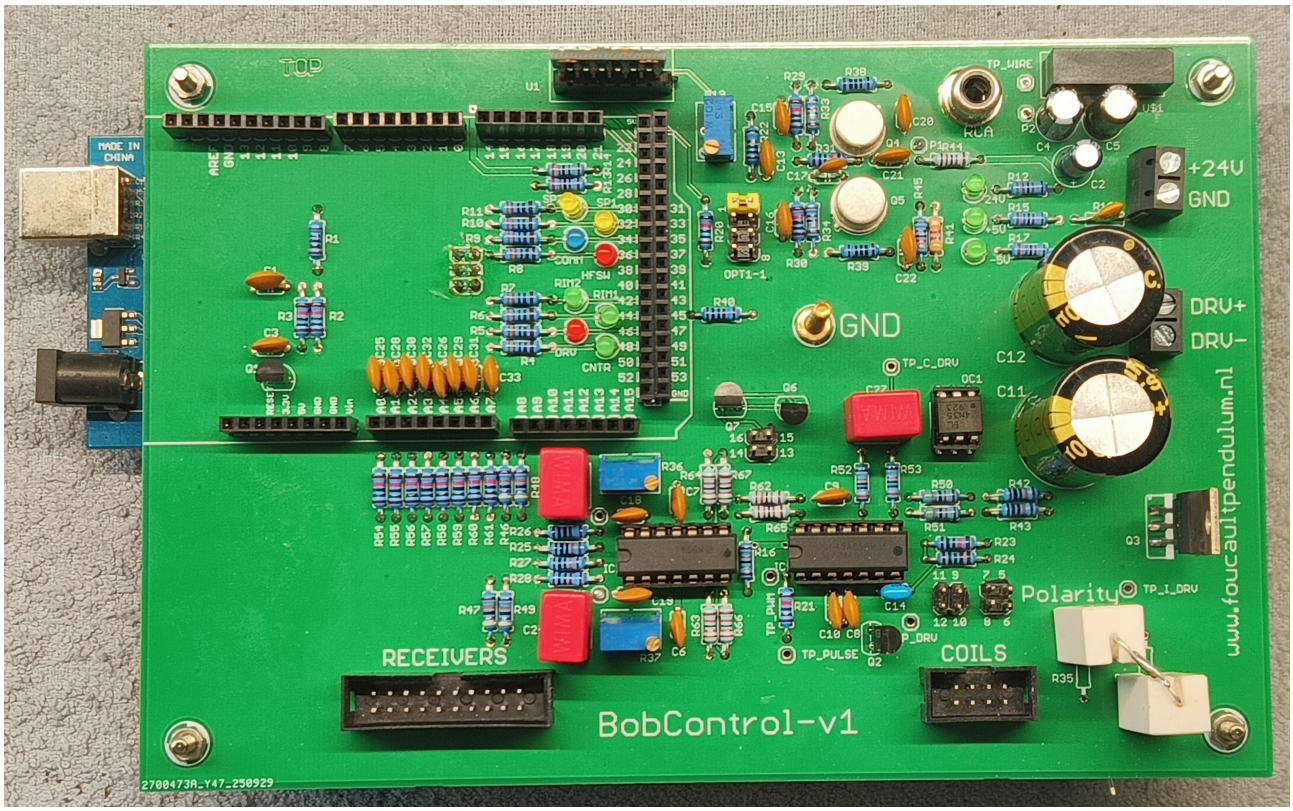


Fig 1. The populated BobControl Board, without the Ethernet shield.

Assembly of the Receiver PCB.
It is best to first mount the lowest components, like the resistors. Suggestion: use a flat piece of soft foam plastic to keep the components in place when you turn the board for soldering. After that the connectors, capacitors, trimpots, ceramic filters and transistors can be mounted. The ceramic filters must be placed with the text pointng to the left!.
The hole marked GND is to mount the long M3 screw + nut. This is very convenient during testing, to connect the GND leads of the oscilloscope probes to.

In the Version v1 board the traces to TP5, TP6, TP11, TP12, TP17 and TP18 are missing. They are on the schema but not on the board.
The remedy: Take 6 pieces of cutoff wires from resistors, bend a eyelet of a few mm on one side, put it in the TP-hole, and solder it on the bottom side to the cathode of the ajacent diode. The eyelet can be used to hook an oscilloscope probe for testing.

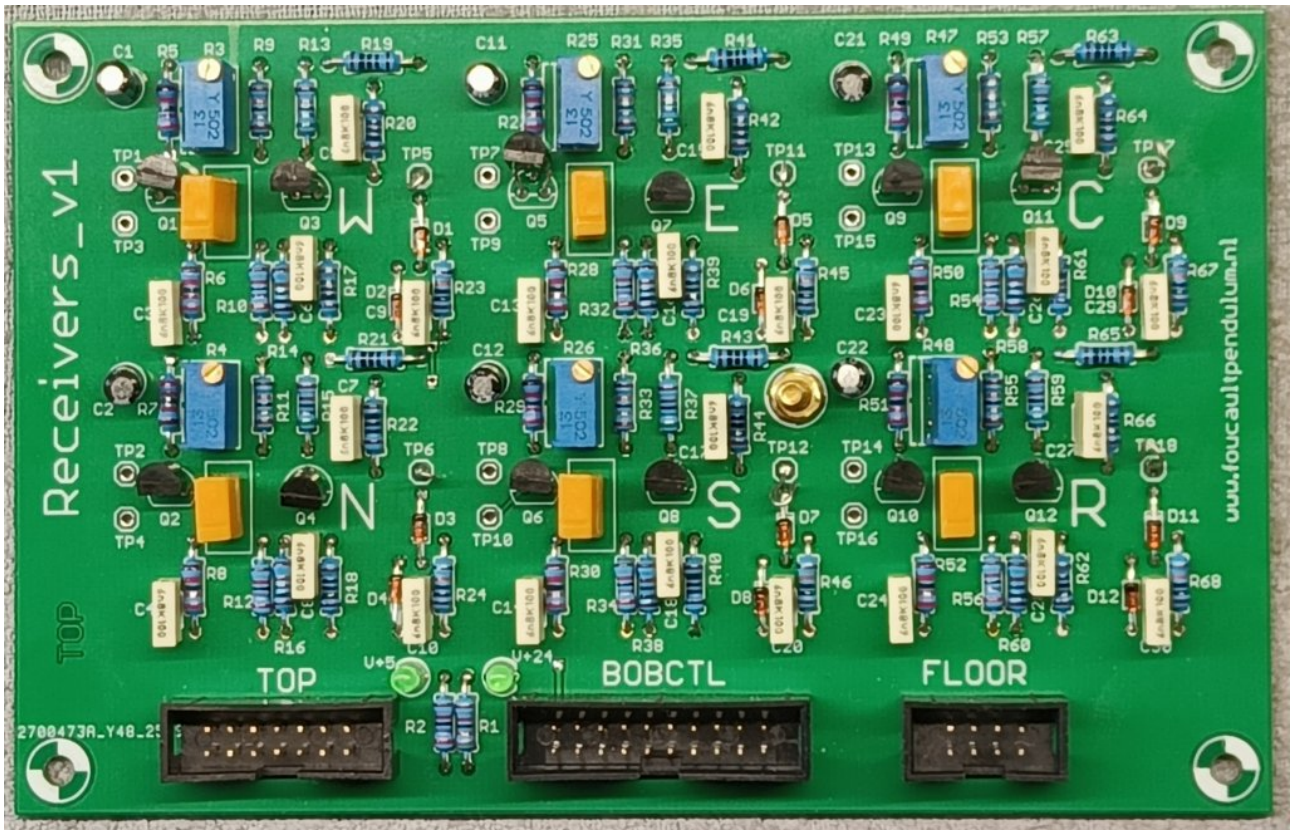


Fig 2: The populated Receiver board.

Assembly of the Pre-amplifier board is much the same as the other boards. This board is only required when you are going to use the Capacitive method for Center- and/or Rim Pass detection.

Assembly of the Top unit (PMS).
The Top Unit consists of 4 different PCB's:
- The base plate with the 4 pre-amplifiers,
- The sensing electrodes (4 pcs),
- The shielding electrodes (4 pcs),
- The top plate.

Start mounting the electronic components on the base plate.
Place the 4 sensing electrodes in the holes of the base plate and connect the signal terminals with a stiff wire. The same with the 4 shielding electrodes. Use cut-off's from the resistors for the wires.
Then place the top plate. This is a bit tricky, you might need a multitude of fingers to bring every part in the right position at the same time.
When success place the assembly with the top side down, put some weight on the base plate and apply two-component glue to the 16 junctions. After hardening all the extra fingers will not be needed anymore. Better not glue the top plate, it makes the unit's internals inaccessible.
Finally mount the grounding wire between the base and top PCB's.

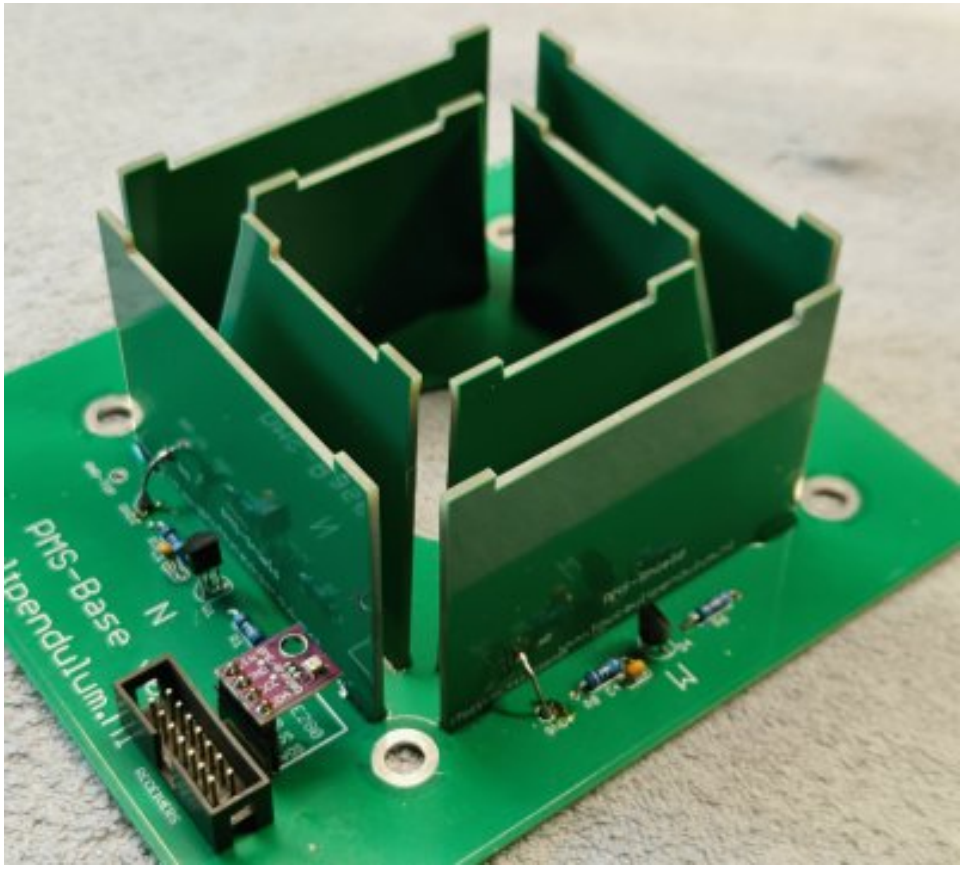
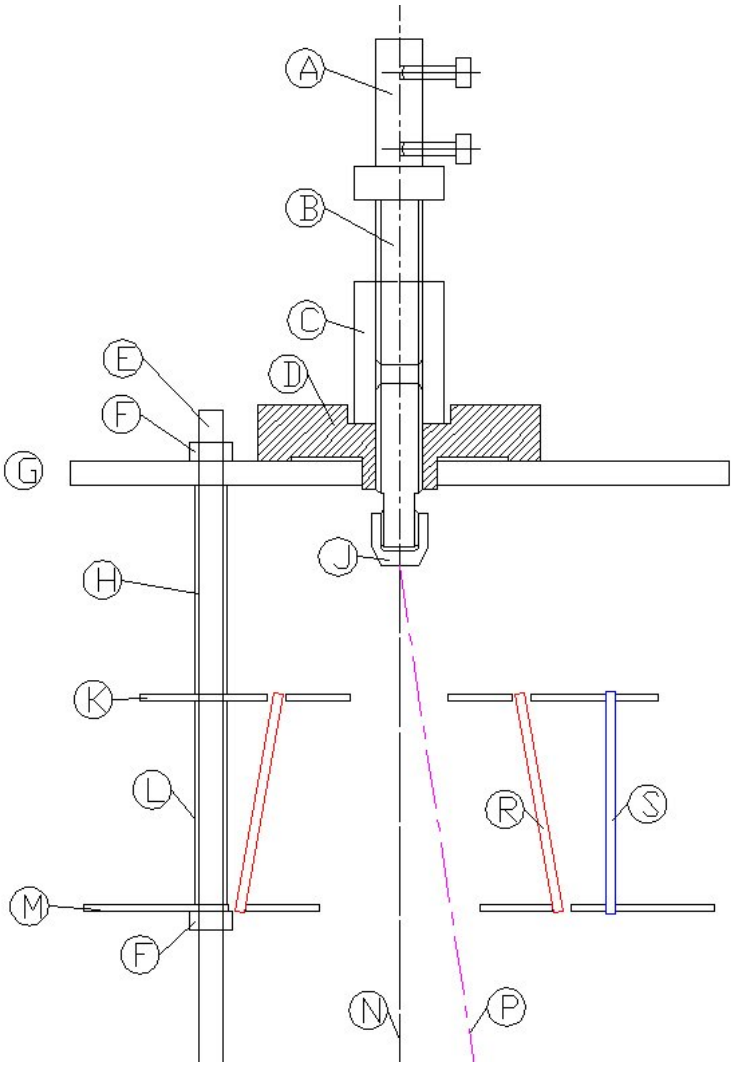


Fig 3: PMS without the top plate.

Mounting the PMS in your Pendulum.
To find a proper place for the PMS it is best to make a drawing on scale, like the one below (from my sub-meter pendulum).
Place the PMS as low as possible, but not so low that the wire can touch a PCB.
The mounting holes in the PMS are on a 80 x 80 mm square.



Legend:
A: Clamp to fix the wire vertically. This clamp takes most of the weight of the bob.
B: Hex headed screw M10 to adjust the height of the bob. Drill a centered hole for the wire.
C: Long nut M10.
D: Insulated carrier.
E: M5 threaded brass rod. (x4, only one side is drawn)
F: Brass nut M5, (x8). Brass washers optional.
G: Support.
H: Aluminium bus (x4). outer diam 7, inner diam: 5mm . length: at your choice.
J: Wire Clamp (from a proxxon PCB drill). This clamp takes the sideway forces of the wire.
K: Top plate of PMS.
L: Aluminium bus as above, L=43mm, (x4)
M: Base plate of PMS.
N: Wire in rest position.
P: Wire at maximum amplitude.
R: Sensing electrode of PMS (x4).
S: Screening electrode of PMS (x4).
Not numbered: Between J and C:
hollow threaded rod, upper part: M10 x 1.5 (standard), lower: M8x 0.75 for Proxxon clamp.