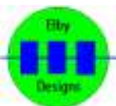




MonoWave(X)

Construction Guide
Version 1.2

June 30th, 2018



MonoWave(X) Build Guide

Construction

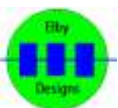
Construction of the MonoWave (X) is relatively straightforward and generally only requires good general soldering skills. As always, we recommend building the board up in layers starting with the smaller components like resistors and diodes and moving up to the largest components. If you have IC Sockets then fit them after the resistors and diodes. If not, then I would suggest leaving the IC's until last. Normal anti-static precautions should be followed throughout, especially when handling the IC's. Please pay particular attention to the orientation of the IC's, diodes and electrolytic/tantalum components.

If acquiring your own components then please follow these suggested guidelines when selecting suitable items:-

- All resistors should be 1% 0.5W Metal Film.
- All capacitors less than 1nF are normally miniature ceramic discs. I would recommend Low K NPO types. The pcb footprint accepts 0.2" pitch components.
- All capacitors between 1nF and 1uF are 10% Metallised Polyester capacitors on a 0.2" pitch. These are usually rated to either 63V or 100V but larger voltages can be used as long as they fit in the space available.
- Capacitors over 1uF are either Low ESR Electrolytics or Tantalums. These should, ideally, be a minimum of 25V. Larger voltage ratings can be used but again, the larger the voltage the larger the footprint.
- Trimpots are from the Spectrol/Vishay 64W/64X family or the Bourns 3296W/3296X family. These have their 3 pins inline and not staggered.

The display board utilises specific manufacturer components to ensure a uniform construction and to allow the board to be fitted to a custom front panel. Use of this board virtually eliminates all wiring from the construction. Three 40-way IDC cables are all that are needed to connect the display board and main board.

Defining specific models for the pots and switches does severely restrict the options you have when supplying your own components and some constructors may find it more desirable to use their own choice of components. If these components are not physically compatible with those chosen for this board then constructors should consider mounting their chosen components directly on to the front panel and then direct wiring from the IDC cables to the components. There are over 120 connections on the front panel and so constructors will need to consider this when making their choice on the panel components.



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For those wishing to supply their own components here is a list of the specific devices used. :-



All pots with the exception of P103 and P105 are from the OMEG LA2ECO16 family which are a double-gang pot. With the exception of P120, all of these pots have a dummy pot in the upper position.



P103 and P105 are from the OMEG XAG16ECO family and incorporates a push-push switch with a single-gang pot.

All switches are from the ITT-Cannon C&K 8121 series and are a pcb-mounted push-button switch with a mounting-support bracket.

Utilising these components allows for the pcb to be mounted directly to the front panel using the bushes and nuts of the pots. There is no need for mounting brackets.

The LCD module is a fairly standard model. Constructors should note the location of the module connections.

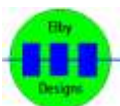


Firmware

The firmware that has been released by Paul Maddox under GPL will not work with this board. The MonoWave(X) uses newer micro-controllers and consequently the code needs to be recompiled for the new devices. Atmel have made several updates to their development platforms and in some cases have altered register names which may cause Paul's original code to report a number of errors when compiled with the current versions of AVR compilers.

We have also added new features including a larger display and updated MENU control.

To minimise the changes that need to be made to the original code, the main board currently retains the same crystal/clock frequencies as the original board.



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General Assembly Notes

Main PCB Assembly ([3D Model](#))

Install all components as per [General Construction Notes](#).

- When installing U4, form its legs first and then mount to the pcb with its heatsink and fixing hardware. Once securely installed, solder in to place.
- R2 should be positioned over the cut-out in the PCB and raised to be about 1-2mm clear of the PCB.
- Refer to the [3D Model](#) for positioning of the wire links in P801 and P1001
- Test Points (TPxxx) should be left clear. This will assist with 'poking' a test probe tip in to the test point and help prevent the probe from wandering.

Display PCB Assembly ([3D Model](#))

Refer to the [PCB overlay](#) and cut the track on the topside to P114_1.

Install all components except the 8x pushbutton switches, P120, 3x LEDs and 1x LCD plus header.

We recommend placing all the pots in to place without soldering. Then place the Front Panel over the controls to ensure that all the pots are correctly aligned on the Display PCB. Carefully turn the assembly over and solder the pots in to place.

Repeat with the 2x rotary switches.

Check that the switch stops are correctly located in the 'STOP 5' position and secure using the nuts supplied.

Install P120 and check that the front set of legs on P120 are not touching the rear set of legs. Once satisfied, fit the front panel and solder in to place.

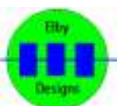
Refer to the [PCB overlay](#) and fit a wire link between P114_1 and C2_1.

Due to a manufacturer supply issue we are currently supplying a different pushbutton switch to what the pcb was designed for.

Install but do not solder the 8x switches, ensuring that the markings 'C NO NO' are visible at the front (nearest bottom edge of the Display PCB), and carefully offer the PCB up to the front panel. With the panel sitting squarely to the pots (you might like to fit 2 or 3 nuts to ensure the panel remains in place) raise each switch one by one and fit a nut to the switch. Do the nut up so that it is JUST flush with the top of the panel, the legs of the switches should still be in the Display PCB and should finish flush with the bottom of the Display PCB. Repeat for the other 7 switches. Turn the assembly over and rest on a suitable support to allow easy finger access to the switches. Start at the switches furthest from you, push a switch up until the legs are in their Display PCB locations and the switch nut is firmly against the panel. Solder tack the middle pin of the switch and repeat for the other 7x switches. Check that all switches are suitably mounted and then solder all the remaining legs, and finish off by reflowing the tacked centre legs.

Install the LCD as follows:-

1. Install the 4x 8mm spacers using the 4x 16mm bolts.
2. Install, but do not solder, the header for LCD1.
3. Install LCD1 and secure using the 4x M3 Nuts.



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4. Check that the header is seated properly on the Display PCB and solder in to place starting with the pads on the LCD and then moving to the pads on the Display PCB

Fit the lens mounts to the Front Panel. Install, but do not solder, the 3x LEDs.

Turn the assembly over and position the LEDs in to their respective mounts. Solder in to place.

Enclosure Assembly

NB: We recommend using the 2 carry handles supplied to attach the front panel as they help provide protection to the panel controls. However, fitting these front handles will marginally restrict access to the two right-most panel controls. If this is not desired or you prefer a more open front panel, then secure the panel using the M5 bolts and M5 nuts, mounting the bolts from the front panel side.

Attach the side panels to the Front Panel as desired. Ensure that the slots in the side panels are at the bottom of the panel.



Centre the side panels vertically on the Front Panel before locking the bolts.

Fit 2 braces to the Rear Panel using the long black M3 screws and nut, leave the fixings loose.

The bottom of the 'U' should be facing the Rear Panel.



Mount the Rear Panel assembly in to the main frame using the shorter black M3 screws. Slide the assembly as far forward towards the middle of the frame and lock the screws.

Lock the Rear Panel screws.

- Mount 2 braces in the base of the main assembly using the shorter black M3 screws. Including the rear slot, place the braces in the 4th and 8th slots. The bottom of the 'U' should be facing upwards. Leave the screws slightly loose.



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- Counting from the left, fit M5 spacers using the M3x12mm PEM screws at positions 3 and 29 on both braces.
- Using the M3x 4mm PEM screws fit M5 spacers at the 12th position on the front brace and 20th position on the rear brace.
- Install the main board and secure using 4x M3 nuts.
- Lock the braces in to position.
- Mount the Panel PCB on to the Front Panel.
- Place the supplied lock washers on to the pots and secure using the supplied nuts. Be very careful to not cross-thread the nuts. The 2x rotary switches do not have panel fixing nuts.

Fit a brace behind the Front Panel on the top side only using the shorter black M3 screws. The bottom of the 'U' should be facing the Front Panel.

Fit the 3x IDC cables between the main board and the panel board. The central and right-hand cables should be folded to allow them to sit neatly in the chassis.

Drawings for the 3 cables:

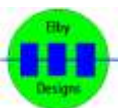
- [Cable J101](#)
- [Cable J102](#)
- [Cable J103](#)



Main pcb – Panel pcb interconnect cables

Fit the Rear Panel component assemblies and plug on to their respective headers on the main board.

The MonoWave(X) should now be calibrated after which the top and bottom covers can be fitted.



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The complete MonoWave assembly



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CALIBRATION

Initial Setup

Set the following controls to maximum (CW):-

OSCILLATOR-1 OZ
OSCILLATOR-1 SUB
OSCILLATOR-2 OZ
OSCILLATOR-2 SUB
VCF-EG SUSTAIN
VCA-EG SUSTAIN

Set the following controls minimum (CCW):-

TUNE
VCF ENVELOPE
VCF NOTE
VCF VELOCITY
VCF Q
VCF-EG ATTACK
VCF-EG DECAY
VCF-EG RELEASE
VCA-EG ATTACK
VCA-EG DECAY
VCA-EG RELEASE
VCA-EG VELOCITY
VOLUME

Set the following controls '0'

DETUNE
OSCILLATOR-1 OCTAVE
OSCILLATOR-2 OCTAVE

Set VCF CUTOFF to its centre position '5'

Connect a MIDI Controller to MIDI IN
Connect AUDIO to a suitable amplifier

LCD Contrast

Apply power and adjust P1301 for optimum contrast.

MIDI-CV Module

Trimmer	Module	Function
P401	MIDI-CV	V/Octave Scaling

Monitor TP401 and adjust P401 for an output of -10.667V



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Voltage Controlled Amplifiers (VCA1 and VCA2)

Trimmer	Module	Function
P1111	VCA1 – Velocity	Offset
P1201	VCA2 – Main	Offset

Adjust P1201 full CCW

Play and release a MIDI Note near Middle C.

Adjust VOLUME for a suitable listening level.

Adjust P1201 CW until the note just cannot be heard.

Monitor U1102_1 and adjust P1111 for 5VDC.

VCF CV Scaling

Trimmer	Module	Function
P901	VCF	CV Scale
P902	VCF	EMPHASIS Trim

Set the following controls minimum (CCW):-

OSCILLATOR-1 SUB

OSCILLATOR-2 OZ

OSCILLATOR-2 SUB

Play and hold a MIDI Note and adjust P902 until the output just starts to self-oscillate.

Repeat to check for consistency across a range of MIDI Notes.

Set the following controls to their mid-position:

VCF CUTOFF

VCF Q

Set the following controls minimum (CCW):

VCF VELOCITY

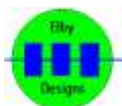
VCF-EG SUSTAIN

Set VCF ENVELOPE to maximum (CW).

Adjust VCF-EG ATTACK and VCF-EG DECAY to give an envelope control of the filter so that you can hear it sweeping through it filter range.

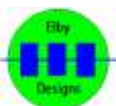
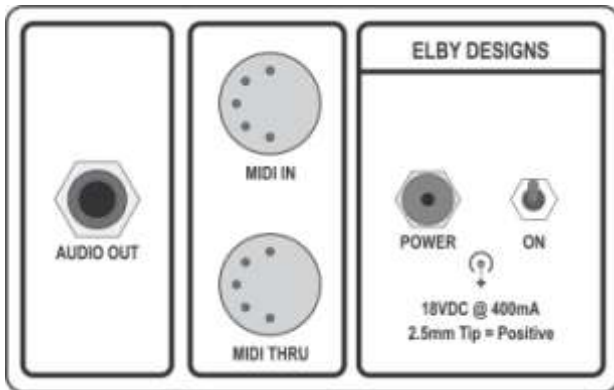
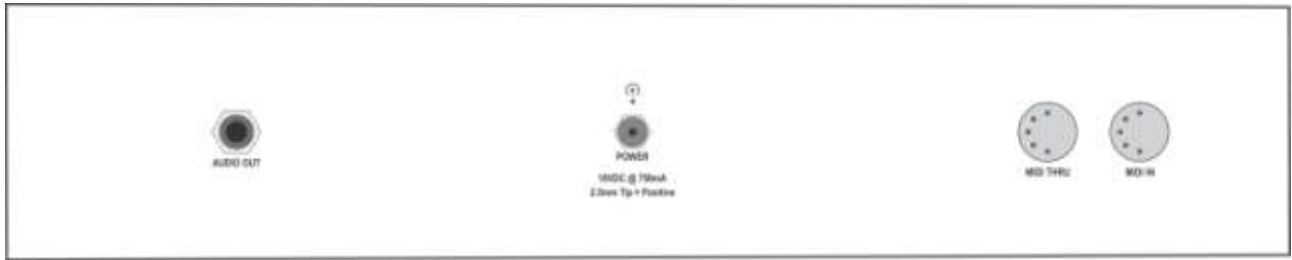
Play and hold a low MIDI Note (eg C2)

Adjust P901 so that after the envelope has complete you can just hear the note



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Rear Panel



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