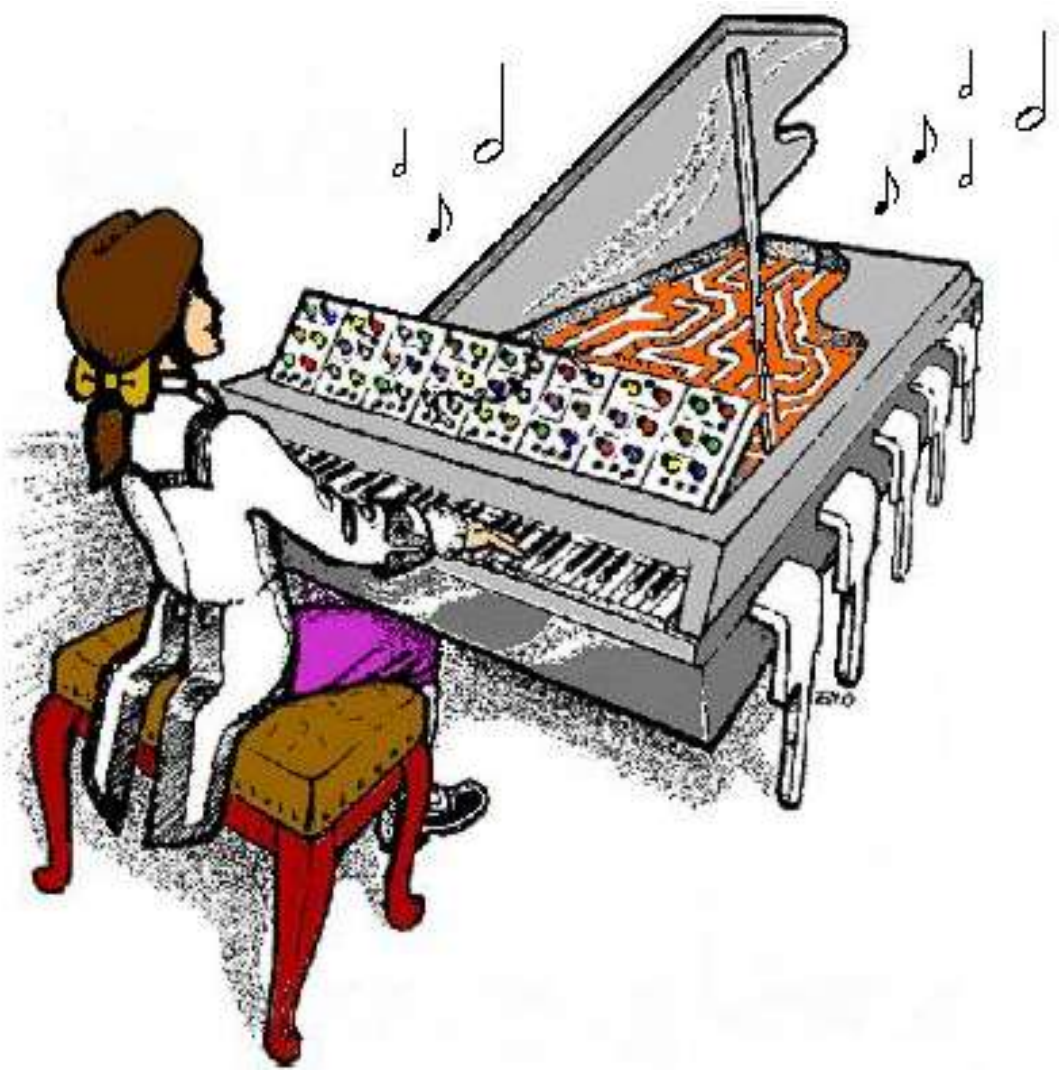

Pixie Construction Notes

PCB V2a

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Please note that this document is still currently under revision and we apologise for any errors or omissions.
Readers should feel free to e-mail any comments to me at the address given below.

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Construction Notes

The following notes are provided as a guide for those who choose to assemble their own Pixie using the Elby Designs Pixie Printed Circuit Board.

1. Let LK901 (wire link) stand 2mm above the board to make a useful earthing point for a scope lead.
2. Mount X1401 (16MHz crystal) approximately 1mm above the board to prevent the possibility of the crystal case touching any of the pin pads.

The following links require to be fitted to allow full operation of the Pixie. These links may, optionally, be replaced by headers and shunts if you prefer to experiment with the electronics.

1. LK501 (VCFEG)
2. LK1201 – LK1204 (Filter Controller)
3. LK401-LK402 (LFO)
4. LK1501 – LK1506 (Mixer 1)
5. LK1701 – LK1704 (Mixer 2)
6. LK1101 – LK1102 (PWM LFO)
7. LK1201 – LK1203 (Ring Modulator)
8. LK201 – LK203 (Sawtooth Generator)
9. LK1901 (VCF Switcher)
10. LK801 – LK802 (VCA)
11. LK601 – LK602 (VCAEG)
12. LK1001 (VCF1)
13. LK1301 (VCF2)
14. LK1601 – LK1604 (VCF3)

LK301 (Noise) should be fitted with a permanent wire link

To assist with the wiring process it is prudent to adopt a colour-coding scheme. The simplest one is to use the colour of the wire (as defined by the resistor colour code convention) to identify the pin number of the connection so that BROWN represents pin 1, RED represents pin 2 and so on.

The scheme I have adopted, however, is somewhat different. The general sequence of the colours are:- ORANGE, WHITE, BLUE, BROWN, GREEN, PURPLE, GREY, WHITE. The colours RED, BLACK and YELLOW are reserved for power rail connections and represent +VE, 0V and –VE in that order. For the Panther Series these can be read as +12V, 0V and –12V respectively.

There is some (vague) logic behind this choice. Two guidelines are assumed:-

1. Most panel components to be wired are 2-wire or 3-wire devices.
2. There is often a need for power connections to one or more terminals.

For 3-wire devices the colours ORANGE, WHITE & BLUE are used. ORANGE is used to represent the most positive terminal on the component (for a potentiometer this would normally be the clockwise terminal). BLUE is used to represent the most negative terminal on the component (for a potentiometer this would normally be the anti-clockwise terminal). While WHITE is used for the 3rd terminal (for a potentiometer this would normally be the wiper).

For 2-wire devices the colours BROWN & GREEN are used. BROWN is used to represent resent the most positive terminal on the component (for an LED this would normally be the anode). GREEN is used to represent the most negative terminal on the component (for an LED this would normally be the cathode).

This colour-code arrangement assists with identifying the `orientation' of the component being wired.

So, for example, a potentiometer wired in to a circuit with no power connections would be wired:-

Clockwise	ORANGE
Wiper	WHITE
Anti-clockwise	BLUE

Where a component termination is to a power rail, then that rails coloured wire is used. So, for example, if a potentiometer was wired between +VE and 0V with the +VE terminal being clockwise, the wire colour sequence would now be:-

Clockwise	RED
Wiper	WHITE
Anti-clockwise	BLACK

This allows the constructor to see at a glance where true power rail connections are being made to a component. Also, the generally repetitive colour sequence also helps to quickly determine the correct orientation of components and wiring.

Connections requiring more than 3 wires simply follow the original colour sequence (ORANGE, WHITE, BLUE, BROWN, GREEN, PURPLE, GREY & WHITE), which supports 8 terminals.

Of course, there will be occasions where the circuit requires the sequence to be different (reversed for example) and so the visual aspect of the colour scheme will not work fully.

Constructors can, of course, adopt any colour scheme they wish or even have no scheme at all. The Wiring drawings provided for this (and other Elby Designs projects) uses this scheme.

Construction Sequence

If you are going to build your Pixie in modules then I would suggest the following sequence:-

1. PSU – Construct module and wire up the panel controls. If you have a multimeter then apply power and check the two regulated output voltages. Randomly select a few IC positions across the whole board and check the power supply pins on those locations for correct polarity and levels.
2. MIDI-INT – Complete construction of this module including panel controls. If you have an oscilloscope or high-impedance amplifier input then check for a squarewave signal at pin 1 of U200A and U204A (if using an audio amplifier be careful as the signal here will be 5V pk-pk). Connect a suitable MIDI controller and send some MIDI NOTE-ON/NOTE-OFF commands (MIDI Note range of 60 to 96)
3. SAWTOOTH & TRIANGLE – Construct both modules and wire up panel controls. If you have an oscilloscope or high-impedance amplifier then check the outputs of the DCOs at pin 1 of LK1501 and LK1502. You should be able to select all the waveform outputs for each DCO.
4. MIXER1 – Construct module and wire up the panel controls
5. MIXER2 – Construct module and wire up the panel controls. If you have an oscilloscope or high-impedance amplifier then check the mixer output (pin 1 of LK1704) for a signal. Only the DCO1 and DCO2 controls on MIXER1 and MIXER control on MIXER2 will work and should allow you to mix varying levels of the 2 oscillator signals.

ADDENDUM

The following modifications are recommended for improved operation of the Pixie:-

Mixer 1

- Remove C1509
- If you wish to utilise link LK1503 you will need to cut the track that, inadvertently, shorts the two link pins together

Power Supply

- Replace R901 with a Wire Link
- Omit C902 this is to be replaced with 2x 1-pin headers to power the Pixie Chicklet

This modification connects all the 9V rails together. As a consequence, the output drive from the voltage oscillator may not be high enough to guarantee reliable operation of the following CMOS logic *U200, U201, U204 and U202). The output voltage (5V) does exceed the CMOS threshold of 4.5V and so should work without any further modification and builders are suggested to try this first. If the drive signal does prove to be unreliable or non-operational then we recommend the additional circuitry be added as shown in the boxed area at the top right of the MIDI Interface and Dual DCO schematic.

The Battery Drawer holds 2 x PP3 9V batteries. These were, originally, wired in parallel but we recommend now wiring these in series to ensure a good working voltage is maintained for the regulators.

LFO Module – Power rail interference

The LFO BEAT LED, when driven from the 5V supply, can cause instability in the power rail which results in audio interference. The LED (D404) should have its anode connected to the 9VDC supply and the value of R415 increased to maintain the LED current.

This also requires a small modification to the output buffer. Pin 12 of U602 should be removed and a wire link fitted on the pcb between U602_12 and U602_13.

- Add C404 across U400_8 and U400_9
- Remove connector P402 and fit a wire link between pins 2 & 3 (left-hand pins)
- Run wires from P402 (pot on the panel) directly to LK401 (1-1 and 2-2)
- Connect pin 3 of pot P402 to AGND (eg left leg of R253)
- Change P401 to a 1M Linear pot (2M if you have one)
- Remove U602_12 and short (on the pcb) pin 12 to pin 13
- Replace R414 with a 56K resistor
- Cut track on underside of PCB to D404 pin 1 and connect this pin to the cathode of D900

NOISE Module – Unreliable start-up

The following modification ensures that the clock generator always starts up properly. Lift the leg of R302 that is connected to U304_8/U304_11 and re-terminate on to U304_12

LFO Module – NOISE Input

It has been noted that the NOISE input to the LFO module is taken from the output attenuator in the NOISE module. This means that the NOISE level to MIXER 1 has to be raised for the NOISE output to have any affect and results in a NOISE signal being permanently mixed in to the normal audio path.

To fix this problem it is necessary to add a small wire link as detailed on the overlay. The necessary cut to the track should already have been done in the factory but if not, cut the track the runs from J301 as indicated on the overlay.

This modification allows for a permanent NOISE signal being made available to the LFO while still allowing normal mixing of the NOISE input to MIXER 1

- Cut the track (topside) from J301-2 to LK301-1
- Fit wire link between J301 pin 2 and P301 pin 1
- Fit LK301 with a wire link

LFO Module – VCO Modulation pot

To prevent possible damage to the M16C microprocessor and to define a better control range for this pot, the following modification has been applied:-

- Place a wire link between pins 2 and 3 of P402 on the PCB.
- Take a wire from pin 1 of LK401 to the clockwise pin of P402.
- Take a wire from the wiper of P402 to pin 2 of LK401
- Take a wire from the anti-clockwise pin of P402 to AGND (MASTER TUNE or GLIDE pot)

Pixie Chicklet

To correct an error with the operation of VCF3 the Pixie analogue power rails have been increased to 9V. As the microcontroller section must operate on 5V we need a level translator to raise the 5V outputs from the digital section to the inputs of the analogue section.

A small pcb (chicklet) has been provided to assist with the upgrade. Your Pixie pcb has been pre-modified in the factory to have 2 tracks cut. In the chicklet kit there are 4 single-pin headers. These are to be fitted in to via holes on the pcb as indicated in the printed component overlay for the Pixie. The chicklet is then connected to these headers, having first mounted the chicklet in some convenient position in your unit, using 4 short pieces of wire. Two additional wires are needed for power and these are connected to the pads originally assigned to C900.

Front Panel

Please note that if not using the kits of panel components supplied by Elby Designs that you need to pay particular attention to the holes sizes on the panel. Some pot holes are different to others to accommodate a different brand of pot that was being used to cater for some extra large values not readily available. Where a larger hole is provided on the panel (5 pots in total) we have supplied a `special' round nut. This nut should be fitted on to the relevant pot and the pot then offered up to the panel. The `special nut' should sit inside the enlarged hole and helps to keep the pot centred within the hole. Fit a pot washer and then secure using the standard pot nut.

If you need to enlarge any holes, for any reason, then use a small round Swiss file. Be careful while handling the panel to prevent scratches, grease marks and finger prints.

Enclosure Assembly Details

The Pixie Enclosure comes pre-cut/drilled for the front and rear panels and pcb mounting.

- Start by attaching the four feet. Insert an M4 x12mm bolt in to the foot (make sure it still has a metal washer in the hole) and pass the bolt through one of the pre-drilled holes. Fit an M4 washer and secure using an M4 locknut. Repeat for the other 3 feet,
- Attach the Rear Panel using 6 M3 x 16mm bolts and M3 nuts,
- Install the Battery Drawer and secure using M3 x 10mm countersunk bolts and M3 nuts,
- The Rear Panel hardware may be fitted at this point. Ensure you have easy access to the solder terminals,
- Install the Pixie PCB and secure using M4 nuts.

Once all the hardware has been installed, you should check the fit of the Front Panel. You will need a small round Swiss file and a larger flat file. Carefully elongate the fixing holes, in the Front Panel, towards the mid-point on each side. Check regularly by placing on to the fixing bolts in the case. The board should drop on freely and be easily removed without being forced in either direction.

Inspecting the rim of the case where the lid and base meet, you will notice a small ledge running around the inside (matching rim runs around the outside as well). The Front Panel needs to sit inside this rim otherwise it will get caught between the base and the lid when closed. Carefully file the edges of the Front Panel to ensure that it does not sit over this rim.

Handle the Front panel carefully to prevent damage to the front face. Try to not touch the front face with your hands to prevent grease and finger marks. If the panel does become marked, then wipe carefully using a lint free cloth being particularly careful over the silk-screening.

When all assembly and testing is completed, install the Front Panel and secure using the M3 domed nuts.