FatMan troubleshooting tips/suggestions

The MIDI LED flickers but sound isn't controlled.

The MIDI In LED simply shows that the cable is plugged into FatMan and the controller MIDI is getting to FatMan. But the digital 'half' of the circuitry on FatMan must be 100% operational for the MIDI messages being received to be converted to Pitch CV, Velocity CV, and Gate-trigger control signals for the synthesizer 'half' of the kit. One little thing awry can bring the digital half to a halt, whereas on the analog side, it could be limping along and still seem OK.

It is OK for the MIDI Input indication LED to continuously flicker--some controllers send a periodic message as a signal that the cable is in place. More important, the Gate Indicator LED should be lighting for keys pressed on the MIDI Controller. The Gate LED lighting when a key is pressed is basic to the DIP Switch settings selecting the MIDI Channel (all on or closed for MIDI Channel 1) and the digital 'half' of the board operating the analog synth section. One little solder joint not making a good connection or jumper wire not reaching through at each end, or, a bridge or break can stop the control voltage and gate from being made.

Gate LED not lighting.

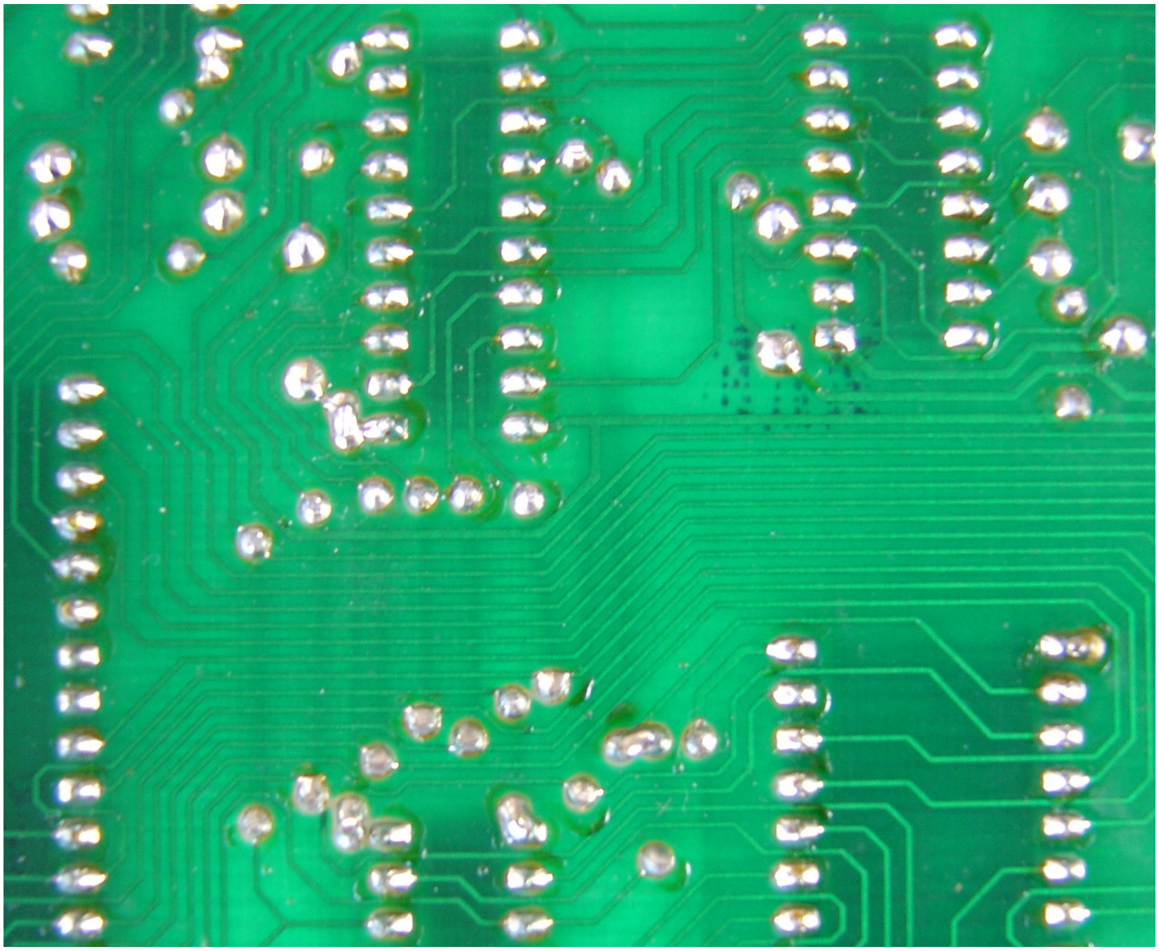
First, it is important the MIDI Channel setting on the DIP switch matches the controller's MIDI Channel. Most controller's power-up or default to MIDI Channel 1. To set FatMan for MIDI Channel 1, set all switches 'On" or Closed (only four select channel, but to eliminate the possibility of setting the wrong four, operate them all). The settings are only read by the uC on power-up so, if you make a change, switch the FatMan power off and then on again. If setting them all to the direction you understand to be On or Closed does not make the difference, it could be a matter of misinterpretation--set them all the opposite way, power-down, power-up and send in the MIDI notes again watching for the Gate LED to light indicating the MIDI conversion is occurring. Also, turn the controller off and then on again to ensure the next note pressed has the Status byte for the FatMan, or, press a program change button, roll the pitch wheel or modulation wheel to change Running Status.

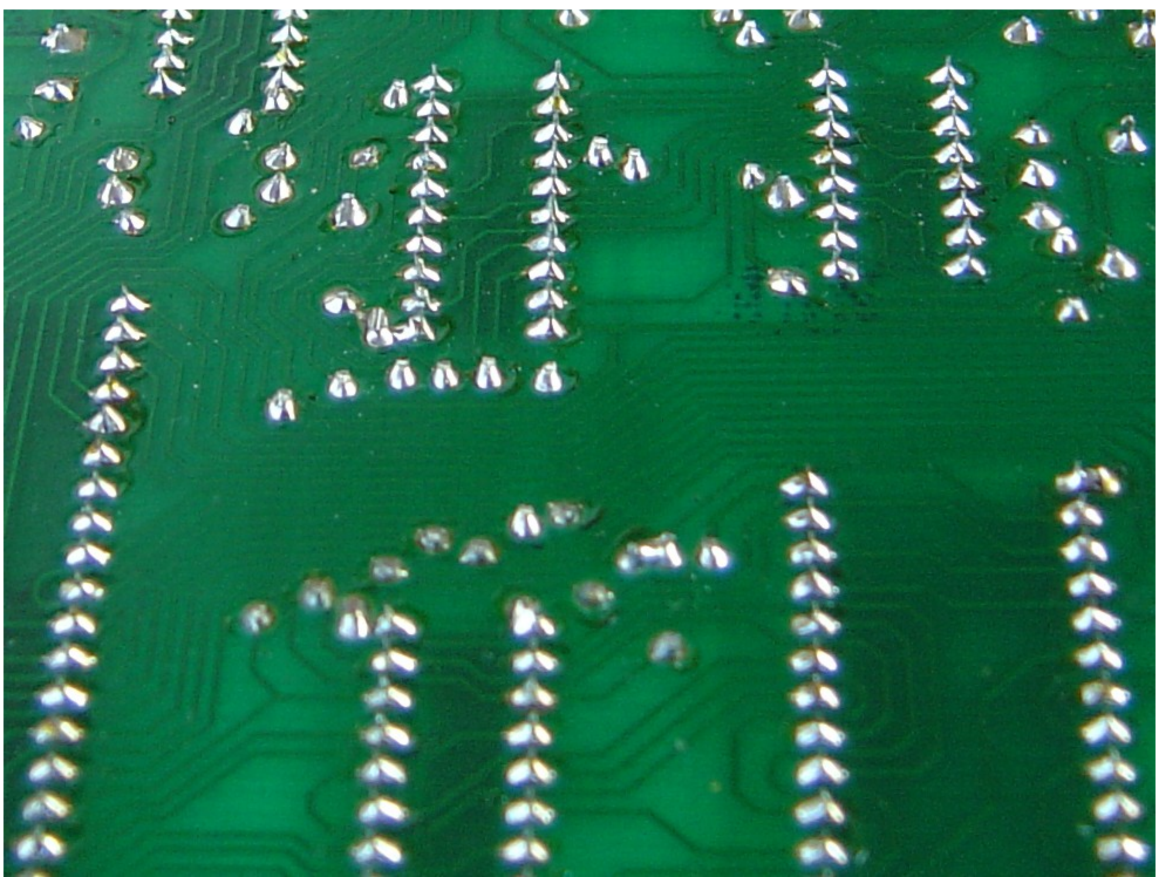
Soldering and jumper wires.

There are many closely spaced solder joints in the kit. It is important to flow the solder to both the printed-circuit pad and the wire or component lead extending through. It is best if the wire is mostly perpendicular with the board and not bent over against it. The pad should fill but not bulge or glob. The excess extending from the top of the joint should be clipped at the joint. The joint should not be clipped too close to the pad.

There are many jumper wires in this kit and even though these are just wire and may not seem as important as semiconductors and other components, these other components rely on them, and their soldering.

The following images are examples of the way the soldering should look in the area of the board with lots of jumper wires.





For the desktop versions of the kit, soldering of the DIP Switch can be a little more difficult. We try to stock and include a DIP Switch in the kits that has legs that wrap-up and enter on the top side of the part giving more area to touch the leg with the tip of the iron as the joint is being made. If your kit has a type with the pins exiting the bottom of the part, it is important it is spaced away from the board enough that the tip of the iron can get in at the side and heat the leg and the pad for the solder to flow to each. The action of the switch is to close the circuit between a processor port line and ground. The On or Closed settings should have continuity to ground/circuit-common. Since channel one selection is the four selects On or Closed, it is important there good connections here.

Other Checks, Tests.

Look to be sure the uC and EPROM are fully pressed into their sockets (with no pins bent under). The board flexing up in the desktop case can touch the metal case bottom if the wires are bunched up below. It is OK to put rubber or cardboard to prevent contact if you think this could be occurring. A couple of the stick-on rubber feet stacked at each corner of the board will press the board away from the bottom if it is sprung up too near, but also, the L-brackets which attach the board can be bent to put a better angle on the board as it extends back.

The main area to look for trouble is in the printed-circuit jumper wire connections located between ICs 2 and 4. Inspect the soldering here looking to be sure all jumpers are in place, none are touching each other, and that there is evidence the excess wire needed to be clipped from the top of the joint. A shallow, smooth dome of solder can be a joint where the wire dropped out of the joint as it was being soldered, resulting in an open circuit. The concentration of joints for these jumpers makes it a likely spot for a bridge to occur, resulting in a short circuit. The tiny solder pads make it more difficult to get a good heat transfer between the tip of the iron and the wire and the pad which can result in a joint where the solder did not flow to each and there is an open. An open can also occur if the cutters tear at the joint and break the printed-circuit path, or, if they're nice, new ones, they can cut or score the trace next to the clipped wire/joint.

If you see one that didn't make it through into the joint, look to see if there is slack on the top-side that can be pushed down as the joint is heated. Otherwise it might be best to desolder each end and put in a new wire that reaches through enough.

If this all looks OK, it could be the uC or EPROM firmware ICs not fully seated in their sockets. A small screwdriver can be used to lever each end up a bit at a time until the part is freed, allowing you to inspect for possible pins that did not meet with the socket receptacles but bent under the part. When the parts are new, out of the shipping tube, they're legs are splayed outwards slightly. It makes it easier to get them reliably inserted into the socket, if the pins are bent to extend straight down from the part. You can firmly grasp the part at each end and press the row of pins against a hard flat surface with the most force near the body of the part to bend them all straight. Go just a bit at a time, checking to see they don't go inwards from the straight-down, perpendicular angle with respect to the body of the part. They'll push down into the socket the best when formed this way. You'll know they're seated good when you don't see much if any gap between the bottom of the part and the end of the socket.

It is important that the power supply voltage regulators are all in the proper spots too, and that none of the three different types' tabs are touching each other. The 7912 negative 12 volt regulator has the negative dc supply on it's tab while the 7805 and 7808 positive voltage regulators have ground on theirs.

Set a tester to measure DC volts (up to 15) and touch or jumper the black probe to ground/common. A good spot for this is the lug of the VCF ADSR control with three wires on it (R115, lug 1). If the tester has a digital readout, it will have auto polarity and if the voltage is negative it will indicate this with a "-" preceding the digits; however, if it has an analog meter movement, you'll need to reverse the probes when you know you'll be measuring for a negative DC--put the red on ground and measure with the black (sometimes you might be expecting a positive voltage or not know what to expect, so be looking at the needle when you make the test and if it tries to swing the wrong direction, pull it away quick and reverse the probes).

So you see, it is less to worry about if you have a tester with a digital readout. Also, if you have a test lead with alligator clips at each end, you can clip the black probe over to the ground point.

The three DC power supplies in the FatMan originate at the three voltage regulators ICs 14, 19, and 20. It's a bit difficult to get in at their pins to make a measurement though, so we'll make the initial checks on IC pins. To count the pins of the ICs, look at the part from the top of the board and count around the part in a ccw direction from the notch at the end. For the largest IC, the 8031/8051 uController at IC1, you'd go to the first pin ccw from the notch for pin 1, the count would proceed down the side of the part from 1 through 20, straight across to pin 21, and then up this other side, 21 through 40. On this part, the Vcc power supply (+5V DC) should be on pin 40. The positive and negative DC power supplies are easy to get to on one of the LM324 or TL084 op-amp ICs (there are 324s at ICs 10 and 13). On these parts, pin 4 is the positive DC supply and it should measure +8V DC: Pin 11 is the negative DC supply (if a meter readout, swap the leads) and it should measure -12V DC.

Troubles that could be causing voltages to be wrong or missing include voltage regulators out of place at the ICs 14 (7912), 19 (7805), and 20 (7808) positions, or, broken legs or printed circuits below the regulators (their height affords a lot of leverage here), or a jumper wire might not be reaching all the way through at both ends causing an open circuit (these jumper wires often have tiny solder pads and connecting traces that can tear, crack, or be cut. The tabs and/or cooling fins on the regulators should not touch each other. In particular, the 7912, which has the negative input voltage on the tab, should not touch the 7805 or 7808 which have ground/common on their tab.

The four main ICs in the digital section ICs 1 through 4 are ones that can malfunction if subjected to a static electricity discharge or an accidental short-circuit. Trouble-shooting these beyond the visual checks for soldering, installation, etc. is not so simple. When, I get to this point on the repairs that come through here, I'll first do a quick check of the vital signals on a scope to see if any are missing or garbled. If nothing is obvious, I'll pop out the uC and EPROM ICs from the sockets and try them in place of the parts in the FatMan I have here, one at a time. If either is the trouble, the FatMan doesn't work after the exchange, and I'll try a good part in the spot where the bad one was found. If you run into a dead-end and want to send the socketed parts to me for testing, you may do so, but avoid conditions where a static discharge could occur and push the parts into the black-conductive foam or through foil into styrofoam so their pins are in electrical contact with each other and do not get smashed or bent in shipping (PAiA, 3200 Teakwood Lane, Edmond, OK 73013). It can save time if you just send the whole kit too though, as the trouble might not be with these two ICs. Let me know if you would like me to email the service authorization form/instructions for kit repairs.

If the audio is present and the +5, +8, and -12V supplies are right, check to find out if the Pitch CV output changes when notes are played on the MIDI Controller. If not, it may be trouble with the MIDI or the processor not executing the program contained in the FatMop EPROM. There are some simple things that can keep the MIDI from being acknowledged and lots of things that can keep the processor from executing the program.

A second MIDI sound device could be connected to the FatMan's MIDI Thru jack to confirm the ICs 6 and 7 sections in the MIDI circuitry. If this second device doesn't respond either, the trouble could be with or related to one of these two ICs (or the microcontroller, IC1, but this IC could be removed and ICs 6 and 7 should still pass the MIDI on to the Thru jack).

For a unit that gets a Gate Trigger as indicated by the Gate LED, but has no audio output, a common trouble is an accidental short circuit causing IC17 in the VCF section to fail.. DC voltages for the pins of the IC are (count up in a ccw direction around the part from the notch): Pins 1-16, -10.84, 0.86, 0.22, 0.22, 1.4, -12.06, 1.4, 0.19, 0.13, 1.32, 7.95, 1.32, 0.23, 0.23, 0.87, -10.84.

IC18 VCA readings:

Measure to see that the V- circuit, (-)12 volt dc power supply, is getting to pin 6 and the V+, 8v dc power supply, is getting to pin 11.

Pin 1 is at about -10to11 v dc. The current flow at this pin to Q12 is about -120uA with only the VCA ADSR control, -200uA with both the ADSR and the Velocity.

Look for the V+ on one end of the 12k brown-red-orange-gold resistor R108 and about 1v on the pin 2 end. The 470ohm yellow-violet-brown-gold resistors at Rs 110 and R111 should set the voltages on pins 3 and 4 to about 150mV with about 50mV of audio on pin 3..

Pins 5 and 7 share a connection with the 33k orange-orange-orange-gold. The audio signal should develop to about 0.2-0.3V as the VCA goes 'on'. This audio should wind up at the 4700ohm yellow-violet-red-gold R112 on about a -1v dc offset before running on through the C25 capacitor to the audio Output level control, R113 and output connector J6.

-0-0-0-0-0-0-0-0-0-0-0-0-0-0-

A scope or logic probe can be used for these checks:

Conditions you should observe on pins of ICs 1, 2, and 3:

.......On power-up................................After Note On Message Received......

IC3pin2......0v...0v.....
IC3pin23....0v...0v.....
IC3pin21....0v...0-5v switching.....
IC3pin24....0v...0-5v switching.....
IC3pin25....0-5v switching.........................0-5v switching.....

IC2pin11....0-5v switching.........................0-5v switching.....

IC3pin22....0-5v switching.........................0-5v switching.....

IC1pin9.....0v, with a pulse to 5v on power-up
IC1pin18....3v switching
IC1pin19....4v switching

-0-0-0-0-0-0-0-0-0-0-

sl0309