A good start is to check to see if the decimal in the display lights to indicate the unit is in Program mode and will respond to control panel changes. The front panel controls on the Proteus aren't directly linked to the analog circuits, but through A/D, memory, and then back through D/A. When the Program button is pressed and the decimal point in the display lights, the control settings feed right on through and they should affect the audio output. The LEDs associated with controls or groups of controls indicate when the controls are set the way they were for the preset in memory. Then, you can set everything like it was when it was programmed and when the program button is pushed, the sound will be the same and can be 'edited'. Advancing to the next preset, stores the current settings and reverts to memory for the patch control.

The control of the sound via the panel settings and adjustments are via selector circuits or multiplexed/de-multiplexed cvs. Checks in the cv mux/de-mux sections should be made first, but the action of the selector circuits can be telling.

In tracing possible trouble with the waveform select, listen to the VCO#1 OUT and VCO#2 OUT, rear panel patch points while in Program mode and changing the waveform select controls for each of these. Also, when listening to VCO#2 OUT, varying the #2 Fine tune control should cause fifteen changes in pitch. This is a good test to tell if the levels seen on the PACV are sixteen steps as they should be and they're being recognized.

More rear panel patch point tests: The Filter FX Send patch point is the 'mix' of the VCOs before going into the VCF and should have a blend of the two VCOs as set by the panel Source control. When in Program mode, a ccw Source setting should be VCO1 and advancing cw should mix in VCO2 until you're fully cw and then it's only VCO2. Below the filter Fc input is the Filter Output, an audio output of the vco mix after going through the VCF section. The KBD connectors on the rear are outputs for the pitch cv and the gate trigger. The pitch cv should be a varying dc voltage range as keys are pressed and released going up and down the keyboard. The Gate output should be 0V when no keys are pressed and 5v when a key is pressed. An external Gate signal inadvertently connected into this output jack could damage the 4042 at IC2 on the backplane.

If everything on the Proteus seems to work except the keyboard, check the 14pin DIP connector cable to be sure it is plugged in at each end. Otherwise, it might be trouble in the area of transistor Q5 which causes the 'ground' for the keyboard circuit to be 0v when active or 5v when under external, computer control. The three short (3/16") #8-32 machine screws along the lower rear case edge can push the 'j-nut' against the circuit possibly scraping it 'open'.

Here are some notes I have about getting inside one of the Proteus, and getting it back together without causing trouble:

> The top lifts off when the lower wood-end hex bolts and three #8-32 machine screws along the lower rear edge are removed. A short transformer cable should be unplugged to allow the top to lift up and off to the side and then you'll notice a longer, flat cable keyboard connector that can be disconnected to completely separate the top and bottom sections.
>
> The three screws along the lower rear edge go into j-nuts that slip over holes in the case and it's important that these don't miss the threads of the j-nut and push the part against the backplane board printed circuits. The one near the power cord entry point can scrape/score a ground trace and the one in the middle can contact a

transistor circuit associated with the keyboard local/remote control.

When putting it back together, installing the three screws along the rear edge before the wood-end hex nuts allows the top to be positioned best for aligning the screws with the j-nuts.

Note the pins on the schematic for IC6 have some typos. the inputs pins are like the other 4042 latch ICs (4, 14, 7, and 13 top to bottom, on the schematic and on the output side, 1, 3, 10, and 11 (per notes in my manual)).

In the voice card manual, fig 4 Pitch and Parameter De-multiplexing, IC37 (3302 or 339 quad comparator) at the top is supposed to shift the "low" levels of data bits D0-D3 from 0v to -5V. The pulsing on the input pins 4, 6, 8, and 10 should appear on the output pins 1, 2, 13, and 14. The other input pins are fixed at about 2.5v dc. The outputs from the ICs go to latches associated with 'selectors' for the parameters ($) 8, B, C, E, and F. These run through jumper wires which is a likely spot to 'lose' them via an open circuit due to the jumper not reaching through or the printed circuit breaking as the joint is clipped. If the D0-D3 get through to the output pins of IC37, confirm they get to each of these parameter latch/selector sections. For example, Parameter $8 is the #1 and #2 vco waveform. A pulse from pin 13 of IC33 strobes the latch IC6 to signal the data for waveform select is valid and the latch should hold this information steady selector ICs 4 and 5. Other IC33 outputs are voltages stored by op-amp and capacitor sample/hold circuits; ie parameter $0 (vco1 mod amount) on pin 10 of IC29 should vary with the panel control in program mode, or, according to preset memory.

ICs 4 and 5 get changing hi/lo levels on pins 9 and 10 as the waveform select controls are changed in program mode. These changing levels are for data bit changes to the input of the 4042 latch (you can see these changes on the PACV line) and passed when there is a pulse on the pin 5 line (PS $8).

Is there any sign of the flux being washed from the board. Sometimes this can find it's way to the component side of the board through holes and get in socket contacts...

Another spot trouble could occur in this kit is where wire jumpers are used as 'hold-downs' for the other wire jumpers and heat from soldering melted insulation causing shorts. If you see a tight looking bundle, you might move things around to see if this has occurred.

The pacv is a sequence of voltage levels. The various levels should be seen to move along with the panel controls when in program mode. This should be causing the sound at the 1/4" audio outputs to change too. But before scrutinizing this area of the board, another potential trouble area should be checked.

As shown on the schematic with the memory, fig 35, is the PD signal. This PD signal operates the CE2 pin on the memory IC. It originates on the backplane board from a 4001BE quad nor gate at IC5 (see top, center of fig. 32, backplane schematic). It can blow easily, I think partly due to its output floating during some of the preliminary tests but also because of the length of the circuit at the output and the possibility of an accidental static discharge to this CMOS, static-sensitive part. It can be measured at the IC or the edge connector and should read a steady +5V when power is on. If not, a new 4001 ought to take care of things. Another possibility of trouble with the PD signal is if it has more than a volt of fluctuation on it which would be a trouble pointing to the 0.05uF in the circuit

needing replacement with a 0.1uF. If replacing the 4001 IC doesn't help, try tack soldering a second 0.05 in parallel with the one there to make the overall capacitance here 0.1uF.

If the PD is OK, scope the PACV signal to confirm there is a series of sixteen 0-5v steps (the multiplexed panel voltage levels). Syncing the scope to A3 makes the pattern hold steady on the screen. In program mode, control panel changes vary the level of the segments. This PACV signal is affected amplitude-wise by the trim on the backplane, Parameter Cal. Its adjusted as one of the final steps in the voice card calibration procedure that matches a maximum setting with the results you hear. If it's not working right it might be trouble in the trim or 4136 op-amp section associated with it.

-0-0-0-0-

Calibration Steps:

1) Adjust the backplane R7, R8 trims for +12.5 and -12.5 readings on the "+and-12v" supplies, connector pins 1 and 2.

2) Use a test lead to temporarily jumper the top lead of backplane resistor R24 to ground, press the high G sharp and adjust the backplane KBD CAL trim for 4v at pitch cv connector pin 10. Remove the temporary jumper.

3) Adjust VCO MOD trim R37 for symmetry about ground at IC16 pin 6 (top lead of R41).

4) Adjust VCF MOD trim R130 for symmetry about ground at pin 6 of IC15 (bottom end of R134).

5) Adjust LFO SYM trim R144 for equal hi/lo durations of square-ware LFO modulation.

6) Adjust VCA OFFSET trim R163 for audio output is balanced about ground.

7) Adjust SINE SYM trim R26 for smoothest sounding sine wave.
8) Adjust VCO#1 SCALE trim R12 so the pitch produced for the highest key pressed is the proper octave relationship with the lowest key pressed. Repeat until no further adjustment is needed.

9) Adjust the KBD TRANS trim R43 so the pitch produced when the Keyboard Octave control is fully cw is the proper octave relationship with the lowest key pressed when the panel Keyboard Octave control is at the fully ccw setting.
10) Adjust the VCO#1 HIGH END trim R9 for the proper octave relationship with the low key pressed, for the highest key pressed when the panel Keyboard Octave control is fully cw. If it won't go far enough, just leave it at the extreme setting.
11) Center the rear-panel Unison control. Set the Keyboard Octave control to fully ccw. Center the front-panel Pitch and Filter Source controls. Press the lowest key and adjust the UNISON trim R123, tuning oscillator two to oscillator one. Press the highest key and adjust #2SCALE trim R55 for tuning of the two oscillators. Repeat the low-key/R123 and high key/R55 steps until no further adjustment is needed for the two to be in tune.

12) Turn the Keyboard Octave control fully cw and turn the VCO#2 HIGH trim R82 as far as possible towards the tuned setting.
13) Set Keyboard Octave fully ccw and OSC 2 Coarse control to the fully CW setting and adjust the #2 TRANS trim for the proper octave relationship with the other osc.

14) Set the OSC 2 Coarse control fully ccw and adjust the OSC 2 Fine control for 12 changes and stop. Adjust the backplane trim PARAMETER DAC trim R27 for an octave relationship between the two vcos.

15) Set the OSC 2 Coarse control to the +1 setting and the OSC 2 Fine control fully ccw. Adjust the UNISON trim R123 to tune the two VCOs.

16) Measure and note the dc voltage on pin 3 of IC12 and adjust the SUSTAIN trim R175 for the same reading on pin 9 of IC12.

That's it.

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