Control and Speaker Protection Board for F5X Power Amplifier

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2. Test Procedure

2.1 Overview

Further to chapter 1 of this document on the circuit description of the protection board, a simple test procedure is described here. This is done in a step-by-step testing of each functional block of the protection board. They include :

1) Start-Up Delay
2) Status toggle
3) Output DC detection
4) Relay Drivers

2.2 Useful tools

It is entirely possible to test the protection circuit on its own without needing the rest of F5X. In fact, it is much safer to do so. For the testing, you will require two simple laboratory supply of 15V each, even though the protection board already have on board rectifiers and regulators. Ideally they should have an adjustable current limit which should be set to say 50mA. The two supplies should be connected to Pin 1/2 and Pin 3/4 of terminal block P7 respectively. Polarity can be random, as the rectifier on board will take care of it properly.

Also useful are a bunch of normal red LEDs, each wired in series with a 10k resistor in series at its anode. These can then be used to replace all the relays. They will consume much less current (about 2mA each), and give easy visual indication to relay ON/OFF status.

An additional 3V dry battery will also be useful to generate a DC offset to test the speaker protection circuit.

2.3 Start–Up Delay

Once you apply power to the protection board, there will be a time delay before the mains relay is being switched on. Thus the above-mentioned LED connected at the mains relay terminals is a useful indicator of the start-up status. The default values give you a time delay of about 2s. You can increase or decrease this delay by increasing or decreasing the value of R41 proportionately. The start-up status can also be verified at Pin 1 of U11 (active low).

2.4 Status Toggle

The front panel dual-colour LED should at this stage remain off. Pushing the push button should change this to red, then to blue, and then back to off. This exact sequence is important as it also determines later how the relays are turned on and off.

In the “LED OFF” state, only the mains relay should turn on after start-up delay.
In the “LED Red” state, only the two Regulator Shunt Relays (plus mains relay) should be active.

In the “LED Blue” state, all relays should be active.

Once this is working properly, you can already ensure a controlled start up and shunt down of the amplifier.

2.5 Fault Detection

The only remaining function to be tested is amplifier output DC detection and speaker protection. To do so, first operate the pushbutton to the LED Blue state. Then apply 3V (dry battery) across pin 3/4 of terminal P5. This should trip off ALL relays, including the mains relay. The fault status should remain latched even if the 3V offset is now removed. To reset, simply turn off power to the protection board (2x15V).

Repeat the same again by reversing the polarity of the 3V applied. Then repeat again by applying 3V to Pin 3/4 of terminal P6, also in both polarities.

This completes the entire test procedure, and your protection board should now be fully operational.