# T r o ubleshooting

**PLX 1202 | PLX 1602 | PLX 2402 | PLX 3002**

## Power Supply - - Replacing Blown IGBTs.

In order to improve EMI performance, reduce cost, and increase current capacity, the PLX IGBT's are driven by an active, direct coupled integrated circuit, rather than a gate drive transformer. IGBT or driver failure should be rare (when correctly assembled) but when the IGBT's blow, it usually damages the following parts:

CHECKLIST AFTER BLOWN IGBT'S

Q96, Q97, (IGBT's generally fail in pairs)
D78, D79, R358, R359, gate drive coupling comonents, check after removing blown IGBT's.
U18, IR2110 high-side gate driver, Fault current when low-side IGBT shorts to upper rail. Such currents also typically damage the gate coupling parts noted above.
U19, 3525 controller, Blows from currents shorted thru U18, or possibly by overvoltage on the supply rail
SOMETIMES U14, 556, powered from 5V output of 3525, which may fail high when 3525 fails.
RARELY U13, which has fairly high supply voltage ratings.

PROBABLE CAUSES OF MASSIVE IGBT FAULTS

SHORTS IN CONTROL CIRCUIT.
The parts operate well within their ratings and should hold up well in the field. The usual cause of failure is when both IGBT's turn on at once, shorting Pri-Hi to Pri-Lo. This occurs when something causes the drive signal to one part to remain on when the other part is supposed to turn on. Shorts from solder or debris are one obvious cause.

SHORTS IN THE LOAD.
Although there is peak current shutdown, shorts in the power amplifier transistors or secondary-side supply components can cause currents to increase too quickly to prevent damage.

OVERVOLTAGE ON THE BIAS SUPPLY.
If the TOP-210 bias supply fails to operate, no harm occurs, the unit simply does not operate.
However, open circuit (missing part) in several key components can cause the Bias supply voltage to be much too high, This blows the 2110 and thus the IGBT's.

QUICK TEST OF BIAS SUPPLY.
Ramp the AC voltage up slowly to 25% of regular voltage (30V for 120V unit). If the bias supply is working normally, the green "power" LED should come on between 30 and 35V, with its usual, steady "half-bright" start-up level. If the LED comes on at 20V, or not until 50V, or blinks, DO NOT RAISE VOLTAGE PAST 60V until you have measured the bias voltage. The switching will not start until you reach 90V, so you can save the IGBT's from blowing.
Confirm that bias voltage at CI38 is 18-19V. Open or missing D63, 64, 65, 66, 67 or R349 will break the feedback to U16 and cause overvoltage.

# Troubleshooting “TOP-210” Bias Supply.

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CAUTION: if the LED comes on at 20V, or not until 50V, or blinks, DO NOT RAISE VOLTAGE PAST 60V until you have measured the bias voltage. The switching will not start until you reach 90V, so you can save the IGBT’s from blowing.
Confirm that bias voltage at Cl38 is 18-19V.

BIAS SUPPLY VOLTAGE MUCH TOO HIGH
D63,64,65,66,67 or R349 open or missing -- breaks feedback to U16

NO BIAS SUPPLY VOLTAGE
U16 missing or blown.
Tl missing, reversed, or open primary
D62 open or missing.

BIAS VOLTAGE ERRORS
The exact voltage is controlled by the feedback through D63, 64_ 65, 66, 67 and R349 as follows:
Cl38 is the “+18V’ rail with about 18.8V typical.
D63, 64, 65 each subtract a diode drop (0.7V) from Cl38.
Cl39 , is the “+16V” rail with about 16.6V typcial.
D66, a 10V zener diode , plus diode D67, subtract about 1 IV from +16.6V.
R349 subtracts about 0.5V, bringing the net voltage at U16, feedback pin 4, to about 5.IV.
U16 uses this feedback to adjust the “on” time at pin 5, in order toraise or lower the flyback voltage charging Cl38 and thus maintain regulation of the +16V and +18V supplies
C142, R356, and R349 form a closed-loop stability circuit which prevents the regulated voltage from “hunting”.
Q99 and associated R374 reduce the voltage of the Bias supply by 33% when the AC voltage is turned off. This prevents the Power LED from showing at half brightness after turn-off, since U16 continues to run from the main filters for some time after shut down R375 and 376 sense the output of U13:3, the “Loss of AC” comparator, and cause Q99 to turn on. If Q99 is shorted, the bias voltages will remain 33% low when AC is turned on.

REPLACING BLOWN TOP-210.
If U16 has blown, check T-I for continuity after removing U16. Its primary may be open. Pins I-2 It should measure about 15 ohms

# Replacing Blown Output Transistors

OUTPUT TRANSISTOR SHORTED
Shorts in one device tend to cause the opposing device to blow as well,
If an output transistor shorts:

Drive transistor will be shorted (Q26, Q27, Q71, Q72)
Some transistors will short in pairs (Q39 & Q40, Q36 & Q37, Q84 8 Q85, Q81 & Q82)
The rest will short in fours (Q28, Q29, Q34 & Q35; Q73, Q74, Q79 & Q80)
IGBT’s 8 their associated components may fail