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This is a procedure for replacing MOSFETS in the Inverpower 600w bipolar trim p.s.'s

1. First determine which MOSFETS are bad, if any, next check that none of the series ballast resistors (0.1Ù/25W) have burned up. The next two steps will describe how to check the MOSFETS and series ballast resistors

2. To check the MOSFETS:
a) disconnect the copper bar that connects all of the drains together.
b) Perform the following resistance measurements;
    1) gate to source (white wire to red wire)
    2) source to drain (red wire to the part of the MOSFET that was screwed to copper bar)
    3) gate to drain (white wire to the part of the MOSFET that was screwed to copper bar)
c) If any of these resistance measurements are very low in comparison to the others then you probably have a blown MOSFET. Next check the series ballast resistors, especially the ones tied to any MOSFET that may be blown.

3. To check the series ballast resistors measure the resistance of each one with a fluke ohmmeter. The resistance of each one should be 0.1Ù which you won't see on the fluke but if a resistor is open the fluke will show it. If any read high in comparison to the others or if the all read very high one or more may be blown.

4. After determining which MOSFETS and resistors are bad they should be replaced. Next the p.s. shall be tested.

5. Connect the p.s. to a resistive load of 1.5Ù, 600W. If 1.5Ù is not available do not use anything less than 1.0Ù.

6. Set the p.s. to VOLTAGE MODE and LOCAL by setting the toggle switches on the front of the p.s.

7. Adjust the voltage limit and current limit potentiometers so they both are all the way up at **10** on the potentiometer dial.

8. Adjust the local reference potentiometer so it is set at **5** which = 0 volts output. Don't forget this p.s. is in voltage mode now.

9. The first part of the testing will involve adjusting the voltage at TB101(+) to TB100(-). TB101(+) to TB100(-) measures the voltage across one of the series ballast resistors of the NEGATIVE MOSFETS. This is a measure of the current through these MOSFETS. This voltage adjusts the circulating current through the NEGATIVE MOSFETS when the POSITIVE MOSFETS are conducting. This circulating current makes for a much smoother transition through zero so one set of MOSFETS does not abruptly turn off and then the other set abruptly turns on.

10. Attach a fluke meter to TB101(+) and TB100(-). Attach a fluke meter to TP7. TP7 is the voltage the reference is being set to.

11. Place a 25 pin D connector on the back of the p.s. so as to jumper out the external internal interlock and the OFF command from the PLC.

12. Turn on the AC to the p.s. by pressing the orange breaker switch in the front of the p.s. ON. The p.s. is now in the OFF state. Press the STANDBY pushbutton. The p.s. should come to STANDBY without any faults.

13. Turn the p.s. ON, in voltage mode. Adjust TP7 by turning the local reference pot clockwise until TP7 reads +0.5v. This should correspond to about +1.5v on the load because 10v at TP7=30v at the load. LED 1 should be lit. LED 2 should be off.

14. With +0.5v at TP7 measure TB101-TB100. Does this = +30mV? If not adjust pot P7 until TB101-TB100 = +30mV. Once TB101-TB100 = 30mV run the p.s. back down to zero by turning the pot counter-clockwise until TP7=0v. Now press the STANDBY pushbutton. Now press the OFF pushbutton. Now turn OFF the AC breaker switch.

15. Now remove the fluke meter from TB101 and TB100 and reattach it to TB102(+) and TB103(-).

16. Now bring the p.s. back to the ON state. Turn the local reference pot counter-clockwise until TP7 = -0.5v. LED 2 should be lit. LED 1 should be off. The voltage at TB102(+) to TB103(-) should equal about 30mV.

17. Next bring the p.s. back down to zero by turning the pot clockwise until TP7=0v. Now press the STANDBY pushbutton. Now press the OFF pushbutton. Now turn OFF the AC breaker switch.

18. Next the current sharing amongst the MOSFETS will be checked.

19. For this part of the testing refer to the tables made in LOTUS for the previous p.s.'s that were tested. These tables show the important parameters to measure.

20. The most important parameters are the measurements of the voltage across the series ballast resistors (R11, R12, R13, R21, R22, R23). These series ballast resistors are a measurement of the current through each MOSFET. R11, R12 and R13 are connected to the POSITIVE MOSFETS. R21, R22, R23 are connected to the NEGATIVE MOSFETS. Therefore when the p.s. has an increasing positive reference, the voltage across R11, R12 and R13 will increase because the current through the POSITIVE MOSFETS is increasing. The voltage across R21, R22, R23 will start out at 30mV for the low end and then gradually drop off as the reference increases. When the p.s. has an increasing negative reference, the voltage across R21, R22, R23 will increase because the current through the NEGATIVE MOSFETS is increasing. The voltage across R11, R12, R13 will start out at 30mV for the low end and then gradually drop off as the reference

increases The procedure will be:

a) to make the voltage across R11, R12 and R13 be withing ±10% of the average voltage across these three resistors for a positive reference and THEN

b) to make the voltage across R21, R22, R23 be withing ±10% of the average voltage across these three resistors for a negative reference.

21. Set up a way of measuring R11, R12, R13, R21, R22, R23, TB101-TB100, TB102-TB103, the load voltage, TP7 and any other important parameters from the previous test sheets.

22. Keep the p.s. in voltage mode and use the local reference. Turn on the p.s.

23. Increase the reference so TP7 = +0.5v. Measure R11, R12, R13, R21, R22, R23, TB101-TB100, TB102-TB103, and the load voltage. You should see that the voltages of R11, R12, R13 are within ±10% are their average voltage. If not then the one or more of the gate resistors that feed these MOSFETS need to be adjusted. Run the reference to 0 (zero) and turn the p.s. OFF. Refer to the table below in order to know which gate resistors feed which MOSFETS.

Resistors to Gates (on PC board)	MOSFETS	Series Ballast Resistors
R13	T13	R11
R15	T12	R12
R17	T11	R13
R1	T23	R23
R3	T22	R22
R5	T21	R21

24. If the voltages of R11, R12, R13 are not close enough to each other than some adjustment is needed with one or more of the gate resistors R13, R15 and/or R17 as seen from the table above. The p.s. prints show that these three resistors form three separate voltage dividers on the gate to source of the 3 MOSFETS. In changing any of these three resistors, the voltage across GATE to SOURCE changes thereby changing the amount of current that flows from SOURCE to DRAIN. Increasing Vgs increases current flow from SOURCE to DRAIN. Therefore if you want to increase the current through R11, R12, or R13 you must decrease the corresponding MOSFET gate resistor R13, R15 or R17. If you want to decrease the current through R11, R12, or R13 you must increase the corresponding MOSFET gate resistor R13, R15 or R17. When the adjustment of R13, R15 and/or R17 has been made at the low voltages slowly increase the voltage reference at TP7 and see if the current sharing of the MOSFETS continues to the high end.

25. For this positive reference the voltages of R11, R12, R13 should continue to increase uniformly as the reference increases. The voltages of R21, R22, R23 should start out at about 30mV for the low end and then slowly drop off as the high end is approached.

26. Once the POSITIVE MOSFETS are sharing properly in voltage mode repeat this procedure for the NEGATIVE MOSFETS in voltage mode.

27. Increase the reference so TP7 = -0.5v. Measure R11, R12, R13, R21, R22, R23, TB101-TB100, TB102-TB103, and the load voltage. You should see that the voltages of R21, R22, R23 are within ±10% are their average voltage. If not then the one or more of the gate resistors that feed these MOSFETS need to be adjusted. Run the reference to 0 (zero) and turn the p.s. OFF. Refer to the table above in order to know which gate resistors feed which MOSFETS.

28. If the voltages of R21, R22, R23 are not close enough to each other than some adjustment is needed with one or more of the gate resistors R1, R3 and/or R5 as seen from the table above. The p.s. prints show that these three resistors form three separate voltage dividers on the gate to source of the 3 MOSFETS. In changing any of these three resistors, the voltage across GATE to SOURCE changes thereby changing the amount of current that flows from SOURCE to DRAIN. Increasing Vgs increases current flow from SOURCE to DRAIN. Therefore if you want to increase the current through R21, R22, or R23 you must decrease the corresponding MOSFET gate resistor R1, R3 or R5. If you want to decrease the current through R21, R22, or R23 you must increase the corresponding MOSFET gate resistor R1, R3 or R5. When the adjustment of R1, R3 and/or R5 has been made at the low voltages slowly increase the voltage reference at TP7 and see if the current sharing of the MOSFETS continues to the high end.

29. For this negative reference the voltages of R21, R22, R23 should continue to increase uniformly as the reference increases. The voltages of R11, R12, R13 should start out at about 30mV for the low end and then slowly drop off as the high end is approached.

30. Once the negative and positive MOSFETS have been adjusted in voltage mode they should both be checked in current mode for proper current sharing. The last test would be to test the p.s. on a magnet.