

Equipment needed:- Digital multimeter accuracy better than +/- 0.1%
Dual beam oscilloscope of high quality ; at least
50 Mhz bandwidth .

1. Inspect P.S.U. Board , check for component errors , short circuits etc. Check connections from 26 Way transition connector to 26W socket ensuring that there are no shorts between cables.

2. Set up mains voltage to 240v or 220v :-

240v blue lead male bullet crimp connector to brown lead female bullet crimp connector.

purple lead female bullet crimp connector - disconnected.

brown lead 1/4" shrouded crimp connector to switch.

purple lead 1/4" shrouded connector - disconnected.

220v blue lead male bullet crimp connector to purple lead female bullet crimp connector.

brown lead female bullet crimp connector - disconnected.

purple lead 1/4" shrouded crimp connector to switch.

brown lead 1/4" shrouded crimp connector - disconnected.

3. Briefly apply mains voltage and check that LED 3 , 4 illuminate.

4. If all is well apply mains voltage and adjust RV3 to give +5v on the output of IC3 (labelled U3).

5. Adjust RV1 to give +25.5v on the output of IC2 (labelled U2).

6. Check that the output of IC1 is +12v (+ 0.5v)

7. Check voltage across :-

C4 = +10.6v (+0.3v)

C1 = +34.0v (+1.0v)

8. Connect + lead of multimeter to cathode of D10 and - lead to 0v. Using a flying lead (with 1K resistor in series) from +5v supply. Check that voltage goes from 0v to +24.3v when flying lead is touched on P3 (right hand side of R10).

9. Similarly check voltage goes from 0v to +11.3v when flying lead is touched on P4 (right hand side of R13).

10. Move multimeter + lead to output of IC2 (labelled U2). Check that voltage falls from +25.5v to approx.+21v when flying lead is touched on P5 (right hand side of R4). Using RV2 set output voltage to +21.3v.

11. Move multimeter + lead to output of IC4 (labelled U4). Check that voltage goes from 0v to approx.+10.0v when flying lead is touched on P1 (right hand side of R21). Note that until the PSU board is connected to the main board there is no ground reference for IC4. The output voltage will therefore not be +5v but the supply voltage less any drop across the IC. Connect a flying lead from 0v to the L.H leg of RV4 . Using RV4 set output voltage to + 5.1v.

This completes the provisional calibration of the P.S.U.

12. Inspect main board. Check for component errors, short circuits etc.
13. New boards straight from production - do not insert any IC's at this point. Connect board to PSU via 26 Way ribbon socket. Turn on PSU and check that +5v appears across U14 pin 8 = 0v pin 16 = +5v. Switch off PSU and carefully insert all IC's.
14. Switch on and re-check +5v supply, re-adjust RV3 (on PSU Board) if necessary to give +5.0v across U14. When programme is switched on it should "beep" and display [88888888] for 2 seconds before displaying:-
[2732]
15. Connect multimeter + lead to pin 8 of IC48 (LM339). Adjust RV3 on main board for a reading of +2.35v.

Check pin 7 approx. + 2.5v (when Vpp is + 5v)
 " pin 9 " + 2.9v (" " " ")
 " pin 5 " + 5v (0v for E2)
 " " 11 " + 2.5v (this will only be present when sockets
 are powered up e.g. in static read)

If any of these pins fall below +2.35v (the reference level) the PSU fail error code will be displayed (E9).

16. Press reset and select 2716 type.
Press read, display should be:-

[/F800]

Press read again, display should be:-

[0000/FF]

Connect multimeter across Master Eprom socket - lead pin 14 + lead pin 28. Re-adjust RV4 (on PSU) if necessary to give +5.10v.

17. Insert a 39R 7 Watt resistor in Master Eprom socket and each copy socket (9 resistors) from pin 14 to pin 26. Connect multimeter negative lead to pin 14 + lead to pin 26 on MASTER socket. Press read, display should be:-

[/ F000]

then press read again, display should be:-

[0000/FF]

Multimeter should read 4.80v; if less than 4.75v suspect an error and check circuit.

18. Reset and select 2716. Remove load resistors. Select read and press twice as above to achieve a static power up situation to sockets.
Read voltage on pin 23 Master Socket = + 5v.
" " " " " Copy Socket = + 5v.

19. Reset. Using oscilloscope to check waveforms on pins 3, 4, 5, 6, 7, 8, 9, 10, 21, 24, 25 check that address lines have a rapid series of pulses during program. Note you will need to keep re-entering programme mode as the address lines will be low unless driven.

20. Similarly check pin 22 of the Master and each copy socket for rapid pulses. On the copy sockets the pulses will only be present when that socket is selected.
21. Check that pin 20 (on all sockets) remains low.
22. Insert a 2716 Master EPROM in master socket. Read EPROM and make sure that check sum is correct.
23. Connect multimeter + lead to pin 23 of first copy socket and enter into programme mode. (If copier stops on an empty socket step on). Re-adjust RV1 (on PSU board) if necessary to give a reading of 25.2v. Connect 75R 7W Resistor from pin 14 to pin 23 on Copy SK1 - voltage should fall to approx. 24.4v. If less than 24v suspect a fault. Using oscilloscope examine programming pulse on each pin 20 of Copy sockets. This should be high for 50mSec and low for approximately 0.5mSec.
24. Reset and select 2532. (Remove 2716 master Eprom). Check on all sockets that A11 is present on pin 20, chip select on pin 22 and during programming (again very important to check all sockets) the programme pulse which low for 50mSec. Note that to enter programme mode you will need a master Eprom with data in the master socket.
25. Reset and select 2732. Check that pin 20 is at 0v. Check that A11 is present on pin 23 of all sockets. Check each chip select pin 22. With Master Eprom in master socket enter programme mode. When the programmer has checked each socket for programability you will hear the sound of RL2 & 3 turn on. Check each pin 22 with a multimeter the voltage should be +24.9v. Using oscilloscope examine the programme pulse on each pin 20 - it should be low for 50mSec
26. Reset and select 2732A. Enter programme mode and measure the voltage on pin 22 copy socket 1. This should be approx. 21v. Re-adjust RV2 (on PSU board) if necessary to give a reading of 21.2v.
27. Reset and select 2564. Enter programme mode. Check:-
 - a. pin 2 and pin 27 stay low.
 - b. pin 1 is at +25.2v.
 - c. pin 23 has AD12
 - d. pin 22 has prog.pulse - 50mSec.low.
 - e. pin 20 has AD11.
28. Reset and select 2764. Enter programme mode. Check:-
 - a. pin 2 has AD12.
 - b. pin 1 is at +21.2v.
 - c. pin 27 has prog.pulse - 50mSec.low.
 - d. pin 23 has AD11.
 - e. pin 22 is high.
 - f. pin 20 is low.

29. Reset and select 2764H. Enter programme mode. Check:-

- a. pin 2 had AD12.
- b. pin 23 has AD11.
- c. pin 22 has 25.2v.
- d. pin 20 had programme pulse - 50mSec.low.

30. Reset and select 68764. Enter programme mode. Check:-

- a. pin 23 has AD12.
- b. pin 22 has Vpp pulse (approx. 4v to 25v for 50mSec)
- c. pin 20 has AD11.

31. Reset and select 27128. Enter programme mode. Check:-

- a. pin 26 has AD13.
- b. Pin 1 has +21.2v.

32. Reset and select 2815. Enter programme mode. Check:-

a. pin 23 copy sockets has pulsed waveform in accordance with Intel specification (See Fig.2a page 3 of 2815 data sheet). To set the peak Vpp Voltage at +21.4v connect multimeter to pin 23 and temporarily ground (take to 0v) the base of Q9 with a flying lead. The voltage will now be static and can be adjusted by RV1 on the main board. Note that Prog pulse is nominally 50mSec high.

33. Reset and select 2816. Enter programme mode. Check:-

Check that the pulse waveform on pin 23 copy sockets is in accordance with Intel spec. Note that Prog pulse is nominally 10mSec high.

34. Connect one channel of oscilloscope to pin 1 of IC26 enter Debug mode and trigger scope on the signal. The falling edge of the signal marks the start of the dynamic access time period. With the other scope channel observe the signal on pin 11 of IC35. This should be a high going pulse. The end of this pulse marks the end of the dynamic access time minus 10nS. Select each access speed and check that it is correct.

WAVEFORM DIAGRAM

