TOSHIBA

TECHNICAL TRAINING

PDP-03-2
2003 Plasma TV Power Supply and Shutdown

Course: 2003 Plasma TV Servicing
Model Year: 2003
Chassis: PDP03
Models: 42HP83
Purpose:
Provide an overview of the 2003 Plasma TV power supply and shutdown circuits and identify the electrical adjustments necessary to properly match power supply and plasma panel.

Objectives: Upon completion of this training module, the technician will:

1. Be able to troubleshoot the power supply to PC board level with 80% accuracy.
2. Understand how to properly remove and replace the power supply PC boards with 100% accuracy.
3. Perform the electrical adjustments needed to match the power supply to the plasma panel with 100% accuracy.
4. Be able to troubleshoot shutdown conditions to PC board level with 80% accuracy.

Product Specific Service Manuals:
This training is designed as an aid to the technician in servicing Toshiba products. It is not a replacement for the appropriate service manual(s). Toshiba service manuals contain product and model specific information and must be consulted prior to servicing any product.

Product Safety Precautions:
Product Safety Precautions are described in the Toshiba service manual(s) for products and models covered in this training. All safety precautions and checks must be complied with before returning any product to the customer. Servicers who defeat safety features or fail to perform safety checks may be liable for any resulting damages and may expose themselves and others to possible injury.

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Power Supplies and Shutdown Servicing
42HP83 Plasma Series Television Receiver

The Power Supplies used in this plasma series television receiver consists of four individual boards. Since troubleshooting this unit is done to the board level, our approach will be oriented to determine any failures and possible causes to a modular level.
The supply boards are the Main Power, Sub Power, low B1, and low B2 boards. *(Figure 1)*

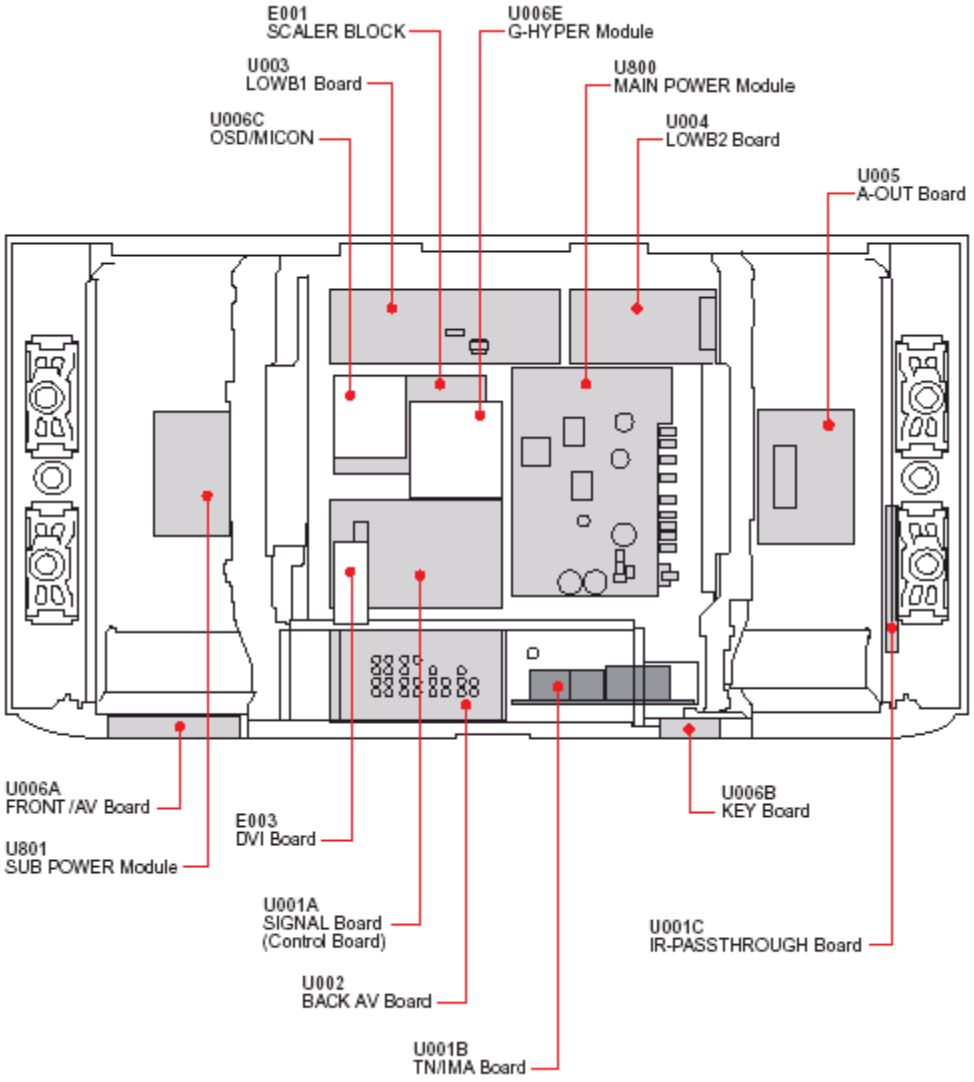

Figure 1

Main Power

The main power board produces a variety of supply voltages used throughout the unit. The following tables indicate plug locations and DC resistance measurements to cold ground.

Main Power Board

CN201

1	171.3 VDC 500K
2	171.3 500K
3	170.8 1M
4	NC
5	0
6	0
7	0
8	69.9 >2K
9	0

CN202

1	3.07 VDC 6.5K
2	2.43 6.8K
3	4.87 6.2K
4	0
5	3.19 1K
6	20.28 >2K

P808

1	11.88 VDC >10K
2	11.88
3	11.88
4	0
5	0
6	0
7	.131 1.4K

P807

1	20.28 >2K
2	20.28
3	20.28
4	0
5	0
6	0
7	31.9 3.2K
8	11.88 >10K
9	4.88 3.9K
10	3.3 100K
11	3.25 5.6K
12	4.87 8.4K
13	.13 1.4K

P801 AC IN

P802 Jumper

P809

1	25.9 VDC 1.5K
2	25.9
3	25.9
4	25.9
5	0
6	0
7	0
8	0

The next group of tables indicates the plug numbers and DC resistance measurements to expect at the Sub-Power board.

Sub Power Board

CN805

1	69.9 VDC >2K
2	69.9
3	0
4	0
5	0

CN202A

1	3.05 VDC 6.5K
2	2.42 6.9K
3	4.88 6.2K
4	0
5	3.2 1K
6	20.28 >2K

CN808

1	3.45 VDC 10.7 OHM
2	3.45
3	0
4	0
5	5.07 >2K
6	0
7	0
8	0
9	3.2 1K
10	0

CN802

1	5.07 VDC >2K
2	14.88 1.4K
3	0
4	0
5	150.3 >500K
6	0
7	0
8	0
9	0
10	171.2 28K
11	171.2

CN201A

1	171.2 VDC >28K
2	171.2
3	171.2
4	NC
5	0
6	0
7	0
8	69.9 >2K
9	0

CN806

1	69.8 VDC >2K
2	69.8
3	0
4	0
5	0

CN803

1	5.07 VDC >2K
2	14.87 1.4K
3	0
4	59.7 >500K
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0

These charts indicate what to expect at the Low B1 board.

Low B1 Power Board

P810B

1	3.18 VDC	42K
2	4.88	8.4K
3	3.24	5.6K
4	3.29	100K
5	0	
6	0	
7	9.18	340 OHMS
8	9.18	
9	0	
10	0	
11	5.15	460 OHMS
12	5.15	

P807A

1	20.26 VDC	2K
2	20.26	
3	20.26	
4	0	
5	0	
6	0	
7	31.9	3.2K
8	11.89	>4K
9	4.87	>3K
10	3.29	100K
11	3.249	5.5K
12	4.88	8.4K
13	.131	1.4K

P823B

1	9.19 VDC	340 OHMS
2	0	
3	5.14	500 OHMS
4	5.21	1.6K
5	0	
6	3.79	1K

P811B

1	4.86 VDC	3K
2	0	
3	0	
4	0	
5	0	
6	31.9 VDC	3.2K
7	11.89	>3K
8	6.66	>1M
9	3.47	>1.1K
10	3.47	

This final group of charts indicates what to expect at the Low B2 supply board.

Low B2 Power Board

P816A

1	3.43 VDC	315 OHMS
2	3.43	
3	3.43	
4	0	
5	0	
6	0	
7	3.42	315
8	3.42	
9	3.42	
10	0	
11	4.84	>3K
12	0	
13	9.06	5.6K

P817B

1	4.8 VDC >3K
2	0
3	0
4	0
5	0

P819

1	11.1 VDC >300K
2	0
3	.09

P808A

1	11.88 VDC >5K
2	11.88
3	11.88
4	0
5	0
6	0

P818

1	11.1 VDC >300K
2	0
3	.09

These tables should assist the technician in the troubleshooting process for the plasma receiver.

Listed voltage measurements indicate nominal voltages exhibited during normal operation. Measured values may vary slightly from unit to unit, but large variations from the recorded values should be investigated.

Listed DC resistance measurements were taken with a digital VOM and indicate nominal values with no AC applied to the unit. These measurements, like the DC voltages, may vary somewhat depending on the instrument used to measure them, but they can be used as guidelines when investigating problems.

If a power supply panel has been replaced, or in the unlikely event of a plasma panel change, certain power supply adjustments must be made. The adjustments (Vs, Va, Vsc, Vset, and Ve) determine the voltages supplied to the plasma screen and are controlled by a variable resistor located on the supply panels. As incorrect voltage levels may cause shutdown or screen damage, it is important to measure the DC voltage level at each test point prior to adjustment. The voltage requirements are clearly marked on the display panel. See Figure 2 and 3.

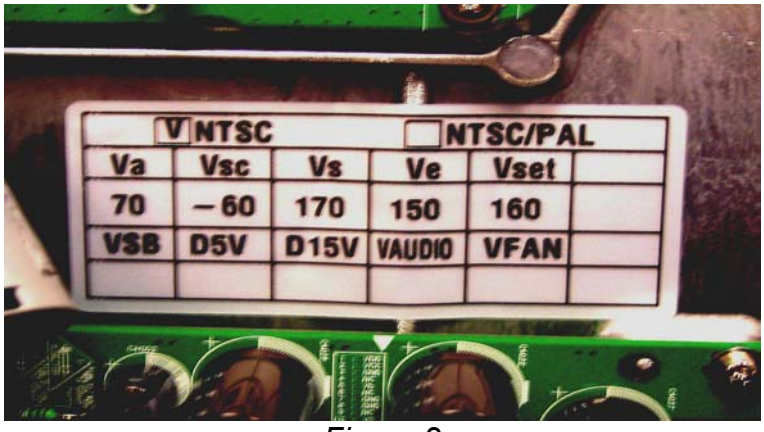

Figure 2

Voltage Distribution

Let"s look at an overview of the four supply boards used in this unit. We begin with drawings depicting plug locations on the Main, Sub, Low B1, and Low B2 Power supply assemblies. (Figure 3)

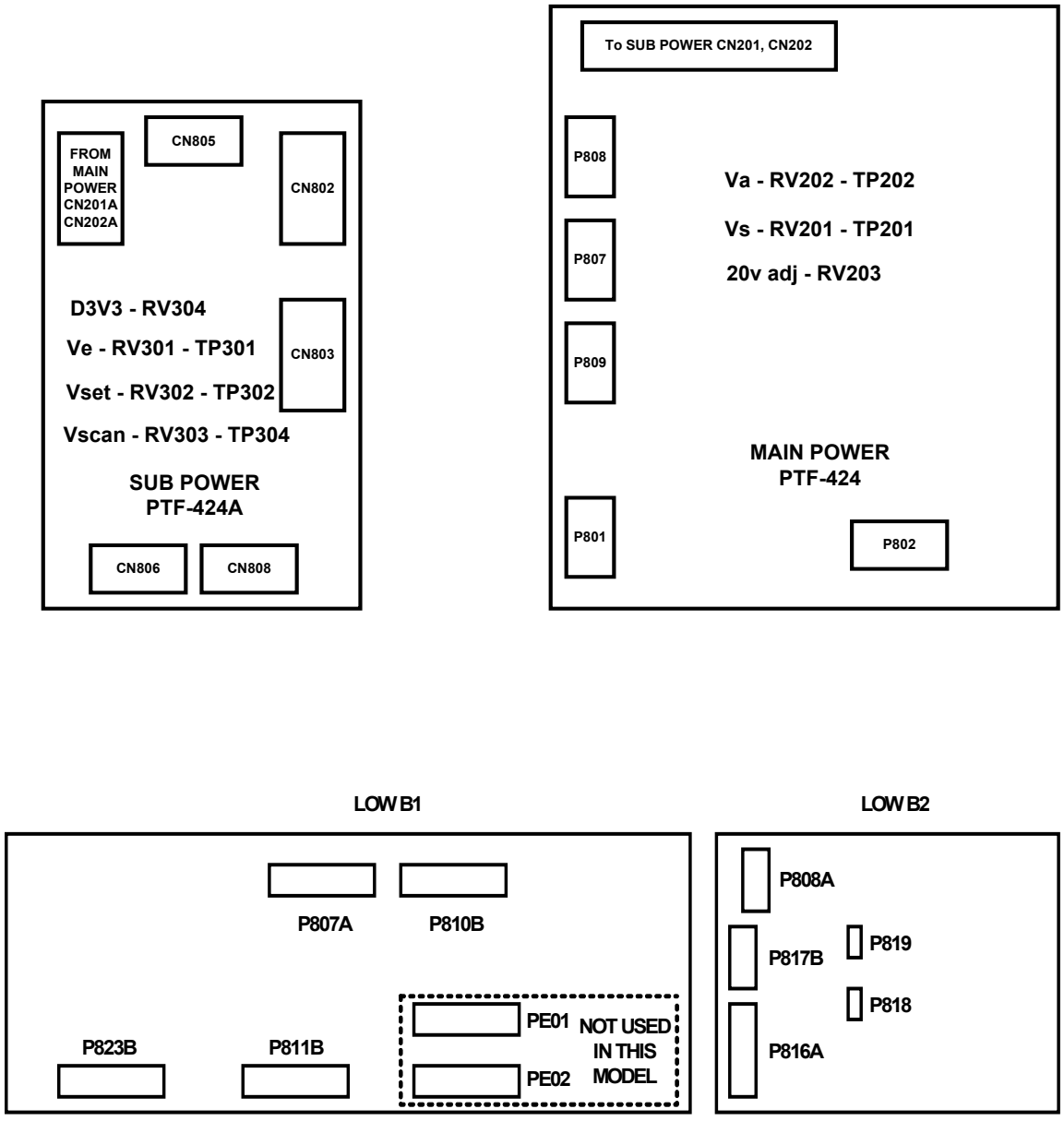

Figure 3

Now let's examine the interconnection paths for these plugs and their destinations. We will begin with the main and sub-power interconnects. The voltage charts below Figure 1 lists the supply voltages at the various pins and what you should expect as a resistance reading to cold ground.

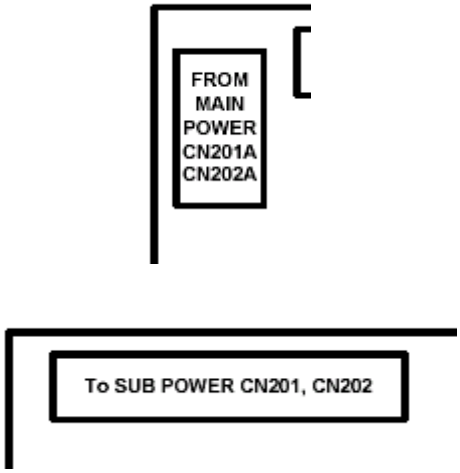

Figure 4

All remaining plugs on the sub-power PCB are outputs and are input to the plasma display. (Figure 5)

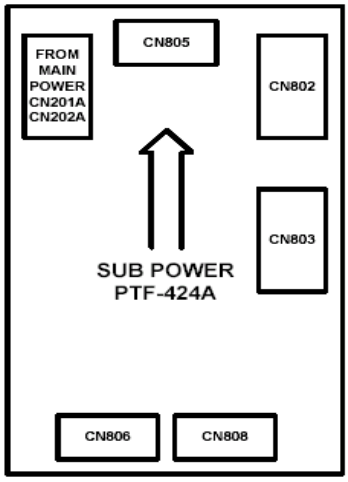

Figure 5

The remaining plugs on the main power supply (Figures 6 - 10) are connected to AC power, audio and the Low B1, B2, PCB's. P802 is a jumper. Again, the voltage measurements and DC resistances to cold ground are listed in the table.

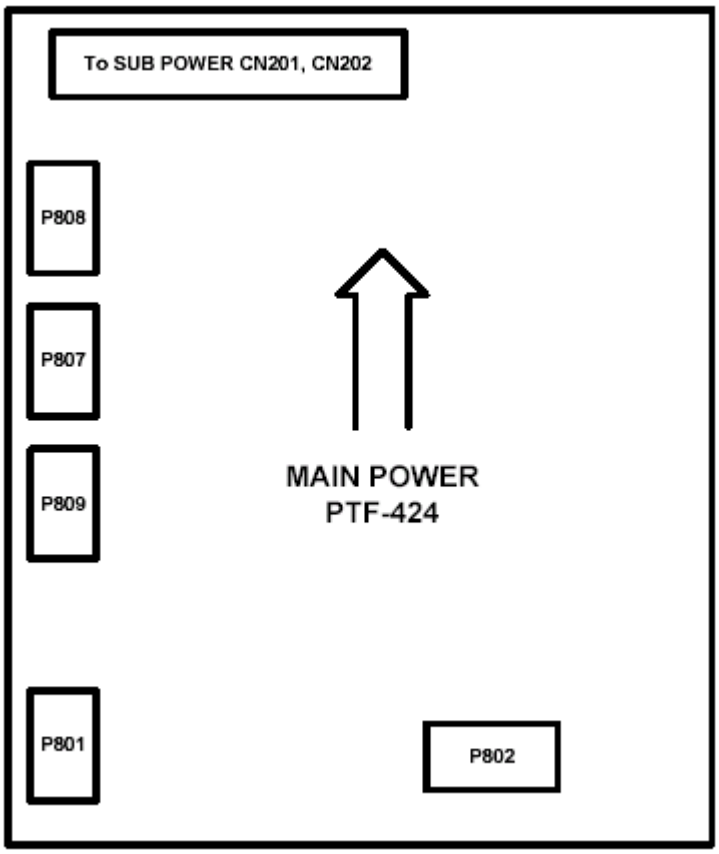

Figure 6

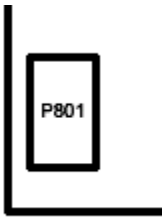

Figure 7- AC Input

Figure 8 – Audio Supply

Figure 9 shows interconnect from the main supply to the Low B1 PCB.

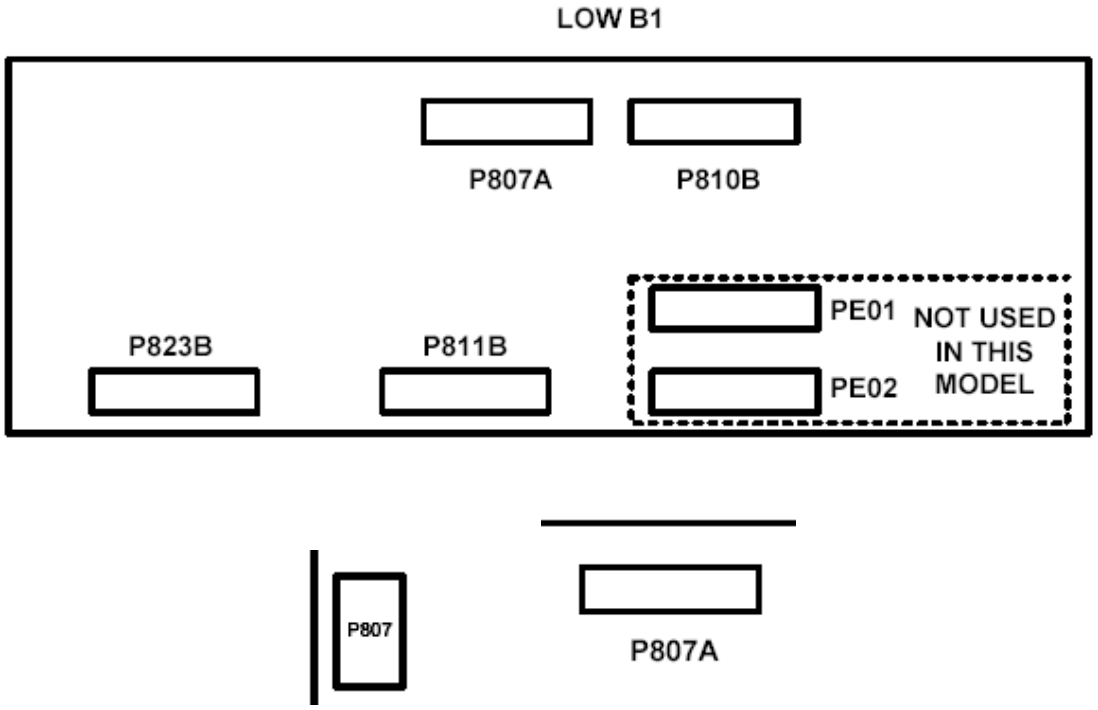

Figure 9 Low B1 Supply

Figure 10 indicates interconnect between the main supply and the Low B2 PCB.

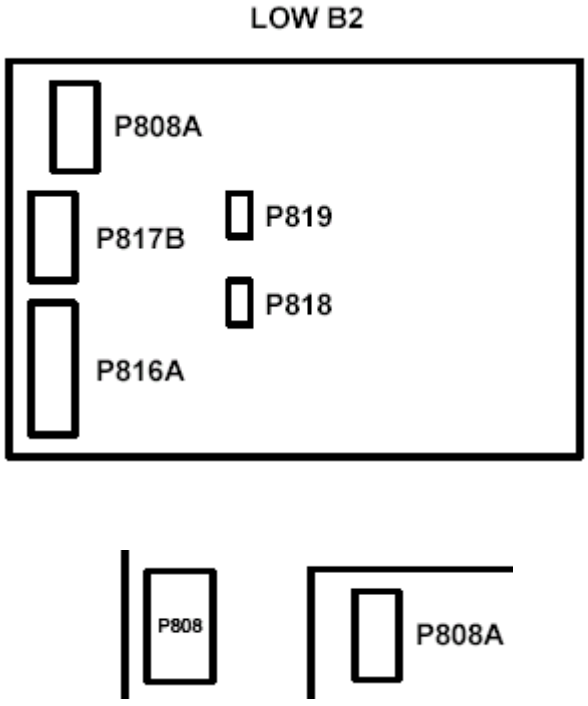

Figure10 Low B2 Supply

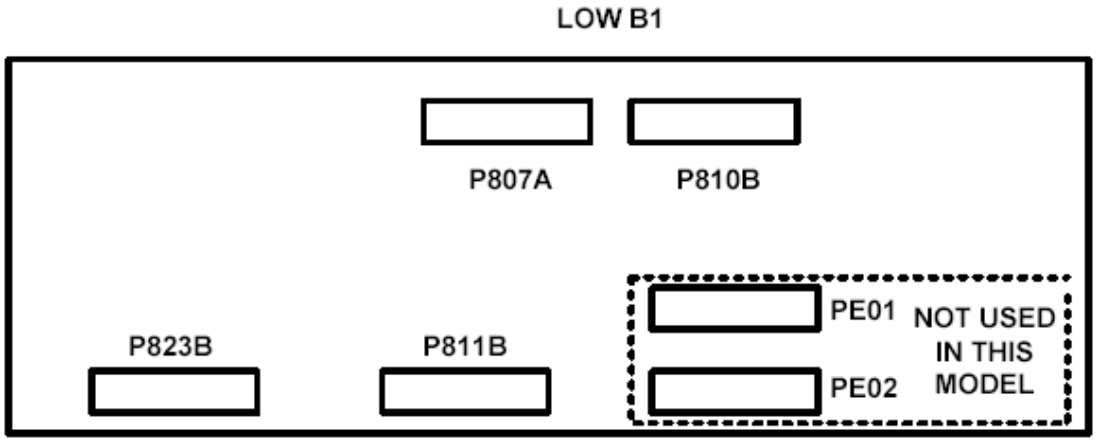

Figure 11

The outputs provided by the Low B1 PCB are P810B, P823B, and P811B. P810 and P811 are routed to the signal circuits and P823 is used to power the DVI/HDMI module. As before, see the charts following figure 1 for measurements.

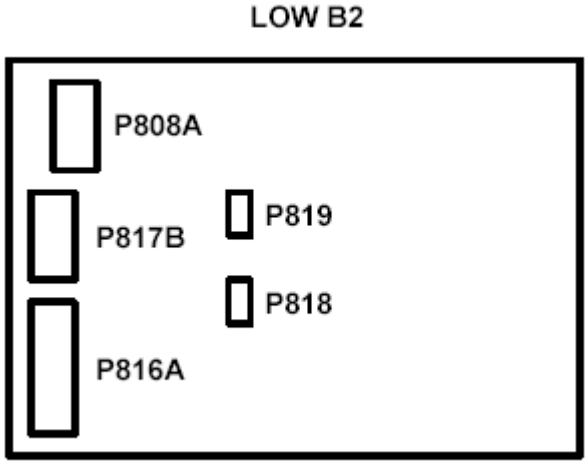

Figure 12

Outputs provided by the Low B2 PCB are at P817B, P816A, P819, and P818. P817B supplies power to the signal circuits. P816A supplies power to the scaler (microprocessor) circuit and P818 and P819 provide power to the fans. These voltage sources and the DC resistances are also listed in the chart following figure 1.

Shutdowns

Shutdowns in the 42HP83 plasma receiver can be divided into two categories. The unit can shutdown due to a problem, such as an inoperable fan, or it can shutdown due to an over voltage condition. Both of these shutdowns are noted by the microprocessor but can be identified by two different error symptoms.

- Shutdowns such as the lack of fan rotation simply cause the microprocessor to turn the unit off and exhibit an error code by blinking the power LED. When these occur, the unit will be allowed to restart by turning it off and back on. In this situation, we will normally have enough time to troubleshoot the unit and in some cases read the error codes in the service menu.
- Over voltage shutdown is a function of the power supply distribution system and latches the unit off when it occurs. It will not attempt to start again until it is unplugged and AC is reapplied. In addition to latching the unit off, the shutdown usually occurs immediately, generating a dead set with no indication other than the blinking power LED indicating a shutdown condition. This indicates a power supply related problem.

Let's see what causes the power system shutdowns and how to troubleshoot the power system shutdowns to board level.

This system monitors most of the DC sources being developed by the regulators located on the Low B1 and Low B2 power supply boards. When an over voltage condition is detected by this shutdown circuit, the protect line will rise, causing the unit to shut down and signaling the microprocessor that this has occurred.

The circuit shown in figure 13 is the actual shutdown circuitry.

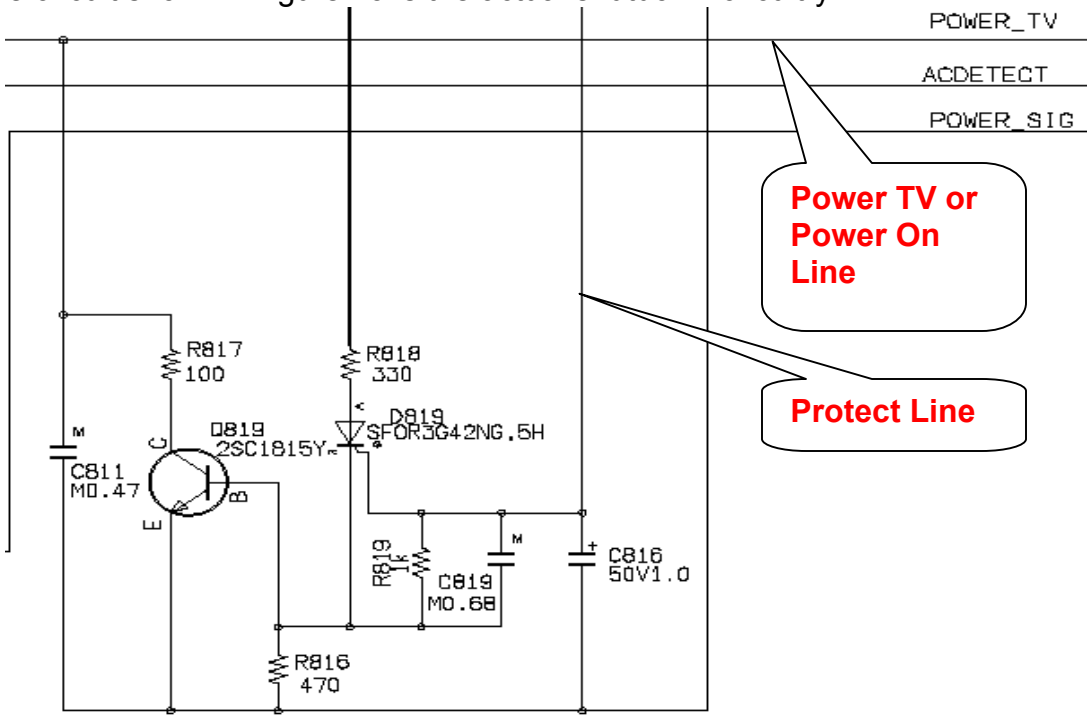

Figure 13

When the protect line in this circuit rises, the gate of SCR D819 will rise. This will cause D819 to conduct and apply a DC voltage to the base of Q819. Q819 will conduct and the Power TV or Power On line will be pulled low. This causes the power relays in the unit to open. As well as opening the relays and shutting the unit down, when Q819 pulls the power line low, signaling the microprocessor that the unit has shut down and the blinking LED display, indicating shutdown, will begin.

The protect line that operates this shutdown circuit monitors 5 different voltage sources.

- On the Low B1 power supply board, the 6.5VD, the 3.3VD, the 5V2, and the 9-volt sources are monitored.
- On the Low B2 power supply board, the 3.3 VS1 source is monitored.

These sources are monitored by zener diodes in series with steering or blocking diodes and a resistor connected between the protect line and the source. Figure 14 is an example of this monitoring system as it applies to the 5V2 source on the Low B1 board.

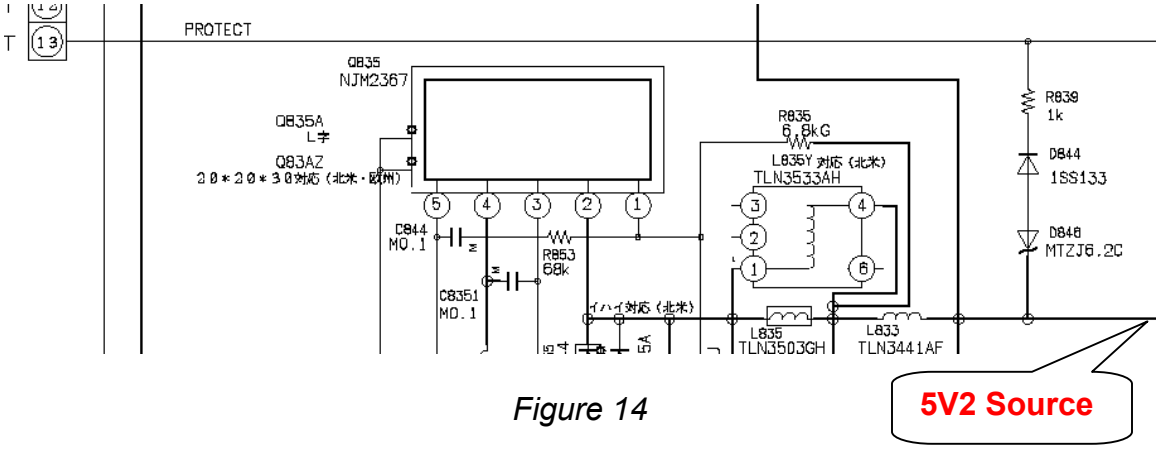

Figure 14

Since troubleshooting is done to board level, all that needs to be done is to determine which of the two boards is causing shutdown. Let's see how.

We know from our text that only one source is monitored on the Low B2 board. Since this is the case we need to only make one measurement to determine the cause to board level. That measurement involves the 3.3VS1 source located on the Low B2 supply board. (Figure 15) Let's see how to measure and make a determination.

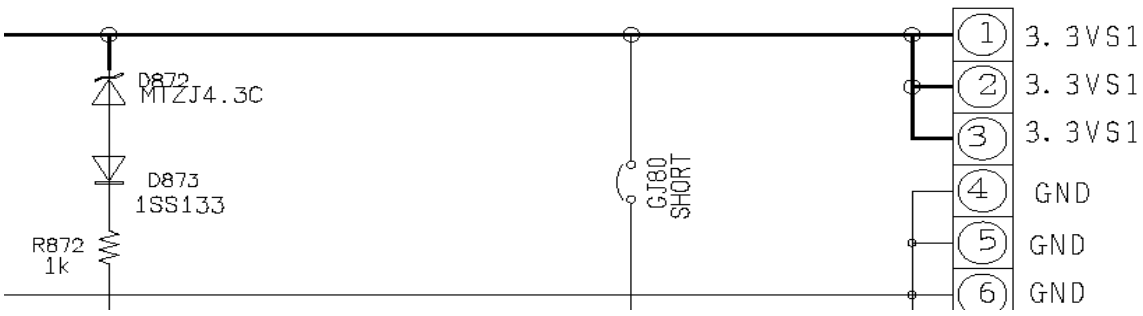

Figure 15

Using a DC coupled oscilloscope, measure the voltage developed across resistor R872 at turn on. (Figure 16) To do this, ground the scope to the protect line and the input of the scope to the junction of R872 and the cathode of D873. Remove AC to let the unit reset, then reapply AC and turn the unit on.

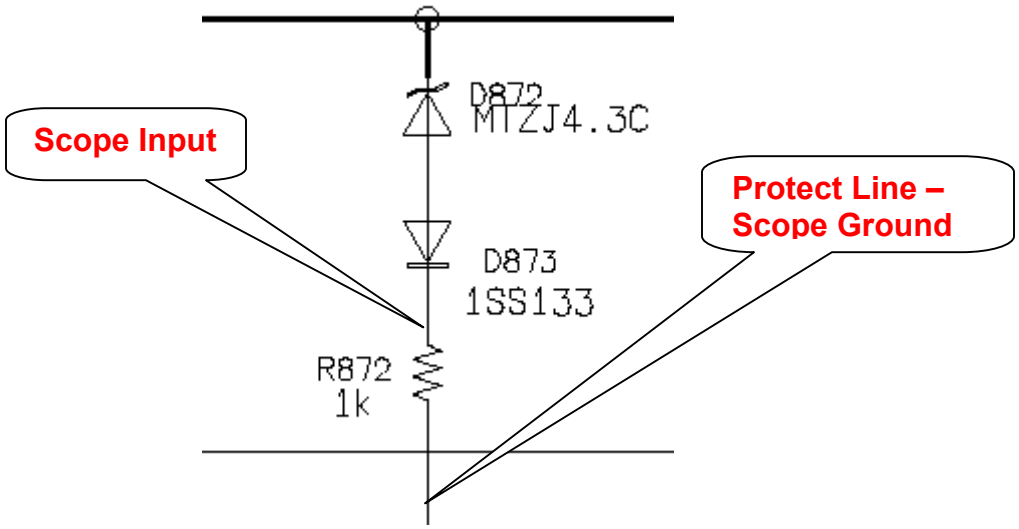

Figure 16

If the Low B2 board is defective the scope will measure a momentary voltage (approximately 1.8 VDC) across R872 when the unit is turned on.

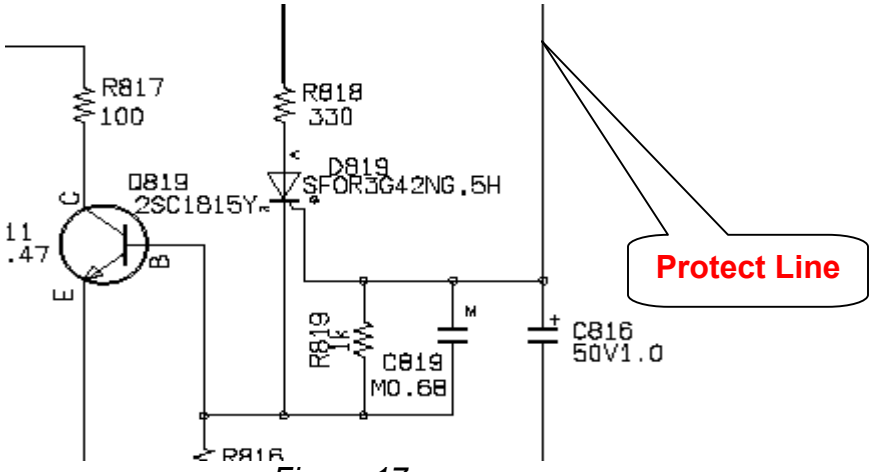

Figure 17

Let's see why. Notice that the break over point of the zener diode, D872 is 4.3 VDC. If it conducts due to over voltage on the 3.3VS1 supply line, this voltage will appear at its anode. After it passes through D873, it will be reduced approximately .6 volts due to the diode junction. R872 (Figure 16) and R819 (Figure 17) form a voltage divider network. They are both 1000 ohms meaning the voltage appearing across each resistor will be approximately ½ of the voltage appearing at the cathode of D873, 4.3 -.6 = 3.7. ½ of 3.7 = approximately 1.8 VDC.

Conclusion

If a voltage (1.8VDC) appears across R872 as the unit is turned on, it means that the shutdown is being initiated by the 3.3VS1 source developed by the Low B2 power supply. If that is the case the Low B2 board should be changed. Since this is the only source monitored on this board, if no voltage is detected across R872, the shutdown problem is probably related to one of the Low B1 sources and that board should then be suspected. We could use the same method to check the sources developed by the Low B1 board but since the repair is limited to board level, it is not necessary. The Low B1 board should simply be changed.