

Welcome

Amusement & Music Operators Association

LCD Power Supply Troubleshooting Tech Seminar



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LCD Monitor Power Supply Tech Seminar - Agenda

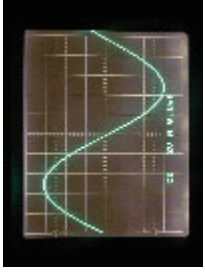
Morning Session

- A. Introduction/Tech Seminar Objectives**
- B. Equipment Familiarization**
 - Power Supply Trainer
 - Test Equipment
- A. LCD Color Monitor Theory**
 - Block Diagram/System Overviews
 - Understanding Basic SMPS Power Supply Technology
 - Testing LCD Monitor Power Supplies
 - Signal Processing & Feedback Circuits
 - Analyzing Different Signals
 - Inputs & Out-put Circuits
 - Testing the AC Power Adapter or SMPS
- B. LCD Monitor Power Supply Troubleshooting**
 - Main Signal Processor Power & Control Circuits
 - LVDS Interface & LCD Panel Power Supplies
 - LCD Display Backlight/CCFLs Theory
 - LCD Color Monitor Troubleshooting

Afternoon Session

- E. Backlight Inverter Power Supply Theory**
 - Backlight Inverter Theory
 - Performance Testing/Symptoms
 - LCD Display Backlight/CCFLs Theory
 - Backlight Inverter Troubleshooting
 - Testing with a Bench DC Power Supply
 - Replacing CCFLs or Inverter Power Supplies
- F. CCFL (Cold Cathode Fluorescent Lamps) Types**
 - Safety Precautions
 - Handling Precautions

11-Golden Rules of Safety



1. Anything with a AC plug must go into an isolation transformer.
2. Remove all jewelry (rings,watches,chains, hanging I.D. Cards) when working on anything electrical or electronic.
3. Always hook instrument *ground* (Black) connection up first.
4. Only one hand touching chassis or circuit components; preferably right hand; with fingers pointing up.
5. Never place one hand on one piece of electronic equipment then one hand on a separate piece of electronic equipment.
6. Always use Safety Ground Strap when working the Bench or on site.

7. When working with an Electronic Trainer with Trouble Switches, turn power to Trainer off, switch in Trouble Switch, turn Trainer on.

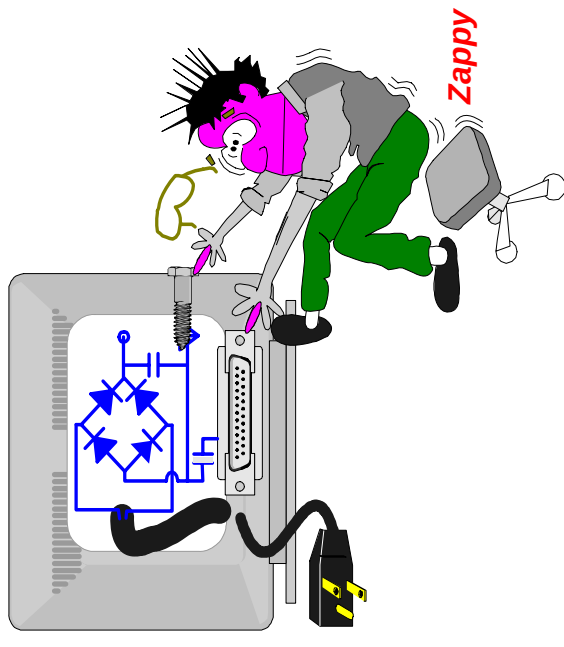
8. Electronics and liquids do not mix. (no drinks on working benches please)

9. Use *all* senses *all* the time. See, hear, feel, smell or sense something not right, power down Bench or product under test.

10. Power Down Bench when leaving for any period of time.

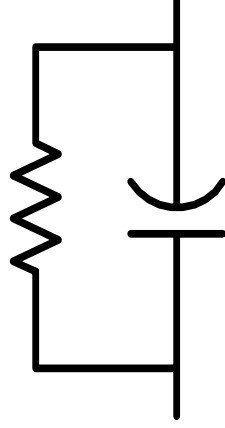
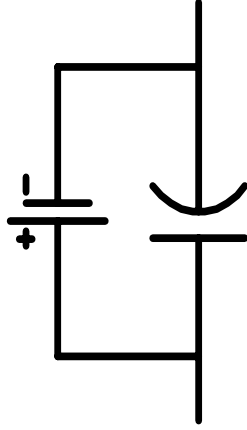
(preferably with one Bench Master Power Switch)

11. Don't Feel Well? Take a Break or Go Home!



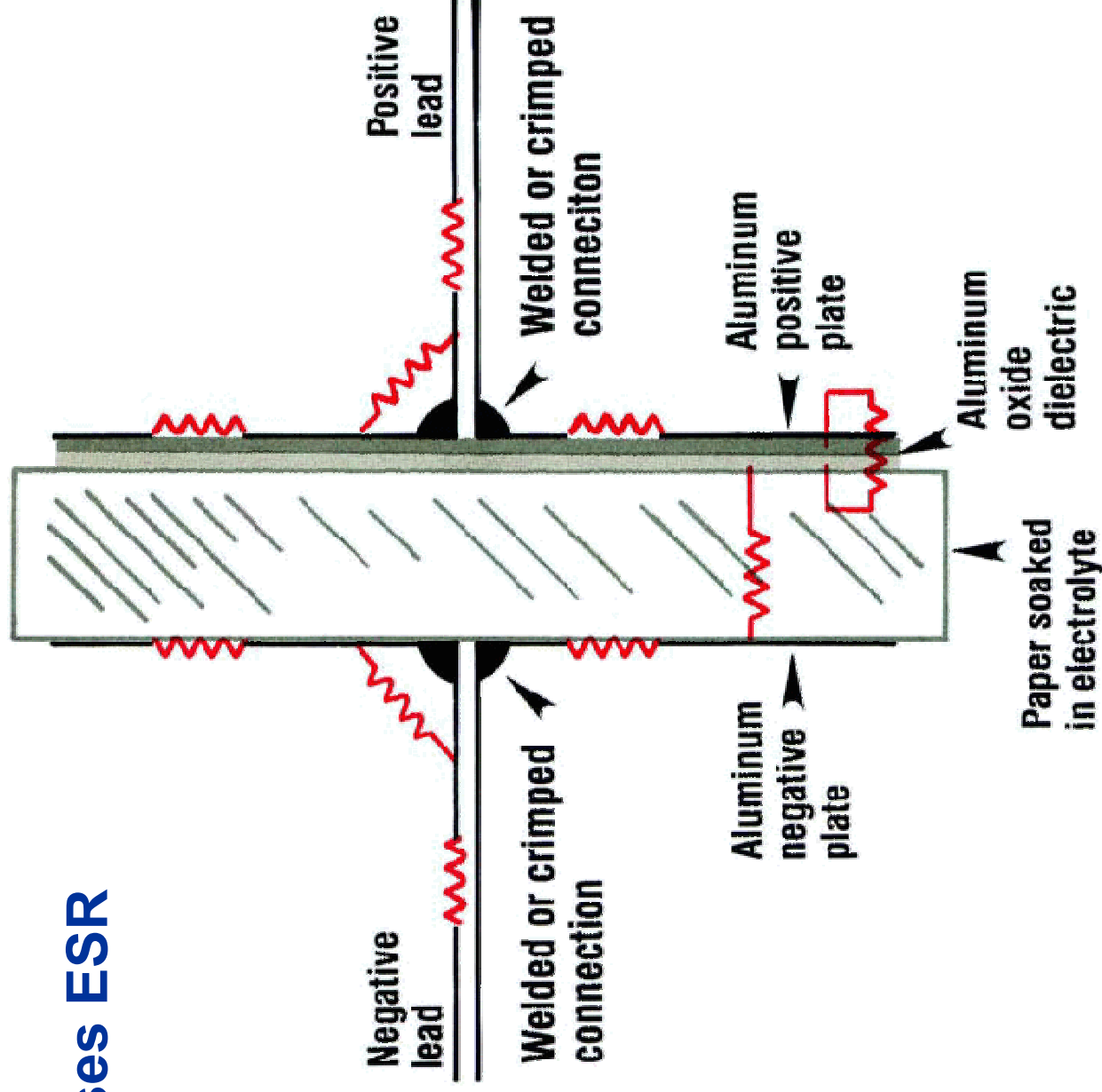
Capacitors fail in one of four ways

- 👉 **Value Change**
- 👉 **Excessive dielectric absorption (DA)**
- 👉 **Excessive leakage**
- 👉 **High equivalent series resistance (ESR)**



A value change alone is rare

What causes ESR



SENCORE

10 Key Computer Monitor Waveforms

Waveform

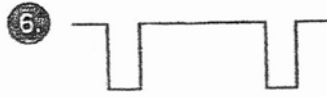


Vert Atten : 1 VPP to 10 VPP
Waveform Analyzer Setting:
Timebase : 5 μ sec Horiz. (VGA)
: 10 msec Vert.

**Located At
Block Diagram
Test Points**

R,G,B Video
11, 12, 13, 14,
21, 22, 23, 24,
31, 32, 33, 34

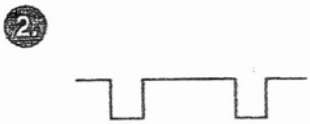
Waveform



Waveform Analyzer Setting:
Vert Atten: 1 VPP
Timebase: 5 μ sec

**Located At
Block Diagram
Test Points**

Horizontal Sync
Buffer Input,
Output, 50



Waveform Analyzer Setting:
Vert Atten: 1 VPP
Timebase: 10 msec

Vertical Sync.
Buffer Input,
Output, 40



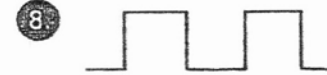
Waveform Analyzer Setting:
Vert Atten: 2 VPP (VGA)
Timebase: 5 μ sec

Horizontal Osc.	
51	



Waveform Analyzer Setting:
Vert Atten: 1 VPP
Timebase: 10 msec

Vertical Oscillator



Waveform Analyzer Setting:
Vert Atten: 50 VPP
Timebase: 5 μ sec

Horizontal Driver
Output Collector

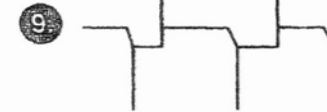
* 52



Waveform Analyzer Setting:
Vert Atten: 1 VPP
Timebase: 10 msec

Vertical Driver
Output

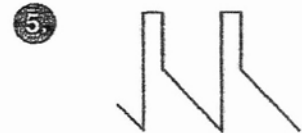
42



Waveform Analyzer Setting:
Vert Atten: 5 VPP
Timebase: 5 μ sec

Horizontal Output
Base Drive

* 52



Waveform Analyzer Setting:
Vert Atten: 20 VPP
Timebase: 10 msec

Vertical Output
43



Waveform Analyzer Setting:
Vert Atten: 200 VPP
Timebase: 5 μ sec

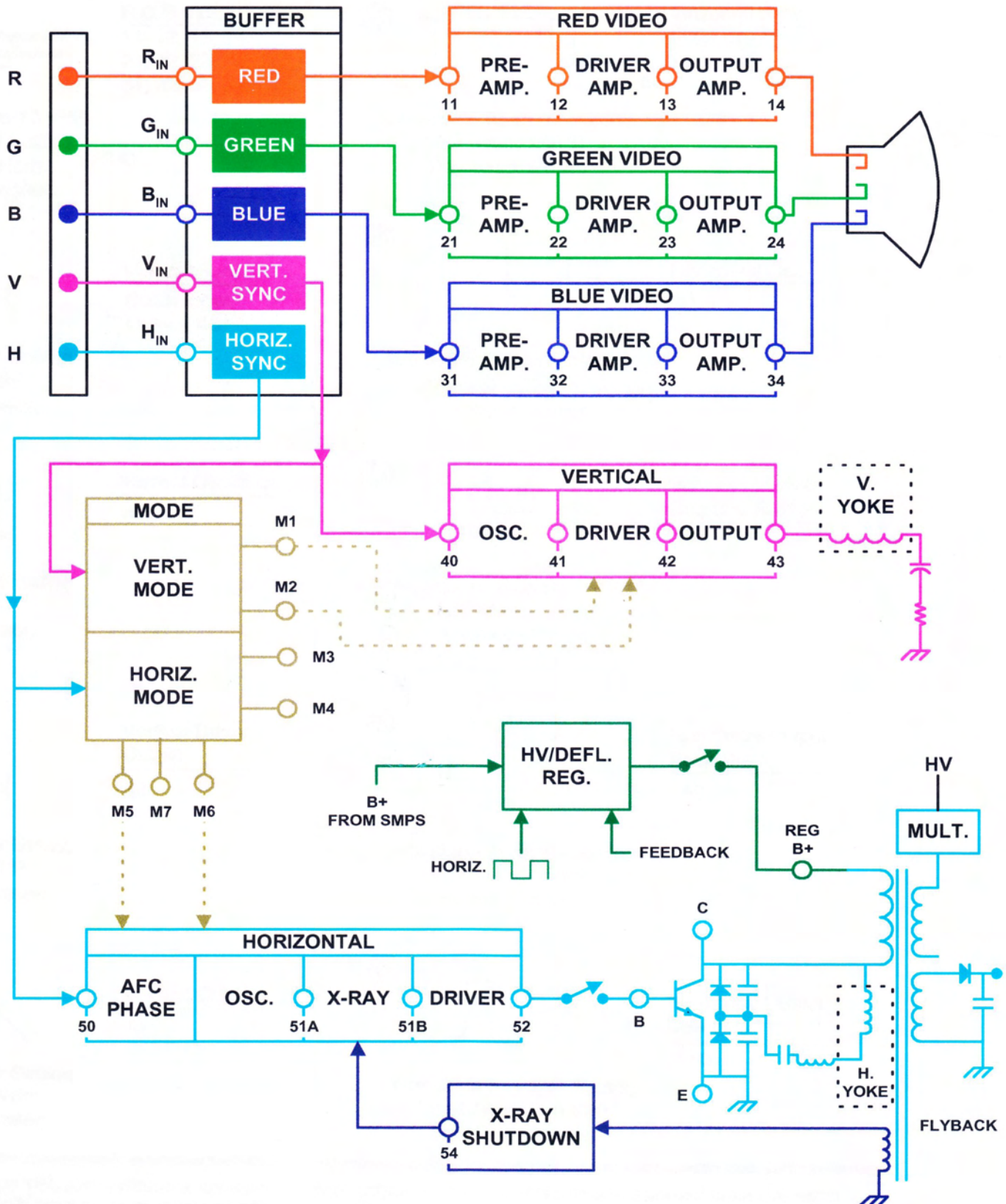
Horizontal Output
Collector

** 53

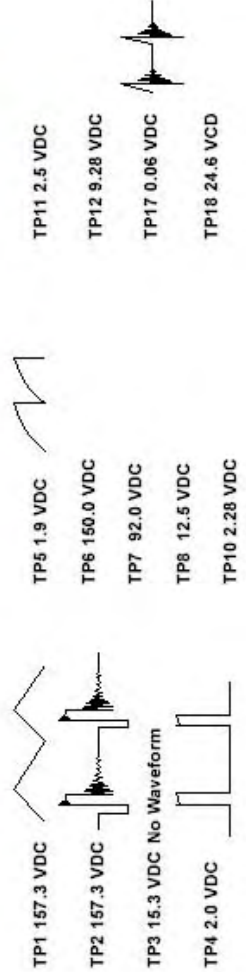
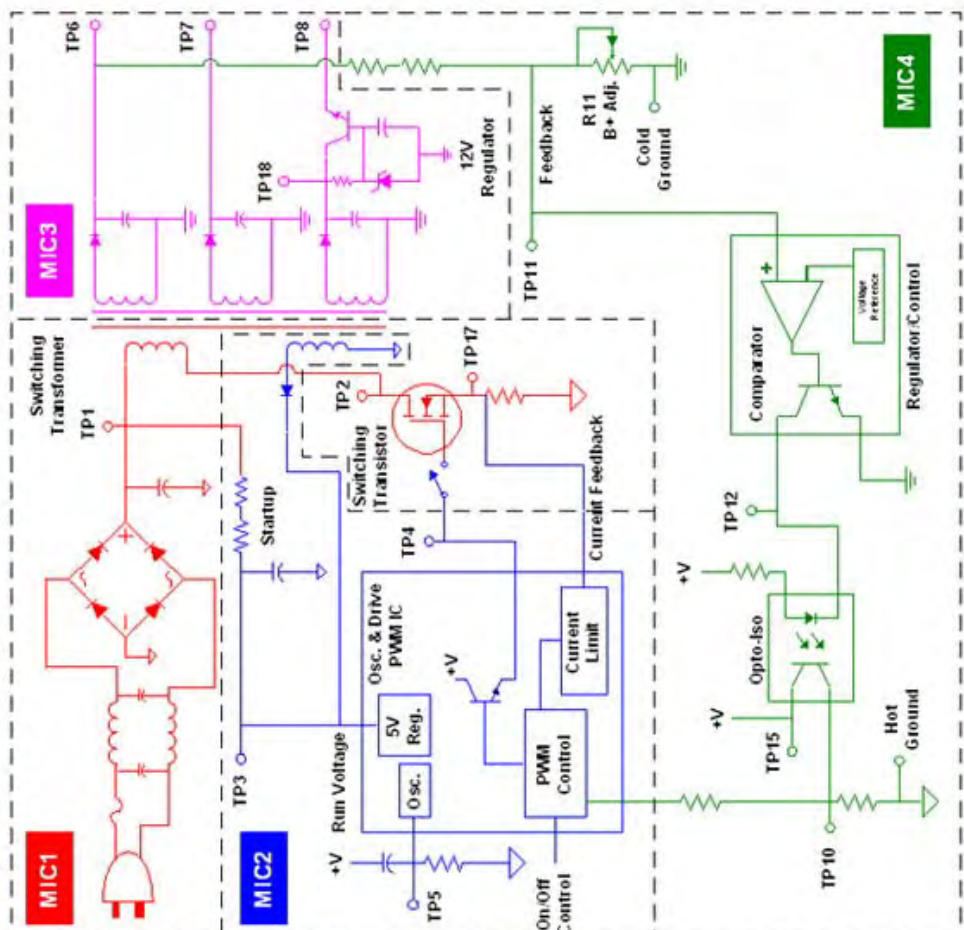
* One test point location with two waveforms represents voltage output waveform transformed to a current input waveform.
 ** "Caution" – Most oscilloscopes can be damaged attempting to measure this waveform

Universal Computer Monitor

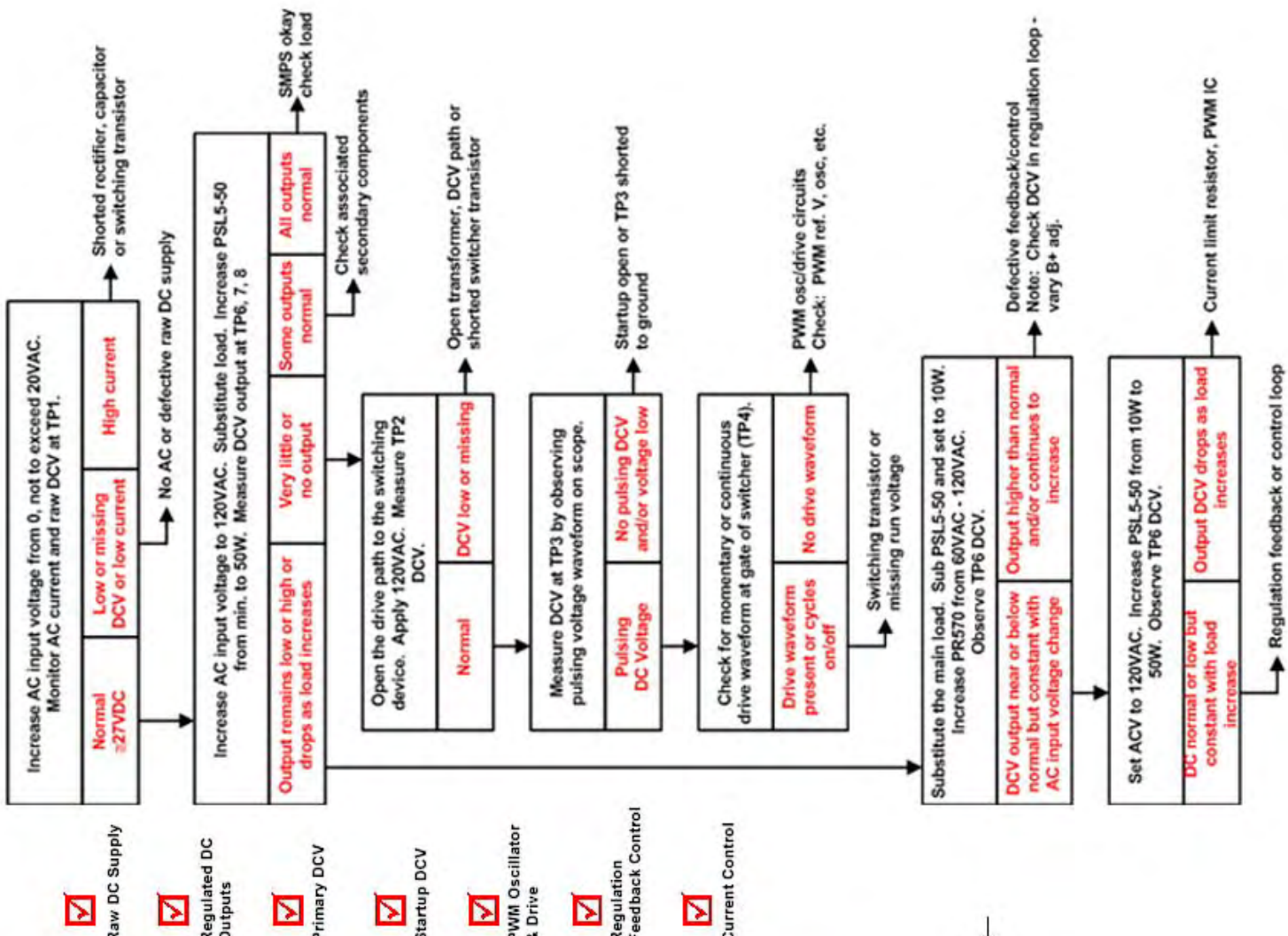
Block Diagram



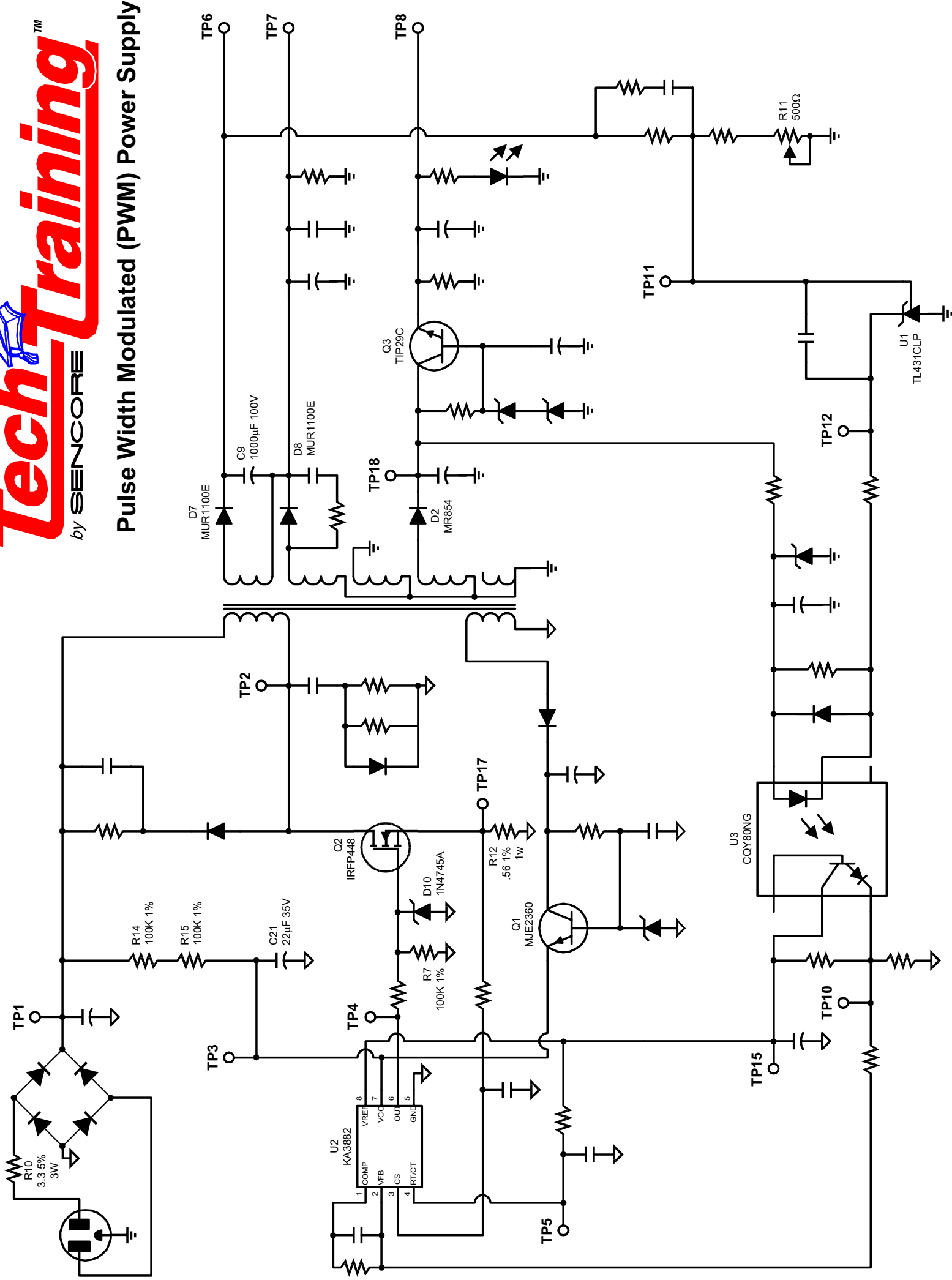
Simplified Pulse Width Modulated (PWM) SMPS

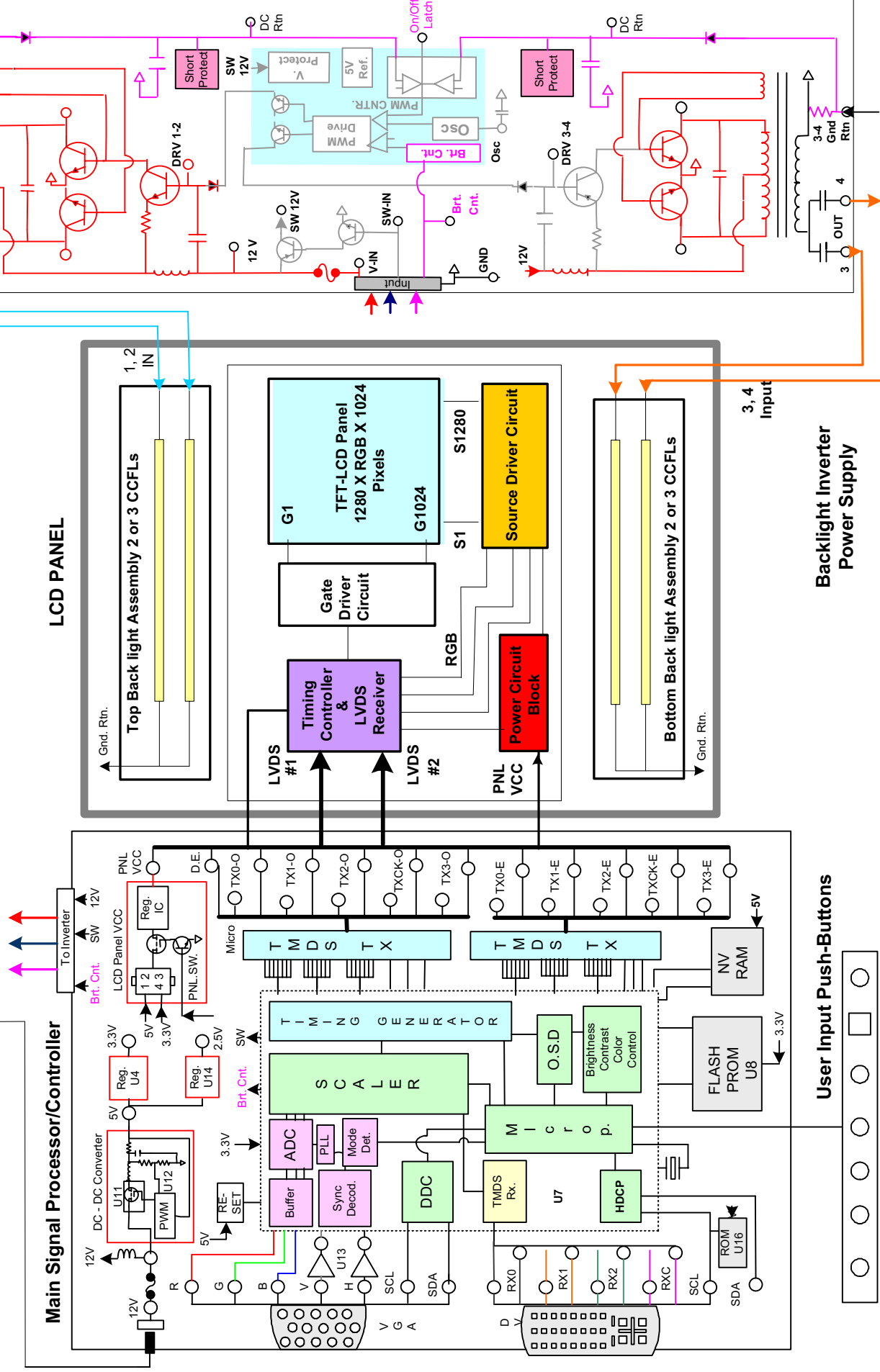


Troubleshooting Tree



Pulse Width Modulated (PWM) Power Supply





PNL VCC (FL1)

TXCK+E (CN1 pin 3)

3.3 Volts +
(U4 heatsink)

5 Volts + (R23)

Horiz. Out
(U13, pin 10)

12 Volts + (F1)

Vert. Out
(U13, pin 8)

Horiz. In (R49)

SDA (ZD2)

Vert In (R57)

Blue In (R58)

SCL (ZD1)

Green In (R59)

Red In (R60)

Reset (R29)

2.5 Volt + (U14 heatsink)

