Homework

Whitaker book, Chapter 6 mostly. Some research outside the book. **Due Tuesday**. Steve suggests that we develop an outline of Chapter 6 first, then go back and fill in the answers to the homework from your outline. About 45 pages in Chapter 6.

More on the Sony BVP-360 Camera

Signal flow and how to identify where signal is going through a circuit.

Schematic of PP-30 Board

Pre-preamp.

All on one board. No values shown because they expect you to change the entire board.

See an FET diagram. Accepts signal from the pickup tube. Takes advantage of high input impedance which avoids loading down the voltage from the tube. Common source configuration gives higher voltage and current gain (high power gain). Overcoming noise with high amplification and high impedance.

PA-77 Board Schematic

Pre-amplifier. Has component values. Input labeled R/G/B (PP) in.

Transistors on Board

Q1 is in common base configuration. Input going into emitter, output coming from collector. It is a PNP transistor. Characteristics of common base: some voltage gain, negative current gain, in-phase output signal, low input impedance, high output impedance. This is a buffer amplifier; it isolates one stage from another. Isolates input of the preamp from the rest of the preamp.

Q2 is in common emitter. The output collector goes to another transistor.

Q3. No coupling capacitor between Q2 and Q3. This is called direct coupling.

Q4 output outputs from the board.

Board Design Choices

Why no coupling capacitors? Want low frequencies. For example, long stretches of black or white. Using some higher-noise PNP transistors but this permits going without coupling capacitors. Alternates NPN and PNP transistors except between last two stages.

Why are last two transistors in common collector /emitter follower? High current gain, so trying to drive something with a higher current to ensure it makes it to the other board.

Base is always in-only. **Emitter can be in or out**. **Collector is always out-only**.

How do we know that AC is tied directly to ground at Q1 base? There is an RC combination in parallel

hooked between Q1 base and ground. AC passes through the capacitor and ignores the resistor, so the AC is tied to ground.

Why use -9V and +9V at transistors instead of ground and +9V? This lets us alternate NPN and PNP. Working with AC, balanced circuitry (NPN alternating with PNP) so we don't have to use coupling capacitors and thus don't have limits on low frequency response.

What are the inductors for? Like the capacitor being a coupling capacitor, the inductors help decouple power supply line by using an inductor in series and a capacitor in parallel. Helps remove high-frequency AC. Refer to an inductor used in this way as a **choke**.

Why are there resistors between (Q3 collector - Q5 base) and Q2 emitter? Adjusts the amount of high frequency response. One of the resistors is a variable resistor.

Access to Test Signal Generation

Test signal called ramp or saw. Comes into the pre-amp. Adjustment to adjust the amplitude. Why? Testing the rest of the camera. If we see purple color in normal operation but when inject sawtooth in we see gray shades, anything past the preamp must be good. Could have a bad preamp or a bad tube. Saw gets pumped directly to the output on this board. Diagram 2. This saw signal is applied only at the output of this preamp; it isn't supplied to any other board in any other place. This occurs in each of the three separate color circuit lines so we can get gray from RGB.

Ramp Signal

Ramp or saw(tooth). Controlled at CCU. Generated by ramp generator at CCU.

Creates a dark-to-light transition for the color associated with the circuit to which it is being applied.

Sometimes just called *test signal*. All cameras have a ramp generation capability.

Can determine if shading off if ramp line thickens in the WFM.

VA board

Video amplifier. Accepts input from PA output.

Input goes into base of Q53. Configuration is common collector. Signal comes out emitter. High current, so can drive a few sources. Have lots of devices trying to drive: 4 FETs.

The controls here in this board are for gain. What is gain in a camera? 0, 3, 6, 9, 18dB amplification, not the ratio of output to input through a transistor or amplifier.

Operational amplifier (op amp) shown after two of the four FETs. Diagram 3. Has many transistors. Used here to control gain.

From op amp, goes to ??? of Q58. Not the base, since there is a capacitor there that would short out the video AC. The signal comes into the emitter (from the other two FETs) and out of the collector. Signal has one of three paths:

- resistor
- series RL then FET

- resistor through FET

The two FETs and the op amp are used as a clamping circuit.

Q58 signal out of collector. Is in common base configuration. Avoiding capacitor (since we have clamped) by using direct coupled circuitry.

Q62 is strange device seen occasionally. It is a constant current source. Sends specific amount of current into the next stage. Ensures there's always current in the circuit even if there is no signal.

Sample and Hold

Like a ramp and sample. Sample and hold a specific level. May be a circuit to support our clamping circuit.

IC

Proprietary IC (ASIC = application-specific integrated circuit). A way of hiding proprietary information. Has gain, gain, -CAR, +CAR, +SIG, -SIG, VEE, BIAS, +OUT, -OUT pins.

Moving On Past the IC

Outputs to Q68. Common collector. Out emitter to Q67. Looks like these are fine-tuning the clamp.

Outputs to Q73 (an FET). This is acting as a switch. This is called the pre-blanking in. Shut off video signal during blanking else would see garbage from the intervals in the video. At this point there is no sync, this is just leaving space for sync.

Beam blanking. Must blank the tube at the same time. This is Q74. Really ensuring that blanking is blank.

In Q75's base, out emitter to Q77's base. Out emitter. Q77 goes off the board to G (VA) Out.

Q76 is just a temperature compensation device. Using diodes and transistor compensates for temperature variations. If early transistor heats up, will cause subsequent transistors to work harder and heat up even more. This is called **thermal runaway**. These start to bring current down, but doesn't always work.

E1 is usually a reference for ground. E anything is ground. E for earth, a European term for earthing something meaning grounding something.

RV15 – Green Flare

Compensates for lens flare. A variable resistor on base of Q70. Signal comes out of op amp below Q73, then gets fed to base of Q71, then to emitter of Q70.