ABOUT THIS ASSIGNMENT:

You will need the following materials to complete this assignment:

9390

Sharp pencils
CM-1 Color Video Monitor Service Manual
About 1 hour of your time

The questions are taken almost directly from the CM-1 Video Monitor Lab that you will perform tomorrow. No question on this assignment requires more than the CM-1 Service Manual and/or a little thought. You are invited to freely use the CM-1 Service Manual and schematic to answer the questions on this homework assignment.

Once you have completed the assignment, transfer the answers into the appropriate sections of the lab manual (if applicable). WRITE IN PENCIL, JUST IN CASE YOU MAKE A MISTAKE. The Homework will be collected before the lab begins. You can correct any errors in the lab manual during the lab.

The questions are numbered to match the lab manual. Question 1.2.B is found in the lab manual, Section 1, Activity 2, Question B. Question 2.9.B is found in Section 1, Activity 2, Question B, etc.

## PRELIMINARY QUESTIONS

These questions do not appear on the laboratory sheets, but are important to the understanding of the laboratory results.

1) Which of the following can be measured using an oscilloscope and no other equipment → There is more than one answer. Circle the numbers of all that apply.

(including calculator + brain!)

Scope reads PERIOD, frequency meter reads FREQUENCY

1) DC voltage
2) RMS AC voltage
3) Peak-to-Peak AC voltage
4) Relative phase of two signals
5) Frequency of a signal
6) Total circuit capacitance
7) Frequency difference between two signals
8) Period of a signal
9) Pulse width
10) Total circuit resistance

(some of these wouldn't be measured very accurately, or would require you to be able to take reciprocals in your head, for example - but you could do it.)

2) What is the frequency of the vertical sweep signal used in the CM-1?

60 Hz

3) What is the frequency of the horizontal sweep frequency used in the CM-1?

26.4 kHz

4) You are measuring a pulse wave signal with the following qualities:

Positive ("1") level = 12 volts
Negative ("Ø") level = Ø volts
Frequency = 6Ø Hz  Duty cycle = 75% HIGH 25% LOW

A) Using a DC voltmeter, you measure a DC voltage of 9 volts. Explain why this is so.

The voltmeter is, effectively, taking a weighted average of the voltages it sees. To put it another way → $\left(\frac{3}{4}\right) * 12V + \left(\frac{1}{4}\right) * 0V = \underline{9V}$.

all of this for one lousy point?

↑ time high ↑ high voltage  ↑ time low  ↑ low voltage  ↑ voltage seen

5) You are reading a signal on the oscilloscope. It measures exactly 3 divisions of peak-to-peak amplitude. Your vertical setting is at .5 volts/div. Your probe is set to x1Ø. What is the amplitude of the signal you are measuring?

0.5 V/div * 10 = 5V/div

3div * 5V/div = 15V peak to peak.

1.2.B) Locate the B4 adjustment procedure on page 13 of the CM-1 Service Manual. Why does the B4 adjustment procedure require a white screen and maximum contrast and brightness?

1 A white screen and max brightness and color implies the highest number of electrons hitting the screen, which translates to the highest current draw. It is necessary to provide the maximum load on the circuit to accurately adjust the voltage at B4.

1.2.C) Using the schematic diagram contained in the CM-1 Service Manual, name five (5) major circuit areas supplied by the 112 volt B4 voltage.

5
1) vertical output
2) video gun drivers
3) flyback transformer (Horizontal output)
4) x-ray protection
5) horizontal oscillator IC

1.7.A) The voltage at the junction of L601 and C608 goes to 7 GENERAL portions of the circuitry. Name them.

7
1) video amplifiers
2) video gun drivers
3) blanker circuit
4) brightness circuit
5) video buffers
6) contrast circuit
7) horizontal sync 5V regulator

1.10.A) The voltage at TP-9Z on the CRT PC board serves two functions. Name them.

2
1) powers the cutoff controls
2) powers the constant current source transistors (R-G-B Drive Z)

1.11.A) Locate D930, the PCB-LED, on the schematic diagram. Other than as a power on indicator, what purpose does it serve?

1 It shows that you have scan derived voltages, which implies that you have horizontal output ~~for at least scan~~) and the B4 voltage. You could have scan, but no H. output

[this question does not appear on your lab sheet]

2.2.x) Using the schematic, what type of signal (CMOS, TTL, analog, etc) would you expect to see at IC602 pin 3. What frequency would you expect here? What would be your first choice for oscilloscope setting necessary to view this signal? HO

Signal type TTL Frequency 26.4 kHz

10 µSS /division horizontal 0.1 V/division vertical x 10 probe

2.4.A) What is the function of Q615?

h. sync amplifier

2.9.A) Referring to the schematic diagram, there is an unlabeled component coil attached to the collector of Q591. The component is inside a dotted box. Pin 1 of this coil is attached to the collector, pin 2 attaches to T553. What is this component called?

horizontal yoke

2.9.B) What does the dotted box indicate?

component found off-board

2.11.A) There are two other controls in horizontal oscillator circuitry that you should be familiar with. When you figure out what they do, make a note here.

S591 = controls (toggles) horizontal centering

L552 = ~~filters flyback spikes~~ Horizontal width (see schematic)

[this question does not appear on your lab sheet]

2.12.x) Using the schematic, what type of signal (CMOS, TTL, analog, etc) would you expect to see at IC602 pin 6. What frequency would you expect here? What would be your first choice for oscilloscope setting necessary to view this signal? VO

Signal type TTL Frequency 60 Hz

5 ms /division horizontal 0.1 V/division vertical x 10 probe

2.16.A) Referring to the schematic diagram, there is an unlabeled component attached to the emitter of Q401. The component is inside a dotted line box. Pin 4 connects to the emitter of Q401. Pin 3 connects to switch S491. What is this component called?

vertical yoke

2.17.A) There are four variable components in the vertical oscillator circuitry. What are the function(s) of these components?

VR401 = vertical hold

VR402 = vertical linearity

VR403 = Vertical height

S491 = Vertical centering

4

[this question does not appear on your lab sheet]

3.1.x) Using the schematic, what type of signal (CMOS, TTL, analog, etc) would you expect to see at IC601 pins 1, 4, and 13. What frequency would you expect here? What would be your first choice for oscilloscope setting necessary to view this signal?

3 Signal type TTL Frequency ~~dots were (on/off)~~ 26.4 KHz (It would depend on how the display looked - what colors were displayed, how close the ~~but no faster than 22.4 MHz~~)

~~50 AS~~ /division horizontal 0.1 V/division vertical x 10 probe

10 or 20 μs

3.2.A) Using the schematic, trace the RED, GREEN, and BLUE video signals to their associated buffer transistors, Q616, Q617, or Q618. Label each transistor below.

Q616 = red [color]

3 Q617 = green [color]

Q618 = blue [color]

3.3.A) Since all three video amplifiers are identical, what assumption can you make about the voltages appearing on the collectors of Q616, Q617, and Q618?

1 They should be identical.

3.7.A) Using the schematic diagram, note that there is a R-DRIVE CONTROL, VR651, and a B-DRIVE CONTROL ,VR653, but no G-DRIVE CONTROL. What are the functions of the R-DRIVE and B-DRIVE controls? Why is there no G-DRIVE control?

2 The green phosphor is "weakest", so it is driven as hard as possible and used as a non-adjustable reference. The red and blue drivers are used to balance the levels of brightness of red & blue with regards to green.

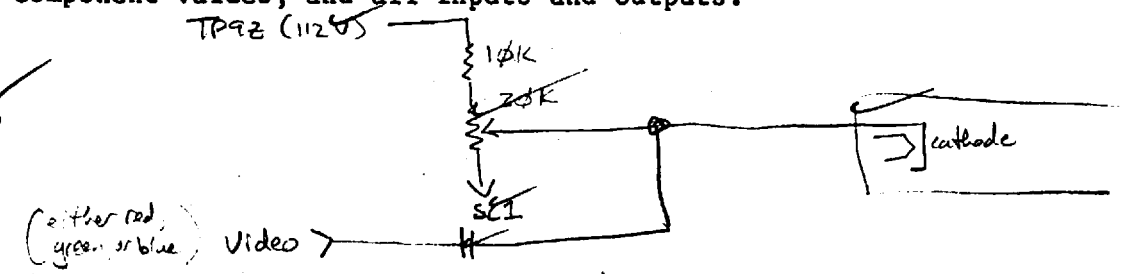
4.3.A) Which pins on the CRT accept which video signals?

RED = pin 8

3 GREEN = pin 6

BLUE = pin 11

4.4) Using the schematic diagram, locate the CUTOFF CONTROLS (VR654, VR655, VR656) on the CRT PC board. Redraw the circuit for ONE of these controls. Be sure and label the souce of the voltages appearing at each end of the circuit, the component values, and all inputs and outputs.




5

4.5.A) What is the purpose of the cutoff controls?

To ensure that when the screen is supposed to be off, it is off - without any screen glow.

1

4.5.B) How do the cutoff controls work? How do they effect the CRT and the visible display?

Good. The cutoff controls make the cathode more positive with respect to the control grid, which is grounded. As stated above, when adjusted correctly, the cutoff controls ensure that the screen will be off when required.

2

4.5.C) Why are cutoff controls necessary?

The DC video signals are stopped by capacitors - the ~~cutt~~ cutoff controls are necessary to drive the CRT.

1