

TEST OF U-300 UTILISCOPE

The testing of Utiliscopes on Proposition 4753 will be broken down into two groups as follows:

1. Preliminary Test

- A. Video Amplifier
- B. Camera
- C. Power Unit
- D. Monitor

2. Final Test of Complete Equipment

1.A Preliminary Test of Video Amplifier

1. Equipment Required:
 - 1 Standard Signal Generator
 - 1 Special Power Supply
 - 1 RCA Volt Ohmyst
 - 1 General Radio V. T. V. M.
2. Test of Blanking Adjustment
 - a. Plug special power supply into V. Amp. and adjust B to 275 V on meter of power supply.
 - b. With Volt Ohmyst on 0 to 100 V scale, measure the DC voltage on the input plug of V. Amp. This must vary from 0 to 65 V (min.) as blanking level potentiometer is run over its complete range. Leave this potentiometer set at zero end for next test.
3. Test of V. Amp. Gain and Pass Band
 - a. Place the output of the Standard Signal Generator into the input of V. Amp.
 - b. Connect the General Radio V. T. V. M. (with 100 ohm resistor across its input terminals) to the output of V. Amp. (Be sure that zero setting is correct and meter on the 1.5 V range.)
 - c. Set the signal generator to 80 KC (.08 on A scale) and adjust its output to .2 V (20 Microvolts x 10 K), with modulation switch off.
 - d. Read the output on the V. T. V. M. which must read at least .35 V. This reading will be used in next test, so record.
 - e. Set frequency to 4.8 MC (E scale 4.8) and again read the output on the V. T. V. M. with the input voltage adjusted the same as in 3 C. This reading must be at least 0.7 of the value recorded in part d. See below for calculated readings.

If reading in "d" was

Reading in "e" must be
at least

.35	.245
.36	.252
.37	.259
.38	.266
.39	.273
.40	.280
.41	.287
.42	.294
.43	.301

1.C Preliminary Test of Power Unit

1. Equipment required

- 1 AC voltmeter 0-150V
- 1 Variac
- 1 DC voltmeter 0-750V
- 1 RCA Volt Ohmyst
- 1 C.R.O. Dumont 241
- 1 G.R. Best Frequency Oscillator
- 1 Simpson Model 250 Meter

To test the power unit, a complete Utiliscope must be available. Never turn the power unit on unless the cable is connected to the camera. All cables must be connected properly for the power unit to operate properly.

2. Test of Regulating Transformer

- a. Set the equipment upright and connect the power cable into a variac across which is connected an A.C. 0-150 V voltmeter.
- b. Connect a standard D.C. 0-750 voltmeter from T-1 on TBI to ground
- c. Turn the equipment on and adjust the Variac to give 115V line voltage
- d. Record voltage on meter installed according to directions of 2-b. This voltage must be between 275 and 290 volts.
- e. Adjust the A.C. voltage with the variac to 95 and 130 volts, recording the voltage as in 2-d, to check the regulated power supply.

3. Set Horizontal Oscillator Frequency

- a. Connect output of General Radio B.F.O. into X Signal Input of Dumont 241 Oscilloscope, and set B.F.O. frequency to 21.5 Kc.
- b. Turn Oscilloscope Frequency Range switch to X Signal Input.
- c. Connect ground of Test Probe to Power chassis somewhere in vicinity of 6L6 (there will be enough pickup on other lead that it need not be connected).
- d. Adjust the divider R120, 100 ohm, 10 watt, until the frequency of the oscillator is the same as that of the B.F.O. (21.5 Kc). This will be the case when a single wave shape is seen on the oscilloscope.
- e. Turn the equipment off and with a Simpson Model 250 Meter on the RX1 scale measure the value of the cathode resistance of the 6L6 to ground. This must be over 65 ohm.

4. Test of H. Scan - High Voltage Oscillator

- a. The Camera is set up so that (1) there is a maximum gain from multiplier, (2) there is a 2-inch picture on the cathode, and (3) the light is below the overload point.
- b. Adjust the following controls so that the complete picture on the cathode is being scanned: Height and V. Lin. on Power chassis, and Width and Focus on the Camera chassis.
- c. Under these conditions make the following measurements:
 - (a) High voltage - measure this from the terminal to which the yellow lead is connected on the front of the Camera (minus) to ground (plus) with the Simpson Model 250 on the 5000 volt scale. This reading must be over 2350V.

- (b) Anode to cathode voltage - leave the minus lead connected as in (a) and connect the plus lead to the terminal to which the black lead is connected. Read this on the 1000V scale. This reading must be between -295 and -315V.
- (c) Cathode voltage of 6L6 - on the Power Unit measure the voltage for pin 8 of V103 to ground with the Simpson meter on the 0-50V scale. This should not read over 15V.
- (d) Look at the picture on the Monitor and with the Monitor H. Sync. control adjusted so that the picture synchronizes properly, see that there is 1/8" blanking on each side of picture.

5. Test of Vertical Oscillator Circuit

- a. While observing the picture on the monitor, run the variac from 95 to 130 volts and check to see that the vertical oscillator will hold synchronization.

6. Test of Vertical Amplifier

- a. Observe the picture on the Monitor (which has been previously adjusted for best vertical linearity) while using the circle slide provided.
- b. Adjust the Height and Vertical Linearity controls for proper height and best vertical linearity on the Camera.
- c. The vertical scan must be linear within 10%. Check this in the following ways:
 - (a) There are 15 circles within the vertical $6 \frac{3}{16}$ " and so each circle should measure .4125 inch.
 - (b) Use the dividers and scale provided and measure the largest and smallest circles vertically (the largest circle will be in the middle and the smallest will be at the top and bottom and equal).

(c) Then calculate the % distortion from this equation

$$\% \text{ distortion} = \frac{(\text{largest} - \text{smallest})}{.4125} \times 100$$

for example

$$\% \text{ distortion on } \frac{(27/64 - 26/64)}{.4125} \times 100$$

Production sample

$$= \frac{.421875 - .40625}{.4125} \times 100 = \frac{1.56}{.4125} = 3.79\%$$

- (d) With the equipment set properly as above, check to see that the Height control is approximately in the center of its range. As the control is turned all of the way counter clockwise the picture should decrease to, at maximum, 3 inches.
- (e) Check the Vertical Linearity control to see that, as it goes over its range, the picture will stretch both the top and bottom.

7. Test of Blanking Mixer

- a. For this test simply look at the video wave shape into the monitor on the oscilloscope provided and
- (a) Observe to see that both vertical and horizontal blanking is present
- (b) That the clipping level control can be turned to give at least .5V blanking
- (c) That the clipping level control can be run in the opposite direction far enough to completely cut off the blanking pulses.

8. Check of Synchronization Circuits

- a. Use the calibrated scope provided and
- (a) look at the vertical sync. output of power unit to see that it is positive and at least 4.0V peak to peak.

(b) look at the Horizontal Sync. output of Power unit to see that it is negative and at least 5.0V peak to peak.

9. Breakdown Test

a. Lay the Power Unit on its side and run the A.C. voltage to 130 volts with the variac and check to see that there is no corona or breakdown around the Beam Relaxor transformer, its associated terminal board, or at the Jones plug on the rear panel. Do not leave equipment adjusted in this manner for more than one minute. A semi-darkened room will allow better inspection for corona.

10. Shock Test

a. Pound chassis with hand, or other object that will not mar chassis, to check for shorts and loose connections and microphonic tubes.

11. Readjust Power Unit for normal operation.

Test of U-300 Utiliscope

IB - Camera:

1. Equipment required

- (A) Dumont 241 scope
- (B) General Radio B.F.O.
- (C) Simpson 20,000 ohm 1 volt meter
- (D) Standard Meter 0-750 V. D.C.
- (E) Slide projector #819
- (F) Standard A.C. voltmeter 0-150 V.A.C.
- (G) Two 0-180V. Variacs
- (H) Power Unit

2. Set Up

- (A) Set line voltage to Power Unit at 115 V.A.C.
- (B) Set D.C. voltage with standard meter to read 275V. Do this by adjusting voltage control on Power Unit.
- (C) Use calibrated B.F.O. and measure frequency of B.R. This reading should be within \pm 1KC of 21.5 K.C.
- (D) Adjust Projector scan to 2 inches. Get indication of picture on Monitor.
- (E) Turn width control full clockwise, then adjust focus control for best focus. This will help to indicate bad orientation of vertical coil, and will aid in adjusting horizontal coil. Scan will be approximately 2"
- (F) After adjustment vertical coil should be staked with glyptol. This vertical coil is seen through a hole at the top of the bakelite housing. This can be adjusted with a screwdriver. The horizontal coil is adjusted from the front by loosening 3 thumb screws and turning.
- (G) Next adjust scan for 2 inches. Which means: The picture will just fill the portion not cut off by blanking. This adjustment is done by adjusting width and focus controls on Camera unit.
- (H) Set video overload controls for max. gain. This should be near the center of the range of this control and adjust light level and monitor for best picture.
- (I) Record resolution should be between 250 and 300 lines horizontal and vertical.
- (J) Use Simpson meter and measure H.V. Measure from cathode to ground. Minimum voltage - 2350. The cathode is the cap on the Dissector painted yellow.

- (K) Measure anode to cathode voltage. The anode is the top terminal on the bakelite board in front. This voltage should be in the neighborhood of 350V.
- (L) Set video overload at one end. Run light up until video starts to overload. Measure A.C. voltage to the projector. Do not run past 120V. Record this voltage.
- (M) Note any irregularities in the picture, or operation and record.

1.D Preliminary Test of Monitor

1. Equipment Required:

- 1 Standard Signal Generator (Boonton)
- 1 RCA Volt Ohmyst
- 1 C. R. Oscilloscope Dumont 241
- 1 General Radio V.T.V.M.
- 1 AC Voltmeter 0-150 V
- 1 General Electric Electrostatic Voltmeter
- 1 Cathode Ray Tube 10" (Special)
- 1 Variac
- 1 DC Voltmeter 0-750 V

2. Test of Video Amp. Gain and Pass Band

- a. Insert the output of the Standard Signal Generator into the Video plug of the Monitor (be sure the terminal plug is on the terminal chassis connector).
- b. Connect the General Radio V.T.V.M. across R339, 470K, $\frac{1}{2}$ W resistor (be sure zero setting is correct).
- c. Set the Signal Generator to 200 KC (.20 on A scale) and adjust the output to .04 V (4 x 10K microvolts) with modulation switch off.
- d. Adjust the following potentiometers:
 1. Turn V. Lin. potentiometer all the way counterclockwise
 2. Turn Focus potentiometer all the way clockwise

3. Turn Contrast potentiometer all the way clockwise
 4. Turn H. Sync. potentiometer all the way clockwise
(The controls are left to right: 1. Video Overload,
2. Focus (Remote Camera Controls), 3. V. Cent., 4. V. Lin.,
5. Contrast, 6. Height, 7. Brilliance, 8. On-Off,
9. Focus, 10. H. Sync., 11. H. Cent.)
 - e. Disconnect green lead from B. R. Terminal Board
 - f. Plug equipment into Variac adjusted to 115V and turn equipment on.
 - g. Read the output on the V.T.V.M. which must read at least 4.2V.
(Record the reading for use in next test.)
 - h. Set the Signal Generator to 5 MC (5.0 on E scale) and reset its
output to .04V. Again read the output on V.T.V.M. and this read-
ing must be at least 65% of reading in test "f".
 - i. Turn equipment off and replace green lead disconnected in "d".
3. Test of Operation of Vertical Osc. Circuit
- a. Connect a 500 K, $\frac{1}{4}$ W potentiometer between pin 4 of V301 and
ground, using very short bus wires.
 - b. Adjust the following controls to give the best picture, properly
centered on the tube:
1, Brilliance, 2, the potentiometer inserted in "a", 3, H. Sync.,
4, Focus, 5, Contrast, 6, H. Cent., 7, V. Cent., 8, Height,
9, V. Lin.
 - c. Run the variac from 90V to 130V and find a setting of this
potentiometer where the vertical will hold synchronization
as the variac is varied. Record the B_e voltage at the B. R.
Terminal Board (Red Lead on T303) when variac adjusted at 90V
and 130V.

- d. Measure the value of this resistance, record it, and install a resistor this size in the circuit

4. Test of Vertical Amplifier

- a. Adjust H. Cent. and V. Cent. to the middle of the potentiometers' range.
- b. Adjust Deflection and Focus coils to give maximum scan and to center raster without corner cutting.
- c. Run Height control to zero and center line of picture tube vertically with V. Cent. control.
- d. Run Height and V. Lin. controls all way clockwise to see that there are at least 8 inches of scan available.
- e. Adjust Height and V. Lin. controls to see that the vertical can be adjusted to give:
 1. Correct height picture and
 2. Even distribution of horizontal scanning lines over the complete picture

5. Test of Controls

- a. Adjust Brilliance so as to barely see picture
- b. Run the H. Centering control counter-clockwise (picture must move to the left) to see that the left edge of the picture will extend at least $\frac{1}{4}$ " past the left edge of the picture opening marked on the tube.
- c. Do the same as "b" as the control is turned all of the way clockwise and picture moves right.
- d. Adjust the Height and V. Lin. controls to give a picture with the proper height and linearity.

- e. Run the V. Centering control counter-clockwise (picture must move downward) to see that the bottom of the picture will extend at least $3/4$ " past the bottom edge of the picture opening marked on the tube.
- f. Do the same as "e" as the control is moved clockwise and the picture moves upward.
- g. Notice as the picture is run from top to bottom, that the picture moves smoothly and does not jump (indicating a bad centering capacitor).

6. Test of H. Scan. Oscillator and H. V. Circuit

- a. Adjust the Vert. Lin., Height and Centering controls to give the proper size picture, centered on the tube.
- b. Run the Contrast control down and the Brilliance control up until the blanking can be seen on the sides of the picture. This should be approximately the same on both sides and a little less than $1/8$ ".
- c. Readjust for normal picture and measure the B+ voltage to the Beam Relaxor tube with the standard DC Voltmeter (the red lead on T303). This value must be between 320 and 335 V.
- d. Measure the voltage on the screen of the 6L6 (pin 4). This value must be between 130 and 140 V.
- e. Measure the DC voltage on the cathode (pin 8) of the 6L6. This must be between 30 and 40 V.
- f. With the G. E. Electrostatic voltmeter, measure the high voltage to the picture tube (on the top capacitor of the B. R. terminal board). Because of the high voltage, be sure the Monitor is turned off while connecting to the terminal. This high voltage must read between 7.75 KV and 8.5 KV.

- g. Use the RCA Volt Ohmyst on the 0 - 500 V scale and measure the DC voltage on the cathode of the cathode ray tube (T3 of TB #5) as the Brilliance control is moved over its complete range. It should measure 0 as the control is all way clockwise and at least 130 V as it is all the way counter-clockwise.

7. Breakdown Test

- a. With the equipment adjusted as in (6), lay the equipment on its side and run the AC voltage to 130 V with the variac. Check to see that there is no corona or H. V. breakdown around the B. R. transformer and its mounting panel. A semi-darkened room will allow better inspection for corona.