MR P Durham

Robert E. Priebe Company
2211 Fifth Avenue
Seattle, Washington 98121
(206) 682-8242

December, 1972

INDEX TO APPLICATIONS BULLETINS

Program Announcement		Aug. 1971
Bulletin No. 1	Definitions	Sept. 1971
Bulletin No. 2	Beam Current	Oct. 1971
Bulletin No. 3	Extended Red Plumbicon	Nov. 1971
Bulletin No. 4	Target Voltage	Dec. 1971
Bulletin No. 5	Tube Life	Dec. 1971
Addendum to Bulletin No. 5		May 1972
Bulletin No. 6	Alignment	May 1972
Bulletin No. 7	Plumbicon Brochure (U.R.I. Course)	Sept. 1972
Bulletin No. 8	Set-up Procedure	Oct. 1972
Bulletin No. 9	Customer Data Card	Nov. 1972
Bulletin No. 10	Gamma Set-up Chart	Dec. 1972

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

TO: USERS OF PLUMBICON® TV CAMERA TUBES

SUBJECT: PLUMBICON APPLICATIONS BULLETINS

This is to inform you of our plan to prepare a regular and continuing series of newsletters or bulletins for color broadcast television camera users giving applications information on Plumbicons. The intent is to describe tips or ways in which Plumbicon camera users can obtain the best performance from these tubes The bulletins will also describe product improvements and new developments.

The topics to be discussed are the result of our direct experience with many users, data which we have accumulated here at Amperex, seminars which have been held in several locations throughout the country, and information which has been fed to us by the various equipment manufacturers. Copies of the proposed bulletins will be sent to you and/or anyone else in your organization who is interested in receiving them.

We shall, of course, be pleased to hear from you at any time with suggestions as to topic matters, questions regarding Plumbicon tube operation, and any information which may be helpful to other users. Ultimately, the end result will be an applications booklet which will serve as a manual on the best use of the Plumbicon.

In recent past months, we have held Plumbicon applications seminars in Los Angeles, Syracuse, Baltimore, Philadelphia, Dallas, Houston, and New York. It is our plan to continue this program; we will notify you when one is scheduled in your area.

Further, in a continuing effort to bring better service to you, we have formed, within Amperex, a Commercial/Technical team. Our purpose is to provide fast and efficient attention to matters that relate to your purchase orders, the operational quality of Plumbicons, and the handling of in-warranty replacements or credits. With a closer relationship and a more rapid exchange of technical information through this team, we expect to provide to you a product of improved quality and longer life. The names and responsibilities of this team are listed below.

We appreciate opportunities to serve you and trust that the programs outlined above will interest and assist you.

Sincerely,

Raleigh E. Utterback

Raleigh E. Utterback
Manager, Plumbicon Marketing

® T.M. N.V. Philips of Holland

MARKETING
Raleigh E. Utterback
Manager, Plumbicon Marketing
401 - 762 - 3800 Ext. 66/61

CUSTOMER SERVICE
Robert A. Raboin
Supervisor, Customer Service
401 - 762 - 3800 Ext. 64/67

ENGINEERING/TECHNICAL
Peter K. Birnstein
Manager, Commercial Engineering
401 - 762 - 3800 Ext. 69/61

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

September, 1971

PLUMBICON® APPLICATIONS BULLETIN NO. 1

DEFINITIONS: When a Plumbicon user sees an effect in a picture, what do we call it?

The purpose of this first Applications Bulletin is to define some of the terms we, as a camera tube manufacturer, are using and equate them in terms of the commonly used phrases in the television broadcast industry.

Burn-In – An afterimage created by a high contrast stationary scene within the beaming capabilities of the tube.

Highlight Effect – An afterimage created by a highlight generating a signal current which cannot be stabilized by the beam (measured as % of afterimage to background after 2 sec. and 10 sec.).

Highlight Tail – An afterimage created by a highlight generating a signal current which cannot be stabilized by the beams (measured at the time of fade out to 20% of the background illumination – generally long term).

Lag – Lag has two components, rise time and decay. Measurements are made of rise and decay time at 50 ms. and 200 ms. from 0 to 16% of nominal color channel signal current.

Local Dark Current – An area of the target which has broken down chemically and no longer blocks in the presence of darkness. This shows up as a white unstabilized area under capped conditions.

Modulation Depth – The ratio of the peak to peak amplitudes of 0.5 to 5.0 MHz (40 to 400 TVL) signals as measured on a waveform monitor.

Non-Uniformity of Signal – Commonly called shading, but defines the variation in sensitivity across the target.

Picture Quality – Cleanliness of the scanned raster area with respect to the spurious signals, i.e. spots and blemishes.

Stabilized Beam Current – The target current which can be handled at a particular beam current control setting (usually 2 times picture white) without loss of stabilization.

We will, no doubt, encounter other terms in the course of these newsletters which will be defined as required.

In our next Applications Bulletin we will discuss:

BEAM CURRENT: What is the effect of correct beam current setting on Plumbicon performance and life?

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

October, 1971

PLUMBICON® APPLICATIONS BULLETIN NO. 2

BEAM CURRENT: What is the effect of correct setting on Plumbicon performance and life?

In order to analyze the effects of correct beam current setting, it is first necessary to arrive at a method of measuring beam current in a color camera.

Beam current need not (from a user standpoint) be measured in absolute numbers, but rather in relation to some known reference point. If we choose a reference point of 250 foot candles scene illumination at a lens iris stop of f4.0, for most cameras this will result in approximately 300 - 400 nanoAmperes of green or luminance tube signal current. Opening the iris one f-stop to f2.8 and simultaneously looking at video before gamma correction for double the peak to peak amplitude should result in a signal current of 600 - 800 nanoAmperes. The aforementioned tests are easily performed using a chip chart (Logarithmic Reflectance Chart).

Carefully discharging the beam at this twice operating point setting will result in the best performance and life. Running the beam setting closer to operating (lower beam setting) will result in poor highlight handling. Setting the beam to a higher than the twice operating point (greater than one f-stop over) will probably not be noticeable in the picture, except for a slight shift in edge geometry, but will result in shorter tube life. However, greater geometry shifts can be expected if the beam is set to discharge a target current in excess of 1200 nanoAmperes.

A comparison of the older integral mesh 55875 to the newer separate mesh XQ1020 shows that geometry shifts occur nearer the 800 nanoAmperes point making it difficult to run higher than normal beam. This geometry shift is caused by the space charge which accumulates in the area of the mesh. Running the mesh at a slightly higher voltage than the collector dissipates the space charge and moves the poor geometry point to a higher beam current.

The user should be guided in his operating conditions by scene content. If it is necessary to run elevated beam settings, by all means do it with the understanding that the full life expectancy may not be reached.

Our next Applications Bulletin will discuss:

THE EXTENDED RED PLUMBICON: What are the advantages and trade-offs in using the Extended Red Plumbicon?

® T.M. N.V. Philips of Holland

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

November, 1971

PLUMBICON® APPLICATIONS BULLETIN NO. 3

THE EXTENDED RED PLUMBICON: What are the advantages and the trade-offs of the Extended Red Plumbicon?

The standard lead oxide layer Plumbicon has enjoyed widespread acceptance in the broadcast industry, even though its resolution and response to red light left something to be desired. The extended red layer offers improvement in both of these areas. The changes in performance are most dramatic in the red channel: twice the sensitivity, a 50% increase in modulation depth, a 30% increase in limiting resolution, and sensitivity to light between 6500 and 7000 angstroms. In the luminance channel of four tube cameras, a 20% increase in sensitivity, a 35% increase in modulation depth, a 17% increase in limiting resolution, and a panchromatic type of spectral response are each realized. In the green channel, the performance is similar to the luminance channel performance with the exception that sensitivity is the same as for the standard layer.

The title of this Bulletin implies advantages and trade-offs. Increasing the sensitivity in the deep red region results in an increase in burn-in and highlight tail.* The standard layer usually has highlight tail decay readings of less than 5 seconds and no burn-in. The extended red layer has both highlight tail and burn-in readings between 5 and 15 seconds. Both types of layers are controlled with a limit of 20 seconds. The lag characteristics are also changed. In the red channel, the lag AT THE SAME SIGNAL CURRENT is approximately twice the standard layer, but AT THE SAME LIGHT LEVEL (due to the double sensitivity) the two layers are equal. In the luminance channel lag is increased about 30%, but since this does not result in color edges this should not be a problem. In general it is felt that when all things are considered the Extended Red Plumbicon offers more of an improvement in performance than trade-offs in characteristics. Let the user, however, be guided by the requirements of this application.

In our next bulletin we will discuss:

TARGET VOLTAGE: How is it properly measured and what is the optimum setting?

* Ref Bulletin No. 1

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

December, 1971

PLUMBICON® APPLICATIONS BULLETIN NO. 4

TARGET VOLTAGE: How is it properly measured and what is the optimum setting?

Measurement of Target Voltage — Target voltage is defined as the voltage present at the target electrode using the cathode as the reference point. The most accurate method of measuring target voltage in a camera is a two-step approach. First, measure, with a dc coupled oscilloscope, the cathode potential during picture time. (If dynamic focus parabolas are present temporarily remove them.) Secondly, measure, with a high impedance VTVM, the target potential at the power supply side of the target load resistor. (Measurement at the actual target lead could result in damage to certain preamplifiers). Algebraically add these two voltages to determine the actual target voltage.

The optimum setting of target voltage should take several factors into account:

1. The maximum target voltage rating — 50 volts.
2. The recommended target voltage — 45 volts.
3. The dynamic focussing potentials — 20 to 25 volts max.
4. The tube properties at various target voltages.

The Maximum Target Voltage Rating — The target voltage rating of +50 volts maximum was chosen after careful consideration of the properties and breakdown characteristics of lead oxide. Exceeding 50 volts will seriously effect the life and performance of the tube and could result in permanent damage to the layer if extended even for a few moments. Operating above the rated 50 volts will also void the warranty.

The Recommended Target Voltage — The target voltage recommended for best performance is 45 volts. Our factory testing is also performed at this voltage. You might ask how close to 45 volts should the target be run? Certainly the range of 40 to 45 volts is acceptable.

The Dynamic Focussing Potentials — In certain cases, dynamic focussing is applied to the cathode and Grid No. 1 simultaneously. In this case, the target voltage varies with the dynamic focussing. The peak target voltage at the edge of the picture should not exceed 50 volts and at the center of the picture not less than 25 volts.

(over)

Tube Properties at Various Target Voltages

White Spots: The higher the target voltage, the greater the chance of white spots, both initially and developing over the tube's life.

Highlight Tail & Burn-In: The lower the target voltage, the greater the tendency of highlight tail and burn-in initially and over the tube's life.

Sensitivity: Sensitivity is fairly constant over the range of 20 to 50 volts. The sensitivity characteristic curve vs. target voltage resembles a pentode characteristic curve with the knee around 15 volts. (Automatic target control of sensitivity is ineffective in a Plumbicon.)

In our next builetin we will discuss:

AVOID UNNECESSARY REDUCTION IN TUBE LIFE:
Five suggestions to help you in extending the life of the Plumbicon, by a slight change in your modus operandi.

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

December, 1971

PLUMBICON® APPLICATIONS BULLETIN NO. 5

AVOID UNNECESSARY REDUCTION IN TUBE LIFE

Information gathered from a large number of Television stations together with data recorded by our Amperex production tests, indicates that a slight change in your modus operandi may result in a longer Plumbicon life for you. Five suggestions derived from the data recorded are as follows:

1. Wait a minimum of one minute from the time the camera is energized to switching ON or turning up the BEAM. This will allow the Plumbicon filament to heat the cathode to emission temperature prior to placing a demand for beam current.

2. When the cameras are running idle the lens may be capped although the beam should be switched OFF or turned down to the minimum setting of the beam potentiometer. For short periods between production time this may not be convenient, however, if the idle period is to run 30 minutes or more, the BEAM OFF procedure should be followed.

3. The maximum rated target voltage (the voltage measured between the target and the cathode) is 50 volts. Operation at a target voltage of 45 volts is recommended as providing optimum performance and picture quality. Consistent with good lag characteristic, a low target voltage (as low as 25 volts) will improve the ability of the camera to handle a somewhat greater dynamic range. The resultant loss in sensitivity should be less than 10%. (Remember the target potentiometer calibration is only relative. Measure it to be sure. High target shortens life.)

4. Correct stabilization of the brightest highlight in the scene at 6dB or one F stop over will result in typical beam currents of 600nA for the green and luminance and 300 nA for the red and blue. Operating above these suggested values of beam current will appreciably shorten tube life. (For reasons of good design practices and long life characteristics the Plumbicon is capable of as much as 3000nA). Operating at lower than the point of stabilization will result in loss of picture detail in the highlights and/or comet-tailing.

5. When the camera is turned OFF at the end of a program or at the completion of the operating day, the BEAM should be switched OFF or the beam potentiometer turned down to minimum setting prior to switching off camera power. This shut-down procedure will set up the camera controls for proper turn-on as described in No. 1 above.

With but a few minutes of attention you may prevent your Plumbicon from suffering early end-of-life. This represents dollars saved in your maintenance budget.

In our next bulletin we will discuss:

ALIGNMENT CURRENT: How to align the tube properly and the effects of poor alignment?

® T.M. N.V. Philips of Holland

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

May 1972

Robert E. Priebe Company
2211 Fifth Avenue
Seattle, Washington 98121
(206) 682-8242

PLUMBICON® APPLICATIONS BULLETIN NO. 6

Alignment Current: The effects of poor alignment on tube properties.

Alignment currents are necessary to correct slight mechanical and electrical misalignments encountered in yoke and tube manufacture. The pictorial diagrams shown below will be useful in explaining the exact result of varying alignment current.

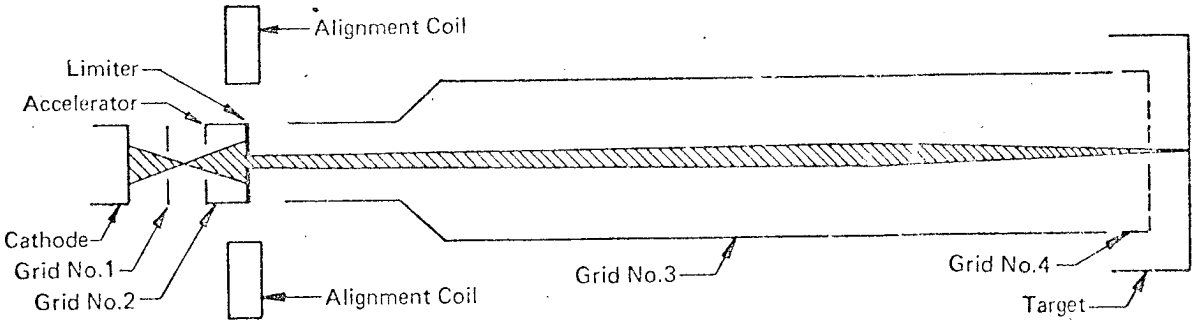
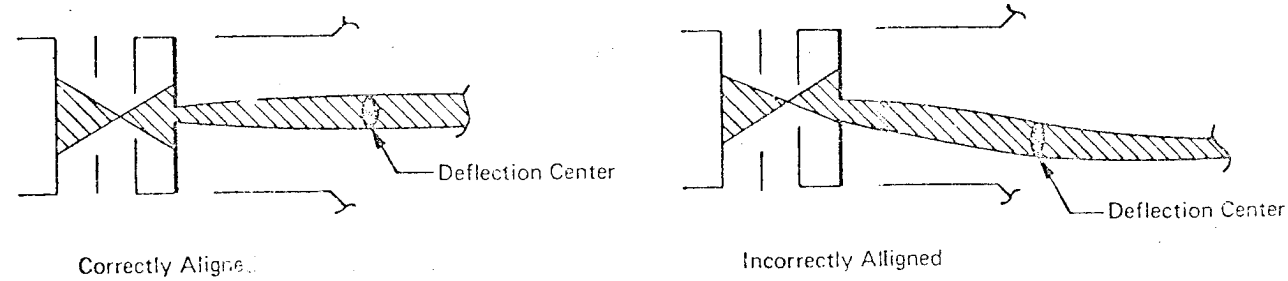


FIGURE 1



Correctly Aligned

Incorrectly Aligned

FIGURE 2

As can be seen in both figures 1 and 2, the alignment field governs which part of the beam cone is allowed to pass through the limiting aperture. If the center of the beam cone is not selected, the effective center of deflection is altered.

Alteration of the deflection center can have disasterous effects on corner focus, geometry, beam size and registration.

(over)

Other, not so obvious, problems which can be generated by poor alignment are lag and a degradation of picture quality with respect to spots and blemishes.

Lag: Lag in a Plumbicon is a function of beam resistance and target capacitance. The user cannot vary the effective target capacitance; however, he can vary the beam resistance by improperly aligning the tube. Improper alignment results in selecting the high resistance portion of the beam which could degrade the performance, of an otherwise good tube, to an unacceptable level.

Spots and Blemishes: Beam size, shape and trajectory are also effected by alignment. Just as the sun causes longer shadows to be cast when it is not directly overhead, if the electron beam does not land perpendicularly to the target, a spot or blemish will cast a longer shadow and appear larger or higher in contrast.

Proper alignment depends not only on having alignment fields available, but on the optical image being in the correct position on the target and the yoke coils being correctly positioned with respect to the tube. Therefore, optical alignment is an important factor in achieving electrical alignment.

Since the tube is a concentric device, slight deviations in concentricity can cause alignment problems. It is therefore necessary to specify proper rotation in the coil. This is done by means of a white mark on the base of the tube. This mark must be in the 12 o'clock position when the tube is in operating position. This will place the mark at the bottom of the optical image in line with vertical scan direction.

REMEMBER ..... Electrical alignment is dependent upon:

- optical alignment of the tube to lens axis
- position of the optical image on the tube faceplate
- rotation of the tube in its yoke assembly
- concentricity of the tube in its yoke assembly

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

June, 1972

PLUMBICON® APPLICATIONS BULLETIN NO. 7

THE PLUMBICON TV CAMERA TUBE

While there have been many publications issued relative to the Vidicon, less information has been made available concerning the Plumbicon, its physical properties, its mechanical construction and its operation in a camera system. For this reason you will find attached a copy of a two part bulletin entitled, "The Plumbicon TV Camera Tube" with the first part concerning the "Physical Properties of the Plumbicon" by Dr. E.H. Strupp of Philips Laboratories in Briarcliff Manor, New York. The second part is presented by Dr. Ralph S. Levitt of Amperex Electronic Corporation, Electro-Optical Devices Division in Slatersville, R.I. and is concerned with the "Operating Characteristics of the Plumbicon."

® T.M. N.V. Philips of The Netherlands

NOTE: Amperex in Slatersville has RPY-13s in stock for your McCurdy Audio Amplifiers.

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

Robert E. Priebe Company
2211 Fifth Avenue
Seattle, Washington 98121
(206) 682-8242

OCTOBER, 1972

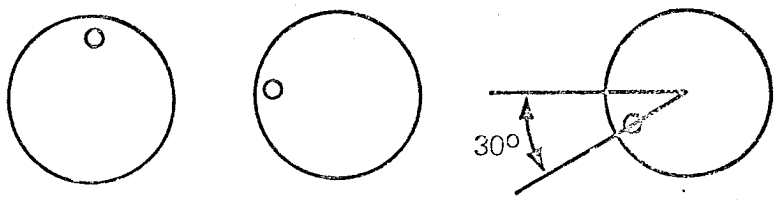
PLUMBICON® APPLICATIONS BULLETIN NO. 8

The Plumbicon: Installation and Set-up.

To properly install and set-up the Plumbicon for best performance, the procedure below should be followed consistent with your camera manufacturer's recommended steps.

1. Prepare the yoke for installation of the Plumbicon. (Remove the yoke assembly from the camera if this is required for normal changing of the Plumbicon.)
2. Carefully remove the Plumbicon from its carton and gimbled cylinder (gyro-pack).
3. Using a high quality lens tissue carefully clean any dust or foreign matter from the Plumbicon faceplate. Care should be taken to prevent exposure of the Plumbicon to direct sunlight or bright incandescent lights. The protective hood should be in place when the tube is not installed in the camera.
4. The Plumbicon may now be installed in the yoke assembly. Take care to be sure that the positioning line on the base sleeve of the Plumbicon is located in the 12 o'clock position which in turn is the bottom of the optical image. In the event that the tube base does not have a positioning line on it, use the following as a guide:

Key pin location



55875 family | XQ1020/3/5 family | XQ1070 and XQ1080 families

The positioning line on the base takes precedence over the key pin position. The position of the XQ1080 will be governed by the target connection. The above right hand diagram is for reference only with regard to the XQ1080.

The Plumbicon must be firmly seated in the yoke. This will insure a proper target connection as well as correct positioning for good optical and electrical focus. If the tube being replaced is an Extended Red Plumbicon, the mask should now be applied to the faceplate. Carefully position the mask to coincide, rotationally, with the image area.

® T.M. N.V. Philips of Holland

5. The yoke assembly may now be re-installed (if removal was required) and the socket placed on the base of the tube.

   The socket should not be forced in any way when being placed on the tube.

   IF ROTATION OF THE TUBE IN THE YOKE ASSEMBLY BECOMES NECESSARY, BE SURE TO LOOSEN THE YOKE/TUBE CLAMP. ROTATE THE TUBE BY ITS BASE SLEEVE ONLY. NEVER USE THE TUBE SOCKET FOR ROTATION.

6. Before switching the camera ON the operating controls should be preset as follows:

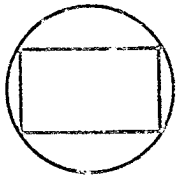
   a. IRIS closed (or camera capped)
   b. BEAM control set to cut-off beam
   c. Horizontal and vertical SIZE controls set for maximum scan amplitude (overscan target).

7. The camera may now be switched ON. Allow five minutes for initial heater and cathode warm-up and the target voltage must be set between 40 and 45 volts measured from target to cathode during picture time before proceeding.

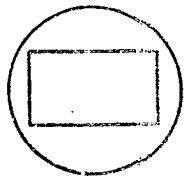
8. Open the IRIS (uncap the lens) to approximately f8.

9. Slowly rotate the BEAM control until the image is fully discharged.

10. With the camera aimed at the RETMA Linearity Chart, center the chart image in the target area below:



55875 & XQ1020 families



XQ1070 & XQ1080 families

Notice that the image area on the 55875/XQ1020 families is larger in relation to the total imaged target area on the XQ1070/XQ1080 families. The above images can only be seen when the target is overscanned.

11. The scanning amplitudes may now be set to properly scan the Linearity Chart. When this is accomplished a crosshatch generator whose frequency corresponds to the frequency of the Linearity Chart may be fed into the monitor. Now adjust the scan AMPLITUDE, LINEARITY and CENTERING for best horizontal and vertical geometry along the respective center lines. Note that this is a preliminary adjustment so that beams may be set properly and alignment may be adjusted with the camera near normal set-up.

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

NOVEMBER, 1972

PLUMBICON® APPLICATIONS BULLETIN NO. 9

We are pleased to announce that by the end off this year we will again be including factory test data with each Plumbicon® Camera tube. The information we will be supplying is slightly different from past data and is explained in this bulletin. The data card is divided into four sections:

1. Amperex Test Data
2. Initial User Data
3. Final User Data
4. Service Record Card

We would appreciate the return of the entire card when you have retired the tube from service in order to supply us with further information to be used for product improvement.

In the event you have need for extra copies of this form, for tubes already in service, please don't hesitate to request as many as you require.

® T.M. N.V. Phillips of Holland

PLUMBICON® FACTORY TEST DATA

TUBE TYPE XQ1020G (1) SERIAL NO. 12730B (2)

SENSITIVITY, 2854°K ..... 168 (3) μA/L

MODULATION DEPTH, 400TVL ..... 42 (4) %

E_{c1} CUTOFF (REF. TO CATHODE) ..... -54 (5) VOLTS

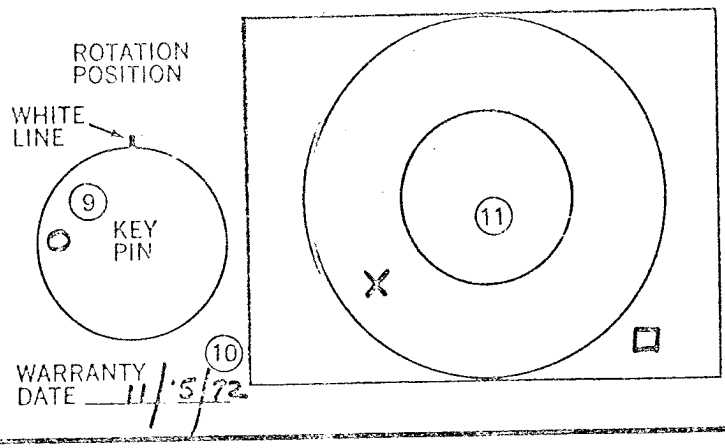
LAG, DECAY, 50 ms ..... 12 (6) %

LAG, DECAY, 20 ms ..... 3 (7) %

LAG, RISETIME, 50 ms ..... 91 (8) %

SPURIOUS SIGNALS (AMPEREX FINAL TEST)

X = layer blemish ☐ = low contrast mesh mark



BULLETIN #9 Pg 2

(1) Tube Type – suffix letter indicates color channel: L–Luminance, G–Green, R–Red, B–Blue.

(2) Serial No. – as shown on the metal tag inside the tube envelope.

(3) Sensitivity – in the assigned color channel is measured using proper filters inserted between the tube faceplate and the 2854° K light source.

(4) Modulation Depth – in the picture center as the ratio in percent of peak to peak 40 TVL amplitude to peak to peak 400 TVL amplitude. (Without aperature or gamma circuitry being active.)

(5) E_{c1} Cutoff – is the voltage necessary between G1 and Cathode to cutoff the beam with blanking removed.

(6) Lag, Decay, 50 ms – is measured in the proper color channel using signal currents typical of the operation in that specific color channel. Since lag is most critical in low light level operation, lag measurements are made at approximately 15% of the normal 100% white signal current. Decay Lag at 50 ms is the signal remaining after 3 fields with the light at 0%

(7) Lag, Decay, 200 ms – is measured as shown above except it is the signal remaining after 12 fields with the light at 0%

(8) Lag, Risetime, 50 ms – is measured as shown above except it is the signal level 3 fields after applying a light level sufficient to generate approximately 15% of 100% white signal current.

(9) Rotation Position – shows the correct position of the key pin with respect to the white line on the tube base. It also shows the position used for the spurious signal measurement.

(10) Warranty Date – is the date of shipment from the factory and is supplied as a guide to the end user in determining when the tube is nearing the end of warranty.

(11) Spurious Signals – indicate those minor spots and blemishes that are within the manufacturing specifications and their location within the raster area. The low contrast mesh mark may be a particle on the mesh which should be virtually invisible when the beam is properly focused on the layer.

12. With the camera viewing a RETMA Logarithmic Chip Chart set the illumination level and the iris of the camera according to the camera manufacturer's recommendation. Adjust the channel GAIN at these recommended (standard) settings for proper video level at the camera manufacturer's specified test point.

13. Now open the iris one f stop then slowly and carefully adjust the beam to just discharge the brightest chips. (Emphasis is placed on slowly adjusting the beam for stabilization because the target normally takes a few seconds to stabilize after the proper beam setting is reached.)

14. Return the iris to "standard" opening (closed one f stop from the preceding step.) Frame and focus a RETMA Resolution Chart in the scanned area using only the lens controls. Now adjust the electrical focus for best resolution.

15. Adjust the back focus of the channel using the camera manufacturer's recommended method.

16. The camera should now be aimed at a RETMA Linearity Chart centering it in the image area by zooming, focusing, panning, and tilting. Until the chart is properly centered do not adjust any electrical positioning controls.

17. Adjust the IRIS for proper video level then proceed as in step 11.

18. Perform the electrical ALIGNMENT of the Plumbicon by either of the following methods:

    Method 1 . . . Switch ON the electrical "WOBBLER" and adjust the electrical ALIGNMENT controls so that the center of the image is stationary. (This method is preferred when the camera is equipped with a "wobbler").

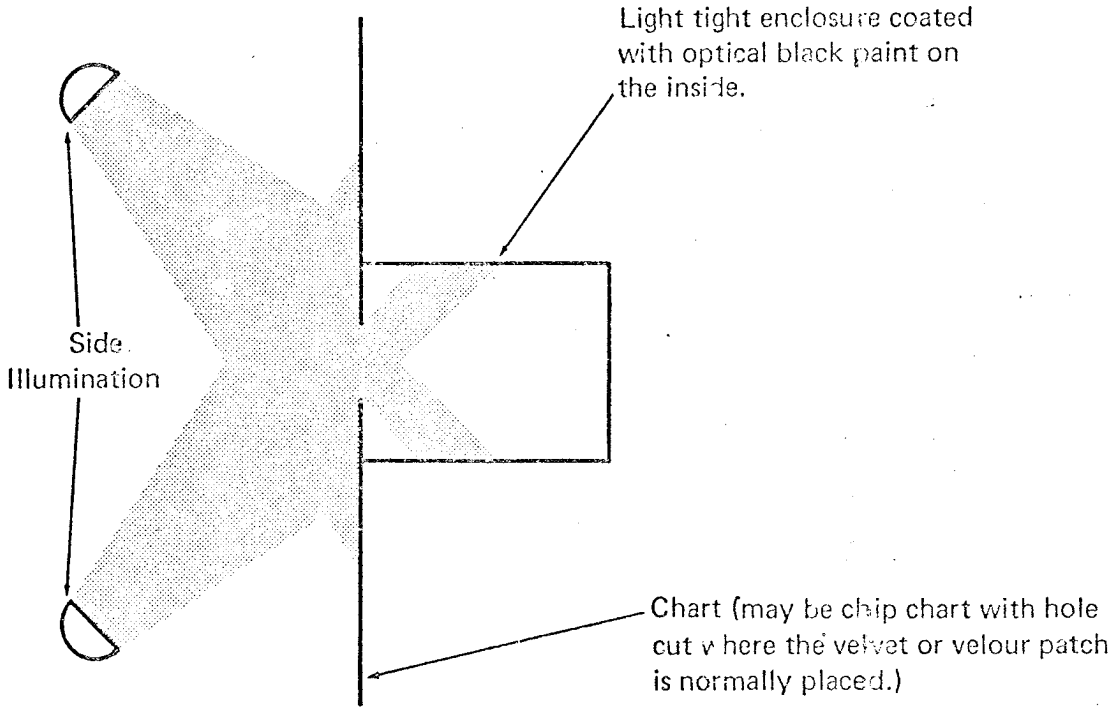
    Method 2 . . . Lower the TARGET voltage to 2 to 5 volts and adjust the electrical alignment controls to obtain the most uniform sensitivity possible and to simultaneously center the sensitive area about the center of the image. With this accomplished return the target voltage to normal. (40 to 45 volts target to cathode.) Note that dynamic focussing should be switched OFF to properly use this method.

19. Using the electrical CENTERING control re-center the image in the raster area and proceed as in step 11.

20. Register the camera using the camera manufacturer's recommended procedure taking care not to disturb the BEAM, electrical FOCUS and ALIGNMENT control settings previously established.

21. As a final step in the set-up procedure adjust the GAIN, BLACK LEVEL and GAMMA TRACKING to obtain minimum deviations of chroma when viewing the RETMA Logarithmic Chip Chart.

    Note that the eye is a poor judge of the quality of the black reference used for IRIS, GAIN and FLARE COMPENSATION. Materials such as flocking, velvet or velour are generally unsuitable as a black reference especially when using the Extended Red Plumbicon. It is therefore recommended that a black hole be used as a black reference for setting these circuits as shown below:



When the above steps have been completed your new Plumbicon may be evaluated for picture quality. The above outlined procedure must be utilized prior to evaluation to make certain that improper or incomplete set-up is not degrading the performance. The Plumbicon should be evaluated only in its properly designated color channel. Tubes may not perform desirably in channels other than recommended or designated by the label.

Using this procedure and reasonable care you will get the best picture possible from your new Plumbicon tube.

The End User Initial Test Data block is provided in order to give the end user an area in which to record his observations when initially testing the tube. We realize that the majority of the End Users have only the studio camera with which to make their observations. The important thing is to record in these spaces information that will be meaningful to you. Measurements such as Sensitivity and Lag will certainly be relative to previous tube performance or performance in relation to the other tubes in the camera.

END USER INITIAL TEST DATA

SENSITIVITY .....

MODULATION DEPTH (resolution) .....

E_{c1} CUTOFF .....

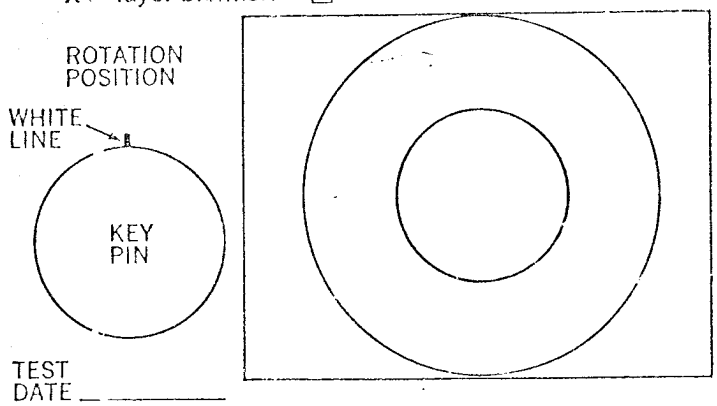
LAG, DECAY .....

LAG, RISETIME .....

COMMENTS:

SPURIOUS SIGNALS (CUSTOMER TEST)

X = layer blemish ☐ = low contrast mesh mark



END USER RETIREMENT TEST DATA

SENSITIVITY .....

MODULATION DEPTH (resolution) .....

E_{c1} CUTOFF .....

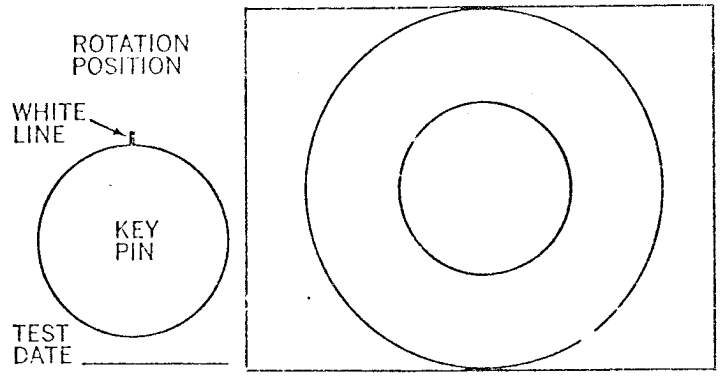
LAG, DECAY .....

LAG, RISETIME .....

COMMENTS:

SPURIOUS SIGNALS (CUSTOMER TEST)

X = layer blemish ☐ = low contrast mesh mark



The End User Retirement Test Data section should be used just before the tube is removed from service for recording of your final observations. This will help both you and us to close the loop on "end of life" technical data. As indicated we would appreciate the return of this card to us with your data.

On the reverse side, for your convenience, is a service record card specifically designed for the Plumbicon® camera tube which you should find convenient for recording various bits of operating data.

Bulletin #9 Pg 6

PLUMBICON® T.V. CAMERA TUBE SERVICE RECORD

TUBE TYPE _____

SERIAL NO. _____

Date Received _____ Purchased From _____

Date In Service	Clock In	Date Out	Clock Out	Total Hours	Studio	Cam	Target Volts	Preamp Gain Setting	Comments	Engr.

*Registered trademark of N.V. Philips of Holland

FIRST CLASS
PERMIT NO. 6
SLATERSVILLE
RHODE ISLAND

BUSINESS REPLY MAIL
NO STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY—

Amperex® Electronic Corporation
A NORTH AMERICAN PHILIPS COMPANY
POST OFFICE BOX 278
SLATERSVILLE, RHODE ISLAND 02876

ATTN: ELECTRO-OPTICAL DEVICES DIVISION

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

December, 1972

Robert E. Priebe Company
2211 Fifth Avenue
Seattle, Washington 98121
(206) 682-8242

PLUMBICON® APPLICATIONS BULLETIN NO. 10

In the course of many discussions with end users of the Plumbicon , questions have come up relative to the proper setup of the camera gamma circuitry. We felt that, while this point is not directly related to the Plumbicon, the setup of this circuitry can certainly effect the overall system performance. Attached you will find a chart prepared with the aid of our IBM 1130 computer. This chart can be used to accurately set gamma to any predetermined point desired. Theory says that the system gamma should be the reciprocal of the CRT gamma or 0.40, however, in general, more pleasing pictures are obtained with gamma set at 0.6 or 0.65 which yields a system gamma of 1.54 to 1.66. The result is to increase contrast in blacks, minimize black shading, and increase color saturation. The easiest way to use the chart is to set Chip 1 to 100 IEEE Units, Chip 9 to 0 IEEE Units, and then adjust gamma for the proper crossover level. (The values of the other chips can be used as a further check. Also refer to Bulletin No. 8 for complete setup procedure.)

P.S. You will also find attached an index for Bulletins thru No. 10. If you are missing any , please let us know and we will be happy to supply them.

® T.M. N.V. Philips of Holland

BULLETIN 10 rg

GAMMA SET-UP CHART
COURTESY
OF
AMPEREX ELECTRONIC CORPORATION
E.O.D. DIVISION
SLATERSVILLE, R.I., 02876

DECEMBER 1972

TELEPHONE, 401-762-3800

INSTRUCTIONS-

TO BE USED WITH THE EIA LOGARITHMIC REFLECTANCE CHART - AUGUST 1968. THE VALUES IN THE CHART ARE VALID WHEN CHIP 1 IS SET TO 100 IEEE UNITS AND CHIP 9 IS SET TO 0 IEEE UNITS. UNDER THESE SET UP CONDITIONS THE CROSSOVER MAY THEN BE USED TO READ OR SET GAMMA TO THE PROPER VALUE. CHIPS 2 THRU 4 AND 6 THRU 8 MAY ALSO BE USED AS FURTHER CHECKPOINTS. ALTHOUGH CHIP 9 IS SET TO 0 IEEE UNITS WHEN USING THIS CHART, IT SHOULD NOT BE USED AS REFERENCE BLACK LEVEL FOR ACTUAL SCENES.

GAMMA VALUE	CHIP 1 WHITE	CHIP 2	CHIP 3	CHIP 4	CHIP 5 X-OVER	CHIP 6	CHIP 7	CHIP 8	CHIP 9 BLACK
1.00	100.00	66.40	44.56	29.96	19.26	11.70	6.34	2.56	0.00
0.95	100.00	67.77	46.39	31.82	20.91	13.02	7.27	3.07	0.00
0.90	100.00	69.17	48.31	33.79	22.70	14.49	8.35	3.69	0.00
0.85	100.00	70.60	50.30	35.89	24.65	16.14	9.58	4.43	0.00
0.80	100.00	72.06	52.37	38.12	26.77	17.97	11.00	5.32	0.00
0.75	100.00	73.55	54.53	40.49	29.07	20.00	12.63	6.39	0.00
0.70	100.00	75.07	56.78	43.01	31.56	22.27	14.50	7.68	0.00
0.65	100.00	76.63	59.13	45.68	34.27	24.79	16.64	9.23	0.00
0.60	100.00	78.21	61.56	48.52	37.22	27.60	19.10	11.09	0.00
0.55	100.00	79.83	64.10	51.53	40.41	30.72	21.93	13.32	0.00
0.50	100.00	81.48	66.75	54.73	43.88	34.20	25.17	15.99	0.00
0.45	100.00	83.17	69.50	58.13	47.65	38.07	28.90	19.21	0.00
0.40	100.00	84.88	72.37	61.74	51.74	42.39	33.17	23.08	0.00
0.35	100.00	86.64	75.35	65.58	56.18	47.19	38.08	27.72	0.00
0.30	100.00	88.44	78.46	69.65	61.00	52.53	43.71	33.30	0.00
0.25	100.00	90.26	81.70	73.98	66.24	58.48	50.17	39.99	0.00
0.20	100.00	92.13	85.07	78.57	71.93	65.10	57.59	48.04	0.00
0.15	100.00	94.04	88.58	83.46	78.10	72.48	66.11	57.70	0.00
0.10	100.00	95.98	92.23	88.64	84.81	80.68	75.89	69.31	0.00

OPTICAL PERCEPTIONS

technical & commercial sales information on electro-optical devices

ELECTRO-OPTICAL DEVICES DIVISION • AMPEREX ELECTRONIC CORPORATION • SLATERSVILLE, RHODE ISLAND 02876

June, 1973

PLUMBICON® APPLICATIONS BULLETIN NO. 11

THE EXTENDED RED LAYER — A RED TUBE, A LUMINANCE TUBE AND, NOW A GREEN TUBE.

Development of neew and improved products is the continuous task of any manufacturer. The Plumbicon® camerra tube is no exception. Considerable development work has been carried out over the years, resulting in significant improvements in color camera performance.

As new tube types have been developed and become available, the best choice of tubes for the color channels has changed as follows:

I. ORIGINAL PLUMBICON TUBE TYPE 55875

CHANNEL	3-TUBE	4-TUBE
Luminance	N/A	55875L
Green	55875G	55875G
Red	55975R	55875R
Blue	55875B	55875B

ADVANTAGES (Compared to a Vidicon)

1. Negligible dark current.
2. Saturation of the dark current and of the output current with increasing target potential for a fixed light level.
3. Temperature independence of sensitivity and dark current over a wide range about room temperature.
4. A near unity gamma of transfer characteristic.
5. Very fast response.
6. One f-stop highlight handling capability at 300 to 400 nano-Amps.

II. RECOMMENDED CONFIGURATION AFTER INTRODUCTION OF THE SEPARATE MESH XQ1020.

CHANNEL	3-TUBE	4-TUBE
Luminance	N/A	XQ1020L
Green	XQ1020G	XQ1020G
Red	XQ1020R	XQ1020R
Blue	XQ1020B	XQ1020B

ADVANTAGES — All advantages indicated for 55875, plus:

1. More beam handling capability up to the range of 800 to 3600 nano-Amperes for highlight handling.
2. Improved center to edge focus.
3. 3% to 5% higher overall resolution.
4. Better lag performance.

(over)

III. RECOMMENDED CONFIGURATION AFTER INTRODUCTION OF THE EXTENDED RED XQ1023/5

CHANNEL	3–TUBE	4–TUBE
Luminance	N/A	XQ1025L
Green	XQ1020G	XQ1020G
Red	XQ1023/5R*	XQ1025R
Blue	XQ1020B	XQ1020B

ADVANTAGES – The same advantages can be realized with this combination as with that of II above, plus:

1. Twice the red channel sensitivity.
2. 50% higher modulation depth in the red channel.
3. 35% higher modulation depth in the luminance channel.
4. Color response in the reds equal to the eye.

IV Resulting from the use of the extended red layer in the luminance channel of four-tube cameras and the experience of various users (originating with Compact Video Trucks, Los Angeles, California) the following tube complement is recommended for three-tube cameras. (Note that four-tube cameras operate with best performance when using the combination in III above.

CHANNEL	3–TUBE
Green	XQ1023/5G*
Red	XQ1023/5R*
Blue	XQ1020B

* The use of the XQ1023 or XQ1025 is determined by the camera optics. Camera designs incorporating an infrared cut-off filter in the camera optics should use the unfiltered XQ1023 series. The XQ1025 series is used when the filter is required but not present in the camera optics.

ADVANTAGES

The combination of tubes shown above is recommended as providing the best performance in each category, i.e., resolution, highlight handling, modulation depth, sensitivity, etc.

NOTE: For your information, the data sheets for the above mentioned Plumbicon camera tubes are made a part of this bulletin.