

WIZARDS WORKSHOP

TEKTRONIX INTERNAL USE ONLY

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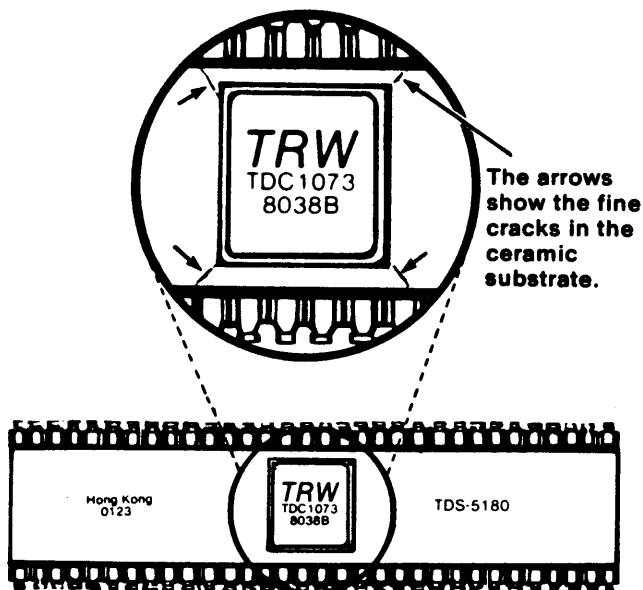
COMPANY CONFIDENTIAL

GENERAL

RELIABILITY SUFFERS WHEN PARTS ARE INSERTED/REMOVED FROM SOCKETS

A recent analysis of plant failures from the 468 product line revealed some interesting information on a mechanical stress-related failure mechanism. The devices analyzed were high-speed A/D converters (TRW P/N TDS-5180, Tek P/N 156-1345-00). The failure mode reported for the parts was excessive non-linearity.

These parts are housed in 64-pin ceramic dual in-line packages. Analysis revealed that the failure mechanism was micro-cracks in the package which caused non-uniform stresses on the chip within the package (see illustration below). The cracks in the packages are undetectable without special equipment, such as a low-power microscope with side lighting, dye-penetrant detection or a method using Fluorinert FC77 in a vapor generator.



The cracks appear to be caused by an uneven stress (end-to-end) on the package while it is being inserted into or removed from a socket. The uneven pressure will cause the package to flex beyond

its structural limitations. This excessive flexing develops cracks which radiate from the cavity corner outwards.

This problem can be minimized (or eliminated) by using special care when inserting or removing large ceramic packages, and by following these instructions:

Inserting: Apply even pressure across the whole package (not one end first) during insertion. Pushing with the palm of your hand, or using a block of wood or plastic will provide the uniformity required to insert the package into the socket.

Removing: To remove these packages, avoid putting any leverage tool under one end and prying up. Instead, use a long letter opener which can be slipped between the part and socket. Do not use a screwdriver to accomplish this. Slide the letter opener to one side of the package pins, then rotate or twist the opener. This will cause one side of the package to be lifted, and the other side can then be lifted in the same way.

Using these insertion/removal techniques will minimize micro-cracks in these large format packages. The result should be reduced plant and field failures for this failure mechanism.

Written by--
Dan Harris
Component Rel. Eng.

Inserted by--
Frank Tucker
92-236, Ext. 1286

ADMINISTRATIVE SUPPORT

SERVICE RECORD PROCEDURES

Product/component failure analysis is very difficult without complete, accurate data. It is our responsibility as an organization to supply this data to the corporation.

An increasingly greater number of Service Records are being received by Reliability Information Services without failure codes. There must be a failure code associated with module/component failures reported on the Service Record.

--Bill Duerden
56-037, Ext. 8938 MR

FUNCTIONS OF SERVICE ADMINISTRATIVE SUPPORT

This article is the first of a two-part series explaining the functions of Service Administrative Support. This issue's will focus on an overview of the department and take a more detailed look at one area, Service Maintenance Agreements. The next issue will contain an article discussing the other areas in SAS, Service Publications and Service Systems and information.

Four years ago, Service Administrative Support was two people. Today, with the expansion of the service market, SAS is a department of thirteen and has responsibility for planning, developing and recommending procedures and systems in support of the Tektronix Service organizations. Specifically, SAS handles a variety of services including maintenance agreement processing and control, service publications, management information and systems development, and the management library.

Functionally, SAS is divided into four areas: Maintenance Service Agreements Administration and Service Publications, supervised by Sharon Huetson; Service

Information, directed by John Brandes; and Service Systems, lead by Bill Bagley.

Service maintenance agreements, which Tektronix' customers may purchase if they wish service charges to be covered after the product warranty expires, is one of the most lucrative ventures in the company. Our approximately 4,000 current contracts generate revenue in the millions of dollars each year. Jean Hickok, Debbie Stewart and Deanna Beasley of our department process the agreements as they pass through from the field offices to Sales Finance. Specifically, once our office receives the customer's purchase order, contract, and transmittal form we audit the paperwork and enter the correct information into the computer, the Rental Administration Data Base (RADB). (Eventually, the field offices will enter their agreements directly, and our responsibility will involve simply auditing.) We release the information to Sales Finance where it will be audited and turned over to the computer for billing on the specified cycle.

Every accounting period a maintenance summary report is compiled which informs the field offices of the contracts they have active and the periods of coverage. The report is divided by the type of contracts (IDD, Systems, Instrumentation).

When changes occur to contracts and they must be credited, re-billed or information must be added or deleted, we update the RADB and paperwork to comply.

--Deirdre Mitchell
56-037, Ext. 8917 MR

IN-HOUSE

FG502 VCF IMPROVEMENT

Serial Numbers Affected: Below B050740

Some FG502's below the affected serial number may not shift Output Frequency 1000:1 with 10V or less as specified.

To correct this problem, change R125 from 10K ohm (P/N 321-0289-00) to 9.41K ohm (321-0632-00).

--Terry Turner
92-236, Ext. 1288

PROPER HANDLING OF LARGE SCREEN CRT'S

Two new video tapes are now available on Proper Handling of Large Screen CRTs, Part I & II. These tapes cover:

- What a CRT looks like when it implodes
- Recommended handling procedures
- Removal, Installation, Rotation

GMA125
4016-1
4014-1
GMA102A

These tapes are especially useful for training new persons or reviewing correct removal, installation, rotation procedures.

Recommendations are also made as to eye protection, clothing, etc.

To order, telex Media Services, 74-115 and ask for "Proper Handling of Large Screen CRTs, Reference # 16.787". This procedure is for all U.S. and International Tektronix Field Offices.

--Jim Tiano
63/503, 3701 (WI)

SAFETY GOGGLES

Safety goggles will become part of the standard U.S. Field Service Kit. Tektronix part number for these goggles is 006-3924-00.

These goggles are mentioned in the new video tapes, Proper Handling Of Large Screen CRTs, Part I & II, Reference No. 16.787.

--Jim Tiano
63/503, ext 3701 (WI)

SOFTWARE PATCHES - ANSWER SERVICE BULLETIN #17

This bulletin is being issued to correct an error in a previous bulletin (ASB #15).

The correction is as follows:

Change Figure 3, Line 8020 to read-

8020 MINMAX V(0,200:800), S,I IF
V(0,I) -V(0,S)<39 THAN CM=7 GOTO
8160

--Bill Bean
53-108, Ext. 8695

TLD66/TLD67 CATASTROPHIC FAILURES

Due to high failure rate and resulting catastrophic damage to the unblanking circuit, all Telequipment TLD67's with old mylar type capacitors P/N 285-0914-00 in C251 and C252 must be replaced by new discap P/N 281-0754-00.

Due to overvoltage and shortened life of pilot lamp, P/N 150-0095-00 should be replaced by P/N 150-0182-00 on TLD66's only.

(ARTICLE CONTINUED ON THE NEXT PAGE)

TLD66/TLD67 CATASTROPHIC FAILURES (cont.)

If the BRILLIANCE pot (R305) on a TLD67 is located directly behind the front of sub-panel, the P/N is 311-1051-00. All others use P/N 311-1398-00.

--Tom Herd
56-103 Ext. 8616 MR

TM500 REAR INTERFACE DATA BOOK PART NUMBER CORRECTION

The correct part number for the TM500 Rear Interface Data Book is 070-2088-00, not 070-0088-00 as shown in the previous article (Issue 11-18, Sept. 25).

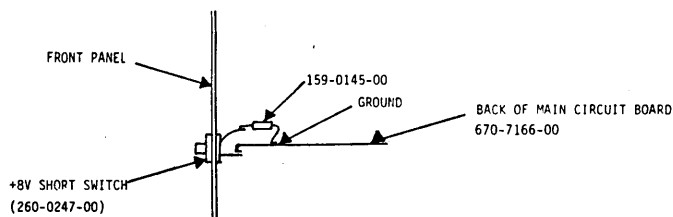
--Terry Turner
92-236, Ext. 1288

TM5006/TM5003 TEST LOAD UNIT BOARD PROTECTION

Reference: 067-0995-99

To prevent possible board damage when testing a defective +8V supply, a 15A fuse, P/N 159-0145-00, should be installed between the +8V short switch and ground on the back of the main circuit board. (See Figure 1). For future reference, make this correction on Schematic 1 of your manual.

--Terry Turner
92-236, Ext. 1288



TSG-7, REPORT OF CALIBRATION AND CERTIFICATION

Reference: TSG-7 Service Maintenance Information, WIZARD Issue 11-16, Aug. 28, 1981

Please make the following corrections to your "Report of Calibration and Certification".

Step 14 Change to read--

Black Set Amplitude +(plus)
-(minus)

Step 19e Change to read--

Chroma to Luminance Delay R179

--Bill Bean
53/108, Ext. 8695

492/P JUMPERS ON PRESELECTOR DRIVER BOARD P/N 670-5552-03

The new Preselector Driver has two plugs on it to match it to the particular first LO Driver and Mother Board with which it is being used.

1. In post major mod 492's (B03XXXX and above) and all 492/P's, P5052 should have a jumper on it and P5065 should be open. This connects the Peaking control to the Preselector Driver via the first LO Driver programmable peaking output on Pin 46.
2. In pre major mod 492's (below B03XXXX) with a first LO Driver, 670-5550-01 or -00, P5065 should have a jumper on it and P5052 should be open. This connects the Peaking control to the Preselector Driver via Pin 58 on the Mother Board connector. Pin 46 on the first LO Driver has no connection on the -01 board.

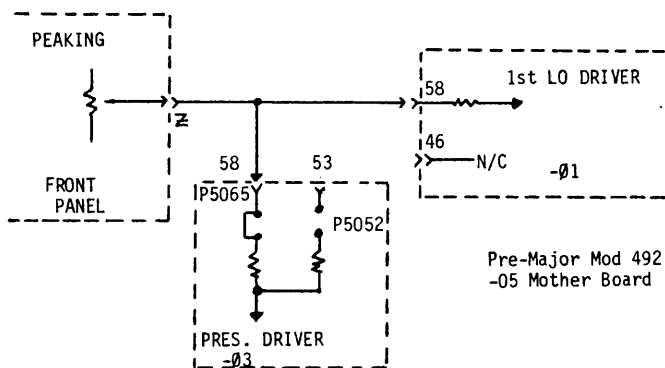
Presently in 492's with -06 Mother Boards, the Peaking control will work

(ARTICLE CONTINUED ON THE NEXT PAGE)

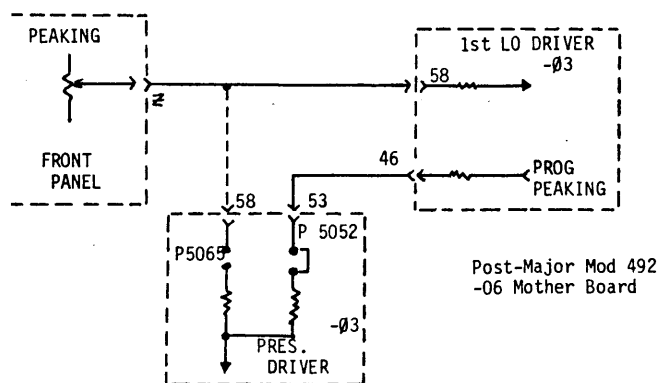
492/P JUMPERS ON PRESELECTOR DRIVER BOARD P/N 670-5552-03 (cont.)

with the jumper on either plug since there is an extra run in the -06 Mother Board between Pins 58 on the LO Driver, and Preselector Driver (see accompanying schematic). Connect the jumpers as in #1 above.

If the jumpers are incorrect on a 492/P, the Peaking control will be useable, but the Programmable Peaking will not work.



Pre-Major Mod 492
-05 Mother Board



Post-Major Mod 492
-06 Mother Board

--Rich Kuhns
53/108, Ext. 8693

Option 1 or Option 15 products. It may be used to substitute the adjustments in steps D4 through D7 or F4 and F5 in the 634 Monitor Instruction Manual (part number 070-2561-00).

Geometry Calibration

The earth's magnetic field affects the position and rotation of the CRT display. If the magnetic lines of force (north-south), display rotation will result. If the electron beam moves perpendicular to the field (east-west), then vertical and/or horizontal displacement of the image will occur. Similar effects may be expected from local magnetic fields produced by electrical machinery, structural steel in buildings and nearby geologic formations. Typically, yoke rotation, vertical repositioning (R315) and horizontal repositioning (R355) will return the display to normal. This is not unique to the 634 but affects all cathode ray tubes.

Setup Conditions:

Prior to adjusting geometry, it should be verified that all power supplies are functioning properly. Setup and check an Option 20 instrument according to pages 6-18 and 6-19 of the 634 Monitor Instruction Manual. Check that the video circuitry performance corresponds to "Video Channel" and "Option 13 Video Reversal: requirements in section 6 of the instruction manual (pages 6-20 through 6-25). Check also that Vertical Rate (R230), Horizontal Rate (R260) and Horizontal Hold (R375) are correct as described on pages 6-26 and 6-27. Option 1 instruments with the new 108-0944-02 deflection yokes should have centering magnets adjusted as per "634 Option 1 CRT, Yoke and Calibration Change" elsewhere in this issue.

634: GEOMETRY CALIBRATION

Numerous questions have been raised regarding those aspects of the 634 adjustment and performance check dealing with geometry. To reduce confusion, the following expanded and detailed geometry calibration procedure has been devised. It may be used with standard,

(ARTICLE CONTINUED ON THE NEXT PAGE)

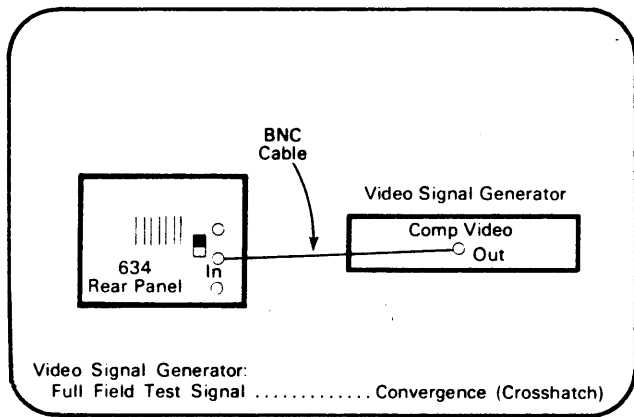


Figure 1. Test setup for geometry adjustment.

A. Replace the clear graticule with the appropriate CRT scale for the given instrument's option. Use the 337-2537-05 scale for an Option 1 product. Use the 337-2537-01 for all others. Place the silk-screened side of the scale against the CRT faceplate to reduce parallax. As a further aide to reducing parallax error, the calibrator may wish to sight through the center of a small plastic or cardboard tube held firmly against the faceplate or scale. Such a tube may be found as the core of a small spool of printer paper. The core of a Tek 31 thermal printer paper spool (006-1775-00) may be used. Any tube similar to that depicted in Figure 2 will suffice provided the end is cut perpendicular to the axis.

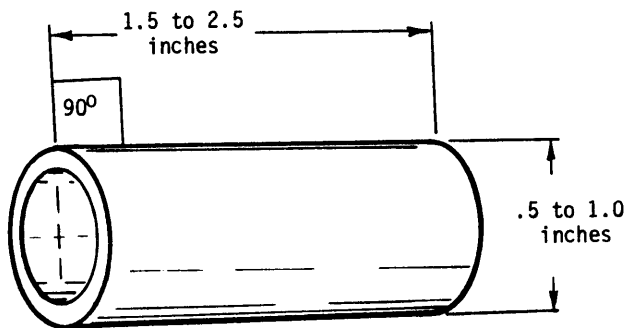


Figure 2. Tube for reducing parallax error.

B. Check that the intersections of the horizontal and vertical trace centerlines fall within the outer diameters of the scale's circles. An example is shown in Figure 3.

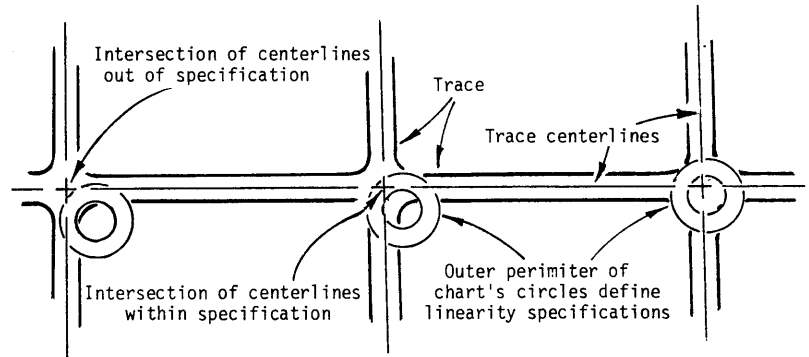


Figure 3. Correct method for interpreting CRT scale.

C. If the product is severely decalibrated, begin by presetting controls as shown below. Otherwise, move on to the next step, "D".

Circuit No	Name (Function)	Location	Preset
R240	Vertical Offset	Sync Board	Mid-range
R248	Vertical Correction	Sync Board	Mid-range
R270	Horizontal Offset	Sync Board	Mid-range
R278	Horiz Correction	Sync Board	Mid-range
R302	Orthogonality	Yoke Driver	Mid-range
R310	Vertical Size	Yoke Driver	Rough adj for size
R315	Vertical Position	Yoke Driver	Center the display
R340	Side Pincushion Adj	Yoke Driver	Mid-range
R345	Horizontal Size	Yoke Driver	Rough adj for size
R355	Horizontal Position	Yoke Driver	Center the display
L364	Horizontal Linearity	Yoke Driver	Max display size

D. Adjust the Horizontal Position (R355) to align the center vertical line with the two centermost circles of the center column on the scale.

E. Adjust the deflection yoke so that the center vertical line falls beneath the center column of circles. On instruments with earlier yoke driver boards lacking an Orthogonality control (R302) it may be necessary to observe the two center horizontal lines as well. In such a case, adjust the yoke so that all three lines (two horizontal and one vertical) fall beneath the appropriate scale circles.

(ARTICLE CONTINUED ON THE NEXT PAGE)

F. Adjust Horizontal Size (R345) to position the center of the rightmost vertical line beneath the rightmost column of circles.

G. Adjust the Horizontal Linearity (L364) to position the center of the leftmost vertical line beneath the leftmost column of circles. Horizontal position, size and linearity interact. Repeat steps D, F, and G as necessary.

On earlier Option 15 products it may be necessary to readjust the Horizontal Hold control (R375) to correctly position the image.

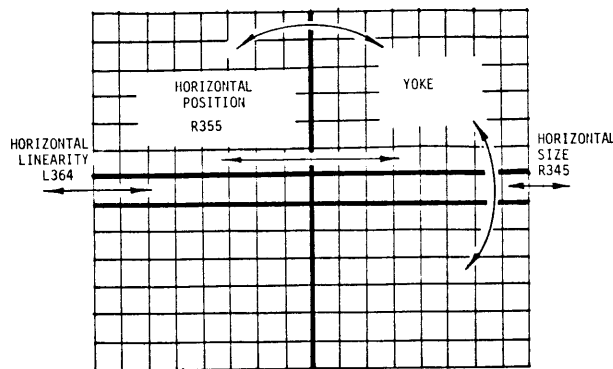


Figure 4. Effects of yoke, L364, R345 and R355.

H. Adjust Orthogonality (R302) so that the two middle horizontal lines are straight and level beneath the two center rows of circles (perpendicular to the center vertical line). See Figure 5.

I. Adjust Side Pincushion (R340) so that the outermost vertical lines are as straight as possible (Figure 5). These lines may or may not fall beneath the appropriate circles at this time as a keystone effect may be apparent.

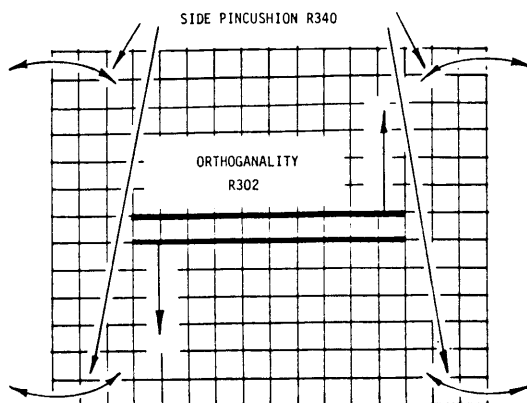


Figure 5. Effects of R302 and R340.

J. Adjust Vertical Correction Offset. Since Vertical Offset (R240) interacts with Vertical Position (R315) both controls must be adjusted together.

While observing the middle vertical lines, adjust R240 and R315 so that the vertical gain at the top of the faceplate is the same as that at the bottom of the faceplate (see Figure 6). The horizontal lines should show spacing above the center symmetric to that below the center. The faceplate center may or may not appear linear at this time. At the conclusion of this step, key-stoning should be negligible.

K. Adjust Vertical Correction Amplitude. Since Vertical Correction (R248) and Vertical Size (R310) interact, both controls must be adjusted together.

While observing the center vertical lines, adjust R248 and R310 so that the center gain is the same as the top and bottom gain (see Figure 6). Readjust Vertical Position (R315) as necessary. With the completion of this step, the center columns of cross-hatches should be correctly positioned beneath the scale's circles. A slight bow may now remain in the top and bottom lines.

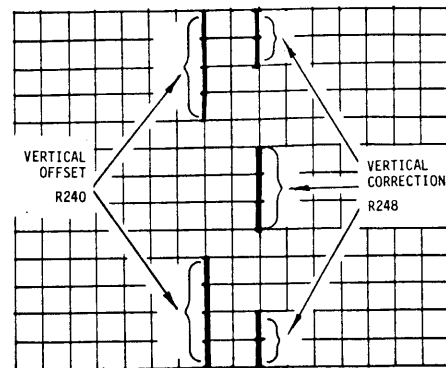


Figure 6. Effects of R240 and R248.

L. Adjust Horizontal Correction (R278) to reduce the bowing of the top and bottom lines of the crosshatch. R278 tends to pull the ends of these lines into the center of the display (see Figure 7). Note that turning R278 too far clockwise will severely distort the image.

(ARTICLE CONTINUED ON THE NEXT PAGE)

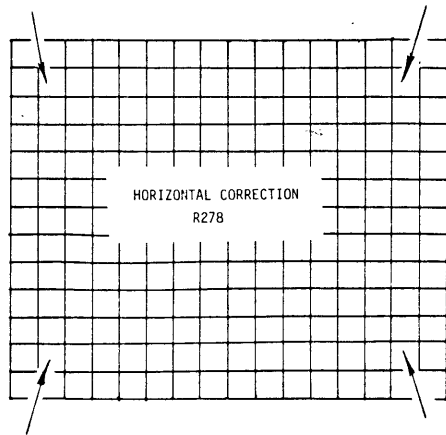


Figure 7. Effects of R278.

M. Adjust Horizontal Offset (R270) to center Horizontal Correction. R270 affects the phasing of the correction signal so that the effects of Horizontal Correction (R278) are uniform along the horizontal lines, i.e., the left and right sides are "pulled in" equal amounts.

--George Kusiowski
63-503, Ext. 3928 WI

634 OPTION 1 CRT, YOKE AND CALIBRATION CHANGE

The electrical center specification (undeflected spot location) for the 154-0799-00 CRT used in the standard 634 monitor is within one centimeter square at the center of the faceplate. To improve the yield of CRTs, a looser specification (two centimeters square) has been adopted for tubes used in option 1 instruments by corporate modification 42201. Tubes that fail the standard specification but meet the new option 1 specification are part numbered 154-0799-10.

The use of the -10 CRT now requires a different deflection yoke, part number 108-0944-02. This new yoke differs from the former 108-0944-00 in that it contains two centering rings to reposition the -10 CRTs errant electron beam. The -02 deflection yoke is retrofitable into earlier option 1 products with the 154-0799-00 CRT.

The addition of magnetic rings to the deflection yoke requires some added steps in the 634 option 1 calibration procedure. These steps (given below) should be done after all power supply, video, horizontal/vertical rate and horizontal hold adjustments are made. The use of a modified option 1 CRT scale is called for but not required unless a marginal CRT or yoke is encountered. Such a scale can be made using the procedure given at the end of this article.

Option 1 Yoke Rings

- Turn the BRIGHTNESS and CONTRAST controls to minimum (CCW).
- Turn the FOCUS control fully clockwise.
- Turn the product "off" and mount a modified Option 1 CRT scale onto the faceplate (see figure).
- Mount a viewing hood onto the product to reduce the possibility of phosphor damage.
- Disconnect the deflection yoke from the yoke driver board at J335. Dress the cable connector housing (harmonica) away from chassis or board components. The yoke develops charge during this process and may arc to components near J335.
- Turn the instrument "on" and CAREFULLY increase the BRIGHTNESS until a very dim dot is seen. Use caution so as not to damage the faceplate phosphor.
- Adjust the ring magnets to place the dot within the one centimeter square at the center of the chart. To increase magnetic deflection, bring the two ring tabs closer together. To reduce deflection, separate the tabs.
- Turn the product "off" and remove the viewing hood.

(ARTICLE CONTINUED ON THE NEXT PAGE)

634 OPTION 1 CRT, YOKE AND CALIBRATION
CHANGE (cont.)

- Discharge the deflection yoke by bringing the J335 harmonica close to the chassis. Avoid touching the harmonica with fingers until after discharge, then reconnect the yoke to the yoke driver board.
- Turn the product "on" and continue with linearity (geometry) calibration, if applicable.

Portions of the above procedure may be used on option 1 or standard products to determine the electrical center of the CRT. This may be warranted if unusual line bowing, insufficient or marginal range of R355 (Horizontal Position) or excessive pin cushion in only one corner is observed during linearity adjustment. However, a chart defining electrical center specifications is needed if questions arise as to the ability of the CRT (or yoke) to meet specifications. A chart to satisfy this need may be made with relative ease using the following procedure.

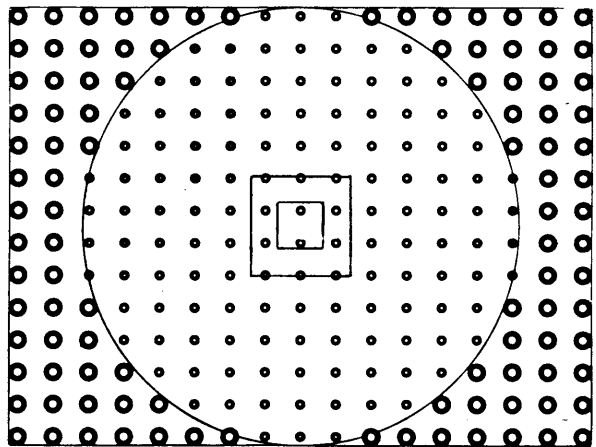
Necessary equipment:

- 1 337-2537-01/05 CRT Scale
 - 1 1003-0201-00 Scribe (or equivalent)
 - 1 1.0 centimeter square drafting template*
 - 1 2.0 centimeter square drafting template*
 - 1 black felt tip permanent marker.
- * The Berol Rapidesign 2030 metric square template may be used with satisfactory results.
- Check the size of the 1.0 cm and 2.0 cm squares on the drafting template(s) to determine whether the template(s) allow for pencil lead diameter, and if so, how much. Use vernier calipers if available.
 - Using the 1.0 cm and 2.0 cm squares of a drafting template, scribe two

squares onto the non-silkscreened side of the scale. Take care to center them as accurately as possible. Since the scribe is narrower than a pencil lead, some correction will be needed when handling the scribe. Do not attempt to scribe the silkscreened side of the scale. This will damage the silkscreening.

If a metric square drafting template is not available, the Rapidesign type R-30 English square template can be used to approximate the 1.0 cm (.394 inches) and 2.0 cm (.787 inches) squares. Use the 3/8" (.405 inches) and 3/4" (.778 inches) squares. Again, use a little "english" on the scribe itself to come closer to the desired dimensions.

- "Paint" over the score marks with a black felt tip permanent marker. Immediately wipe off the excess ink with a tissue. A fine black line should now remain inside the scores. The completed scale should appear as shown below.



This procedure makes possible several thousandths inches of error. In addition, local magnetic fields may displace the "undeflected" spot on a CRT faceplate several millimeters. Therefore, considerable discretion should be used before declaring a given CRT to be in or out of specification.

--George Kusiowski
63-503 ext. 3928 (WI)

634 PERFORMANCE MODIFICATION #43894 CORRECTION

The instructions for modifying the high voltage supply boards in "634 Performance Modification #43894," Wizards Workshop issue 11-18 are in error. The second step should describe the tooling hole as being near lead 7 of T410, not near lead 1 as printed. Note also that figure 2 misrepresents the foil pad for lead 7 as being square instead of round as the rest.

In addition, the metal oxide varistor, RV437 is mistakenly referred to as "RV137" in the first step of the installation instructions and both figures 2 and 3.

--George Kusiowski
63-503 ext. 3928 (WI)

1450 SERIES, INTERMITTENT OPERATION

A possible source of intermittent operation has been traced to the IF DET/ VIDEO AMPLIFIER circuit board. The cause is Q86 transistor case shorting to one or more of the following--R85, R86, R89, R88, L89 or L88.

The interim solution is to dress the transistor and other involved components in such a way as to avoid their contacting one another.

Newer 1450's have had the circuit board altered to allow sufficient spacing. The board numbers are:

OLD	670-5009-00	1450-1
	670-5009-01	1450-2, 1450-3

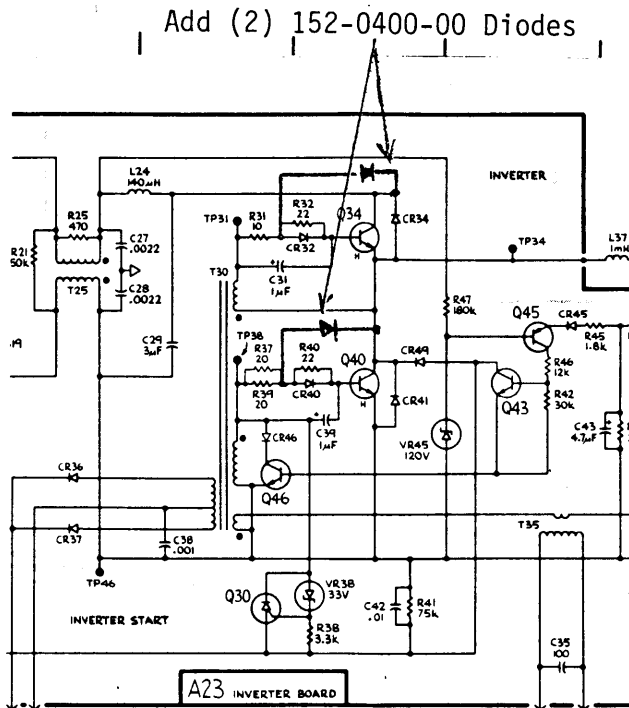
NEW	670-5009-02	1450-1
	670-5009-03	1450-2, 1450-3

--Bill Bean
53/108, Ext. 8695

7104, 7854 LOW LINE, HIGH LOAD, SCHEMATIC CORRECTION

Reference: WIZARD Issue 11-18

In the above mentioned issue the schematic shows CR33 connected to R47. It should be connected to the collector of Q34 as shown below.



--John Eaton
53-108, Ext. 8689 MR

ON-SITE

CP220C MAINTENANCE INFORMATION

The CP220C Remex Reader/Punch is repaired and serviced by few Tektronix service personnel.

The instrument contains precision mechanical parts which require alignment when the major subassemblies are replaced.

Although the Service philosophy for the Remex is return to vendor, a knowledgeable technician with the proper tools will be able to repair and align the instrument on-site. On-site repair is authorized. Refer to CP220C Manual (P/N 070-3384-00).

Special attention should be given to the Lubrication of the punch head. Using Rheolube 723MS and the syringe provided in the kit of parts with the Reader/Punch, grease as shown on page 5-4. Lubricating the punch head mechanism after fifty rolls of tape will minimize wear and ultimately costly repairs.

A list of Remex authorized service facilities follows.

REGIONAL SERVICE CENTERS

BALTIMORE

Metronix E.I.S., Inc.
3450 F. Meade Road
Suite 104
Laurel, MD. 20810
(301) 792-0050 (Baltimore)
(301) 953-3953 (D.C.)

BOSTON

Victor Electronics Corp.
304 Turnpike Road
Southboro, MA. 01772
(617) 481-4010
TWX: 710-390-0340

CHICAGO

S-E-A, Inc.
1225 Carnegie St.
Suite 107
Rolling Meadows, IL. 60008
(312) 255-4820 or
255-4821
TWX: 710-687-2272

INDIANAPOLIS

S-E-A, Inc.
624 B S. Range Line Rd.
Carmel, IN. 56032
(317) 846-2591
TWX: 810-260-2634

LOS ANGELES

Remex
1733 Alton Avenue
Irvine, CA. 92714
(714) 957-0039
TWX: 910-595-1715

NEW YORK

Hansen and Hughes
500 Barnett Place
HO-HO-KUS, NJ 07423
(201) 652-7055

PHILADELPHIA

Denco Equipment Corp.
25 Skippack Pike
Suite 108
Ambler, PA. 19002
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Ossmann Instruments Svc. Corp.
1 Adler Drive
East Syracuse, NY. 13057
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TWX: 710-541-1523

CANADA

Tracan Electronics Corp.
1200 Aerowood Drive
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Mississauga, Ontario
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TWX: 610-492-1696

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INTERNATIONAL

AUSTRALIA

Kenelec (Aust) Pty. Ltd.
48 Henderson Road Clayton
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Phone: (03) 560-1011
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Systemes Industries
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78140 Zone Industrielle
de-Velizy-Villacoublay
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Microtecnica
147, Via Madama Cristina
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Kyokuto Boeki Kaisha, Ltd.
7th Floor New Otemachi Bldg.
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David Reid Data Products
3-5 Auburn Street
Takapuna, Auckland
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UNITED KINGDOM

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Telex: 847395 SINRM G

WEST GERMANY

Nord-Micro
Elektronik Feinmechanik AG
Victor-Slotosch-Strasse 20
6000 Frankfurt/Main 60
Phone: (0 61 94) 303-1
Telex: 4185909 NMD

--Jim Stubbs
92-236, Ext. 1287

IS2 CABLE PART NUMBER CHANGE

The IS2 cable has a part number change only. The existing cable 198-3782-00 is replaced with part number 175-6008-00.

--Ron Lang
92-236, Ext. 1015

PROPER HANDLING OF LARGE SCREEN CRT'S

Two new video tapes are now available on Proper Handling of Large Screen CRTs, Part I & II. These tapes cover:

- What a CRT looks like when it implodes
- Recommended handling procedures
- Removal, Installation, Rotation

GMA125
4016-1
4014-1
GMA102A

These tapes are especially useful for training new persons or review-

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PROPER HANDLING OF LARGE SCREEN CRT'S

(cont.)

ing correct removal, installation, rotation procedures.

Recommendations are also made as to eye protection, clothing, etc.

To order, telex Media Services, 74-115 and ask for "Proper Handling of Large Screen CRTs, Reference # 16.787". This procedure is for all U.S. and International Tektronix Field Offices.

--Jim Tiano
63/503, 3701 (WI)

634: GEOMETRY CALIBRATION

Numerous questions have been raised regarding those aspects of the 634 adjustment and performance check dealing with geometry. To reduce confusion, the following expanded and detailed geometry calibration procedure has been devised. It may be used with standard, Option 1 or Option 15 products. It may be used to substitute the adjustments in steps D4 through D7 or F4 and F5 in the 634 Monitor Instruction Manual (part number 070-2561-00).

Geometry Calibration

The earth's magnetic field affects the position and rotation of the CRT display. If the magnetic lines of force (north-south), display rotation will result. If the electron beam moves perpendicular to the field (east-west), then vertical and/or horizontal displacement of the image will occur. Similar effects may be expected from local magnetic fields produced by electrical machinery, structural steel in buildings and nearby geologic formations. Typically, yoke rotation, vertical repositioning (R315) and horizontal repositioning (R355) will return the display to normal. This is not unique to the 634 but affects all cathode ray tubes.

Setup Conditions:

Prior to adjusting geometry, it should be verified that all power supplies are

functioning properly. Setup and check an Option 20 instrument according to pages 6-18 and 6-19 of the 634 Monitor Instruction Manual. Check that the video circuitry performance corresponds to "Video Channel" and "Option 13 Video Reversal: requirements in section 6 of the instruction manual (pages 6-20 through 6-25). Check also that Vertical Rate (R230), Horizontal Rate (R260) and Horizontal Hold (R375) are correct as described on pages 6-26 and 6-27. Option 1 instruments with the new 108-0944-02 deflection yokes should have centering magnets adjusted as per "634 Option 1 CRT, Yoke and Calibration Change" elsewhere in this issue.

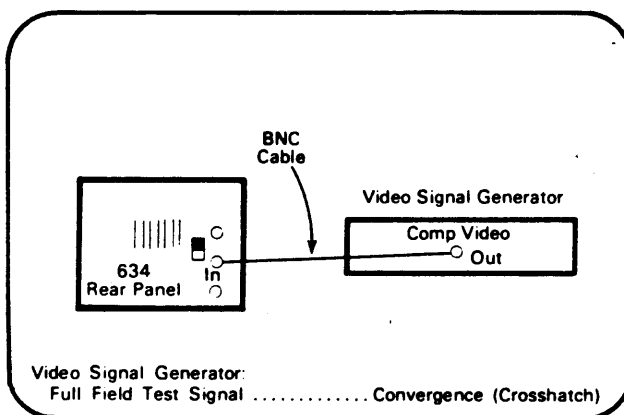


Figure 1. Test setup for geometry adjustment.

- A. Replace the clear graticule with the appropriate CRT scale for the given instrument's option. Use the 337-2537-05 scale for an Option 1 product. Use the 337-2537-01 for all others. Place the silk-screened side of the scale against the CRT faceplate to reduce parallax. As a further aide to reducing parallax error, the calibrator may wish to sight through the center of a small plastic or cardboard tube held firmly against the faceplate or scale. Such a tube may be found as the core of a small spool of printer paper. The core of a Tek 31 thermal printer paper spool (006-1775-00) may be used. Any tube similar to that depicted in Figure 2 will suffice provided the end is cut perpendicular to the axis.

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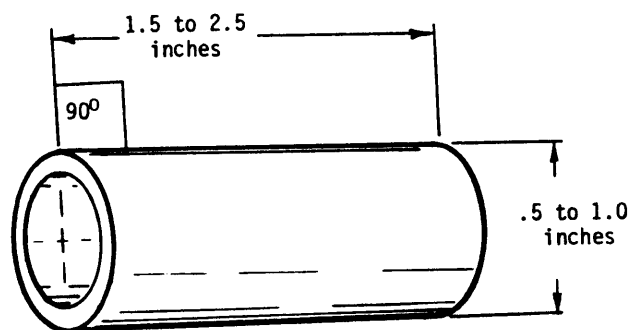


Figure 2. Tube for reducing parallax error.

- B. Check that the intersections of the horizontal and vertical trace centerlines fall within the outer diameters of the scale's circles. An example is shown in Figure 3.

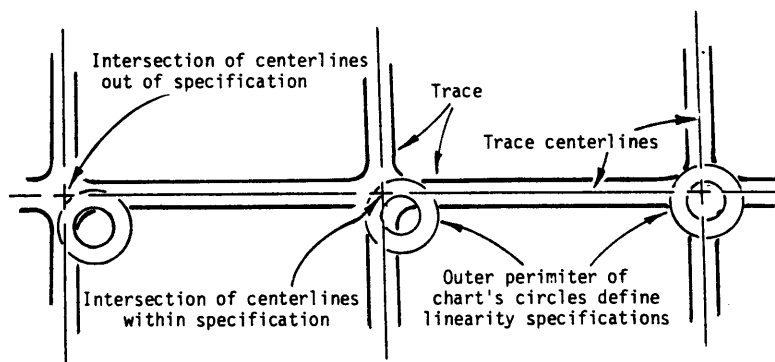


Figure 3. Correct method for interpreting CRT scale.

- C. If the product is severely decalibrated, begin by presetting controls as shown below. Otherwise, move on to the next step, "D".

Circuit No	Name (Function)	Location	Preset
R240	Vertical Offset	Sync Board	Mid-range
R248	Vertical Correction	Sync Board	Mid-range
R270	Horizontal Offset	Sync Board	Mid-range
R278	Horiz Correction	Sync Board	Mid-range
R302	Orthogonality	Yoke Driver	Mid-range
R310	Vertical Size	Yoke Driver	Rough adj for size
R315	Vertical Position	Yoke Driver	Center the display
R340	Side Pincushion Adj	Yoke Driver	Mid-range
R345	Horizontal Size	Yoke Driver	Rough adj for size
R355	Horizontal Position	Yoke Driver	Center the display
L364	Horizontal Linearity	Yoke Driver	Max display size

- D. Adjust the Horizontal Position (R355) to align the center vertical line with the two centermost circles of the center column on the scale.

- E. Adjust the deflection yoke so that the center vertical line falls beneath the center column of circles. On instruments with earlier yoke driver boards lacking an Orthogonality control (R302) it may be necessary to observe the two center horizontal lines as well. In such a case, adjust the yoke so that all three lines (two horizontal and one vertical) fall beneath the appropriate scale circles.

- F. Adjust Horizontal Size (R345) to position the center of the rightmost vertical line beneath the rightmost column of circles.

- G. Adjust the Horizontal Linearity (L364) to position the center of the leftmost vertical line beneath the leftmost column of circles. Horizontal position, size and linearity interact. Repeat steps D, F, and G as necessary.

On earlier Option 15 products it may be necessary to readjust the Horizontal Hold control (R375) to correctly position the image.

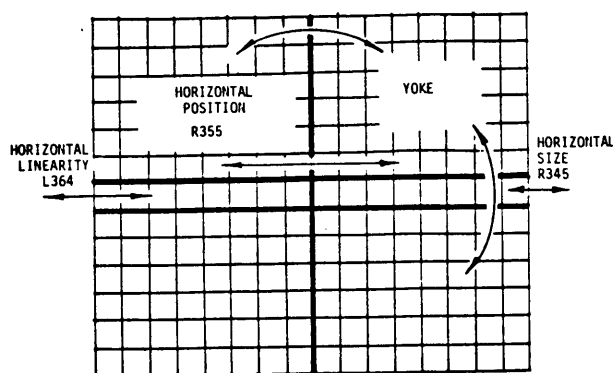


Figure 4. Effects of yoke, L364, R345 and R355.

- H. Adjust Orthogonality (R302) so that the two middle horizontal lines are straight and level beneath the two center rows of circles (perpendicular to the center vertical line). See Figure 5.
- I. Adjust Side Pincushion (R340) so that the outermost vertical lines are as straight as possible (Figure 5). These lines may or may not fall beneath the appropriate circles at this time as a keystone effect may be apparent.

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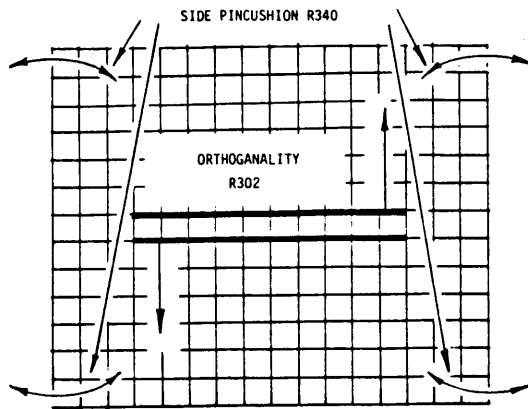


Figure 5. Effects of R302 and R340.

- J. Adjust Vertical Correction Offset. Since Vertical Offset (R240) interacts with Vertical Position (R315) both controls must be adjusted together.

While observing the middle vertical lines, adjust R240 and R315 so that the vertical gain at the top of the faceplate is the same as that at the bottom of the faceplate (see Figure 6). The horizontal lines should show spacing above the center symmetric to that below the center. The faceplate center may or may not appear linear at this time. At the conclusion of this step, key-stoning should be negligible.

- K. Adjust Vertical Correction Amplitude. Since Vertical Correction (R248) and Vertical Size (R310) interact, both controls must be adjusted together.

While observing the center vertical lines, adjust R248 and R310 so that the center gain is the same as the top and bottom gain (see Figure 6). Readjust Vertical Position (R315) as necessary. With the completion of this step, the center columns of cross-hatches should be correctly positioned beneath the scale's circles. A slight bow may now remain in the top and bottom lines.

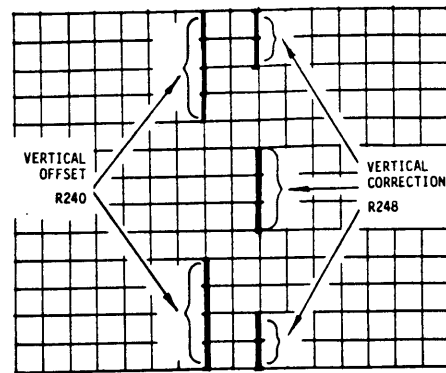


Figure 6. Effects of R240 and R248.

- L. Adjust Horizontal Correction (R278) to reduce the bowing of the top and bottom lines of the crosshatch. R278 tends to pull the ends of these lines into the center of the display (see Figure 7). Note that turning R278 too far clockwise will severely distort the image.

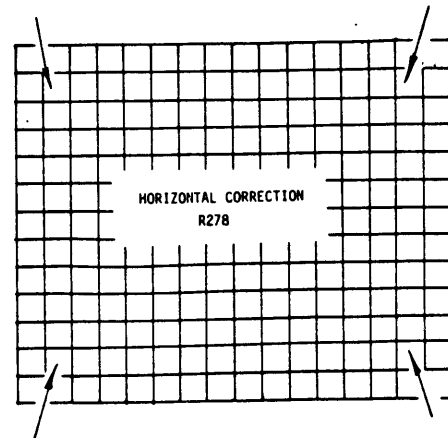


Figure 7. Effects of R278.

- M. Adjust Horizontal Offset (R270) to center Horizontal Correction. R270 affects the phasing of the correction signal so that the effects of Horizontal Correction (R278) are uniform along the horizontal lines, i.e., the left and right sides are "pulled in" equal amounts.

--George Kusiowski
63-503, Ext. 3928 WI

634 OPTION 1 CRT, YOKE AND CALIBRATION CHANGE

The electrical center specification (undeflected spot location) for the 154-0799-00 CRT used in the standard 634 monitor is within one centimeter square at the center of the faceplate. To improve the yield of CRTs, a looser specification (two centimeters square) has been adopted for tubes used in option 1 instruments by corporate modification 42201. Tubes that fail the standard specification but meet the new option 1 specification are part numbered 154-0799-10.

The use of the -10 CRT now requires a different deflection yoke, part number 108-0944-02. This new yoke differs from the former 108-0944-00 in that it contains two centering rings to reposition the -10 CRTs errant electron beam. The -02 deflection yoke is retrofitable into earlier option 1 products with the 154-0799-00 CRT.

The addition of magnetic rings to the deflection yoke requires some added steps in the 634 option 1 calibration procedure. These steps (given below) should be done after all power supply, video, horizontal/vertical rate and horizontal hold adjustments are made. The use of a modified option 1 CRT scale is called for but not required unless a marginal CRT or yoke is encountered. Such a scale can be made using the procedure given at the end of this article.

Option 1 Yoke Rings

- Turn the BRIGHTNESS and CONTRAST controls to minimum (CCW).
- Turn the FOCUS control fully clockwise.
- Turn the product "off" and mount a modified Option 1 CRT scale onto the faceplate (see figure).
- Mount a viewing hood onto the product to reduce the possibility of phosphor damage.
- Disconnect the deflection yoke from the yoke driver board at J335. Dress the cable connector housing

(harmonica) away from chassis or board components. The yoke develops charge during this process and may arc to components near J335.

- Turn the instrument "on" and CAREFULLY increase the BRIGHTNESS until a very dim dot is seen. Use caution so as not to damage the faceplate phosphor.
- Adjust the ring magnets to place the dot within the one centimeter square at the center of the chart. To increase magnetic deflection, bring the two ring tabs closer together. To reduce deflection, separate the tabs.
- Turn the product "off" and remove the viewing hood.
- Discharge the deflection yoke by bringing the J335 harmonica close to the chassis. Avoid touching the harmonica with fingers until after discharge, then reconnect the yoke to the yoke driver board.
- Turn the product "on" and continue with linearity (geometry) calibration, if applicable.

Portions of the above procedure may be used on option 1 or standard products to determine the electrical center of the CRT. This may be warranted if unusual line bowing, insufficient or marginal range of R355 (Horizontal Position) or excessive pin cushion in only one corner is observed during linearity adjustment. However, a chart defining electrical center specifications is needed if questions arise as to the ability of the CRT (or yoke) to meet specifications. A chart to satisfy this need may be made with relative ease using the following procedure.

Necessary equipment:

- 1 337-2537-01/05 CRT Scale
- 1 1003-0201-00 Scribe (or equivalent)
- 1 1.0 centimeter square drafting template*

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634 OPTION 1 CRT, YOKE AND CALIBRATION CHANGE (cont.)

- 1 2.0 centimeter square drafting template*
- 1 black felt tip permanent marker.

* The Berol Rapidesign 2030 metric square template may be used with satisfactory results.

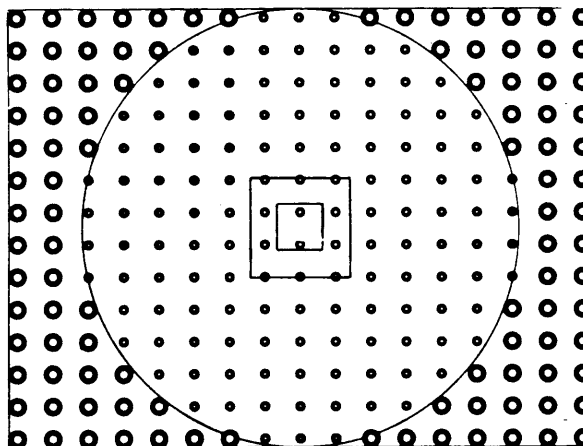
- Check the size of the 1.0 cm and 2.0 cm squares on the drafting template(s) to determine whether the template(s) allow for pencil lead diameter, and if so, how much. Use vernier calipers if available.
- Using the 1.0 cm and 2.0 cm squares of a drafting template, scribe two squares onto the non-silkscreened side of the scale. Take care to center them as accurately as possible. Since the scribe is narrower than a pencil lead, some correction will be needed when handling the scribe. Do not attempt to scribe the silkscreened side of the scale. This will damage the silkscreening.

If a metric square drafting template is not available, the Rapidesign type R-30 English square template can be used to approximate the 1.0 cm (.394 inches) and 2.0 cm (.787 inches) squares. Use the 3/8" (.405 inches) and 3/4" (.778 inches) squares. Again, use a little "english" on the scribe itself to come closer to the desired dimensions.

- "Paint" over the score marks with a black felt tip permanent marker. Immediately wipe off the excess ink with a tissue. A fine black line should now remain inside the scores. The completed scale should appear as shown in the example following.

This procedure makes possible several thousandths inches of error. In addition, local magnetic fields may displace the "undeflected" spot on a CRT faceplate several millimeters. Therefore, considerable discretion

should be used before declaring a given CRT to be in or out of specification.



--George Kusiowski
63-503 ext. 3928 (WI)

634 PERFORMANCE MODIFICATION #43894 CORRECTION

The instructions for modifying the high voltage supply boards in "634 Performance Modification #43894," Wizards Workshop issue 11-18 are in error. The second step should describe the tooling hole as being near lead 7 of T410, not near lead 1 as printed. Note also that figure 2 misrepresents the foil pad for lead 7 as being square instead of round as the rest.

In addition, the metal oxide varistor, RV437 is mistakenly referred to as "RV137" in the first step of the installation instructions and both figures 2 and 3.

--George Kusiowski
63-503 ext. 3928 (WI)

463X: HARD COPY UNITS--CLUTCH NOISE

The driveroller clutch may be the source of a low-pitched moan in the the 463X series of products. If you encounter this, check for clearance between the blue solenoid coil and the brass belt pulley. The solenoid coil is mounted with one slotted screw and a star wash-

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463X: HARD COPY UNITS--CLUTCH NOISE
(cont.)

er. Loosen the screw, pull the coil away from the pulley, and retighten. Check for normal operation by carefully inserting a strip of paper between coil and pulley during the copy cycle. The paper should move freely at all times.

If noise comes from inside the drive-roller clutch, it must be replaced. Never add any lubricant, spray or otherwise, to the clutch.

Special thanks to Bob Hulett, Albuquerque, for his SAR on this.

--Dan Harris
63-503 ext. 3313 (WI)

4663 INTERFACE CHANGES FOR VERSION 5
FIRMWARE

The purpose of this article is to inform its reader of the changes that happen to the 4663 interface (I/F) circuit boards when going from Version 1 thru 4 Firmware to Version 5 Firmware (V-5).

To go from a Version 1 thru 4 circuit board to a V-5 circuit board, perform the following modifications to the I/F boards.

1. Remove the wire connecting U171-20 to U181-20.
2. Remove the wire connecting U181-18 to U271-4.
3. Unsolder the wire connecting to U271-3 and solder it to U181-18. The other end of this wire is connected to U171-18.
4. Remove old microcircuits from U171 and U181.
5. On the RS-232 Interface circuit board, install the new microcircuit, p/n 160-0307-03 in the socket for U181.
6. On the GPIB Interface circuit board,

install the microcircuit, p/n 160-0309-03 in the socket for U171.

NOTE

Some GPIB Interface boards may have one lead of C137 lifted from its circuit board pad which is common with U137-9. The lead should be resoldered to the circuit board pad.

Once these modifications have been done to both interfaces, RS-232 and GPIB, they cannot be used in a Version 1 thru 4 product.

--Larry North
63-503 ext. 3926 (WI)

4663 LOGIC GROUND AND SAFETY GROUND

In the 4663 metal chassis parts are at safety ground, not logic or signal ground. Logic ground and safety ground are isolated to provide noise immunity and to satisfy U.L. safety requirements. Attaching the ground clip of a probe to logic ground provides a path through the scope or meter to safety ground. Noise introduced this way seems to be insignificant, but spurious interrupts could be created.

When checking the voltages in the motor and pen drive tests of the diagnostics, use TP427 for the meter probe common ground connection. It is advisable to connect the ground lead of the meter's probe to TP427 prior to running the diagnostics. This will remove the possibility of a spurious interrupt occurring while the diagnostics are running.

Under no circumstances should the A/C safety ground lead of a scope ever be isolated. In regards to 4663, connecting the oscilloscope probe's ground lead to a logic ground point prior to testing is always sufficient.

Our thanks to Bill Hurst in Syracuse for providing us with this information.

--Larry North
63-503 ext. 3926 (WI)

4663 PLATEN ELECTROSTATIC PAPER HOLDDOWN

Reference: Wizard Workshop, April 10, 1981, Page 27. "4663 Platen Cleaning Procedure, REV."

The 4663 platen's electrostatic holddown feature is very sensitive to moisture. Once the platen has been cleaned off with water it should be dried with a clean, dry towel.

WARNING

Under no circumstances should the platen's electrostatic holddown be energized during the cleaning procedure. If enough moisture is placed on the platen when its energized it can short it out.

If the electrostatic holddown ability of the platen is weak after a water cleaning, one probable cause may be a small amount of residual moisture. To determine if this is the case, the platen can be further dried off by turning the plotter on and letting it sit with the platen de-energized. The heat produced by the plotter's internal logic circuitry will help evaporate any residue moisture.

Our thanks to Robert House in Atlanta for providing us with this information.

--Larry North
63-503 ext. 3926

4663 RS-232 EXTERNAL CLOCK MODIFICATION

The 4663 RS-232 interface requires a modification to be able to use the external clock feature.

Below are the necessary steps that should be done to an RS-232 interface before it's installed in an external clock configuration.

1. Lift U837 pin 5 and tie it to U741 pin 4.
2. Lift U837 pin 9 and tie it to U741 pin 3.
3. Lift U851 pin 1 and tie it to U937 pin 13.

4663's with serial number B06 and above will have this modification already installed as a result of corporate modification #M44043.

--Larry North
63-503 ext. 3926 (WI)

8550 SOFTWARE AND HARDWARE FAILURES

The 8550 System has experienced some very intermittent failures causing the 8501 to "hang" making it impossible to access the discs. Further investigation will note the Processor Busy light will be extinguished on the 8501. The only way to continue is to RESTART the entire system. There are two different causes that give the same failure indication (Processor Busy light extinguished).

The first failure occurs only when the user has assigned the brief name "Spool". The brief name need only be assigned, not necessarily used to cause a failure. The cause of this failure is a "Software Bug" in the 8501 operating system. The following is an approved patch for Version 1.1 of D05-50 to correct the error.

```
>DATE ..... <CR>
>USER /VOL/sysvol TEKTRONIX <CR>
>SYSPATCH 8501.SAV <CR>
*D 1638 <CR>
00001638 F7 09 D0 F1...
*P 1638 5F 00 4A 01 <CR>
*D 14A <CR>
0000014A 00 00 00 00 00 00 00...
*P 14A DF 09 0C 08 C0 0B <CR>
*P 150 02 03 5F 00 3C 16 CE 15 <CR>
*P 158 01 00 DF 09 10 0A F5 01 <CR>
*E <CR>
>
```

Then RESTART the 8501.

The second failure cause is different from the first even though the same failure indication is observed (extinguished Processor Busy light). Unlike the previous cause, the

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System does not necessarily have to be doing any particular function. In fact, the failure occurs most often when the System is "Booted Up" and no disc accesses are being made. Again the Processor Busy light will extinguish making the System appear to "hang". Due to the intermittent nature of this failure, it is difficult to identify what is causing the failure. In fact, the failure has yet to be identified to be a failure of any particular board in the system. To date there has been some success in replacement of the 32K Memory Board. But keep in mind, Memory Board replacement may not be the final cure. Sustaining Engineering is continuing research and ultimately will propose a modification which I will publish when available.

--Brad Griffin/Kevin King
92-236, Ext. 1608/1636



92-515

HAPPY HALLOWEEN!

MICHAEL A MIHALIK

COMBINATION WIZARD