PRELIMINARY

This guide can be used to optimize falltime and aberrations in the 1502.

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CNA
Last Rev. 8/29/84

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FALLTIME MEASUREMENT

I. GAIN ADJUSTMENT

A) Connect the precision 50ohm terminator to the cable connector.

B) Set the mp/Div control to 200. Set the feet/Div control to 20 and multiplier control X1.

C) Adjust the zero Ref set control so that the pulse is at center screen. Adjust the gain for exactly 5 Divisions of Amplitude.

D) Set feet/Div control to 1 (.25 for metric). Set the multiplier to X.1. Set the distance dial to 000. Set all Dielectric push buttons out.

II. FALLTIME CHECK

A) Remove 50 ohm terminator and install a GR to BNC adapter (Tek part no. 017-0064-00) and a GR short (Tek part no. 017-0087-00).

B) Turn the zero Ref set FCCW adjust the position of the baseline so that it is exactly 1-1/2 divisions up from the bottom graticule line.

C) Slowly turn the zero Ref set clockwise, until the falling edge of the pulse is on the second graticule line up from the bottom. (Do not move the position control) (See fig. 1)

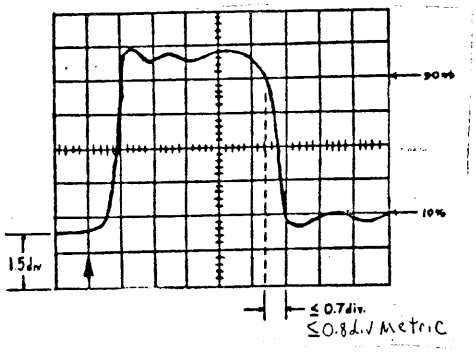


Figure 1

D) Measure the falltime (reflected risetime) from the the point where the falling edge of the pulse is touching the second graticule down from the top to where it touches the second graticule line up from the bottom. (See fig. 1)

E) Make sure that there is no more than .7 division change (.8 div. for metric) of the falling edge of the pulse.

F) If falltime does not make spec. then the stripline needs to be reworked.

Dress stripline as follows:

A) Dress C1639 and C1630 as in fig. 2. Make sure that they don't short to anything.

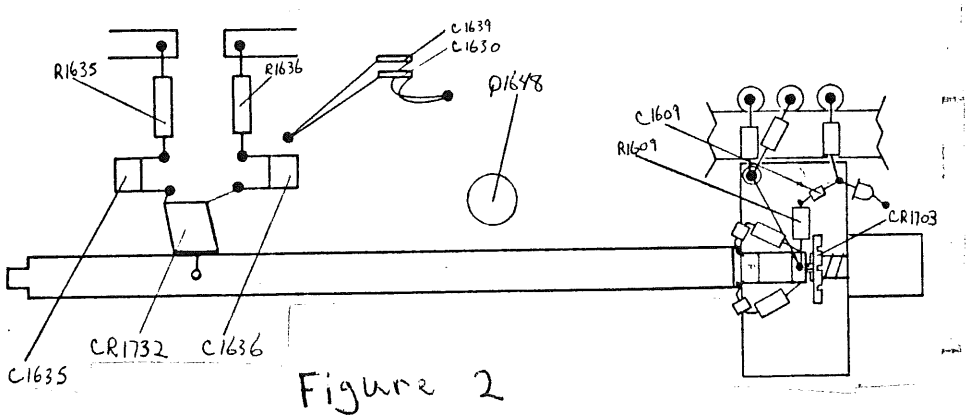


Figure 2

The leads on C1635 and C1636 should have a little bit of lead between the solder and the insulation of the capacitor, but no more than about 1/16 of an inch. The caps should lie flat on the board.

B) The sampling diode CR1732, should be sitting with the side that is closest to the stripline, down on the board and next to the edge of the stripline. (See fig. 3) Do not fill hole on the stripline (next to the diode) with solder. The other end of the diode should be up off the board (see fig. 3).

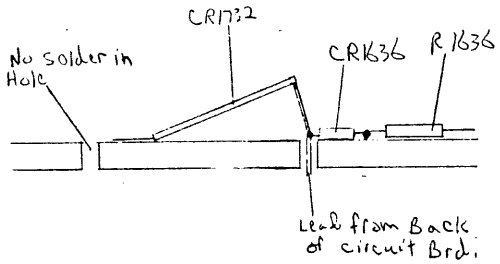


Figure 3

C) Dress the backend of stripline as in fig. 2, except, that the lead on R1609 that is soldered to C1609 should be as short as possible and the other lead on R1609 can be as long as needed.

D) Put two screws on stripline shield. One near the 20 ma TD (CR1703) (see fig. 2) and one near the sampling diode CR1732.

E) Bend the extra lead on Q1648 (see fig. 2) so that it hangs over the top edge of the stripline shield.

F) Put three screws in the sampling circuit cover. (One near the lead of Q1648 which is on the stripline shield and the other two screws anywhere so that the shield is secure.)

G) Adjust avalanche, snap off, LF comp, and TD bias. See manual page 4-14 #89. Check aberrations and falltime. Note: if aberrations or falltime are out of spec. see stripline trouble-shooting guide.

STRIPLINE TROUBLESHOOTING GUIDE

The Stripline Troubleshooting Guide explains the most common fixes (in order, most likely, to least likely fix) of some of the possible problems that could happen on the stripline. The section on how components affect the stripline explains the effects that different component dress can have on aberrations which will directly effect falltime. These should only be used when the normal values or dress of the stripline won't work. Some efficiency of the stripline is lost when component values or dress are changed to their maximum or minimum allowed values.

A "Bateman Bandaid" is referred to in this guide. It is used to lower the 2nd aberration or raise the valley after the 2nd aberration. It should only be used when all other alternatives have been tried. The Bateman does cover up other problems which can affect falltime. See fig. 4 on how to build a Bateman Bandaid.

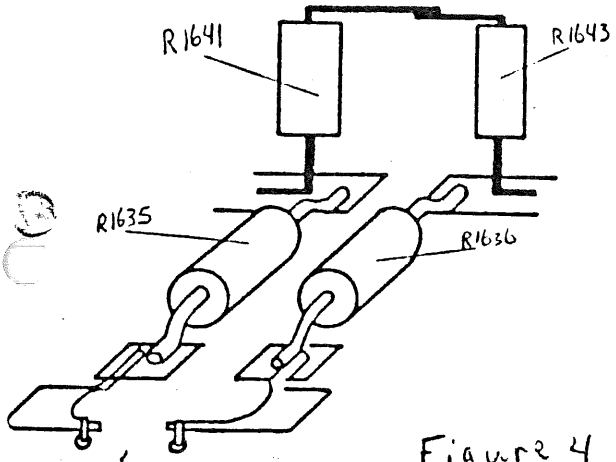
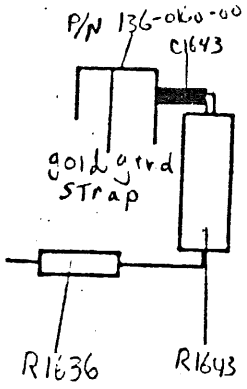


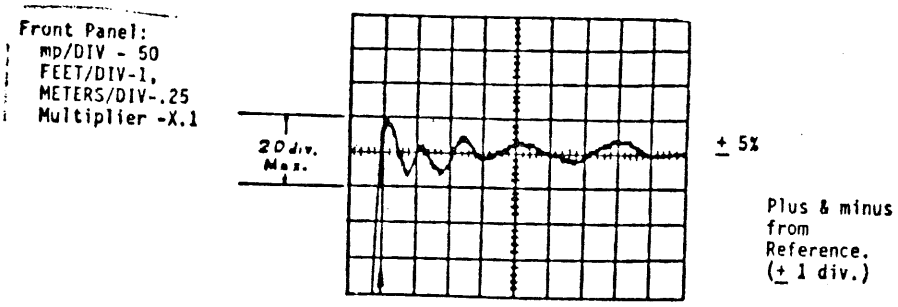
Figure 4



Sideview

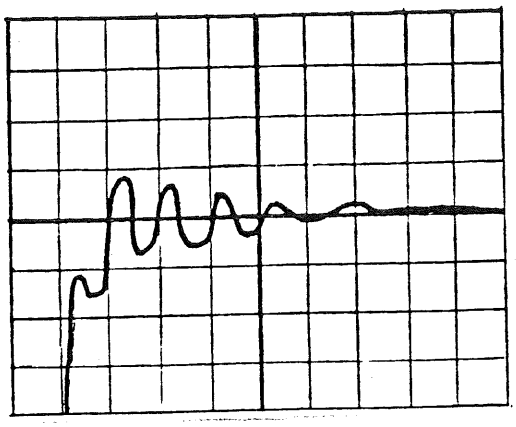
"Bateman":

C1643
R1643
R1641
gold grnd strap - 136-0160-00
refer to pulser/sampler schematic



Typical aberrations for minimum falltime.

LOW FRONT CORNER



1) Redress backend and front end of stripline the same as in the stripline dress procedure.

2) Check that the back side of the 48ohm pellet resistor R1701 is soldered to the stripline.

3) Raise the front 10 pf C1635 capacitor above the board.

4) Replace the short term capacitor C1701.

5) The "short term" resistor R1702 is selectable from 75ohm to 510ohm. A low value raises the front corner and high value lowers the front corner. When the front corner is too low a 100ohm resistor is generally used. Maximum and minimum values should be used only as a last resort.

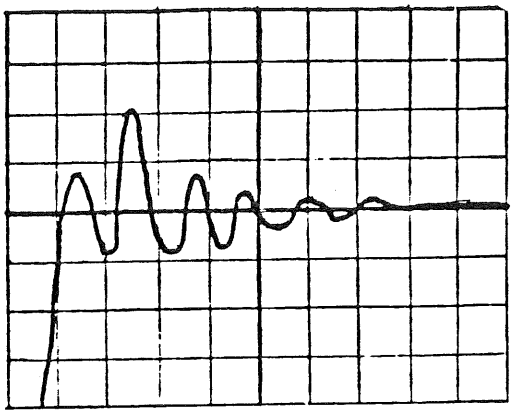
6) Select a 20 ma TD CR1703 for best aberrations.

↑ This is Not selectable IN the manual.

Ed W

HIGH SECOND ABERRATION

Pg 5



1) Redress the front end and back end of the stripline the same as in the stripline dress procedure.

2) Remove any excessive solder from all areas on the stripline.

3) Change the 10 ma TD CR1609.

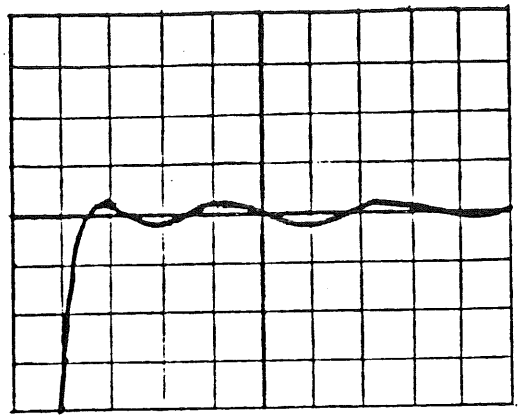
4) Change the rear 10 pf cap C1636, leave leads as short as possible. Use smallest bodied capacitor you can find.

5) Change the snap-off diode CR1632.

6) Change the sampling diode CR1732.

7) Install Bateman Bandaid R1643, C1643, R1641 see procedure on how to build.

NOT ENOUGH RINGING (SLOW FALLTIME) Pg6



1) Redress back end and front end of stripline same as in the stripline calibration procedure.

2) Make sure avalanche and snapoff adjustments are adjusted and working properly.

3) Make sure TD Bias is working properly. See manual page ~~4-14~~ 4-14.

4) Things that can cause the aberrations not to ring enough:

A)	Bad snap-off diode	CR1632
B)	Bad 20 ma TD	CR1703
C)	Bad sampling diode	CR1732
D)	Bad 10 ma TD	CR 1609
E)	Bad 10Pf caps	CR1635 & 1636

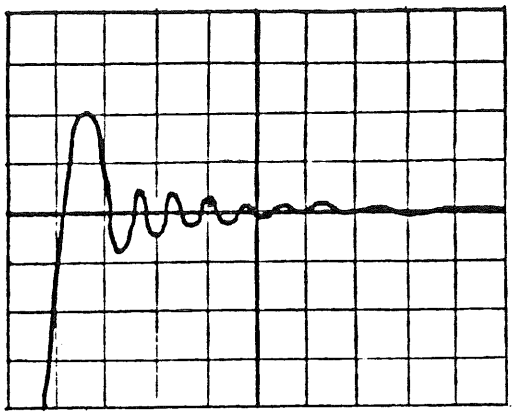
The above are in order starting with the most likely to cause the problem.

5) Remove excess solder from all areas on the front and back ends of the stripline.

6) Raise C1635 & C1636 bodies up above the Brd.

7) Push the 2.7ohm resistor R1703 back towards the 20 ma TD.

HIGH FRONT CORNER



1) Redress backend and front end of the stripline the same as in the stripline dress procedure.

2) Remove any excessive solder from all areas on the front end and back end of the stripline.

3) Change the "short term" capacitor C1701.

4) Check 48ohm pellet resistor R1701 for the proper value.

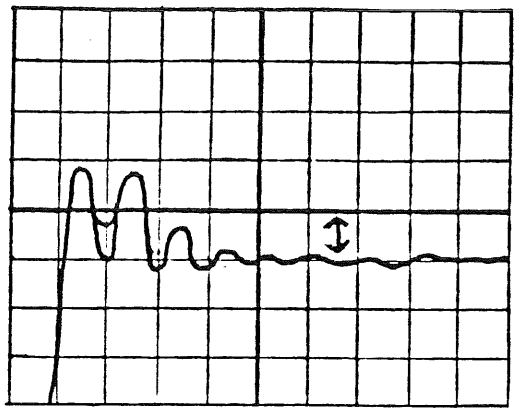
5) Select a 20 ma TD CR1703 for the best aberrations. < Not selectable

6) Shorten the leads on the front 10pf cap. C1635.

7) Change the 10 ma TD CR1609.

8) The short term resistor R1702 is selectable, change only as a last resort. The normal value is 220ohm. It can be changed from 75ohm to 510ohm. Low value raises the 1st aberration and high value lowers the 1st aberration.

OFFSET BASELINE



1) Redress backend and front end of stripline the same as in the stripline dress procedure.

2) Change the "long term" leadless cap. C1706 on the back end of the stripline.

3) Make sure the 48ohm pellet resistor R1701 is 48ohm.

4) Change the 20 ma tunnel diode CR1703 for best < Not selectable abberations.

5) Change the 10 ma TD CR 1609.

6) The "long term" resistor is selectable, change the value of the resistor only as a last resort. The normal value is 750ohm. It can be changed from 470ohm to 1500ohm. 470ohm lowers the long term aberrations and 1500ohm raises the long term aberrations towards the top of the crt.

HOW COMPONENTS AFFECT THE STRIPLINE

BACKEND OF STRIPLINE

1) 20 MA TUNNEL DIODE could cause slow falltime and any abnormal aberrations.

2) 10 MA TUNNEL DIODE CR1609 can cause abnormal aberrations and slow falltime. By changing the length of the anode lead, the second aberration can be changed. Longer lead decreases 2nd aberration. Changing the lead length on the diode will also affect ringing of the aberrations.

3) 1.5pf CAP. C1602 will lower or raise the second aberration. By lengthening the leads the second aberration will get lower and shortening the leads on the cap, the 2nd aberration will get higher. Changing the lead length of the capacitor usually does not have an affect on ringing but it will have an affect on falltime.

4) 39ohm RESISTOR R1609. By changing the lead length of the lead soldered to the 1.5Pf cap the ringing of the aberrations will get bigger. By shortening the lead, the aberrations will get smaller.

5) 2.7ohm RESISTOR R1704. This resistor has the same affect as the 39ohm resistor (#4). By moving the resistor towards the 20 ma TD the aberrations will get bigger and by moving the resistor away from the 20 ma TD the aberrations will get smaller.

6) 220ohm RESISTOR R1702 (short term resistor). This resistor directly affects the first aberration. By changing the value from 75ohm to 510ohm the first aberration can be raised (75ohm) or lowered (510ohm).

7) 750ohm RESISTOR R1707 (long term resistor). This resistor affects the third aberration and beyond. Values can be from 470ohm to 1500ohm. 470ohm will lower the long term aberrations and 1500ohm will raise the long term aberrations.

8) 48ohm PELLET RESISTOR R1701. By removing or adding small amounts of solder to the connection between the pellet resistor and the end of the stripline the aberrations can be radically changed. By removing solder from the bottom side of the pellet the front corner can be lowered. This will also affect the rest of the aberrations. By removing solder from the top of the pellet resistor this might help raise the front corner and help ringing.

FRONT END OF STRIPLINE

1) SAMPLING DIODE CR1732. The position of the diode in relation to the stripline has a radical affect on the aberrations and falltime. By raising the diode off of the brd the aberrations will ring bigger and falltime will be faster. By moving the diode away from the stripline the or closer to the stripline will affect the shape of the shape of the aberrations will be affected in an unpredictable way.

2) 10pf CAPS C1635 & C1636. By changing the lead length of or by raising the caps, one or both will change the first or second aberration. By raising or lengthening the leads of C1635 the first aberration will get higher. By lengthening the leads or raising C1636 the 2nd aberration can be raised, raising the cap will move the 2nd aberration away from the first aberration. By raising both caps the aberrations will ring bigger.

3) 150ohm RESISTORS R1635 & R1636. (If the instrument will not meet the vertical positioning spec when snap off is adjusted properly.) The vertical position of the trace can be moved down towards the bottom of the crt by moving the leads of the resistor that are soldered to the leadless caps as far as possible towards the front of the instrument.

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TEK INTER-OFFICE COMMUNICATION

TO: List

DATE: September 5, 1984

FROM: Tom Fisher, CNA Redmond

SUBJECT: 1502 Falltime/Stripline

Falltime measurement in the 1502 manual appears to be open to interpretation.

Enclosed is a procedure we feel is more complete and will lead to more consistent results. Also included is a "Stripline Guide", describing component dress and their affects on aberrations and falltime.

We would like your evaluation (and comments) of the procedure and guide, for completeness and usefulness. We plan to change the manual Falltime Measurement Procedure and add the "Guide" as a manual "Technical Application Note".

Your input would be greatly appreciated. Please return the enclosed evaluation before October 9, 1984. If you have any questions, please do not hesitate to contact me at (503) 923-4432.

Thanks,

Tom Fisher
Product Assurance Engineer

TF/aw
List (enclosure): Liz Docken, Dayton
Dennis Smykowski, Detroit
Jim Hill, FSC 56-103

cc: John Friedenbach, Dayton
Dave Meyer, Detroit
Dwight Whittum, FSC 56-103
Dave Gillen, D.C.
Larry Davies, St. Louis
Doug Comstock, Tek Redmond

Evaluator(s):

1502 Stripline Guide Feedback Form

Falltime Measurement

1. Completeness:

   Too Much _____
   Everything I needed _____
   Needs more information _____

   Comments:

2. Usefulness:

   Much better than present manual _____
   Same as present manual _____
   Not as good as present manual _____

   Comments:

3. I would like to see incorporated in manual:

   Definitely _____
   Good idea _____
   Don't care _____
   Needs work _____

   Comments:

Stripline Guide

1. Completeness:

   Too much _____
   Adequate _____
   Needs work _____

   Comments:

2. Usefulness:

   Great help _____
   Some help _____
   Didn't help _____

   Comments:

3. I would like to see incorporated into manual (as technical application note):

   Definitely _____
   Good idea _____
   Don't care _____
   Better off w/o _____

   with the following additions/deletions:

   Comments:

Return by October 9, 1984 to:

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