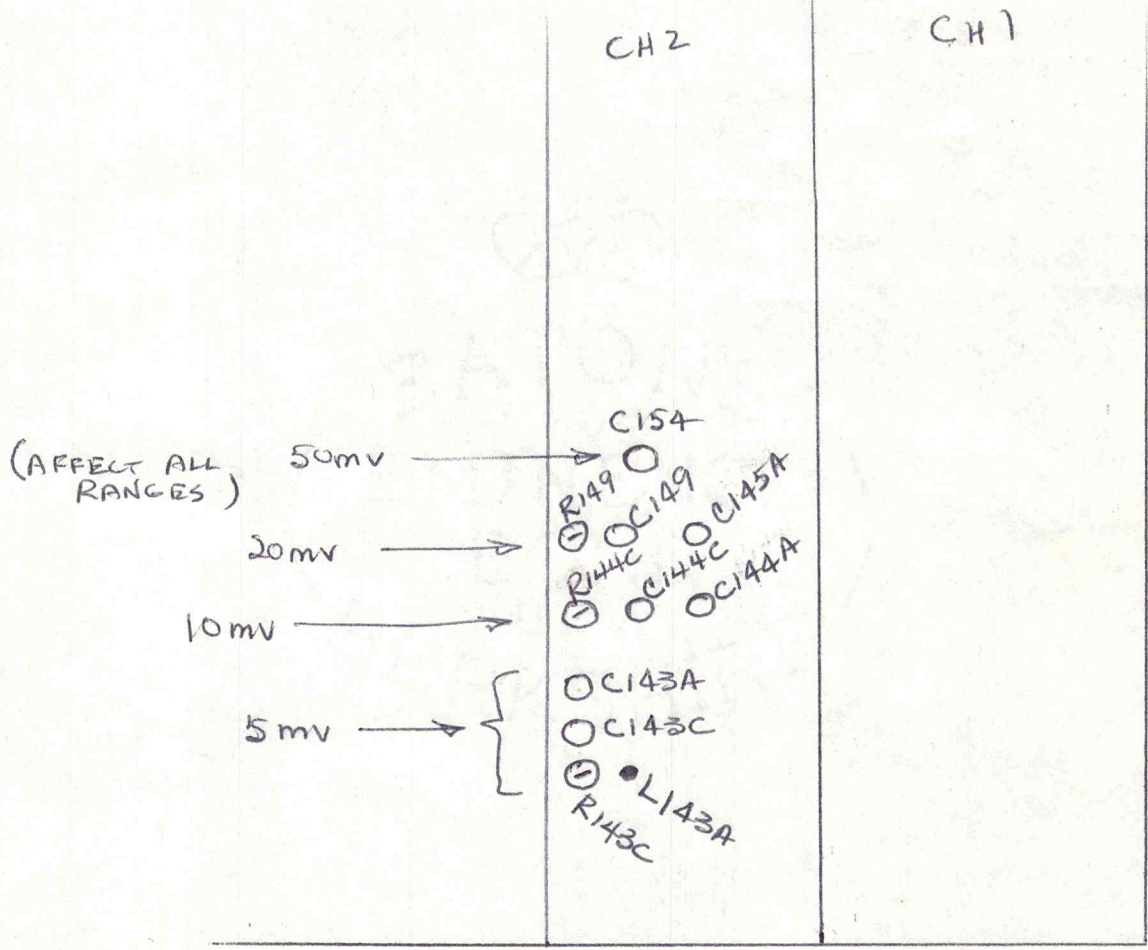


453's WITH RET FRONT END.



Bottom Front View.

Handwritten text at the top left of the page.

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Handwritten text, possibly "AD" or similar.

Handwritten text, possibly "AD" or similar.

Handwritten text with a dashed line and a circled mark.

A large block of handwritten text, possibly a list or notes, including words like "COTTON" and "COTTON".

Handwritten text at the bottom of the page.

453 Calibration Outline

- | | |
|--|---|
| 1. Adjust -12v Supply (R1122) | $\pm 0.012v$ 2mv max ripple |
| 2. Adjust 1v Calibrator (R1152) | Remove Q1255 & adj 12v supply for 1v
$\pm 0.002v$ at Cal Output |
| 3. Check 0.1v Cal position | $\pm 0.001v$ |
| Reinstall Q1255 | |
| 4. Check 12v Supply | 12.1v $\pm 0.12v$ 2mv max ripple |
| 5. Adjust 75v Supply (R1182) | 75v $\pm 0.075v$ 2mv max ripple |
| 6. Adjust HV (R900) | -1950v $\pm 60v$ |
| 7. Adjust CRT Grid Bias (R940) | Set Intensity for 12v at TP1047. Use Single Sweep--Adj for no spot on screen. |
| 8. Adjust Z Axis Comp (C1036) | Probe TP1047 with X10 probe--use approx. 1 1/2 v of signal. |
| 9. Adjust Trace Alignment (R980) | Located right side near Cal Out |
| 10. Adjust Y Axis Alignment (R989) | Located left rear of scope |
| 11. Adjust Geometry (R982) | Located bottom rear of scope |
| 12. Adjust Astigmatism | Located right side near Cal Out |
| 13. Adjust Step Atenn Bal (R30, R130) | No shift 20 to 5mv |
| 14. Adjust Position Center (R55, R155) | Center position pots with trace centered |
| 15. Adjust Vert Gain (R90, R190) | Use .1v cal signal at 20mv/div |
| 16. Check AC-DC-Gnd switches | |
| 17. Check Added Mode | Use 50mv cal signal |
| 18. Check Deflection Accuracy | $\pm 3\%$ |
| 19. Check Cascaded Deflection Accuracy | Less than 1mv/div |
| 20. Check Var v/div Pots | |
| 21. Check Compression & Expansion | Use 2 div of signal. Both Chan for 0.15 div max. |

Adjustment Outlines

1. Adjust 12V Supply (R122) ±0.015V 50V max ripple
 2. Adjust LV Calibration (R125) remove (R125) & 12V supply for 10 ±0.005V at 100 Ohm
 3. Check 0.1V Cal Position ±0.01V
- Removal of R125
4. Check 12V supply 12.1V ±0.15V 50V max ripple
 5. Adjust 70V supply (R122) 70V ±0.02V 50V max ripple
 6. Adjust HV (R100) -1000V ±0.0V
 7. Adjust CRT Grid Bias (R140) Set intensity for 10 at TR104. Use single sweep--off for no spot on screen. Probe TR104 with X10 probe--see approx 1 1/2 V of signal.
 8. Adjust X Axis Comp (C103) Located right side near Cal Out
 9. Adjust Trace Alignment (R101) Located left side of base
 10. Adjust Y Axis Alignment (R102) Located bottom rear of scope
 11. Adjust Geometry (R103) Located right side near Cal Out
 12. Adjust Astigmatism
 13. Adjust Step Attenu Bal (R130, R131) No signal 50 to 50V
 14. Adjust Position Center (R132, R133) Center position pins with trace centered
 15. Adjust Vert Gain (R104, R105) Use 10V cal signal at 200V/div
 16. Check AC-DC-Off switches
 17. Check Loaded Mode Use 500V cal signal
 18. Check Horizontal Accuracy ± 3%
 19. Check Channel Deflection Accuracy less than 100V/div
 20. Check V₀ V/div Trace
 21. Check Compression & Expansion Use 2 div of signal. Both Chan for 0.1V div max.

22. Check Grid Current 0.4 div max at 5mv/div
23. Check Alternate & Chopped Chopped rate: 1.7-2.5 us/cycle
24. Adjust v/div Compensations

Position	Ch 1		Ch 2	
	spike	top	spike	top
20mv	-	C17	-	C117
50mv	C6C	C6B	C106C	C106B
.1v	C7C	C7B	C107C	C107B
.2v	C8C	C8B	C108C	C108B
.5,1v	-	C11	-	C111
2v	C9C	C9B	C109C	C109B

25. HF Compensations Use 5 div of 100kHz signal

Position	Ch 1	Ch 2	Observe
20mv	C263, C265		Flat top
	R328, C328, C336 R45C, C45A, C45C	C145C, C145A, R145C	Front Corner
10mv	C44A, C44C	C144A, C144C	Front Corner
5mv	L43A, C43A, C43C, R43C	L143A, C143C, C143A, R143C	Front Corner

26. Check Bandpass Both Channels

Position	Bandpass
20mv	52.5MHz
10mv	46.5MHz
5mv	41MHz

~~27. Check Added Mode Bandpass 20mv/div--52.5MHz min~~

~~28. Check Cascaded Bandpass 20mv/div--25MHz min~~

29. Check Ext. Horiz. Bandpass 5MHz min--use Ch 1 Only Trig--Internal Trig--191 to Ch 1 input--Horiz Display to Ext. - **MODE TO CH2.**

30. Check CMR Use 20mv/div--Added--80mv of 20MHz--Observe less than 8mv

31. Adjust A & B Trig. Level Centering (R462, R662) Use 0.2div of cal signal

- 24. Adjust with Compensation
- 25. Check Alignment & Change
- 26. Check Grid Element

Ch 2		Ch 1		Position
Spine	Top	Spine	Top	
-	01Y	-	01Y	20m
0100	0100	000	000	30m
0100	0100	010	010	1v
0100	0100	000	000	2v
011	-	011	-	2.1v
0100	0100	000	000	2v

Use 2 div of 100ms. Equal

Position	Ch 1	Ch 2	Observed
20m	0200, 0200		Right Top
30m	0300, 0300, 0300, 0300	0100, 0100, 0100, 0100	Front Corner
10m	0100, 0100	0100, 0100	Front Corner
20m	0200, 0200, 0200	0100, 0100, 0100	Front Corner

Both Channels

Position	Bandpass
20m	20.0MHz
10m	10.0MHz
5m	5.0MHz

- 27. Check level of Bandpass
- 28. Check level of Bandpass
- 29. Check level of Bandpass
- 30. Check CMR
- 31. Adjust A & B Trig. Level Centering (1402, 1402)

32. Adjust Norm Trig DC Level (R285)
33. Adjust Ch 1 Trig DC Level (R60)
34. Check Single Sweep
35. Check A Sweep Trig'd light
36. Check Auto Recovery
37. Adjust Swp Start (R758) and A Swp Cal (R531)
Use lms marks--A swp lms/div--B swp 5us/d
Delay Time Mult at 1.00--Adj R758--Delay
Time Mult at 9.00--Adj R531--Interaction
Check 5.00 for linearity \pm 0.02
38. Check Delay Jitter
A swp lms/div--B swp lus/div--lms marks
Check at 1.00 & 9.00--Less than 0.5 div
jitter.
39. Adjust Norm Gain (R835)
Horiz Display A--Aswp lms--lms marks--
Adj for 1 mark/div
40. Adjust Mag Gain (R845)
Use lms and .lms marks
41. Adjust Mag Regis (R855)
42. Check A Sweep Length
Full: 10.5-11.5 Div
4 Div: Not more than 4 div
43. Check A var & uncal Light
44. Adjust B Cal (R741)
Horiz Display to Dly'd Swp--A swp 2ms
B swp lms--lms marks--Adj for 1 mark/div
45. Check B Sweep Length
10.5-11.5 div
46. Check B var & uncal Light RIGHT SIDE OF SCOPE
47. Adjust lus Timing (A: C530A--B: C740A) \pm 3%
48. Adjust High Speed Linearity (C882, C892) Use X10 mag--lus/div
49. Check A & B Sweep Rates \pm 3%
50. Check B Ends A Operation

- 32. Adjust Norm Trig DC Level (R282)
- 33. Adjust Ch 1 Trig DC Level (R80)
- 34. Check Single Sweep
- 35. Check A Sweep Trig'd Light
- 36. Check Auto Recovery
- 37. Adjust Swp Start (R758) and A Swp Cal (R281)
- 38. Check Delay Jitter
A swp time/div--B swp time/div--line marks
Check at 1.00 & 0.00--less than 0.5 div
jitter.
- 39. Adjust Norm Gain (R832)
Horiz Display A--A swp time--line marks--
Adj for 1 mark/div
- 40. Adjust Mag Gain (R842)
Use line and line marks
- 41. Adjust Mag Range (R852)
- 42. Check A Sweep Length
Full: 10.0-11.5 Div
Div: Not more than # div
- 43. Check A var & uncal Light
- 44. Adjust B Cal (R741)
Horiz Display to Div'd Swp--A swp Sm
B swp time--line marks--Adj for 1 mark/div
- 45. Check B Sweep Length
10.0-11.5 div
- 46. Check B var & uncal Light
- 47. Adjust Line Timing (R: C230A--B: C740A) # 35
- 48. Adjust Line Speed Linearity (R802, R803)
Use X10 mag--1.00/div
- 49. Check A & B Sweep Rates # 35
- 50. Check B Ends A operation
- 51.

22.77 kHz of error

51. Adjust & Check Ext Horiz (R645) Use .1v cal signal in Ch 1--Ch 1 only
Trig--B Trig Int DC--Adj for 5 div Horiz
Deflection. *CH 1 $\frac{1}{cm} = 20mv$*
Apply 2v cal signal to Ext. Horiz in--
Observe 6.5-8.7 div deflection.
Check Ext $\div 10$: apply 20v cal signal--
Observe 6.2-9.2 div deflection.
52. Check Z Axis Operation 5v square wave modulates
53. Check Trace Finder
54. Adjust & Check Calibrator Rep Rate: Adj against lms marks
Risetime: 1us or less
Duty Cycle: 50% \pm 1%
-TIME X100 -- LESS THAN 10CM SHIFT + TO -
55. Check Gate Output Signals 12v square waves

Use 1v cal signal in 2v-1-on 1 only
Trig-B Trig 1v-0.1 for 2 div Horiz
Deflection. 2v-1.5
Apply 2v cal signal to axis. Horiz in--
Observe 2v-0.1 div deflection.
Check 2v-1.0: apply 20v cal signal--
Observe 2v-2.2 div deflection.

2v square wave modulated

Rep rate: Adj. 2v-1.5
Horizontal: 2v-1.5
Duty Cycle: 50% ± 1%
2v-1.5
2v square wave

21. Adjust & Check the Horiz (R21)

22. Check & Axis Operation

23. Check Trace Finder

24. Adjust & Check Calibrator

25. Check Gate Output Signals