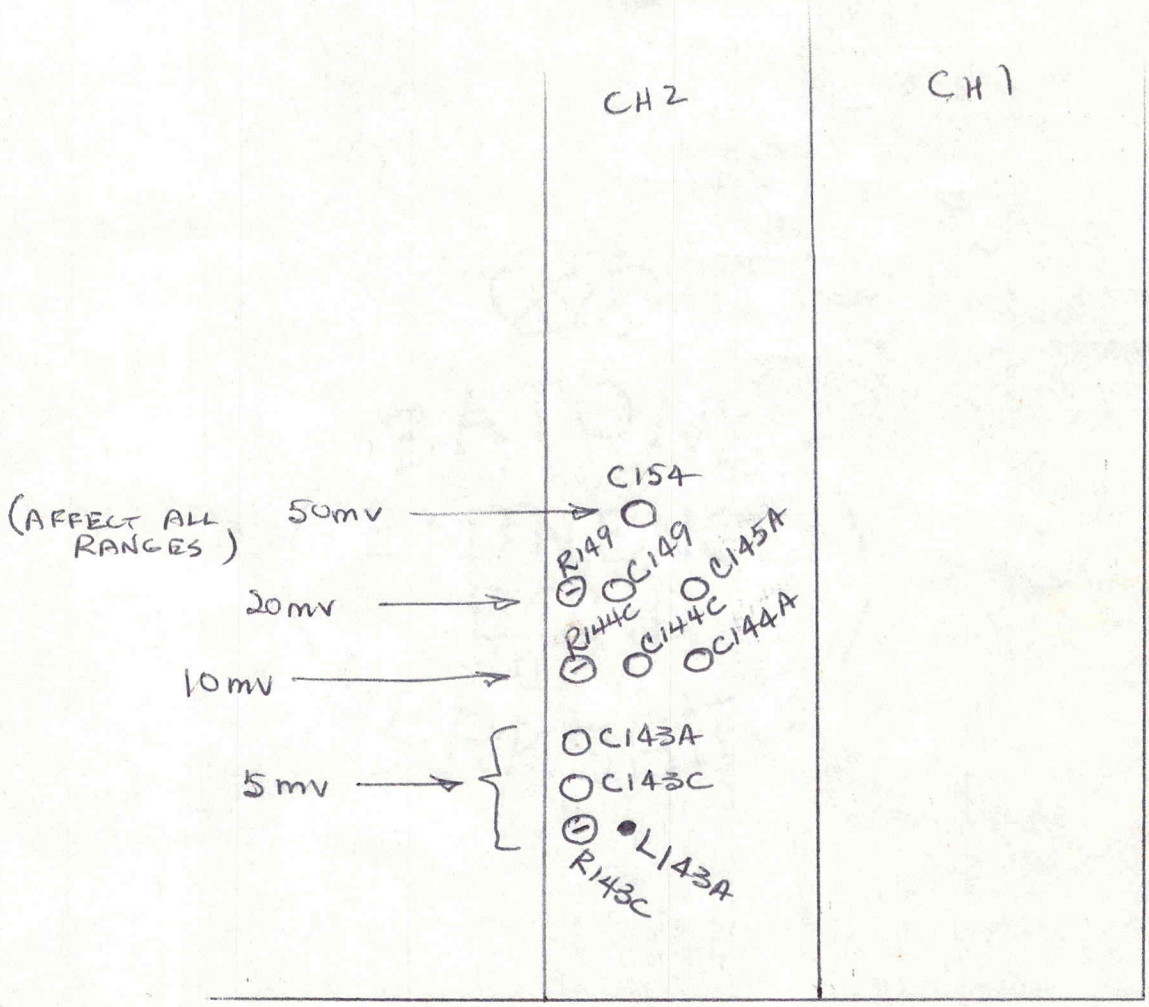
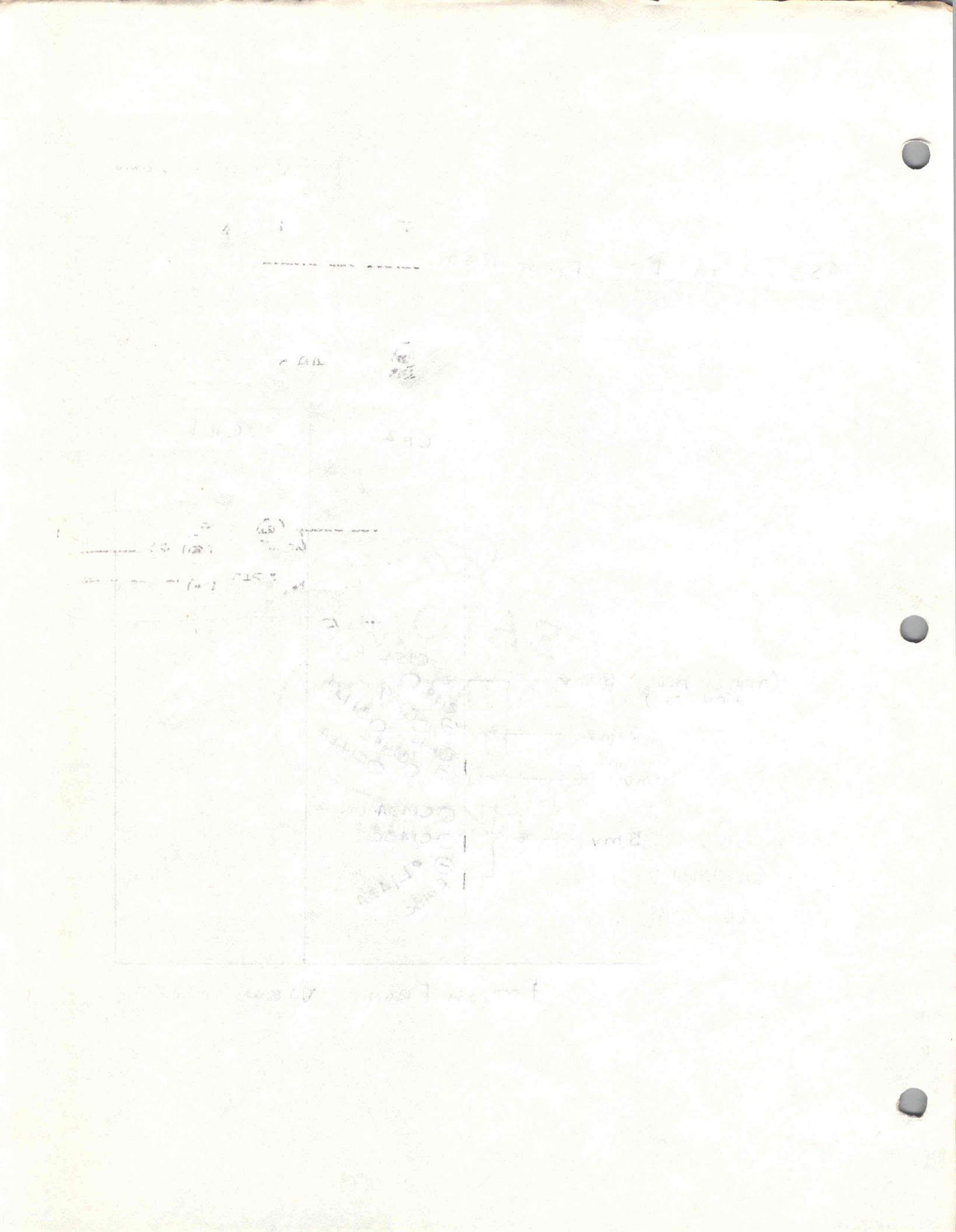
453's WITH FET FRONT END.



BOTTOM FRONT VIEW.



453 Calibration Outline

1.	Adjust -12v Supply (R1122)	±0.012v 2mv max ripple
2.	Adjust 1v Calibrator (R1152)	Remove Q1255 & adj 12v supply for 1v ± 0.002v at Cal Output
3.	Check 0.1v Cal position	± 0.001v
	Reinstall Q1255	
4.	Check 12v Supply	12.1v ± 0.12v 2mv max ripple
5.	Adjust 75v Supply (R1182)	75v ± 0.075v 2mv max ripple
6.	Adjust HV (R900)	-1950v ± 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	± 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.

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

	Ch 1		Ch 2	
Position	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

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 1ms marks--A swp 1ms/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 ± 0.02

38. Check Delay Jitter

A swp 1ms/div--B swp 1us/div--1ms marks Check at 1.00 & 9.00--Less than 0.5 div jitter.

39. Adjust Norm Gain (R835)

Horiz Display A--Aswp 1ms--1ms marks--Adj for 1 mark/div

40. Adjust Mag Gain (R845)

Use 1ms and .1ms 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 1ms--1ms 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 1us Timing (A: C530A--B: C740A) ± 3%

48. Adjust High Speed Linearity (C882, C892) Use X10 mag--.1us/div

49. Check A & B Sweep Rates ± 3%

50. Check B Ends A Operation

32. Adjust Norm Trig DC Level (R29?)

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 Sweet (R130) and A Swp Cal (R93?)

38. Check Delay Jitter

39. Adjust Norm Gain (R83?)

40. Adjust Mag Gain (R8??)

41. Adjust Mag Regis (R???)

42. Check A Sweep Length

43. Check A var & uncal Light

44. Adjust B Cal (R?4)

45. Check B Sweep Length

46. Check B var & Uncal Light

47. Adjust Trig Points (D: C?3?A--B: C?4?A)

48. Adjust High Speed Linearity (C??2, C??2)

49. Check A & B Sweep Rates

50. Check B Trace Operation

51.

Use Time marks--A Swp Tme\div--B Swp ?/a\d
Delay Time Mult at 1.00--Adj R??B--Delay
Time Mult at 9.00--Adj R?3?--Intensification
Check 9.00 for linearity ± 0.02

A Swp Tme\div--B Swp Tme\div--Time marks
Check at 1.00 & 9.00--Less than 0.5 div
jitter.

Norm Display A--Aswp Tme--Time marks--
Adj for 1 mark\div

Use Tme and .Tme marks

Full: 10.5-11.5 Div
4 Div: Not more than 4 div

Norm Display to Div'd Swp--A swp Tme
B swp Tme--Time marks--Adj for 1 mark\div

10.5-11.5 div

Use X10 mag--.Tme\div

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 V/cm - 20mv Apply 2v cal signal to Ext. Horiz in--Observe 6.5-8.7 div deflection. Check Ext ÷ 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 1ms marks Risetime: 1us or less Duty Cycle: 50% ± 1% .1MS X100 -- LESS THAN 10CM SHIFT + TO -.
55. Check Gate Output Signals	12v square waves