

FACTORY CALIBRATION PROCEDURE

5L4N

For Internal use Only

August 1974

EQUIPMENT REQUIRED

All TEKTRONIX test equipment must be calibrated to Factory Test Limits using methods specified in the applicable TEKTRONIX Factory Calibration Procedure. Other test equipment should be calibrated to its manufacturer's specifications. Any exceptions to test equipment accuracies are noted on this Equipment Required List.

Equivalent test equipment may be used. A Staff Engineer must approve any substitutions.

a. TEKTRONIX INSTRUMENTS

- 1. DC-501 COUNTER
- 1. 5103N-D11 MAINFRAME
- 1. 5A15N VERTICAL
- 1. LFSWG
- 1. SAC - 067-0502-00
- 1. TYPE 184 Time Mark Generator
- 1. D-C Voltage Bridge

b. CALIBRATION FIXTURES AND ACCESSORIES

- 1. P6006 x10 probe or equiv. -----010-128
- 2. Plug in extenders -----067-0645
- 2. 50 Ω BNC 40" cable -----012-0057-01
- 1. x5 attenuator -----011-0060
- 1. BNC flexible "T" -----
- 1. BNC cable -----175-1178-00
- 1. BNC "T" connector -----103-0030-00
- 1. x2 attenuator -----011-0069-01

c. Other Manufacturer's Equipment

- 2. H-P651A or H-P654A
- 1. H-P355C & D attenuator set
- 1. Triplet model 630-NA or equivalent

d. In House Specials

- 1. Precision 50 Ω termination
- 1. Precision 600 Ω termination
- 1. 6" special BNC to BNC
- 1. BNC to 2 pin Harmonica
- 1. Log Sweep Generator

d. In House Specials (cont.)

1. 3 pin harmonica extender cable
1. 47pf normalizer
1. -40dBv cal box
3. 10K resistors (0707 connectors)
2. wire straps (4") with 0707 connectors

1. PRECALIBRATION INSPECTION

a. Visual

check for unsoldered joints, rosin joints, lead dress & long ends. Check for loose hardware, smooth operation of controls, proper indexing and knob spacing from front panel.

b. Preset - midrange all pots; internal & front panel.

c. Resistance checks: neg lead to GND; use 1K scale; steps omitted are open;

5L4N - all push-push = out; span = 10K; knobs centered or (if applicable) in detent. (ref - lev = -10dB).

	VERTICAL		HORIZONTAL
A1 - 200K	◇ 9	B2 - 3K	A2 - 4.5K B5 - 7-8K
A2 - 4.5K		B5 - 2.5K	A7 - 3-4K B7 B7 - 4-5K
A4 - 10K	◇ 5	B7 - 5K	A9 - 4.5K
A5 - 4.5K		B13 - 5K	A13 - 3-4K B9 - 4-6K
A7 - 5K		B14 - 0	A14 - 3-4K B10 - 4K
A13 - 5K		B19 - 6K	A16 - 10K B13 - 4K
A14 - 0			A18 - 4-5K B14 - 3-4K
A19 - 4-5K			A20 - 4-5K B16 - 4K

2. ± 15V POWER SUPPLIES

CONNECT: 5L4 to extenders and plug into 5103 - turn on.

CONNECT: Voltage bridge to T.P. 698.

ADJ: R695 for +15V ± 50mv.

CONNECT: Bridge to T.P. 1268.

ADJ: R1255 for -15V ± 50mv.

CHECK: junction of R700 & C700 on sweep bd. for -5Vdc ± .2v. (stop sweep).

3. LIN-LOG PRESET

SET: 5L4N display on, start center to center, sweep speed to 10msec/div., trigger source to left vertical, trigger mode to Auto, & Manual to X1. Input to 2dBv.

ADJUST: R740 on Sweep board for 10.2 to 10.4 divisions of trace. Also, adjust trace to bottom graticule line with vertical position control.

SET: 5L4 to Lin mode (gain selector CCW).

ADJUST: R635 to move baseline down ward, stop adjustment at point where baseline stops moving down. DO NOT OVER ADJUST.

CHECK: for no baseline shift when switching line to 2dB Log.

APPLY: .8V P-P @ 250KHz thru H-P 355C & D to input of Lin-Log amp.

SET: 5L4 to 10dB Log function.

ADJUST: L580 for max deflection.

ADJUST: Front panel 10dB Log pot to linearize 10dB Log @ 10dB/div.

SET: H-P 355C & D to 0dB.

ADJUST: R600 for 8cm deflection.

SET: 5L4 function to 2dB Log.

ADJUST: R605 for 8cm.

RECONNECT: Lin-Log input.

4. VARIABLE RESOLUTION PRESET

To adjust variable resolution go to pages 14 & 15. Do only adjustments for maximum resolution. DO NOT do 10Hz gain adjustments C328, C364, C384, C404, R330, R375, R390 and R410, or use the shorting straps for test points 340 through 410.

INSERT: 5A15 into left vertical.

SET: 5A15 display to "on", 5L4 source to line, auto trig.

ADJUST: R740 for 10.2 to 10.5cm sweep. (interacts with R755 & span cal).

SET: source to left vertical, time/div to 1ms (mult = x1).

CONNECT: LFSWG to left vert input.

SET: LFSWG 5A15 controls for 1 div signal @ 5KHz.

CHECK: for triggered display (both slopes).

SET: LFSWG to 500Hz rate.

CHECK: for + & - triggers.

CHECK: for triggered display at 10Hz rate (100ms/).

EXT. TRIGGERED:

MEASURE: unterminated 250mv of 500Hz signal from LFSWG and connect to EXT input. (use "t" connector).

CHECK: for + & - triggers with trigger source set for EXT. triggers and time/div set to 1ms.

SINGLE SWEEP:

DEPRESS: single sweep button & 100ms/div.

DEPRESS: single sweep light button and check that sweep runs once and that light comes on at beginning of trace and goes off at end.

LINE TRIGGER:

DEPRESS: 10ms/div, line source button.

RELEASE: SGL swp.

CONNECT: x10 probe to left vertical and to some external line source.

CHECK: that display triggers.

AUTO TRIGGERS:

DEPRESS: auto trigger & line source buttons.

CHECK: for sweep at max cw & ccw of level control

VIDEO TRIGGER:

NOTE: must be able to get a signal thru the analyzer at this point.

SET: 5L4 span to 0, display to lin, source to video, mult to max cw,
1ms/div., res. to 3KHz.

CONNECT: 184 @ 1ms to 5L4 input.

SET: signal amplitude to 1cm with ref-level variable.

CHECK: for triggered display.

6. SWEEP SHAPER

CONNECT: x10 probe to pin "f" (swp shaper bd.).

SET: 5L4 span to 10K, trig to auto, time to 1ms, start-center button out, (in start mode).

ADJ: R740 for 10v ramp. (do not include step).

ADJ: Span for 10.2 to 10.4 div. of trace.

CONNECT: x10 probe to wiper of R30.

ADJ: R30 for "0" vdc.

CONNECT: x10 probe to wiper of C-F fine pot.

SET: time/ to mn1.

ADJ: C-F fine pot for "0" vdc.

SET: time to 10ms.

CONNECT: LFSWG @ 50KHz to 5L4 input.

LOCATE: 50KHz mark near left grate line (note: may be necessary to adj. R755 in order to find mark).

CONNECT: 184 @ .1ms to 5L4 input.

ADJ: R995 to point where 50K mark doesn't shift as span is shifted down. Leave span at 10K/div.

ADJ: R755 to set 50K mark on left grat. line. (will have to readjust horiz. position).

SET: start-center to center.

ADJ: R825 to set 50K mark to center.

SET: 184 @ .1ms & 10 μ s.

SET: span to 5K/div.

ADJ: R920 for 1 mark/2div in 30KHz to 70KHz area.

SET: span to 10K/div.

SET: C-F control to move 70KHz to center screen.

ADJ: R960 to linearize on out to 100KHz.

SET: C-F control to move 30KHz mark to center screen.

ADJ: R985 to linearize on down to "0"Hz.

Rock In: R920, R960 & R985.

6. SWEEP SHAPER (cont.)

SET: C-F to "000".

ADJ: R1205 to keep start spuri at center - span down.

SET: C-F to 100KHz.

SET: 184 to 10 μ s.

ADJ: R1215 to center 100K mark.- span down.

ROCK IN: R1205 & R1215.

MANUAL SWEEP:

CENTER: trace horizontally, source to line.

DEPRESS: manual button.

SET: mult max ccw.

ADJ: R710 for trace to just dissappear off left side of screen.

CHECK: mnl swp operation for > 10cm.

EXT SWP:

DEPRESS: 50mv/div button.

SET: mult to x1 position.

CONNECT: SAC to ext. in jack.

SET: SAC to .5V square wave.

CHECK: sweep goes to 0-10cm \pm 1cm.

APPLY: 0-5v signal.

CHECK: sweep goes 0-10cm with mult.

EXT. OUT:

DEPRESS: 10ms/div.

CHECK: for 0 - 5v (\pm .5v) ramp at ext out jack.

7. TRACKING

CONNECT: 184 @ .1ms & 10 μ s.
SET: 5L4 C-F fine to center.
CHECK: tracking at every 10KHz to A \pm 3KHz spec.

8. DISPERSION

SET: 184 to 1ms & .1ms.
SET: 5L4 to 1KHz/div, C-F to set start spuri on left grat. line.
CHECK: disp. & linearity specs (4% disp & 10% lin) over center 8cm, 0-100KHz.
SET: 184 to .1ms.
SET: 5L4 to 10K span, C-F to 50K.
CHECK: disp. of unit as below.

<u>184</u>	<u>SPAN</u>	<u>ERROR</u>	<u>MARKS</u>
.1ms	10K	\pm 3.2mm	1/div
.1ms	5K	3.2mm	1/2div
.5ms	2K	3.2mm	1/div
1ms	1K	3.2mm	1/div
1ms	500	3.2mm	1/2div
5ms	200Hz	3.2mm	1/div
10ms	100Hz	3.2mm	1/div
10ms	50Hz	3.2mm	1/2div
50ms	20Hz	3.2mm	1/div

9. C - F FINE RANGE

SET: 184 to .1ms.

SET: span to 100Hz, res to suto, center 50K mark.

CHECK: C - F fine varies $\pm 200\text{Hz}$.

10. TIMING

CONNECT: 184 @ 10ms to 5L4 input.

SET: 5L4 mult max cw, push 10ms time/div, video trig, span = "0".

ADJ. 5L4 for triggered display.

ADJ: R745 for 1 mark/div.

SET: mult max ccw, push 1ms.

ADJ: R715 for 1 mark/div.

ROCK: in the two timing adjustments.

CHECK: all ranges of time/div to spec. of $\pm 5\%$.

(NOTE: auto trig could cause free running at 1s/div).

11. FREQ. MARKER

ET: 5L4 to 10K span, freq. marker on.

DJ: R1225 for freq. marker 5mm long.

HECK: that start-center has no effect on display.

(NOTE: when the freq. marker is centered on a known input signal, the dial should read within ± 3 KHz of the known freq.)

12. LOG SWEEP

ET: 5L4 to Log Sweep, 50 Ω int. term, 2dB/, -10dB ref-level, res = auto, 10ms/div, C-F = 50K, fine C-F = midrange, freq. marker = on.

ISCONNECT: jumper P1202

ONNECT: LFSWG to 5L4 input. @ 10KHz

ET: mult, & variable gain for pleasing display.

LFSWG to desired frequency, according to following adjustment.

DJ: R1200 to bring 100Hz mark to left edge.

R1195 for 10KHz mark & general spacing.

R1190 for 100KHz mark.

TE: when finished the Log Sweep should appear as follows:

100Hz on left grat. line

1KHz apprx. 3.4 div. in

10KHz apprx. 6.8 div. in

100KHz apprx. 9.8 - 10 div. in

ONNECT: jumper P1202

DJUST: R1209 to position 20Hz to left edge of graticule. Display should be \div by 5.

STALL: 20Hz to 20KHz Log Sweep graticule on screen and check that Log Sweep is within apprx. 3mm of correct marks. It may be necessary to readjust R1195 & R1190. If so, recheck 100Hz - 100Hz Log Sweep.

AVE: jumper in 20Hz - 20KHz position.

13. CALIBRATOR

CONNECT: Tracking gen. to 5L4 600 Ω input, -20dB ref-level, 2dB Log.
ADJ: R1025 & L1038 to start osc. (push track-gen button).
ADJ: R1025 to point of rapidly increasing trace amplitude.
ADJ: L1038 for max trace amplitude.
ROCK IN: The above two steps.
READJ: R1025 slightly into limiting.
CONNECT: Calibrator output to counter.
SET: tracking generator button out.
SET: 5KHz comb on, 20.000 KHz
ADJ: C1020 for 25KHz.

CONNECT: Calibrator out to 5L4 input.
SET: 5L4 to 10K span, 10dB/.
CHECK: For freq. comb of 1 mark/5KHz & 1 major mark/25KHz.

14. VARIABLE RESOLUTION

- CONNECT: 50KHz from LFSWG to 5L4 50 Ω input.
- SET: 5L4 to 2K disp. & max res., 10dB Log.
- ADJ: L212 for max.
- INSTALL: 4 10K swamping resistors across (TP 354 - 356) (TP 384 - 386) (TP 404 - 406) (TP324 - 326).
- ADJ: L414 & L420 for max amp & best symetry.
- NOTE: Use small glitch at top of waveform as center point.
- REMOVE: 10K resistor from (TP 324 - 326).
- INSTALL: Shorting strap from (TP 410 - 370).
- ADJ: C 324 for no wings (in 10dB Log) and balanced about center.
- ADJ: L 324 & R 325 (2dB Log) for symetry & shape.
- ROCK IN: The above two steps.
- CONNECT: Tracking gen to 5L4 input. (5L4 to Man).
- ADJ: 5L4 manual control to set dot to mid CRT.
- SET: Tracking gen. output to 5cm
- REDUCE: res B.W. to 10Hz.
- ADJ: C 328 for max.
- NOTE: insure ability to tune C 328 thru a peak.
- ADJ: R 330 for 5cm.
- ROCK IN: Resolution shaping tweeks.

14 VARIABLE RESOLUTION (cont.)

NOTE: notice that having connected the 10K resistors & straps as directed by the procedure thus far, what you have done is to swamp all stages except the one to be tuned and to by pass all the LED's except the one associated with the same stage. Now you will move to the second stage and swamp all the others in the same manner, doing the same for all remaining stages but using the below listed tweaks in place of the underlined. (underlined tweaks = those used on stage #1).

STAGE	STRAP TP	<i>No 10Ks</i>	<i>2dB</i>	<i>50KHz</i>	<i>50KHz</i>	<i>50KHz</i>
1	<u>370-410</u>	<u>C324</u>	<u>L324</u>	<u>R325</u>	<u>C328</u>	<u>R330</u>
2	340-370 390-410	C360	L364	R365	C364	R375
3	340-390 400-410	C328	L384	R385	C384	R390
4	400-340	C402	L404	R405	C404	R410

REMOVE: 10K swampers.

INSTALL: Res. bd cover. (retweek if necessary spreading the retweeking over all four stages).

RECHECK: Res. flatness & B.W.

SET: 5L4 to auto, 2dB/.

CONNECT: 50KHz from LFSWG to 5L4.

ADJ: LFSWG for 7cm signal, centered at 2K disp.

CHECK: Res. leveling for < 2dB total error, (NOTE: slow sweep speed as necessary).

CHECK: Res. B.W. for < 10Hz min & > 3K at max.

CHECK: Auto res. works in Log swp.

15. RESOLUTION SHAPE FACTOR

CONNECT: 50KHz from LFSWG to 5L4.
SET: Span to 1K, signal centered (8cm) 2dB Log.
SET: Res control for 3KHz @ -6dB point.
SET: Span to 2K, function to 10dB Log.
CHECK: for <12KHz width @ -60dB.
SET: Span to 500Hz (2dB Log).
SET: Res for 1K width @ -6dB.
SET: Function to 10dB Log, span to 1K.
CHECK: < 10KHz width @ -60dB.
SET: Span to 20Hz (2dB Log).
SET: Res for 10Hz width @ -6dB.
SET: Function to 10dB Log.
CHECK: <100Hz width @ -70dB.

16. FREQUENCY MODULATION

CONNECT: LFSWG @ 50KHz to 5L4N
SET: 5L4N to center 50K mark @ 20Hz/div., 10Hz res.
CHECK: F-M \leq 2Hz (1mm).
REPEAT: F-M check at 10KHz & 100KHz as above.

17. TRACKING GENERATOR

REMOVE: Jumpers from P1048 & P1046.

INSTALL: Jumper from P1048 #2 & P1046 #1.

SET: Span to 10K, 2dB Log, -30dB ref-Level, 1meg dBv input.

CONNECT: Tracking Generator output 5L4 input.

SET: Tracking Generator on.

ADJ: Tracking Generator output for 5cm amp.

ADJ: L138 - 142 - 146 for flat response 0 - 100KHz.
(± .2dB referenced to left edge).

REPLACE: Jumpers P1048 & P1046.

ADJ: L1068 for flatness 0-100KHz (± .2dB).

NOTE: Do not use L1068 to compensate for unflat 140KHz filter.

CONNECT: Tracking Gen out to test scope.

SET: 5L4 to manual swp.

SET: Test scope to display 1 cycle (triggered).

ADJ: R1055 & R1060 for least amount of Yuck riding on tracking gen.

ROCK IN: R1055 & R1060.

REMOVE: Tracking gen. output from test scope.

CONNECT: -40dBv amp. cal. fixture to 5L4.

SET: 5L4 to -40dB ref-level (dBv input, 2dB/).

ADJ: Amp. Cal. pot for a reference.

CONNECT: Tracking gen. (set to cal) to 5L4 input.

ADJ: R1020 for same reference.

SET: 5L4 to -10dB ref-level, 10dB log.

CHECK: tracking gen. amp. range = ± 20dB.

SET: tracking gen. off.

18. INPUT AMP BALANCE

MONITOR: DC level ($\approx 9.5V$) at the collector of Q135.
ADJ: R165 for no shift of D-C level when ref-level is switched between -20 & -30.
INSTALL: shields.

19. START SPURII

CENTER: start spurii span at 200Hz/div, man res, dBv.
CONNECT: 50 Ω term on input.
ADJ: sweep speed to give max amp.
SET: 5L4 gain to see top of start spurii.
ADJ: R195, C214 & C212 for min spurii.
NOTE: spec'ed to -70dBv @ 2dB/.

20. FUNCTION LINEARITY

SET: 5L4 for dBv 10dB/, -10dBv ref-level.

CONNECT: LFSWG in line with 355 C & D to 5L4 input.

ADJ: R6 for accurate 10dB logging.

SET: 5L4 to 2dB, signal level to midscreen.

SET: Amp. cal at center; ± 3 dB range.

SET: 5L4N to -30dBv ref-level, 10dB/div.

CONNECT: -40dBv cal fixture to 5L4 input (no 355 C& D)

ADJ: R235 for 1.8v P-P on TP404.

SET: 5L4 to Lin, 2mV/div.

ADJ: R424 for 5 div.

SET: 5L4 to -40dBv ref-level, 10dB/.

ADJ: R600 for 8cm.

SET: 5L4 to 2dB/.

ADJ: R605 for 8cm.

SET: 5L4 to -10dBv, ref-level, 10dB/.

CONNECT: LFSWG in line with 355 C & D to 5L4 input.

ADJ: LFSWG output for 8cm signal.

CHECK: 10dB logging over 80dB dynamic range to $\pm .05$ dB/dB or a max of ± 2 dB.

SET: 5L4 to 2dB/.

CHECK: 2dB logging over 16dB dynamic range to $\pm .1$ dB or a max of ± 1 dB.

SET: 355 C to 12dB of attenuation.

CHECK: Ref-level variable has $>$ dB range.

21. C. M. R.

SET: tracking gen to -20dBv level (full cw).
CONNECT: track gen thru flex BNC "T" to "Y" to input.
SET: 5L4 to dif. input, 10dB/, -50dBv, 10K span.
SET: C56 & C62 near min.
ADJ: C58 for min signal.
ADJ: start spuri to left vert grat. & disp to \approx 1K.
SET: res. for clean waveform.
ADJ: R160 for min signal.
SET: 5L4 to 10K span, C-F to 50K.
SET: 5L4 ref-level to -20dBv, res. to max.
READJ: C58 for min signal (0 - 100K).
SET: ref-level for -70dBv.
CHECK: 0 - 100KHz for < -90dBv.
SET: ref-level to -30dBv, -20dBv, & -10dBv.
ADJ: C62 & C56 for min C.M.R.
CHECK: track gen signal for < 2div, 1div, & 0div respectively.
ADJ: C125 for compromised best action of -20 & -30dBv settings.
ADJ: C125 for lowest C.M.R. 0 - 100K @ -20dBv & -30dBv.

22. INPUT "C" CHECK

CONNECT: tracking gen to 5L4 input.
SET: 5L4 input \geq to 600Ω \geq .
function to 2dB Log, span to 10KHz, res auto.
ADJ: gain for 4cm display.
ADD: 47pfd cap in series with tracking gen at the input to 5L4.
SET: switch int LO \geq off.
CHECK: for 4cm $\begin{pmatrix} + .4\text{dB} \\ - .8\text{dB} \end{pmatrix}$ or $\begin{pmatrix} + 1 \text{ minor} \\ - 2 \text{ minors} \end{pmatrix}$.

23. REFERENCE LEVEL ACCURACY

- SET: 5L4 function to 2dB Log, -40dBv ref level (dif. input).
- CONNECT: 654A in line with 355 C & D to 5L4 input.
- SET: 355 C & D to -30dB.
- ADJ: 654 for 7cm signal centered @ 50KHz.
- SET: 5L4 for centered 50KHz signal at 20Kz/div span and < 10Hz resolution.
- ADD: 10dB of gain to 5L4.
- ADD: 10dB of attenuation to 355 C & D.
- CHECK: for 7cm.
- CHECK: reference levels from -10dBv to -70dBv in 10dB steps to spec of .4dB/10dBv or to a max of 1dB cumulative error (-80 to -130dBv .8dB/10dBv or total cumulative error of 2dBv.
- NOTE: if noise is 10dB below signal it adds .46dB signal.

24. VOLTS/DIV ACCURACY

- SET: 654A to 50KHz 50 Ω output.
- SET: tracking gen to off.
- SET: 5L4N to Lin Mode, 50mv/div, dBv, dif. input.
- CONNECT: 654A to 5L4 inputs, H-P 355 C & D in line.
- SET: 5L4 for centered 50KHz signal a 20Hz/div span and < 10Hz resolution.
- ADJ: 654A for 7cm display.
- CHECK: all v/div settings as per following chart.

ACCURACY SPEC = $\pm 5\%$ (4mm) or
 MAXCUMULATIVE ERROR OF $\pm 12\%$ (9.6mm)

<u>5L4N</u>	<u>H-P 355 C & D</u>
20mv	8dB
10mv	14dB
5mv	20dB
2mv	28dB
1mv	34dB
.5mv	40dB
.2mv	48dB
.1mv	54dB
50 μ v	60dB
20 μ v	68dB
10 μ v	74dB
5 μ v	80dB
2 μ v	88dB
1 μ v	94dB
.5 μ v	100dB
.2 μ v	108dB
.1 μ v	114dB
50nv	120dB
20nv	126dB

25. SENS.

CONNECT: 654A thry H-P 355 C & D to 5L4 (50 Ω).
SET: 654A to 0dBm @ 50KHz, dif. input.
SET: track gen to off.
SET: to lin mode center signal @ 2K span, 3K res.
ADJ: 5L4 gain for 1cm noise.
SET: H-P 355 C & D for 110dBm.
CHECK: 50KHz signal \geq 2cm.
SET: span to 20Hz & decrease res. to 10Hz.
ADJ: gain for 1cm noise.
SET: H-P 355 C & D to 132dB.
CHECK: 50KHz signal \geq 2.5cm

26. SPURII

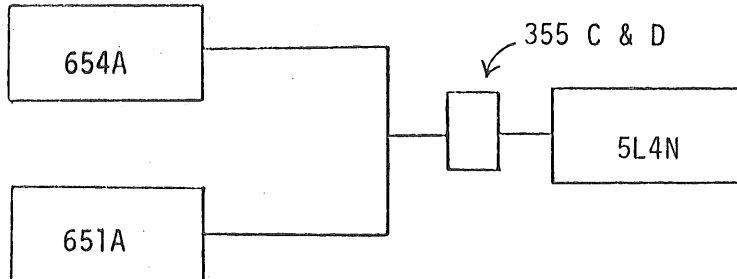
SET: 5L4 span to 1K, res to auto, mult = CW, time 1s/div, 50 Ω input z.
50 Ω term on input, C-F = 5KHz, C-F fine = midrange, 10Hz V.F.,
and set the calib & tracking gen. to off. Use 2dB log @ -120dBm
ref-level.
SET: 5103 to store, chop.
SWEEP: a 10KHz window.
CHECK: for spurii to be < 130dBm.
INCREASE: C-F setting to 15KHz and check again.
CONTINUE: in the same manner until 0 - 100Hz is covered.
RETURN: 5L4 & 5103 to normal settings.

27. INTERMODULATION DISTORTION

SET: H-P 654A to 50KHz, +10dBm.

SET: 651A to 40KHz, +10dBm.

CONNECT: as below.



SET: 5L4 for -10dBv ref-level, 10dB Log.

ADJ: 5L4 to center display @ 10K/div.

NOTE: adj resolution, swp speed, & generator outputs to obtain 8cm signals.

CHECK: that IM is < 1cm (70dB down).

SET: 5L4 to -20dBv ref-level.
H-P 355 C & 10 to 10dB at attenuation

CHECK: that IM is < ½ cm (75dB down).

SET: 5L4 to -30dBv.

SET: H-P 355 C & D to 20dB of attenuation

CHECK: for 2nd order I-M at 10KH to be < ½ div.

CHANGE: C-F & generators to display 4K & 5K signals & recheck in same manner as above

28. INPUT Z CHECK

SET: 5L4 to Lin, 50KHz C-F.
DEPRESS: INT LO z, & 50 Ω .
CONNECT: LFSWG @ 50KHz.
ADJ: 50K signal to center & 7cm tall.
REMOVE: int L.O. z, add 50 Ω terminator (precision) at 5L4 front panel.
CHECK: for 7cm \pm 2% (1.6mm).
REMOVE: 50 Ω term.
SET: 5L4 to 600 Ω input z.
SET: LFSWG for 7cm signal.
REMOVE: int. L.O. z of 5L4 and add 600 (precision) terminator at 5L4 input.
CHECK: for 7cm \pm 2% (1.6mm).
SET: 5L4 to 2dB, 600 Ω input z.
CONNECT: tracking generator.
SET: tr. gen. for a 4cm signal.
REMOVE: int. L.O. z & check for 7 div \pm 3mm.

29. INTERNAL GAIN SWITCHING

SET: 5L4 input z to dBv, 2dB/ -10dB ref-level
ADJ: LFSWG for 1cm signal @ 50KHz centered.
DEPRESS: 5L4 50 Ω input button.
CHECK: for 13dB increase (\pm .2dB).
RELEASE: 50 Ω button & depress 600 Ω button.
CHECK: for 2.2dB increase (\pm .2dB).

30. CHOP - ALT

SET: both vertical displays to on.
SET: chop button out.
CHECK: trace sweeps two times consecutively on each vertical then switches to the other vertical.
DEPRESS: chop button.
OBSERVE: chop operation (50K rate).
RELEASE: chop button, turn left vertical off.

31. VIDEO FILTER

REMOVE: cable from input.
SET: span to 500Hz, res to 3K, gain for 2cm noise..
DEPRESS: 300Hz video filter.
OBSERVE: noise is averaged.
RELEASE: 300Hz video filter.
DEPRESS: 10Hz video filter.
OBSERVE: noise is averaged still further.
RELEASE: video filters.

32. SPAN RANGE

SET 5L4 to 2dB, ref-level to -20, 50 Ω input, span to 10K, res. to auto.
CONNECT: 184 to 5L4 input. (10K marks).
OBSERVE: 1 mark/cm.
CHECK: span pot decreases horiz. sweep from 0 to 1.2cm/mark (apprx.).
RESET: span for 1 mark/cm.

33. SYSTEMS REF- LEVEL RANGE

CONNECT: 50K signal to 5L4 (centered).
SET: 5L4 to 2dB Log.
ADJ: signal source for 4cm.
CHECK: amp cal pot (front panel) has $\approx \pm 3$ dB range.

34. VIDEO OUT

SET: signal source for 8cm signal.
MEASURE: signal at video out jack for 2v $\pm 5\%$.

35. BASELINE CLIPPER

SET: intensity for normal viewing level.
SET: clipper control max cw.
CHECK: that contrast varies trace intensity from normal to full off.
CHECK: that clipper clips to > 2 div from botton grat. line.
SET: left vert to "on".
CHECK: that baseline clipper doesn't work in chop mode with both displays on.
CHECK: in alt mode baseline clipper effects only right vert (5L4) signal.

36. POSITIONING

CHECK: that vert. pos. control positions trace + 1cm & down off screen.
SET: 5L4 to manual swp.
ADJ: manual control to set dot to center screen.
CHECK: that horiz. pos. moves trace > 1 cm to each side.

37. START - CENTER

CONNECT: 50K signal to 5L4 & center at 5K/div span.
SWITCH: start - center to start.
CHECK: the 50K mark goes to left vert line \pm 4mm.

38. FINISHING CHECKS

- 1). Recheck both log sweeps and touch up if necessary (page 11).
- 2). Recheck resolution shape, symmetry and resolution leveling from 3KHz to < 10Hz according to pages 14 & 15.

FRONT PANEL LIGHTING

- CHECK: that 10dB Log light goes out @ -80dBm and above.
- CHECK: that 2dB log light & lin light stays on on all steps.
- CHECK: proper amount of light shows on all applicable lighted switches when on and that no light shows when off.

NOTE! after burn in and before shipping retweek the res. CKT & reset C-F of the tracking gen to match.