

7L5

FACTORY CAL PROCEDURE

For Internal Use Only

September 4, 1975

Equipment Required

NOTE: 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 specs. 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 - 7000 Series Mainframe (4 hole)
- 1 - DC 501 counter (option 1 time base)
- 1 - Type 191 signal generator
- 1 - 067-0542-99 signal generator
- 1 - Type 184
- 1 - DC Voltage bridge
- 1 - 7A16 or equivalent
- 1 - 7L12 Spectrum Analyzer
- 1 - 7A22
- 1 - L-1 OR L-2 PLUG-IN MODULE**

b. Calibration fixtures and Accessories

- 2 - 7000 series plug-in extenders
- 1 - harmonica connector - 3 into 1
- 4 - 10K Ω resistors w/0707 connectors
- 1 - ADP check out box-special
- 1 - Special 3 connector grounding strap.
- 1 - X10 probe
- 2 - 18" 50 Ω BNC cables
- 1 - BNC to 2 pin harmonica - special
- 1 - BNC "T" connector
- 1 - special plug-in (Hi-Z/50 Ω calibrator)
- 2 - X10 BNC attenuators
- 1 - calibrator box
- 1 - special plug in (L.O. out/IF IN)
- 1 - Tracking generator checker

c. Other manufacturer's equipment

- 1 - H.P. 654
- 1 - H.P. 651
- 1 - 355 C&D Atten Set.
- 1 - 20K Ω /V multi-meter
- 1 - H.P. 608 or equivalent

Preliminary Inspection

Check: for unsoldered joints, rosin joints, lead dress and long leads. Check for loose hardware and protruding parts. Check controls for smooth mechanical operation, proper indexing and knob spacing.

Midrange: All pots

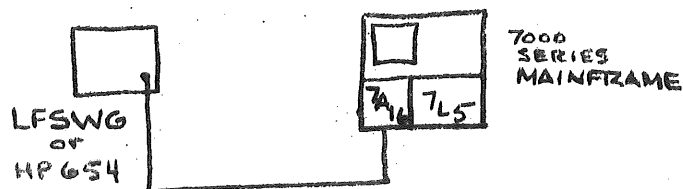
Check: Interface resistances

NOTE: Connect multimeter neg lead to ground; use 1K scale for readings noted in "K" and 10 Ω scale for readings noted in " Ω ". Omitted connectors are open on X1K scale.

A	HORIZ	B	A	VERT	B
2 = 0 Ω	2 = 0 Ω	1 = 45 Ω	2 = 0 Ω	2 = 0 Ω	
3 = 3K	4 = 0.8K	2 = 0 Ω	4 = 0 Ω	4 = 0 Ω	
8 = 45 Ω	7 = 3.5K	5 = 4K	7 = 7K	7 = 7K	
12 = 0 Ω	8 = 25 Ω	8 = 45 Ω	10 = 0 Ω	10 = 0 Ω	
15 = 1K	9 = 0 Ω	11 = 2.5K	11 = 2.5K	11 = 2.5K	
18 = 0.4K	10 = 0.4K	12 = 0 Ω	12 = 0 Ω	12 = 0 Ω	
20 = 50 Ω	11 = 2.5K	13 = 3.5K	13 = 3.5K	13 = 3.5K	
29 = 26K	12 = 0 Ω	16 = 5.5K	29 = 18K	29 = 18K	
30 = 25K	15 = 10K	18 = 0.4K	30 = 30K	30 = 30K	
37 = 3.5K	18 = 0.7K	29 = 18K	31 = 20K	31 = 20K	
	19 = 7K	31 = 30K	32 = 9K	32 = 9K	
	20 = 50 Ω	32 = 13K	33 = 50K	33 = 50K	
	29 = 25K	33 = 13K	37 = 9K	37 = 9K	
	33 = 25K	37 = 2.5K	38 = 2.5K	38 = 2.5K	
	37 = 25K	38 = 2K			
	38 = 30K				

Triggers

Connect: Test set up as follows



Set: 7L5 Trig. Source to INT., mode to NORM, Span to "0".

Set: Mainframe Trig. Source to Vert Mode - Left Vert.

Adj: Signal Source for 1 div @ 500KHz on screen.

Check: 7L5 will trigger + and -.

Repeat: Above test with signal source & 7L5 swp. speed set to display 30Hz.

Set: 7L5 source to free run.

Check: Trace free runs.

Adj: signal source for 0.5 div signal

set: 7L5 source to INT.

Check: 7L5 will not Trigger.

Set: Mode to sgl. swp., source to free run.

Check: That trace runs once each time button is pressed and that sgl. swp. lite is on only while trace is sweeping.

Set: Signal source for 2 div display

Set: 7L5 source to int.

Check: That sgl. swp. will trigger + and =.

Remove: Signal source from 7A16

Set: 7L5 span to something other than "0"

Set: 7L5 swp speed to 2 sec.

Check: For swp approx 10 seconds after S.S. is pressed.

Set: 7L5 Mode to Norm.

Check: Trace automatically re occurs every 10 seconds (approx)

Set: 7L5 source to Line

Connect: X10 probe from Line source to 7A16 input.

Set: 7A16 to display 1 div @ 60Hz.

Check: + and - Line triggers for correct polarity

Remove: X10 probe

Set: 7L5 source to INT, span to "0"

Check: That swp doesn't run.

Set: 7L5 to Free run.

Check: Trace Free runs

Set: 7L5 mode to Mn1. Swp.

Check: Mn1. Swp. >10cm (Normal Trace length must be >10 cm to meet this check).

Set: Time/div to 1sec/div

Set: Source to free run, mode to Sgl. Swp.

Depress: Sgl. Swp button once to start trace and once after trace is started.

Check: That trace restarts after second depress.

Readout

a. Upper Left - ref. Level

Set: Mainframe to Right Vert.

Set: 7L5 ref. Level Knob to "out" position

Check: For 10dB/detent change in ref. level "cw" and "ccw".

Set: 7L5 ref-Level knob to "in" position

Check: For 1dB/detent change in ref-level "cw" and "ccw".

Ref level will not count below ~~-83dBm~~ ^{-70dBm} when operating in 10dB Log mode.

Check: That ref-Level will count from ~~+0 dBm~~ ^{+21dBm} to ~~+44dBm~~ ^{-128dBm} when operating in 2dB Log mode.

Check: That ref-Level readout switch to mv, mv, or nv and counts from 200 mv/div to 20nv/div in A 1-2-5 sequence when operating in "Lin" mode.

Check: That when ref-level variable is out of detent, A < sign appears. (UNCAL lite must be out.)

Check: That A > sign appears before ref-level readout when unit is in uncal state.

b. Dot Freq.

Check: That d-f readout changes in 10kHz steps in coarse mode and in .25kHz steps in fine mode.

Observe: Max readout is 4999.75kHz.

NOTE: When changing direction of rotation of d-F knob there will be 1 click that produces no change in d-F readout.

c. Time/DIV

Set: Freq. span to 0

Check: That time/DIV readout matches F.P. knob.

Depress: Manual button.

Check: Time/DIV readout = 0Hz.

d. Resolution

Check: that res. readout agrees with F.P. Resolution Knob.

e. Lin-Log

Check: That (0dB) and 2dB/readout matches lit button on F.P.

Check; That dBm & dBV agree with switch on plug-in.

Check: that only the resolution readout appears when in Lin.

f. Freq span:

Check: That freq span readout agrees with F.P. knob.

g. Lites

Check: All F.P. push-push buttons for proper operation and light brilliance.

check: That when unit is first turned on the following buttons come on: 10dB/, free run, norm, display A, Display B, and that d-F readout says 0.00kHz.

Check: That Ref. Level comes on at +16 or +17 dBm (NOTE: 7L5 must have been off for >5 sec.)

Tracking Generator

Connect: Tracking generator checker plug to ~~probe power jack on rear~~ **PIN GT (+5V) on Sweep Bd.**
~~of mainframe.~~

Connect: Yellow harmonica to P515.

Set: Up/down switch to up.

Rotate: Dot freq knob - shouldn't have effect on freq. readout.

Operate: S-2 several times

Check: Dot freq. increases at 250Hz increments

Check: LED #5 goes on & off with S-2

Set: Up/down sw. to down.

Operate: S-2 until dot freq. counts down to 0.00KHz.

Remove: yellow harmonica from P515.

Set: Span to 500Hz

Connect: Special harmonica connector from P505 to pin #1 of P515.

Check: Span readout says 500KHz.

Set: Span to "0"

Check: Freq span readout says 20Hz.

Connect: Green harmonica to P525

Check: LED's for following proper operation

#1, 5, & 6 = same brilliance

#2 should brighten more and more as swp runs across.

#3 should be on as long as green harmonica is on.

#4 comes on during retrace.

Remove: Special harmonica conn. from P505

Press: Stop swp button.

Check: Swp does not restart

Connect: t5V (Pin GT) to pin 5 P505


Set: Span to max

Check: Span readout says 50Hz.

Step: Span down

Check: span readout says 20, 10, 5, 2, 1, Hz.

4 Sec.

NOTE: In case readout goes to , ground pin TN on Freq. Span switch.

Function I-F

Set: 7L5 to 10dB/, position trace to bottom graticule line

Connect: HP-654 to input (EK & EJ) of Log Amp bd.
Set: 654 for +5dBm @ 250kHz 50 Ω output.

Adj: L1220 for max baseline rise.
Connect: X10 to pin "6" of U2210 (vert. control bd)

Adj: R2205 for 1 Volt change/ 10dB change of 654 signal (Left
vert trace)
Set: 7L5 to Lin.
Set: 0 volt reference on 7A16 to bottom of screen
disconnect: 654
Adj: R2235 for 0 volts at Pin #6 of U2210
Reconnect: 654 to Log amp.

Set: 654 output for -8V dc at pin #6 of U2210
Set: 7L5 to 2dB/
Adj: R2215 to match 2dB/ and Lin D-C level at -8Vdc

Set: 7L5 to 10dB/
Adj: R2225 to match 10dB/ to -8Vdc level.

Set: Mainframe to right vert **-29dBm**
Adj: F.P Log cal for full screen (ref-level @ ~~-42dBV~~)
NOTE: Lin -2dB/ -10dB/ should match.

Set: 7L5 to 2dB/, ~~-84dBV~~ **-71dBm** ref-level.
Decrease: 654 output by 20dB
Adj: R1065 for full screen.

Set: Ref-level to ~~-104dBV~~ **-91dBm**
Decrease: 654 output another 20dB
Adj: R1115 for full screen.

Set: Ref-Level to ~~-124dBV~~ **-111dBm**
Decrease: 654 output another 20dB

Resolution Preset

Set: 7L5 to 30KHz resolution

Connect: H-P 654 to Pin DE and DF of Resolution Board

Set: 654 to 200mV p-p @ 250 kHz (Approx -15dBm)

Check: For approx full screen (adj R1905)

Set: 7L5 res to 10K & 3K

Check: For baseline rise @ each setting.

250K Amp

Connect: H-P 654 to pins BA and BB of 250 K amp board

Set: 654 to -30 dBm @250kHz.

Adj: L1400 for max baseline rise (should get approx. full screen)

10.7 MHz I-F

Connect: H-P 608 @10.7MHz and -38dBm to P1045 - Pins 1 & 2 of
IF Input Filter

Adj: C1042 (IF input filter) for max baseline rise

Adj: C1600 and C1604 (2nd mixer) for max baseline rise.

Check: For approx full screen baseline rise

Freq Reference Module

Connect: DC501 to P390
Adj: OSC tweek for 10.000 MHz
Remove: counter
Connect: DC Voltage Bridge to Q365 base
ADJ: R365 for -11.00 Volts
Remove: Bridge
Set: d-f to 2500.00 kHz
Set: Span to 200 kHz/div
Adj: Horz. pos. to center dot on screen.
Set: Span to max.

Remove: Jumper (P122 & P124) as needed to position the dot as near as possible to center screen.

Adj: R655 to center dot.

Connect: D-C bridge to "A" memory input. (pin MH of A&B osc. control)
Set: 7L5 dot freq to 0.00kHz
NOTE: "A" memory voltage
Set: Dot freq to 4999.75 kHz
NOTE: "A" memory voltage
Check: difference should = 16.66 volts
Adj: R345 until it does.

Set: 7L5 dot freq to 50.00kHz

Monitor: Voltage at pin "ND" (A&B osc Control)

Adj: Jumpers P260 & P262 as necessary to bring "ND" as close as possible to "0" volts (± 1.5 Vdc)

Set: 7L5 dot freq to 99.75 kHz
Measure: Voltage at pin "ND" with voltage bridge. (NOTE)

Set: 7L5 dot freq to 100.00 kHz.
NOTE: Voltage at pin "ND"
Adj: R325 until the difference between the two is 18.00 Vdc.

Set: Freq span to 50kHz.
Set: Dot to center screen with horiz position
Set: Freq span to max, dot freq to 2500.00 kHz
Adj: R655 to center dot.

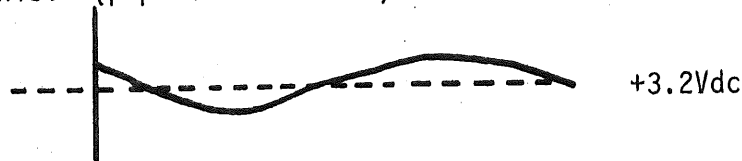
Connect: Jumper from pin "2" to "3" of P246 (1st LO Lock)
Adj: R255 to +1.4 Vdc at gate of Q230

Connect: Jumper pin from "1" to "2" of P246

Set: Test scope vertical to display +3.2V at center screen @1V/div.

Connect: X10 probe to pin "PB"

Set: 7L5 to Max span
Adj: R2015 and R2025 for min P-P amplitude of display similar to this. (p-p= less than 1V)



NOTE: If above adjustment cannot be made then select C2031 for linearity and readjust +1.4V bias on Q230. If adding C2031 increases curvature of error signal, 1+ may be necessary to select L2032 for less inductance.

Set: Freq Span to max
Connect: Calibrator to 7L5 input
Adj: Sweep cal for 1 mark/div.
Tune: Dot across screen checking that it falls on a marker every 500kHz and tunes smoothly.

NOTE: Amount of horiz. display shift as dot is tuned from 0 to 5MHz. If shift is greater than 0.5 minor divisions, select R284 to minimize.

Check: Sweep cal for ≥ 0.5 div range from above setting.

Insert: Special L.O. out/I.F. in L-1 into 7L5.

Connect: L.) out to 7L12

Measure: 1st L.O. Power out. Must be ≥ 17 dBm at 4999.75 kHz and ≤ 18.5 dBm
+ 0.00 dB

Digital Storage

Set: 7L5 d.f. to 0.00kHz, Ref Level to -30dBm, log to 10 dB/
Res. to 10 kHz., freq. Span to 5 kHz/div., Disp A & B On.

Adj: Dot mkr to position dot 1 div in from left edge of graticule.
Adj: R4585 to point where left side of display just stops switching
on and off.

Connect: Calibrator to 7L5 input

Set: ref-level to -40 dBV, res to 30 kHz, span to MAX Log to 10dB.

Observe: Position of 500 kHz marker with digital storage off

Observe: Position of 4500 kHz marker with dig storage off.

Depress: Disp B button

Adj: R4570 so 500 kHz marker is in same position as with digital
storage off.

Adj: R4625 so 4500 kHz marker is in same position as with digital
storage off.

Set: Freq span to 1 kHz, Res. to 3 kHz, Log to 2 dB/
Adj: R4565 for equal vert. gains in and out of digital storage.
Recheck: Setting of R4570 and R4625 and rock in if necessary.

Set 7L5 span to 50K, turn on display "A" save "A"

Set: span to 20K, turn on display "B"

Check: for 2 stored displays

Set: Display "A" and save "A" to off.

Set: ref-level for approx. 1/2 screen signal

set: max hold to on.

Adj: ref-level to increase display amplitude.

Check: that stored display increases in amplitude

set: ref-level to decrease display amplitude

check: that stored display does not decrease in amplitude.

set: cursor to bottom of screen, max hold to off, display "B"
off, (10 dB)

NOTE: Peak Level of noise floor

Set: Display "B" to on

Check: That stored display is approx. at top of noise

Set: Cursor above stored display

Check: That display amplitude decreases by approx 1/2.

Freq Span (Accuracy & Linearity $\pm 4\%$)

"A" Osc:

Set: Dot freq to 2500.00kHz

Check: "A" osc disp & Lin.

Set: dot freq to 0.00K, dot to left grat. line.

Check: "A" osc disp & Lin.

Set: 5 MHz on right grat. line. (Note. will have to change dot freq each time disp is changed in order to maintain 5 MHz on right grat. line, run with dot at center screen).

Check! "A" osc disp & Linearity

Set: Dot freq to 50.00 kHz, 99.75 kHz, and 100.00 kHz

check: "B" osc disp & lin each setting of dot freq.

SPAN		d-f	184	Marks/div
"A" OSC	MAX		1 μ sec	1/2 div $\pm .32$ div
	200 kHz	4000.00K	5 μ sec	1/div
	100K	4500.00K	10 μ sec	1/div
	50K	4750.00K	10 μ sec	1/2 div
	20K	4900.00K	50 μ sec	1/div
	10K	4950.00K	.1msec	1/div
	5K	4975.00K	.1ms	1/2 div
"B" OSC	2K		.5ms	1/div
	1K		1ms	1/div
	500Hz		1ms	1/2div
	200Hz		5ms	1/div
	100Hz		10ms	1/div
	50Hz		10ms	1/2div

Calibrator Amplitude

Connect: 7L5 vert. out to 7A22 input
Install: special Hi-Z/50 Ω L-1 in 7L5
Connect: Cal Box to 7L5 input
Set: 7L5 dot freq. to 500.00K, Log to 2 dB/
Set: Cal box to 50 Ω
Adj: Ref level & variable for full screen display

Set: Cal box to 1M Ω
Set: L-1 to Hi-Z

Set: 7A22 to 20 mV/div.
Adj: 7A22 variable for approx same amplitude display as on 7L5
Set: 7A22 to 1MV/div.

Adj: 7A22 DC offset to position top of waveform to center screen.

Connect: Calibrator out to 7L5 input

Adj: R892 for equal amplitudes
Connect: 7L5 input to Cal Box
Set: L-1 to 50 Ω position
Set: Cal Box to 50 Ω position
Adj: 7A22 DC offset to position top of waveform to center screen
Connect: 7L5 input to calibrator out
Adj: R895 for equal amplitudes
Recheck: Hi-Z amplitude and rock in tweeks if necessary

Timing

Connect: 184 to left vertical

Set: 184 to 10ms

Set: 7L5 time/div to 10ms, freq span to "0", adj for triggered display.

Adj R685 for 1 mark/div

Check: All time/div ranges for \leq 5% error.

Resolution

Connect: 4 10K swamping resistors from (TP1660-TP1665), (TP 1720-TP1725), (TP1760-TP1765), (TP1800-TP1805).

Connect: Calibrator output to 7L5 input

Set: 7L5 dot -req to 500.00kHz, resolution to 3kHz, 10dB/log, freq span and ref level for usable full screen display.

Adj: L1400 & L1220, L1916 & L1918, for max signal.

Remove: 10K resistor from TP1660-TP1665

Ground TP1790, 1795, and 1820.

Adj: C1660 for best symmetry & no wings

Set: 7L5 to 2 dB/

Adj: R1680 for slightly flattened top on waveform

Adj: L1680 for symetry & flat top

NOTE: If L1680 cannot be tuned thru the dip in the waveform top, adj C1664 until proper range of adjustment of L1680 is obtained.

Readjust: R1680 so top of waveform just begins to round off.

Set: 7L5 freq span to "0"., ref-level for 7cm base line rise.

Set: res. to 10Hz

Adj: C1666 for MAX baseline rise.

Adj: R1685 for 7cm

Rock in: Res shaping and amplitude tweeks.

NOTE: Having connected the 10K res. and grounding strap as directed, you have swamped all stages except the one to be tuned and bypassed all LED's except the one associated with the stage to be tuned. Now you will tune the 2nd, 3rd, and fourth stages using the tweeks and test points listed below. (Underlined tweeks are the ones used for stage #1)

Stage #	Ground Point	<i>3kHz 10 symmetry</i>	<i>Remove L1680</i>	<i>2dB symmetry</i>	<i>Remove</i>	<i>750 Span 1 MAX Gc</i>	<i>750</i>
1	1790, 1795 1820	C1660	C1664	L1680	R1680	C1666	R1685
2	1695, 1795 1820	C1720	C1724	L1730	R1730	C1726	R1735
3	1695, 1790 1820	C1760	C1764	L1780	R1780	C1766	R1785
4	1695, 1790 1795	C1800	C1804	L1820	R1820	C1806	R1825

Remove: 10K resistors
 Check: res. shape and retweek for best symmetry spreading tweaks over all four stages
 Adj: R1680, 1730, 1780, 1820 3kHz BW
 Adj: 1kHz BW with R1700, 300Hz BW with R1702, 100Hz BW, with R1704, 30Hz BW with R1706 (@ -6 dB point)
 Adj: R1708 to \leq 100 Hz BW @ -70 dB point on 10Hz res.

 Set: res to 3 kHz, freq span to "0".
 Adj: ref-level and variable for 7 cm baseline rise.

 Set: res to 10 Hz
 Adj: for 7cm using 10 Hz amplitude pots. (all 4)

 Set: 7L5 resolution to 3kHz, span to 1 kHz
 Adj: ref-level for 7 div display

 Check: That amplitudes of 1K, 300Hz, 100Hz do not vary more than 0.5 dB.

 Check: That amplitudes at 30Hz and 10Hz do not vary more than 2 dB from level at 3 kHz.

 set: ref-Level to -40 dBV
 Midrange: FP amp cal pot
 Adj: R1835 for full screen display in 2dB/
 Set: 7L5 res. to 10 kHz, freq span to 5 kHz
 Adj: L1856-L1872 for best shape.
 Adj: R1885 to match amplitudes at 3 kHz.

Set: 7L5 res to 30 kHz, span to 10 kHz

Adj: L916 and L918 for best shape.

Adj: R1905 to match 3 kHz amplitude.

Readjust: 10kHz filter shape if necessary

Measure: BW @ -6 dB point and @ -60 dB point on each filter

Check: That ratio of two numbers obtained above does not exceed
1:5 on 3K, 10K and 30K filters and 1:10 on the remainder.

Tracking

Connect: Counter to TYPE 184 time mark gen.

Set: 184 to 1 μ s

Check: Accuracy to Type 184 at 1MHz

Connect: Type 184 to 7L5 input

Set: Span to 50Hz/div, res to 10Hz.

Check: Tracking as per the following table.

NOTE: 1 Hz error in type 184 at 1MHz will show up as 2Hz tracking error at 2 MHz etc.

<u>C.F. (KHz)</u>	<u>Error</u>
500.00	$\pm 6\text{Hz}$
1000.00	$\pm 7\text{Hz}$
1500.00	$\pm 8\text{Hz}$
2000.00	$\pm 9\text{Hz}$
2500.00	$\pm 10\text{Hz}$
3000.00	$\pm 11\text{Hz}$
3500.00	$\pm 12\text{Hz}$
4000.00	$\pm 13\text{Hz}$
4500.00	$\pm 14\text{Hz}$
5000.00	$\pm 15\text{Hz}$

Connect: H-P 651 to 7L5 with H-P 355 C&D in line.

Set: 7L5 to 2 dB/, res to 3K, ref-level to ~~42 dBV~~
~~-29 dBm~~

Adj: 651 for 7 div display. ("0" dB on 355)

Set: 7L5 ref level to ~~43 dBV~~
~~-30 dBm~~

Set: 355 to 1 dB

Check: for 7 cm $\pm .2$ dB

Check: 1 dB steps from ~~43 dBV~~ thru ~~58 dBV~~ ($\pm .2$ dB/1 dB step)
~~-30 dBm~~ ~~-45 dBm~~

Check: The transitions between ~~74~~ & ~~75~~ dBV, ~~83~~ & ~~84~~ dBV, ~~103~~
~~-91 dBm~~ ~~-110~~ ~~-111 dBm~~ ~~-61~~ ~~-62 dBm~~ ~~-70~~ ~~-71 dBm~~ ~~-90~~
& ~~104~~ dBV, ~~123~~ & ~~124~~ dBV to $\pm .2$ dB.

Adj: If necessary, (R1065 @ ~~84~~ dBV) (R1115 @ ~~104~~ dBV) and (R1145 @ ~~124~~ dBV)
~~-71 dBm~~ ~~-91 dBm~~ ~~-111 dBm~~

Set: Ref-Level to ~~42 dBV~~, H-P 355C&D to "0" dB, 651 for 7 cm.
~~-29 dBm~~

Set: Ref-level to ~~52 dBV~~, H-P355D to 10 dB.
~~-39 dBm~~

Check: for 7 cm $\pm .25$ dB.

Check: in 10 dB steps to ~~141 dBV~~ ($\pm .25$ dB/10 dB)
~~-128 dBm~~

Set: ref-Level to ~~42 dBV~~, HP651 to +20 ~~dBV~~, 355D to 40 dB,
~~-29 dBm~~ ~~dBm~~
355C for 10 dB.

Adj: H-P 651 for 7 div display

Set: ref-Level to ~~41 dBV~~
~~-28 dBm~~

Set: 355C for 9 dB

Check: for 7 div $\pm .2$ dB

Check: Transitions at following ref-levels for $\pm .2$ dB error.
~~-26~~ ~~-25 dBm~~ ~~-22~~ ~~-21 dBm~~ ~~-18~~ ~~-17 dBm~~ ~~-14~~ ~~-13 dBm~~
(~~-39~~ ~~-38 dBV~~) (~~-35~~ ~~-34 dBV~~) (~~-31~~ ~~-30 dBV~~) (~~-27~~ ~~-26 dBV~~)
~~-10~~ ~~-9 dBm~~ ~~-6~~ ~~-5 dBm~~ ~~-2~~ ~~-1 dBm~~ ~~+2~~ ~~+3 dBm~~
(~~-23~~ ~~-22 dBV~~) (~~-19~~ ~~-18 dBV~~) (~~-15~~ ~~-14 dBV~~) (~~-11~~ ~~-10 dBV~~)
(~~+6~~ ~~+7 dBm~~) (~~+10~~ ~~+11 dBm~~) (~~+14~~ ~~+15 dBm~~) (~~+18~~ ~~+19 dBm~~)
(~~-7~~ ~~-6 dBV~~) (~~-3~~ ~~-2 dBV~~) (~~+1~~ ~~to +2 dBV~~) (~~+5~~ ~~to +6 dBV~~)

Set: ref-level to ~~42 dBV~~, HP 355D for 50dB, 35C for "0"
~~-29 dBm~~

Adj: H-P 651 for 7 cm display.

set: ref-level to ~~32 dBV~~
~~-19 dBm~~

Set: H-P 355D to 40 dB

Check: for 7 cm $\pm .25$ dB.

Check: on thru in 10 dB steps ($\pm .25$ dB) to + 8 dBV

Functions Amplitude and Linearity

- Connect: Calibrator to 7L5 input with H-P 355C & D in line.
- Set: 7L5 ref-level to -40 dBV, 500 kHz C-F.
- Check: That full screen amplitudes match in 10 dB/ & 2 dB/
- Set: 7L5 to 10 dB/
- Check: Log Linearity of 80 dB dynamic range to spec of $\pm .5$ dB/10dB
or AMAX cumulative error of ± 2 dB.
- Set: 7L5 to 2 dB/
- Check: Log Linearity of 16 dB dynamic range to spec of $\pm .1$ dB/dB
or AMAX cumulative error of 1 dB
- Set: 7L5 to Lin, 2 mV/div
- Check: for 5 div display $\pm .25$ div
- Set: 7L5 to 5 mV/div
- Check: for 2 div display $\pm .1$ div.
- Set: 7L5 to 10 mV/div
- Check: for 1 div display $\pm .05$ div.

Switch: dBm/dBV switch
Check: That dBm ref-level readout is 13 dB higher than dBV readout
(-27 dBm = -40 dBV)

Set: Dot freq to 0.00KHz, ref-level to -30 dBm, span to 20KHz,
res. to 30K, 10 dB/
Terminate: 7L5 input
Check: That start spurii amplitude is \leq -45 dBm.

Connect: 603 @ 10.7 MHz @ "0" dBm to 7L5 input.
Set: 7L5 ref-level to -70 dBm, 10 dB/
Adj: 608 r-f fine freq for max baseline rise.
Adj: C140, C146, C148 for minimum baseline rise

Connect: H-P 654 to 7L5 @ -28 dBm, 50 Ω .
Set: 7L5 to 2 dB/, -30 dBm ref-level
Check: Flatness for \leq .5 dB P-P ripple

Set: 7L5 to 10 dB/ log.
Insert: Special L) out/I-F in plug-in into 7L5
Connect: 608 @ 10.7 MHz @ -35 dBm to I-F in.
ADJ: 608 if necessary for full screen display

Remove: Amp. Cal Plug from regular L-1
Insert: regular 7L5 plug-in in 7L5.
Set: Dot freq to 500 kHz
Connect: 654 @ same level as HP 608
Check: for \geq 7 cm display. (L-1 Loss \leq 10 dB)
Reconnect: Amp Cal plug-in Regular L-1.

Spurii

Connect: Calibrator to 7L5 input.

Set: 7L5 to 10 dB/ ref-level to -40 dBV, dot freq. to 500.00kHz,
span to 50 Hz, res. to 10 Hz.

Adj: 7L5 ref-level controls for 8 div display.

Set: ref-level for 10 dB more gain (\approx -50 dBV)

Check: Amplitude of Line related sidebands to be ≤ 1 cm.

Set: Freq. span to 2K, res. to 300 Hz, dot to left grat line.

Check: That noise skirts on signal are ≤ 1 cm (mid-screen noise floor)

Check: Spurii listed on following chart are \leq -130 dBm.

Dial Freq. (MHz)	OSC Harmonic	Source	Seen
.150000	2	11 MHz	*
.500000	1	.500000	*
.650000	2	12 MHz	*
883.25 kHz	9	10 X 10.450	
938.75 kHz	9	10 X 10.450	
1.000000	1	1 MHz	*
1.025000	8	9 X 10.450	
1.087500	8	9 X 10.450	
1.150000	2	13 MHz	*
1207.25 kHz	7	8 X 10.450	
1278.50 kHz	7	8 X 10.450	
1.450000	6	7 X 10.450	
1533.25 kHz	6	7 X 10.450	
1.650000	2	14 MHz	
1.790000	5	6 X 10.450	
1.890000	5	6 X 10.450	
2.000000	1	2 MHz	
2.150000	2	15 MHz	
2.300000	4	5 X 10.450	
2331.25 kHz	8	10 X 10.450	
2393.75 kHz	8	10 X 10.450	
2.425000	4	5 X 10.450	

Dial Freq. (MHz)	OSC Harmonic	Source	Seen
2.650000	2	16 MHz	*
2.700000	7	8 X 10.450	
2771.50 kHz	7	9 X 10.450	
3.000000	1	3 MHz	*
3.150000	2	17 MHz	*
	or 3	4 X 10.450	
3191.75 kHz	6	8 X 10.450	
3.275000	6	8 X 10.450	
3316.75 kHz	3	4 X 10.450	
3.650000	2	18 MHz	
3.880000	5	7 X 10.450	
3.980000	5	7 X 10.450	
4.000000	1	4 MHz	*
4.150000	2	19 MHz	*
4192.75 kHz	7	10 X 10.450	
4264.25 kHz	7	10 X 10.450	
4.650000	2	20 MHz	*
4.850000	2	3 X 10.450	
4.912500	4	6 X 10.450	
4933.25 kHz	6	9 X 10.450	
5.000000	1	5 MHz	*

Sens

Connect: Calibrator to 7L5
Set: ref-level to -40 dBV, dot -req to 500.00 kHz
Adj: F.P. amp cal & Log Cal for matching 2 dB/ & 10 dB/ levels

Set: 7L5 log to 10 dB/, ref level to ~~-83 dBV~~
Disconnect: Calibrator ~~-70 dBm~~

Set: Display "B" to on
Set: Cursor to top of screen

Check: Noise floor at each res. setting as per the following chart

30 kHz \leq	105 dBm
10 kHz \leq	110 dBm
3 kHz \leq	115 dBm
1 kHz \leq	120 dB m
300 Hz \leq	125 dBm
100 Hz \leq	129 dBm
30 Hz \leq	132 dBm
10 Hz \leq	135 dBm

F-M

Connect: Calibrator to 7L5 input.

Set: 7L5 to 2 dB/, span to 50 Hz, res. to 10 Hz, ref-level
-40 dBV, dot freq to 500.00 kHz, MODE to MNL. Swp.

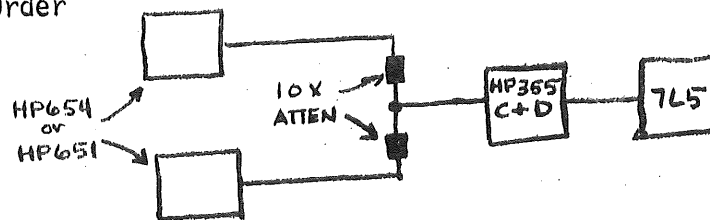
Adj: MNL. Spw to position the swept dot near center screen.
(Vertically & Horizontally)

NOTE: The dot will move vertically when it begins to ride up on the
10 Hz resolved skirt.

Check: Short term vertical jitter does not exceed 0.8 div. (1 Hz)

Intermodulation Distortion

A. 3rd Order



Connect: Test setup as shown

Set: 7L5 ref-level to -30 dBm, dot freq. to 2500.00 kHz Log to 10 dB/, Freq Span to 5kHz/, Resolution to 3 kHz.

Set: HP 355L & D to 10 dB

Adj: HP 654 & 651 for 8 div signals 1 div. apart.

Set: HP 355 C&D to "0".

Set: 7L5 resolution to 100 Hz, Freq. Span to 1 kHz/div.

Adj: 7L5 dot freq. to position left signal to right graticule line.

Check: for IM sidebands ≤ 3.5 div. high

Depress: Input Buffer and check for sidebands ≤ 3 div. high.

Repeat: IM Procedure thus far with 7L5 ref level set to -40 dBm and HP655 C&D set to 10 dB. Check for IM sidebands ≤ 3 div high.

B. 2nd Order

Set: HP654 to 10kHz at -20 dBm.

Set: HP355 C&D to 10 dB

Set: 7L5 dot freq. to 10.00 kHz and adj. generator for 8 div. display.

Set: 7L5 Freq Span to 2 kHz/div., Resolution to 300 Hz.

Adj: 7L5 dot freq to position 2500 kHz signal to right Graticule line.

Set: HP355 C&D to "0".

Check: for IM sidebands ≤ 3.8 div. high.

Dot Switching (4 hole Mainframe)

Set: Mainframe vertical to right, Horiz to left. (dot freq to CAL)
Check: for dot a horiz center screen, 6.4 div from bottom.

Set: mainframe to ADD.
Check: for approx same picture

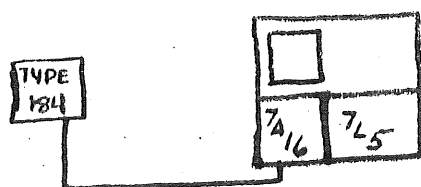
Set: Vert to chop
Check: That no dot is being displayed while left vert is displayed.

Set: Vert to Left.
Check: For no dot.

Set: Mainframe vert. to right, horiz to chop.
Check: for no dot during "B" horiz time.

NOTE: Dot would show up here as dim trace @ approx. 6.4 divs.

Coupled Resolution/Auto Sweep



Connect: Test setup above
 Set: Vert Mode to Chop
 Set: 7L5 Time/Div to Auto, Resolution to Coupled
 Check: That Resolution readout matches table below for appropriate freq. spans. (Verify with 184)

Freq. Span	Resolution	Time/Div.
Max	30 K	50 ms
200 K	30 K	20 ms
100 K	30 K	10 ms
50 K	10 K	20 ms
20 K	3 K	20 ms
10 K	3 K	10 ms
5 K	1 K	50 ms
2 K	300 Hz	.2 sec
1 K	300 Hz	.1 sec
.5K	100 Hz	.5 sec
.2 K	30 Hz	2 sec
.1 K	30 Hz	1 sec
50 Hz	10 Hz	2 sec
0 Hz	30 kHz	10 ms

UNCAL System

Check: For proper UNCAL Sign at the following F.P. control settings.

<u>Resolution</u>	<u>Freq Span</u>	<u>Time/Div</u>	<u>UNCAL</u>
30 kHz	200 kHz	20 ms	off
30 kHz	200 kHz	10 ms	on
10 kHz	MAX	200 ms	off
10 kHz	MAX	100 ms	on
3 kHz	20 kHz	20 ms	off
3 kHz	20 kHz	10 ms	on
300 Hz	100 Hz	50 ms	off
300 Hz	100 Hz	20 ms	on
100 Hz	50 kHz	10 s	on
100 Hz	20 kHz	10 s	off
Any	zero	Any	off

Set: Trigger Mode to manual

Check: UNCAL light is always out.

FRONT PANEL CHECKS

A. Log Cal. Range

Connect: Calibrator to 7L5

Set: 7L5 for 8 div display @ 2 dB/ @ 500 kHz dot freq.

Rotate: F.P. Log CAL pot thru its range and check for $\geq \pm 5\%$ amplitude change

B. Vert. Out:

Set: ~~Log~~^{AMP} cal pot for 8 cm display, **IN LIN.**

Measure: P-P output of vert. out jack for $400 \text{ mV} \pm 20 \text{ mV}$

C. Swp. Out:

Check: Horiz. Out jack for a negative going swp. from $+ .25 \text{ Vdc}$
 $\pm .25 \text{V}$ to $-5.75 \text{V} \pm .25 \text{V}$.

D. Input Buffer:

Set: ref-level for 7 div display

depress: Input buffer button

Check: display amplitude for 7 div $\pm 0.25 \text{ div}$.

Set: 7L5 to 10 dB/

Switch: Input buffer on & Off

Check: for approx 8 dB change in noise level.

E. Dot Position

Set: Span to 200 kHz.

Rotate: Dot knob thru its range

Check: dot moves from center screen to off left side of screen

F. Vert & Horiz pos:

Check: vert position for $\geq \pm \text{div. range}$.

Check: Horiz. position for $\geq \pm 1 \text{ div. range}$.

G. Baseline Clipper:

Set: mainframe vert mode to chop

Position: Left vert trace 1 div from bottom of screen.

Check: That baseline clipper clips from nothing to 2 div from bottom of screen over approx. last 1/3 of rotation.

Check: That left vert. trace is not affected.

H. Variable Ref. Level Range

Check: Minimum 8 dB range.