

FACTORY CALIBRATION PROCEDURE

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INTRODUCTION:

581A

This is the guide for calibrating brand-new instruments, it therefore, calls out many procedures and adjustments that are rarely required for subsequent recalibration. *This procedure is company confidential.* In this procedure, all front panel control labels or Tektronix equipment names are in capital letters (VOLTS/DIV, etc.) internal adjustment labels are capitalized only (Gain Adj, etc.).

Tek form number:

0-147

March 1967

For all serial numbers.

Supersedes
March 1964



FACTORY TEST LIMITS:

We initially calibrate the instrument to Factory Test Limits. These limits are often more stringent than advertised performance requirements. This helps insure that the instrument will meet advertised requirements after shipment, allows for inaccuracies of test equipment used, and may allow for changes in environmental conditions.

QUALIFICATION:

Factory test limits are qualified by the conditions specified in the main body of the calibration procedure. The numbers and letters to the left of the limits correspond to the factory calibration procedure steps where the check or adjustment is made. Instruments may not meet factory test limits if calibration or check-out methods and test equipment differ substantially from those in this procedure.

ABBREVIATIONS:

Abbreviations in this procedure will be found listed in TEKTRONIX STANDARD A-100.

CHANGE INFORMATION:

This procedure has been prepared by Product Manufacturing Staff Engineering. For information on changes that have been made to this procedure, to make suggestions for changing this procedure, or to order additional copies: please contact PMSE, 47-261. (DC)



EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. TEKTRONIX Instruments

- 1 TYPE 533A OSCILLOSCOPE with
- 1 TYPE B PLUG-IN UNIT (test scope)
- *1 TYPE 184 TIME-MARK GENERATOR
- *1 TYPE 191 CONSTANT AMPLITUDE SINE WAVE GENERATOR
- 1 TYPE 76TU LINE VOLTAGE CONTROL UNIT

b. Test Fixtures and Accessories

- 1 Clip Lead Adapter (013-0076-00)
- 3 Coaxial cables, 50 Ω 42" BNC (012-0057-00)
- 1 PROBE, 1X P6028 (010-0074-00)
- 1 PROBE, 10X P6006 (010-0127-00)
- 1 50 Ω Termination, BNC (011-0049-00)
- *1 STANDARD AMPLITUDE CALIBRATOR (067-0502-00)
- 1 BANDPASS PLUG-IN UNIT (PMPE dwg #1435C)
- 1 CALIBRATION FIXTURE (067-0523-00)
- 1 VARIABLE ATTENUATOR (067-0511-00)
- 1 Micro Shock Hammer

c. Other Equipment

- 1 Heathkit Model IG72 Audio Generator, or equivalent
- 1 Multimeter 20,000 Ω /Volt (Simpson 262 or equivalent)

d. Equipment for Sample Checks

- 1 General Radio (GR) 1215B VHF Oscillator with Power Supply
- 1 Any Sampling Oscilloscope with bandwidth of DC to >500 MHz

* This equipment must be traceable to NBS for instrument certification. Substitute test equipment may be used. The Plant Staff Engineer must approve any substitutions. All equipment listed must perform within its manufacturer's specifications, unless otherwise stated.

It is assumed that all equipment is provided with BNC connectors; if equipment used has other than BNC connectors, adapters, not listed, may be needed.

FACTORY TEST LIMITS

QUALIFICATION

Factory test limits are qualified by the conditions specified in the main body of the calibration procedure. The numbers and letters to the left of the limits correspond to the factory calibration procedure steps where the check or adjustment is made. Instruments may not meet factory test limits if calibration or checkout methods and test equipment differ substantially from those in this procedure.

1. PRELIMINARY INSPECTION

- c. Check CRT: Tilt $3/64''$ max; concavity or convexity $3/64''$ max

2. PRESET CONTROLS

3. RESISTANCE

4. POWER SUPPLIES AND CRT HV

- a. Check the time-delay relay: 15 to 60 seconds
- b. Adjust -150V and check the regulated voltages.

<u>Power Supply</u>	<u>Max error</u>	<u>Max ripple</u>
-150V	$\pm 3V$	5mV
+100V	$\pm 2V$	15mV
+225V	$\pm 4.5V$	5mV
+350V	$\pm 7V$	30mV
+500V	$\pm 10V$	30mV

- c. Adjust 12.6V supply and check regulation and ripple error: $\pm 4\%$, max ripple: 15mV, max
- d. Adjust -1350V and check HV regulation:
Voltage: -1350V $\pm 2\%$
Regulation: no trace bloom or voltage change $> 20V$ from 105 VAC to 125 VAC line

5. VERT SHIELD VOLTS ADJ

6. TRACE ALIGNMENT

- a. Check trace alignment range: 6° , min
- b. Align trace: $\pm 1^\circ$, max

7. GEOMETRY

- b. Adjust geometry, R861: bowing 0.67mm, max
- c. Check horizontal geometry: bowing 0.67mm, max

8. FOCUS

- a. Check horizontal focus: no overlap of 1mm spaced marks over the center 8.8cm of the graticule.
- b. Check vertical focus: no overlap of 1mm spaced marks.

9. BEAM POSITION INDICATORS AND SCALE ILLUMINATION

- b. Check beam position indicators: The spot must move off-screen in the direction indicated. The proper beam position indicator must come on and the opposite neon must go off before the spot leaves the graticule area.
- c. Check SCALE ILLUM: max cw, off ccw.

10. 5X MAGNIFIER AND VARIABLE INDICATORS

- a. Check 5X MAGNIFIER indicator: Neon must be off when 5X MAGNIFIER knob is in the ccw position and on when the 5X MAGNIFIER knob is in the cw (ON) position.
- b. Check VARIABLE indicator: Neon must be off when the VARIABLE control is in the cw (CALIBRATED) position and off in all other positions of the VARIABLE control.

11. CRT CATHODE INPUT

- a. Check intensity modulation: 20V
Check alternate trace:
- b. Alternate trace at all sweep rates

12. VERTICAL AMPLIFIER

- d. Check vertical amplifier balance:
0.5cm, max from electrical center
- e. Check for microphonics: 0.25cm, max;
no ringing type
- *f. Adjust Vert Gain Adj, R1015: range
+15% to -15%, 2cm $\pm 2\%$
- g. Check DC shift: 1mm, max
- h. Check vertical drift: 2mm, max from
105 VAC to 125 VAC line
- i. Check compression/expansion: 0.5mm, max

13. AMPLITUDE CALIBRATOR

- *a. Check accuracy: $\pm 2\%$ all settings
- b. Check calibrator frequency: 1 kHz $\pm 20\%$
- c. Check calibrator duty cycle: 45% to 55%

14. TIME BASE TRIGGERING

- a. Set TRIGGERING LEVEL mechanical zero: 0V
- b. Adjust Trig Level Centering, R26: + and -
triggering on 1mm vertical signal.
- c. Adjust Trig Sens, R47: + and - triggering
on $\frac{1}{2}$ mm signals, no triggering on $\frac{1}{4}$ mm
signals
- d. Check internal and external mid-frequency
triggering: 1 kHz, 2mm INT, 0.2V EXT
10 MHz, 2mm INT, 0.3V EXT
3mm HF SYNC, 0.2V EXT HF SYNC

15. LINE TRIGGERING

- b. Check line triggering: triggering on
proper slope

16. PRESET ADJUST

- b. Adjust PRESET ADJUST: center of range

17. TRIGGERING LEVEL RANGE

- b. Check TRIGGERING LEVEL range:
15V, min

18. MAGNIFIER GAIN

- *b. Adjust Mag Gain Adj, R372:
 $\pm 3\%$
Magnified Sweep Linearity: $\pm 1\%$

*19. SWEEP CALIBRATION $\pm 2\%$

20. SWEEP LENGTH 10.2 to 10.8cm

21. NORM/MAG REGISTRATION

0.5cm at graticule center

22. VARIABLE TIME/CM

- a. Check VARIABLE TIME/CM ratio:
2.5:1, min
- b. Check neon: Lighted except in
CALIBRATED switch position.

23. TIMING

- a. Check timing
.1mSEC-.5SEC: $\pm 2\%$, max
1 and 2 SEC: $\pm 2.5\%$, max
- c. Adjust and check timing:
.05 SEC-50 SEC: $\pm 2\%$, max
Magnified Sweep: $\pm 3\%$, max
Linearity: $\pm 1\%$, max

24. LOCKOUT LEVEL

- a. Set Lockout Level: 9V to 11V
- b. Check SINGLE SWEEP triggering:
sweeps once on triggering signal.

25. +GATE INTERVAL

- b. Check +GATE interval: 3 μ s to 400ms

26. EXTERNAL HORIZONTAL AMPLIFIER

- a. Adjust Ext Horiz DC Bal, R317: 1cm shift, max
- b. Check for grid current: ± 0.5 cm shift, max
- c. Adjust C301C: X10 to X1 match $\pm 5\%$
- *d. Check external horizontal deflection factor: 0.15 volts/cm, max
- *e. Check EXT HORIZ ATTEN X10: divide gain by 10 $\pm 2\%$
- f. Check EXT HORIZ ATTENUATOR: 10:1 ratio, min
- *g. Check horizontal bandpass: 375 kHz, or more at -3dB

27. FRONT PANEL WAVEFORMS

+GATE OUT 20V, min
SAWTOOTH OUT 130V, min

28. VERTICAL HF COMPENSATION

- *c. Recheck vertical gain: $\pm 2\%$, max
- *h. Check vertical gain HF adjustments:
gain $\pm 2\%$, max;
aberrations $\pm 2\%$, max.

29. VERTICAL DELAY

40nS, min

30. VERTICAL BANDWIDTH

- *b. Check vertical bandwidth:
95 MHz, or more at -3dB

31. LOW FREQUENCY TRIGGERING

INT: 2mm 15 Hz and 15 kHz
EXT: 0.2V 15 Hz and 15 kHz

32. HIGH FREQUENCY TRIGGERING

- a. Check external HF triggering:
0.4V at 50 MHz; 1.2V at
100 MHz; 1.5V at 150 MHz;
HF SYNC 0.2V at 150 MHz
- b. Check Internal HF triggering:
1cm at 50 MHz; 2cm at 100 MHz;
2.5cm at 150 MHz; HF SYNC 3mm
at 150 MHz

I. SAMPLE CHECKS

HF SYNC at 250 MHz
INT 4mm; EXT 0.2V PTP

* Indicates measurement characteristic;
test equipment used must be traceable
to NBS for instrument certification.

THE END

1. PRELIMINARY INSPECTION

a. General

Check for unsoldered joints, rosin joints, lead dress and long lead ends. Check for loose hardware and protruding parts. Check controls for smooth mechanical operation, proper indexing, and knob spacing from the front panel. Correct all defects found.

b. Check Shield

See that a HV shield is installed.

c. Check CRT: Tilt $3/64$ " max; concavity or convexity $3/64$ " max

Check that CRT neck pins are tight. Remove the CRT faceplate protector and light guide. Align the CRT faceplate with the front panel using a straight edge. Check CRT faceplate tilt, concavity and convexity.

Tighten two allen head CRT clamp screws. Replace the light guide and position the CRT faceplate flush with the edge of the light guide. Place an external graticule on the graticule studs and rotate the CRT to place the internal graticule lines parallel with the external graticule lines. Tighten the CRT clamp.

Remove the external graticule and replace the faceplate protector. Note CRT serial number and code date. Inspect the CRT for structural defects including:

- phosphor defects
- scratches
- cracks around neck pins

d. Check graticule light positioning

Ends of the light bulbs must be seated in recesses of the light guide when it is flush with the panel.

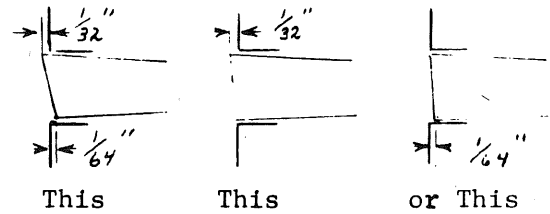
e. Check fuse

Fuse must match the line voltage source as follows:

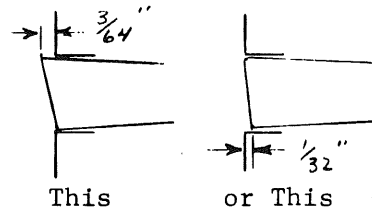
Connected for:

- | | | | | | | | | |
|--------|----|-------|----|-----|----|--------|----|----------|
| 117VAC | -- | 50 Hz | -- | 3ag | -- | 6.25 A | -- | slo-blo |
| 117VAC | -- | 60 Hz | -- | 3ag | -- | 6 A | -- | fast-blo |
| 234VAC | -- | 50 Hz | -- | 3ag | -- | 3 A | -- | slo-blo |
| 234VAC | -- | 60 Hz | -- | 3ag | -- | 3 A | -- | fast-blo |

Allowable tilt.



But not



Allowable convexity or concavity.



A straight edge and a guage made of $3/64$ " diameter wire are useful in checking CRT measurements.

These are abbreviated CRT checks. For more information consult the CRT check out procedure.

2. PRESET CONTROLS

FOCUS	ccw
INTENSITY	ccw
ASTIGMATISM	ccw
SCALE ILLUM	cw
HORIZONTAL DISPLAY	INTERNAL SWEEP
5X MAGNIFIER	OFF
AMPLITUDE CALIBRATOR	OFF
TIME BASE	
STABILITY	ccw (not PRESET)
TRIGGERING LEVEL	CENTERED
TRIGGER SLOPE	+
TRIGGERING SOURCE	INT AC
TIME/CM	1mSEC
VARIABLE	CALIBRATED

All internal adjustments midr.

Set the TRIGGER LEVEL knob to the approximate center of its rotation. Tighten the set screw just enough to permit rotating the pot shaft. The TRIGGER LEVEL control will be set later.

3. RESISTANCE*a. Setup*

Install a CALIBRATION FIXTURE in the TYPE 581A. Preset the CALIBRATION FIXTURE controls as follows:

LOAD	NORMAL
DISPLAY SELECTOR	EXT INPUT
VERTICAL POSITION	midr
PULSER AMPLITUDE	midr
PULSER FREQUENCY	midr

Set SW135 in the CALIBRATION FIXTURE to 12.6V load.

b. Measure resistance

Measure the resistance between each power supply and ground as in the following table:

<u>Test Point</u>	<u>Approx Resistance</u>
Transformer term 1	inf
Transformer term 4	inf
+12.6	5-10 Ω
-150V	3k
+100V	2k
+225V	5k
+350V	20k
+500V	30k
+325V unreg	3.5k

4. POWER SUPPLIES AND CRT HV

- a. *Check the time-delay relay*
 15 to 60 second delay

Apply power to the TYPE 581A via a TYPE 76TU. Set the line voltage to 117 VAC. Turn the POWER switch ON. Check that none of the regulated power supplies are energized before the time-delay relay has closed.

Check for a delay of 15 to 60 seconds before the time-delay relay closes with an audible click.

- b. *Adjust -150V and check the regulated voltages*

Adjust -150V Adj for exactly -150V. Change the CALIBRATION FIXTURE LOAD switch to HIGH. Measure the voltages and ripple from 105 VAC to 125 VAC line as in the following table:

Power Supply	Max error	Max ripple
-150V	±3V	5mV
+100V	±2V	15mV
+225V	±4.5V	5mV
+350V	±7V	30mV
+500V	±10V	30mV

Change the CALIBRATION FIXTURE LOAD switch to LOW and measure the voltages and ripple from 105 VAC to 125 VAC line. Return the line voltage to 117 VAC.

- c. *Adjust +12.6V and check regulation and ripple*
 error: ±4%, max
 ripple: 15mV, max

Connect the SAC UNKNOWN cable -- clip lead adapter -- red lead to the front of C786, black lead to ground. Set the SAC AMPLITUDE to 10V and MODE to +DC MIXED. Set the TYPE B plug-in VOLTS/CM to 1, INPUT SELECTOR to INPUT A DC and position the trace to the bottom graticule line. Connect the SAC OUTPUT to TYPE B INPUT A. Adjust R785 for 2.6cm of vertical deflection. (12.6-10 = 2.6)

Check regulation from 105 VAC to 125 VAC line at HIGH LOAD. Note display change: 0.5cm, max. Repeat regulation check at LOW LOAD.

- b. Use the test scope to measure ripple and the multi-meter to measure voltage.

-150V may be adjusted ±2% to bring other supply voltages within test limits.

4c. (cont'd)

Remove the SAC OUTPUT cable. Connect a 1X probe from the front of C786 to TYPE B INPUT A. Set the VOLTS/CM switch to .005. Measure the 12.6V supply ripple at 105 VAC line with the CALIBRATION FIXTURE LOAD switch at HIGH, then at 125 VAC line with the CALIBRATION FIXTURE LOAD switch at LOW. Return the line to 117 VAC.

- d. *Adjust -1350V and check HV regulation voltage: -1350V $\pm 2\%$
regulation: no trace blooming or voltage change >20V from 105 VAC to 125 VAC line*

Set the multimeter to a range suitable to read -1350V and connect the meter to the front of R847 (27k) on the F & I chassis. Adjust HV Adj, R840 for a -1350V reading on the multimeter. Turn STABILITY and VERTICAL POSITION cw. Lower the line voltage to 105 VAC and vary the INTENSITY control from full cw to full ccw while checking the reading on the multimeter. In similar fashion check the regulation at 125 VAC line. Check for no trace blooming while varying line from 105-125 VAC. Return the line voltage to 117 VAC.

- e. *Check elevated heaters*

Check the elevated heater supply voltages as in the following table:

<u>Transformer terminal</u>	<u>Approx DC voltage</u>
22 and 23	+50V
27 and 28	+225V
24 and 25	-1350V
9 and 16	+350V

5. VERT SHIELD VOLTS ADJ

Center the trace vertically. Connect the multimeter leads between the rear neck pins and the center arm of the Vert Shield Adj pot, R860. Set the Vertical Shield Adj to 0V.

6. TRACE ALIGNMENT

- a. *Check TRACE ROTATION range: 6° , min*
Set TRACE ROTATION to each extreme and check for at least 6 degrees of total tilt.
- b. *Align trace $\pm 1^{\circ}$, max*
Set the TRACE ROTATION to align the trace parallel with a horizontal graticule line.

- a. Adjust TRACE ROTATION through a hole in the center of the ASTIGMATISM knob. 6 degrees = 1cm difference in vertical deflection in 10cm of horizontal trace.

7. GEOMETRY

- a. *Setup*
Apply 1mS and .1mS markers from the TYPE 184 to CALIBRATION FIXTURE EXT INPUT. Set the TIME/CM to 1mSEC. Adjust the VARIABLE control for exactly 15, 1mS markers in 10cm. The distance between markers is now 0.67mm. Adjust the VERTICAL POSITION so the baseline is off the bottom of the graticule, with the markers extending above the top of the graticule.
- b. *Adjust Geometry, R861*
Bowing: 0.67mm, max
Adjust R861 for minimum bowing of the vertical lines. Check over the entire graticule for 0.67mm or less of bowing within the 4cm height of the graticule.
- c. *Check horizontal geometry*
bowing: 0.67mm, max
Turn the TYPE 184 markers off. Turn the STABILITY control cw. Position the trace over the entire graticule area with the CALIBRATION FIXTURE VERTICAL POSITION control. Check for 0.67mm or less of bowing.

8. FOCUS

- a. *Check horizontal focus: No overlap of 1mm spaced marks over the center 8.8cm of the graticule.*

Turn the TIME/CM to 1mSEC and apply .1mS marks from the TYPE 184. Adjust the TIME/CM VARIABLE for 10 marks/cm. Check that the FOCUS and ASTIGMATISM controls can be adjusted so all marks in the center 8.8cm of the graticule are clearly defined with no overlap.

Remove the TYPE 184 signal cable from the CALIBRATION FIXTURE EXT INPUT.

- b. *Check vertical focus: No overlap of 1mm spaced lines within the graticule area*

Connect SAC OUTPUT cable to CALIBRATION FIXTURE EXT INPUT. Set the SAC AMPLITUDE for a 1mm amplitude display at the graticule center. Use the CALIBRATION FIXTURE VERTICAL POSITION control to position the trace. Check for a clearly defined trace with no overlap of the two lines at the center, top and bottom of the graticule. Remove the SAC signal and return the TIME/CM VARIABLE TO CALIBRATED.

- b. It may be necessary to adjust the TYPE 581A Vert Gain Adj to maintain precisely 1mm of deflection at the center, top and bottom of the graticule.

9. BEAM POSITION INDICATORS AND SCALE ILLUMINATION

- a. *Setup*

5X MAGNIFIER	ON
STABILITY	ccw (not PRESET)
INTENSITY	see NOTES

- a. Adjust the INTENSITY for a minimum useable brightness to avoid damaging the CRT phosphor.

- b. *Check beam position indicators: The spot must move off-screen in the direction indicated. The proper beam position indicator must come on and the opposite neon must go off before the spot leaves the graticule area.*

<u>Position Control</u>	<u>Turn</u>	<u>Spot must Move</u>	<u>Beam Position Indicator</u>
CALIBRATION FIXTURE VERTICAL POSITION	cw	up	↑
CALIBRATION FIXTURE VERTICAL POSITION	ccw	down	↓
TYPE 581A HORIZONTAL POSITION	cw	right	→
TYPE 581A HORIZONTAL POSITION	ccw	left	←

Turn 5X MAGNIFIER OFF

9. (cont'd)

c. Check SCALE ILLUM: max cw, off ccw

Turn the SCALE ILLUM control full cw.
Observe maximum graticule illumination.
Turn the SCALE ILLUM control full ccw. The illumination should decrease smoothly from maximum to no illumination.

10. 5X MAGNIFIER AND VARIABLE INDICATORS*a. Check 5X MAGNIFIER indicator*

Neon must be off when the 5X MAGNIFIER knob is in the ccw (OFF) position and on when the 5X MAGNIFIER knob is in the cw (ON) position.

b. Check VARIABLE indicator

Neon must be off when the VARIABLE control is in the cw (CALIBRATED) position and on in all other positions of the VARIABLE control.

11. CRT CATHODE INPUT AND ALTERNATE TRACE*a. Check intensity modulation: 20V*

Remove CRT ground strap. Loosen the EXTERNAL CRT CATHODE and GND binding posts at the rear of the scope. Swing the strap away from the EXTERNAL CRT CATHODE binding post, making sure the strap pivots on the GND binding post.

Set the INTENSITY control for a normally bright trace. Connect the SAC to EXTERNAL CRT CATHODE and set the SAC AMPLITUDE to 20V. Check that alternate light and dark trace segments are displayed.

b. Check alternate trace

Set the CALIBRATION FIXTURE DISPLAY SELECTOR to ALT SYNC and check for alternate trace at all positions of the TIME/CM. Return TIME/CM to 1mSEC and DISPLAY SELECTOR to EXT INPUT.

12. VERTICAL AMPLIFIER*a. Find CRT vertical electrical center*

Set the STABILITY control cw. Short-circuit the front CRT vertical deflection plate pins together and note the trace vertical position. This is the CRT vertical electrical center. Remove the short-circuit.

12. (cont'd)

b. Adjust R1294

Connect a jumper between pin 2 of V1274 and pin 2 of V1284. Position the trace to electrical center with R1294. Remove the jumper between pin 2 of V1294 and pin 2 of V1284.

c. Check for loose tube socket connections

Move the vertical amplifier tubes in their sockets while observing the trace. Check for no erratic shift.

d. Check vertical amplifier balance: 0.5cm, max from electrical center

Short-circuit V1214 pin 2 to pin 7. The trace must not shift more than 0.5cm from previous stage or CRT electrical center.

Press the CALIBRATION FIXTURE SCOPE AMPL BALANCE CHECK button. The trace must not shift more than 0.5cm from the previous stage or electrical center.

e. Check for microphonics: 0.25cm, max; No ringing type

Set the TIME/CM switch to 10mSEC. Apply a shock from a micro-shock hammer at the top of the TYPE 581A front panel and check for 0.25cm, or less of microphonics, with no ringing type.

*f. Set Vert Gain Adj: R1015
range: +15% to -15%
setting: 2cm \pm 2%*

Set R1293 (across vert defl plate leads) 90° from full cw. Set the CALIBRATION FIXTURE DISPLAY SELECTOR to CAL (2cm) and ALT SYNC. Swing Vert Gain Adj R1015 from full cw to full ccw and check the deflection. Range must be from 1.9cm to 2.3cm. Adjust R1015 for exactly 2cm with the trace centered.

g. Check DC shift: 1mm, max

Position the trace just off-screen in either vertical direction. Push the CALIBRATION FIXTURE SCOPE AMPL BALANCE CHECK button. Check the trace shift after it returns to the approximate CRT center.

12. (cont'd)

- h. Check vertical drift
2mm, max from 105 VAC to 125 VAC line*

Note the trace drift while varying the line voltage from 105 VAC to 125 VAC.

- i. Check compression/expansion: 0.5mm, max*

Remove the CALIBRATION FIXTURE and install the Bandpass Plug-In. Set the Bandpass Plug-In to AMPLITUDE SET and CONSTANT. Adjust the AMPLITUDE and POSITION controls for 2cm of deflection at graticule center. Position the display to the top and bottom of the graticule and check for 2cm of deflection ± 0.5 cm, max.

13. AMPLITUDE CALIBRATOR

- a. Check accuracy: $\pm 2\%$ all settings*

Preset the test scope controls as follows:

TRIGGERING MODE	AUTO
TRIGGER SLOPE	-LINE
TIME/CM	5mSEC

TYPE B Plug-in

VOLTS/CM	.5
VARIABLE	CALIBRATED
INPUT SELECTOR	A, AC

Connect the TYPE 581A CAL OUT to the SAC UNK IN connector. Connect the SAC OUTPUT through a 50 Ω cable to the TYPE B INPUT A. Set the SAC AMPLITUDE to 100V and the MODE to DC, MIXED. Set the TYPE 581A AMPLITUDE CALIBRATOR to 100V. Remove V875 from the TYPE 581A.

The first complete half cycle of the test scope display will be the SAC voltage. The next half cycle will be the error voltage. The direction of error can be determined by the direction of the first error voltage. A positive going waveform would indicate a positive error and a negative going waveform a negative error.

13a. (cont'd)

Set the Cal Adj, R879 for a voltage null.
(The point where the display appears as
a straight line.) Note the TYPE 581A
AMPLITUDE CALIBRATOR error as the controls
are changed as in the following table:

AMPLITUDE CALIBRATOR and SAC VOLTS	TYPE B VOLTS/CM	max deflection
100	.5	adjustable
50	.5	2cm
20	.2	2cm
10	.1	2cm
5	.05	2cm
2	.02	2cm
1	.01	2cm
.5	.005	2cm
.2	.005	8mm
.1	.005	4mm

Add the error found in the .1 volts SAC
position to the largest error in the same
direction in previous positions. This
total error must not exceed 2%.

b. *Check calibrator frequency: 1 kHz $\pm 20\%$*

Set the SAC MODE to UNKNOWN ONLY. Replace
V875 in the TYPE 581A. Set the test scope
TRIGGER SLOPE to +INT and TIME/CM to 1mSEC.
Set the TYPE B VOLTS/CM to .1. Check the
frequency of the display on the test scope.
(8 to 10 cycles in 10cm).

c. *Check calibrator duty cycle:
45% to 55%*

Change the test scope TIME/CM to 50 μ SEC
and adjust the VARIABLE for 1 cycle in 10cm.
Check that $\frac{1}{2}$ cycle occupies from 4.5cm to
5.5cm. Return the scope VARIABLE to CALI-
BRATED.

b. Check the falling edge of
the AMPLITUDE CALIBRATOR wave-
form for rounding and the bot-
tom of the waveform for 60
cycle modulation.

14. TIME BASE TRIGGERINGa. *Set TRIGGERING LEVEL mechanical
zero: 0V*

Connect SAC OUTPUT -- 50 Ω cable -- BNC T
adapter at Bandpass Plug-In INPUT --
50 Ω cable -- TYPE 581A TRIGGER INPUT.
Set the Bandpass Plug-In to EXTERNAL
INPUT. Set TYPE 581A TRIGGER SLOPE to
+ and TRIGGERING SOURCE to INT AC.

a. Allow sufficient clearance
so the TRIGGERING LEVEL knob
does not rub against the panel.
Tighten the set screw securely
enough to prevent the knob
turning on the shaft, but not
enough to cause the concentric
shafts to bind.

14a. (cont'd)

Connect the multimeter to the junction of R14 and R15 (82k & 470k on TRIGGERING MODE switch). Adjust the TRIGGERING LEVEL knob for a zero volt indication on the meter. Use the lowest voltage range on the meter for final setting. Loosen the TRIGGER LEVEL knob set screw. Position the knob so the white dot on the knob aligns with the 0 on the panel. Tighten the set screw, making certain the meter reading remains at zero.

b. *Adjust Trig Level Centering, R26:
+ and - triggering on 1mm vertical signal*

Set SAC AMPLITUDE to 2 VOLTS and adjust the Bandpass Plug-In AMPLITUDE control for 2cm of vertical deflection. Change the SAC to .1 volts and change the TYPE 581A TIME/CM to .1mSEC.

Preset the Trig Level Centering control, R26 to midrange and the Trig Sens, R47 near its clockwise end. Ground the junction of R14 & R15. Set the test scope TIME/CM to .5mSEC, TRIGGERING MODE to AUTO and TRIGGER SLOPE to +INT. Set the TYPE B VOLTS/CM to .05 and INPUT SELECTOR to INPUT A, AC. Connect the 10X probe to the junction of R41 and C45, a 68k resistor and .001 μ F capacitor. Adjust the Trig Level centering and Trig Sens for a stable display of square-waves on the test scope. Switch the TRIGGER SLOPE switch between + and -. Touch up R26 and R47 for stable triggering both + and -.

c. *Adjust Trig Sens, R47: + & - triggering
on 1/2mm internal signals, no triggering
on 1/4mm signals.*

Change the SAC AMPLITUDE to 50mVolts. Adjust Trig Sens, R47 and Trig Level Centering, R26 for stable triggering + and -. Reduce the signal amplitude to $\frac{1}{4}$ mm by adjusting the Bandpass Plug-In AMPLITUDE control. Check that the TYPE 581A does not trigger. If the scope triggers, adjust the Trig Sens, R47 so it does not trigger on a $\frac{1}{4}$ mm signal. Remove the ground from R14-R15 junction.

14. (cont'd)

- d. Check internal and external mid-frequency triggering: 1 kHz, 2mm INT, 0.2V EXT
10 MHz, 2mm INT, 0.3V EXT
3mm INT HF SYNC, 0.2V EXT HF SYNC

Check triggering on + & - SLOPE as in the following table:

TRIGGERING SOURCE	TRIGGERING LEVEL	SIGNAL	SIGNAL GENERATOR
INT AC	centered	2mm	SAC
INT AC	variable	2mm	SAC
INT AC LF REJ	variable	2mm	SAC
EXT AC	variable	.2V P to P	SAC
EXT DC	variable	.2V P to P	SAC
	10 MHz		
EXT DC	variable	.3V P to P	TYPE 191
EXT AC	variable	.2V P to P	TYPE 191
EXT HF SYNC	---	.2V P to P	TYPE 191
INT AC	variable	2mm	TYPE 191
INT AC LF REJ	variable	2mm	TYPE 191
INT HF SYNC	variable	3mm	TYPE 191

- d. In checking EXT trigger sensitivities use the test scope to set the amplitude of the TYPE 191. Set the amplitude with the TYPE 191 FREQUENCY RANGE in the 50 kHz ONLY position.

15. LINE TRIGGERING

a. Setup

Remove the TYPE 191 signal cable from the Bandpass Plug-In and connect a 10X probe to the INPUT. Connect the probe tip to 117 VAC at the TYPE 581A fuse holder. Set the TIME/CM to 5mSEC and change the TRIGGER SOURCE to LINE. Adjust the Bandpass Plug-In AMPLITUDE for a 4cm display.

b. Check line triggering: triggering on proper slope

Check for correct triggering slope both + and -. Remove the probe from the fuse holder and Bandpass Plug-In INPUT.

16. PRESET ADJUST

a. Setup

Set TYPE 581A controls as follows:

TRIGGER SLOPE	+
TRIGGERING SOURCE	INT AC
TIME/CM	.1mSEC

16a. (cont'd)

Connect the multimeter leads to the center arm of the PRESET ADJUST and ground.

b. Adjust PRESET ADJUST: center of range

Set STABILITY full ccw to PRESET. Turn the PRESET ADJUST fully ccw, then slowly cw until a trace appears. Note the meter reading. Continue turning PRESET ADJUST cw until the trace brightens. Note the meter reading.

Set the PRESET ADJUST to a position halfway between the readings. Remove the meter.

b. The PRESET ADJUST should have approx 15 volts range between the trace appearing and the trace brightening.

17. TRIGGERING LEVEL RANGE

a. Setup

Connect SAC -- Variable Attenuator
TYPE B INPUT A. Set the SAC and
Variable Attenuator for 15 volts amplitude.

b. Check TRIGGERING LEVEL range: 15V, min

Remove the Variable Attenuator from
TYPE B INPUT A and connect it to TYPE
581A TRIGGER INPUT. Set TYPE 581A TRIGGER
SOURCE to EXT AC, STABILITY to PRESET and
TIME/CM to 1mSEC.

Rotate the TRIGGERING LEVEL control from
full ccw to full cw and check that the
sweep stops when the control reaches
either extreme position.

18. MAGNIFIER GAIN

a. Setup

Connect the TYPE 184 to the Bandpass Plug-In INPUT. Set the TYPE 184 for .1mS and 1mS markers. Set the TYPE 581A TIME/CM to 1mSEC. Turn the 5X MAGNIFIER ON. Set the TRIGGERING SLOPE to INT AC, TRIGGER SLOPE to + and adjust the STABILITY and TRIGGERING LEVEL for a stable display.

a. Unless noted otherwise, use the middle 8 horizontal centimeters when making horizontal amplifier gain and timing checks or adjustments.

18. (cont'd)

- b. Adjust Mag Gain Adj R372: $\pm 3\%$
Magnified sweep linearity: $\pm 1\%$

Adjust Mag Gain Adj R372 for two .1ms marks per cm at center of sweep. Check timing accuracy over entire sweep.
Error: $\pm 0.8\text{mm}$, max.

b. Sweep linearity

There should be no non-linearity that causes a timing change of greater than $\pm 1\%$ in any 8cm time window of the magnified sweep. The total timing error with MAGNIFIER ON must be 3% or less for all sweep rates (basic timing errors + errors caused by non-linearity of magnified sweep).

19. SWEEP CALIBRATION $\pm 2\%$

Switch the 5X MAGNIFIER OFF. Adjust Swp Cal, R348 for one 1mS mark per cm.

20. SWEEP LENGTH 10.2 to 10.8cm

Adjust Swp Length, R176 for a trace length of 10.5cm.

20. Pre-adjust Swp Length, R176 for 10.3cm. If it will not adjust at 10.3cm, D44 may be defective.

21. NORM/MAG REGISTRATION $\pm 0.5\text{cm}$ at graticule center

Switch 5X MAGNIFIER ON. Use the HORIZONTAL POSITION control to position the trace start to graticule center. Switch the 5X MAGNIFIER OFF and adjust the Norm Mag Regis, R358 to position the trace start to graticule center. Switch the 5X MAGNIFIER OFF and ON several times and check that the trace start stays at the graticule center.

Switch the 5X MAGNIFIER OFF and position the trace start at the left edge of the graticule.

22. VARIABLE TIME/CM

- a. Check VARIABLE TIME/CM ratio:
2.5:1, min

Apply 1mS marks from the TYPE 184. Adjust the TRIGGERING LEVEL control for a stable display. Turn the VARIABLE TIME/CM control full ccw and check for at least 5 marks/2cm.

22. (cont'd)

- b. Check neon: lighted except in the
CALIBRATED switch position

Check that the UNCALIBRATED neon is lighted.
Turn the VARIABLE TIME/CM cw and check that
the neon stays lighted until the control
actuates the CALIBRATED switch.

23. TIMING

- a. Check timing
.1mSEC-.5 SEC: $\pm 2\%$, max
1 and 2 SEC: $\pm 2.5\%$, max

Check the timing over the center 8cm of the
graticule as in the following table:

TYPE 184			
TIME/CM	Markers	Marks/cm	Max error
.1mSEC	.1mS	1	1.6mm
.2mSEC	.1mS	2	1.6mm
.5mSEC	.5mS	1	1.6mm
1mSEC	1mS	1	1.6mm
2mSEC	1mS	2	1.6mm
5mSEC	5mS	1	1.6mm
10mSEC	10mS	1	1.6mm
20mSEC	10mS	2	1.6mm
50mSEC	50mS	1	1.6mm
.1 SEC	.1 S	1	1.6mm
.2 SEC	.1 S	2	1.6mm
.5 SEC	.5 S	1	1.6mm
1 SEC	1 S	1	2 mm
2 SEC	1 S	2	2 mm

- b. Adjust C330

Set the TYPE 184 for 10 μ S marks and the TYPE
581A TIME/CM to 50 μ SEC. Adjust the TRIGGER
LEVEL for a stable display. Switch the 5X
MAGNIFIER ON and position the start of the
trace to graticule center.

Switch the TIME/CM between 50 μ SEC and .1mSEC
and adjust C330 so the start of the trace
falls under the center graticule line in
both TIME/CM positions.

- c. Adjust and check timing:
.05 SEC-50 SEC: $\pm 2\%$, max
Magnified Sweep: $\pm 3\%$, max
Linearity: $\pm 1\%$, max

c. Exclude all sweep in excess
of first 50cm for any sweep rate
faster than 50 μ s/cm.

Make checks and adjustments as listed in the
following table:

23c. (cont'd)

TYPE	TIME/CM	Adjust	for
184			
10nS	.05μSEC	C384	as short as possible
10nS	.05μSEC	C364	as long as possible
10nS	.05μSEC	C160A	1 cycle/cm ±3% (over 50cm sweep)
10nS	.05μSEC	C372	exact linearity center 3cm without repositioning

Check magnified sweep linearity (see Step 18b. Notes) and timing accuracy over 50cm (10cm unmagnified). Switch 5X MAGNIFIER OFF.

.1μS	.05μSEC	C348	1 mark/2cm	±2%
.1μS	.1 μSEC	C160B	1 mark/cm	±2%
.1μS	.2 μSEC	--	2 marks/cm	±2%
1μS	.5 μSEC	--	1 mark/2cm	±2%
.1μS	.05μSEC		Check for	
.1μS	.1 μSEC		C348-C160B interaction	±2%
1μS	1 μSEC	C160C	1 mark/cm	±2%
1μS	2 μSEC	--	2 marks/cm	±2%
5μS	5 μSEC	--	1 mark/cm	±2%
10μS	10μSEC	C160E	1 mark/cm	±2%
10μS	20μSEC	--	2 marks/cm	±2%
50μS	.50μSEC	--	1 mark/cm	±2%

Recheck timing for interaction of adjustments. Remove TYPE 184 connection.

24. LOCKOUT LEVEL

a. *Set Lockout Level: 9V to 11V*

Set the multimeter to the 300V scale and connect it between pin 8 of V133 and ground. Set the TYPE 581A TRIGGER SOURCE to +INT and TIME/CM to .1mSEC. Turn the STABILITY control ccw then cw to a point just before the trace appears. Note the voltage reading. Change the HORIZONTAL DISPLAY switch to SINGLE SWEEP. Adjust the Lockout Level, R125 for a reading of from 9V to 11V less than the first reading.

b. *Check SINGLE SWEEP triggering: sweeps once on a triggering signal*

Set the HORIZONTAL DISPLAY to INTERNAL SWEEP. Connect the SAC to the Bandpass Plug-In INPUT. Set the controls for a 2mm display. Switch the HORIZONTAL DISPLAY to SINGLE SWEEP. Remove the SAC signal, press the RESET button. Check that the READY neon lights. Reconnect the SAC signal to the Bandpass Plug-In INPUT. Check that one sweep is produced, after which the READY neon goes out. Return the TYPE 581A HORIZONTAL DISPLAY to INTERNAL SWEEP.

25. + GATE INTERVAL*a. Setup*

Set the TYPE B INPUT SELECTOR to INPUT A DC and connect a 10X probe from the TYPE 581A + GATE binding post to TYPE B INPUT A.

b. Check + GATE interval: 3 μ s to 400ms.

Check + GATE interval as in the following table: (change the test scope TIME/CM control as necessary)

TIME/CM	+ GATE Interval
.05 μ SEC	3 to 9 μ s
.1 μ SEC	3 to 9 μ s
.2 μ SEC	3 to 9 μ s
.5 μ SEC	3 to 9 μ s
1 μ SEC	15 to 40 μ s
2 μ SEC	15 to 40 μ s
5 μ SEC	15 to 40 μ s
10 μ SEC	15 to 40 μ s
20 μ SEC	15 to 40 μ s
50 μ SEC	15 to 40 μ s
.1mSEC	150 to 400 μ s
.2mSEC	150 to 400 μ s
.5mSEC	150 to 400 μ s
1mSEC	1.5 to 4ms
2mSEC	1.5 to 4ms
5mSEC	1.5 to 4ms
10mSEC	15 to 40ms
20mSEC	15 to 40ms
50mSEC	15 to 40ms
.1 SEC	150 to 400ms
.2 SEC	150 to 400ms
.5 SEC	150 to 400ms
1 SEC	150 to 400ms
2 SEC	150 to 400ms

26. EXTERNAL HORIZONTAL AMPLIFIER

- a. *Adjust Ext Horiz DC Bal, R317:*
1cm shift, max

Connect a jumper lead from SAWTOOTH OUT to Bandpass Plug-In INPUT. Switch the HORIZONTAL DISPLAY to EXT HORIZ ATTEN X1. Turn the STABILITY control fully cw. Center the vertical trace on the graticule. Rotate the EXTERNAL HORIZ ATTENUATOR back and forth while adjusting Ext Horiz DC Bal, R317 for no trace shift. Leave the EXT HORIZ ATTENUATOR control full cw.

- b. *Check for grid current: ± 0.5 cm shift, max*

Connect a jumper to HORIZ INPUT. Connect the opposite end of the jumper to ground while watching the trace for a horizontal shift.

- c. *Adjust C301C: X10 to X1 match $\pm 5\%$*

Connect a .5 volt signal from the SAC to the HORIZ INPUT and TRIGGER INPUT. Set the TIME/CM to .2mSEC, TRIGGER SLOPE to + and TRIGGERING SOURCE to EXT AC. Adjust the STABILITY and TRIGGERING LEVEL for a stable display. Adjust the Bandpass Plug-In AMPLITUDE control for 1 complete cycle of square-wave. Check the waveform aberrations, change the HORIZONTAL DISPLAY switch to X10 and the SAC AMPLITUDE to 5 VOLTS. Adjust C301C to match the X1 waveform.

- d. *Check external horizontal deflection factor: 0.15 VOLTS/CM, max*

Set HORIZONTAL DISPLAY to EXT HORIZ X1, EXTERNAL HORIZONTAL ATTENUATOR cw and set the SAC AMPLITUDE to 1 VOLT. Check for 6.7cm or more of horizontal deflection.

- e. *Check EXT HORIZ ATTEN X10: Divides X1 gain by 10 $\pm 2\%$*

Increase the SAC AMPLITUDE to 2 VOLTS and adjust the EXTERNAL HORIZ ATTENUATOR for 10cm of deflection. Switch the HORIZONTAL DISPLAY to X10 and the SAC AMPLITUDE to 20 VOLTS and check for 10cm of deflection.

26. (cont'd)

*f. Check EXTERNAL HORIZONTAL ATTENUATOR
10:1 ratio, min*

Change the SAC AMPLITUDE to 10 VOLTS and the HORIZONTAL DISPLAY to EXT X1. Turn the EXTERNAL HORIZ ATTENUATOR ccw and note the deflection.

Switch the HORIZONTAL DISPLAY to EXT X10 and turn the EXTERNAL HORIZ ATTENUATOR cw. The deflection should be equal to or greater than with EXT X1 and ccw.

*g. Check horizontal bandpass: 375 kHz
or more at -3dB*

Remove the SAC signal. Set the HORIZONTAL DISPLAY to EXT X1 and turn the EXTERNAL HORIZ ATTENUATOR cw. Apply a 50 kHz signal from the TYPE 191 to the HORIZ INPUT. Adjust the TYPE 191 AMPLITUDE for exactly 4cm of deflection. Without changing TYPE 191 AMPLITUDE controls increase the frequency until the amplitude of the horizontal deflection falls to 2.8cm. Check the frequency for 0.375 MHz, or more.

27. FRONT PANEL WAVEFORMS

+ GATE OUT 20V, min
SAWTOOTH OUT 130V, min

Remove the TYPE 191 connection from the TYPE 581A. Set the TIME/CM switch to 1mSEC and STABILITY cw. Set the HORIZONTAL DISPLAY to INTERNAL SWEEP.

Connect the test scope 10X probe tip to the + GATE OUT binding post. Check the amplitude of the test scope display for 20V minimum. In similar manner check the SAWTOOTH OUT for 130V minimum.

27. The SAWTOOTH OUT waveform should display a flat segment between sawtooth waveforms with the TIME/CM at .05μSEC, indicating hold-off time.

28. VERTICAL HF COMPENSATION*a. Setup*

Remove the Bandpass Plug-In and install the CALIBRATION FIXTURE. Set TIME/CM to .2 μ SEC. Set the CALIBRATION FIXTURE LOAD to NORM and DISPLAY SELECTOR to PULSER. Adjust PULSER AMPLITUDE for a 2cm signal. Trigger scope for a stable display. Adjust FOCUS, ASTIGMATISM and INTENSITY for a sharp, waveform of min intensity.

Vertically center the waveform.

b. Preset Vertical Amplifier

C1260 and C1261	near min capacity (slug out) located to rear of V1254
C1254 and C1214	near max capacity (slug in)
C1224, C1234 and C1244	mid r
C1276	near max capacity (located near rear vertical deflection plates)
R1293	about 10° from ccw (located near front vertical deflection plates)
C1041 and C1042	near min capacity (slug out) located on V1044 tube socket

c. Recheck vertical gain: $\pm 2\%$, max

Set CALIBRATION FIXTURE DISPLAY SELECTOR to ALT SYNC and recheck gain. Reset the CALIBRATION FIXTURE to PULSER.

d. Adjust C12009, C1006

With TIME/CM at .1 or .2 μ SEC and 5X MAGNIFIER ON, adjust C1209 (near V1214) and C1006 (front tube side of delay line driver stage) for best level and min wrinkles.

e. Adjust C1214 thru C1254

Starting with C1214, adjust C1214 thru C1254 for best level and min wrinkles.

f. Adjust C1260, C1261

Adjust C1260 and C1261 for a square corner and min wrinkles.

c. C1042, C1041

(1) C1042 and C1041 are oscillation suppressors. Misadjustment appears as a wide trace.

(2) Keep these adjustments approx equal.

d. Over-all level

Check over-all level by periodically switching from fast to slow sweep speeds.

f. C1260, C1261 - ringing

Ringing will occur if C1260 and C1261 are not kept near min capacity.

28. (cont'd)

g. Adjust R1293, C1276

Change TIME/CM to 1 or 2 μ SEC and adjust R1293 and C1276 for best over-all level. Set TIME/CM to .05 μ SEC.

*h. Check vertical gain HF adjustments
gain $\pm 2\%$ max
aberrations $\pm 2\%$ max*

Set CALIBRATION FIXTURE DISPLAY SELECTOR to ALT SYNC and recheck gain. Reset CALIBRATION FIXTURE to PULSER.

Most of the vertical HF adjustments interact, repeat as necessary to obtain a waveform with flat top and minimum aberrations: 0.4mm, max.

i. Selected values

Select values of R1204, C1204, R1205, and C1205 (input of vert output stage) for no peaks or dip on 5 μ SEC and 50 μ SEC. Do not select parts until all efforts to adjust for best waveform have been exhausted. Nominal values are 4 Ω and 0.1 μ F. Present value limits are 2 to 5 Ω , 1/2W 1% and .1 to .005 μ F capacitors.

A Rolloff or peak can usually be corrected by changing resistive elements, decreasing for a peak and increasing for rolloff. A hump or dip can usually be corrected by changing capacitive elements, decreasing for a hump and increasing for dip.

j. Check with side panel

Install the left side panel or shield the output stage -- CRT deflection plate area. Recheck the front corner and over-all level. It may be necessary to slightly readjust R1293

h. Flatness

Line must be flat ($\pm 2\%$, max) from 1mSEC to .05 μ SEC.

R1293

Adjustment of R1293 effects gain, therefore Vert Gain Adj R1015 must be rechecked.

i. Selected parts

The selected parts provide compensation for mismatch in termination networks. The mismatch appears as a deviation from a flat top waveform behind the leading edge as observed at slower sweep speeds (.5 μ SEC and slower). Picking components often requires much trial and error before achieving success. Do not attempt unless actually out of specifications.

29. VERTICAL DELAY

40nS, min

Set the TYPE 581A TIME/CM to .05 μ SEC.
Set 5X MAGNIFIER to ON.

Adjust TRIGGERING LEVEL so that rising portion of the waveform is 4cm or more from the sweep start (40nS or more).

30. VERTICAL BANDWIDTH*a. Setup*

Remove the CALIBRATION FIXTURE and install the Bandpass Plug-In. Set the TYPE 581A TRIGGER SOURCE to INT HF SYNC.

Apply a 20ns sinewave from the TYPE 184 to the Bandpass Plug-In EXT INPUT. Adjust the STABILITY and TRIGGERING LEVEL for a stable display. With the HORIZONTAL POSITION control near midr, check the timing accuracy over the full 10cm of the graticule. If the timing is short, note the amount.

If the timing is long use the VARIABLE TIME/CM to set it for exactly 5 cycles in 10cm.

Remove the TYPE 184 signal. Set the AMPLITUDE SET switch to AMPLITUDE SET, and the CONSTANT switch to CONSTANT VERTICAL IN BANDPASS.

Set the TYPE 581A STABILITY control cw and adjust the Bandpass Plug-In AMPLITUDE control for 2cm of vertical amplitude.

b. Check Vertical Bandwidth: 95 MHz or more at -3dB

Set the AMPLITUDE SET switch to 50 to 100 MHz and adjust the FREQUENCY control for 1.4cm of vertical amplitude (-3dB). Adjust TRIGGERING LEVEL and STABILITY for a stable display. Check for 9.5 MHz cycles or more in 10cm (95 MHz). Return VARIABLE TIME/CM to CALIBRATED.

31. LOW FREQUENCY TRIGGERING

INT: 2mm 15 Hz and 15 kHz
 EXT: 0.3V 15 Hz and 15 kHz

Install a BNC "T" connector on the INPUT of the Bandpass Plug-In. Connect a 50 Ω coax cable from the "T" connector to the TRIGGER INPUT.

Connect the output of the audio generator to the "T" connector. Set TIME/CM switch to 50mSEC. Use the following table to check LF triggering. Check EXT triggering amplitude with test scope.

TRIGGERING			TRIGGERING	
SOURCE	amplitude	frequency	SLOPE	
INT AC	2mm	15 Hz	+ & -	
INT AC	2mm	15 kHz	+ & -	VARIABLE
INT AC LF REJ	2mm	15 kHz	+ & -	TRIGGERING
EXT AC and DC	0.3V P to P	15 Hz	+ & -	LEVEL
EXT AC and DC	0.3V P to P	15 kHz	+ & -	

32. HIGH FREQUENCY TRIGGERING

a. Check external HF triggering:
 0.4V at 50 MHz; 1.2V at 100 MHz;
 1.5V at 150 MHz; HF SYNC 0.2V at 150 MHz

Use the following table to check External HF triggering. Set amplitude with the test scope, Bandpass Plug-In at AMPLITUDE SET.

a. Triggering frequency is read from the TYPE 585A display:
 50 MHz = 1 cycle/2cm
 100 MHz = 1 cycle/cm
 150 MHz = 3 cycles/2cm
 (TIME/CM .1 μ SEC, 5X MAGNIFIER ON)

TRIGGERING			TRIGGER	
SOURCE	amplitude	frequency	SLOPE	
EXT AC	0.4V P to P	50 MHz	+ & -	
EXT DC	0.4V P to P	50 MHz	+ & -	Variable TRIGGERING
EXT DC	1.2V P to P	100 MHz	+ & -	LEVEL and STABILITY
EXT AC	1.2V P to P	100 MHz	+ & -	control.
EXT AC	1.5V P to P	150 MHz	+ & -	
EXT DC	1.5V P to P	150 MHz	+ & -	
EXT HF SYNC	0.2V P to P	150 MHz	+ & -	

32. (cont'd)

- b. *Check Internal HF triggering:*
 1cm at 50 MHz; 2cm at 100 MHz;
 2.5cm at 150 MHz; HF SYNC 3mm at 150 MHz

Change the TYPE 581A TRIGGERING SOURCE to INT HF SYNC. Set the Bandpass Plug-In CONSTANT switch to CONSTANT VERTICAL IN BANDPASS. Adjust the AMPLITUDE control for 2.5cm of 150 MHz signal. Check INT HF triggering using the following table:

TRIGGERING SOURCE	amplitude	frequency	TRIGGER SLOPE	Variable TRIGGERING LEVEL and STABILITY
INT HF SYNC	3mm	150 MHz	---	
INT AC	2.5cm	150 MHz	+ & -	
INT AC LF REJ	2.5cm	150 MHz	+ & -	
INT AC LF REJ	2.0cm	100 MHz	+ & -	
INT AC	2.0cm	100 MHz	+ & -	
INT AC	1.0cm	50 MHz	+ & -	
INT AC LF REJ	1.0cm	50 MHz	+ & -	

SAMPLE CHECKS

[THE FOLLOWING CHECK IS NOT MADE ON 100% OF THE INSTRUMENTS BUT IS DONE ON A SAMPLING BASIS.]

- I. HF SYNC at 250 MHz INT 4mm; EXT 0.2V PTP.

Connect the output of the GR1215B to Band-pass plug-in INPUT. Check INT HF SYNC with a 4mm display amplitude at 250 MHz.

Check EXT HF SYNC with a 0.2V PTP 250 MHz signal. Use sampling system to determine amplitude.

THE END

