

NOTE REGARDING FACTORY CALIBRATION PROCEDURES
AND TEST SPECIFICATIONS

Factory Calibration Procedures and Test Specifications are intended for use at the factory as a general guide for calibrators and quality control men. Most of the tolerances listed in these sheets are closer than advertised specifications. This is done purposely in order to insure that the instrument will meet or exceed advertised specifications when it reaches the customer.

These calibration procedures and test specifications should be used, therefore, as a guide only.

Some of the test equipment referred to in the calibration procedures is not available commercially; the Tektronix field engineer will be glad to suggest alternate approaches.

TYPE T PLUG-IN UNIT

F A C T O R Y C A L I B R A T I O N P R O C E D U R E

The following instruments and equipment are needed:

- 1 Test Oscilloscope
- 1 TYPE 536 OSCILLOSCOPE
- 1 TYPE 190 CONSTANT-AMPLITUDE SIGNAL GENERATOR
- 1 TYPE 180 TIME-MARK GENERATOR
- 1 Meter (Triplet 630)
- 1 TYPE CA Plug-In Unit

Check TYPE 536 horizontal gain and VERT. SIG. OUT dc level, before calibrating plug-in.

PRE-CHECK

Make a careful visual inspection of the unit for proper wire dress and check controls for smooth mechanical operation. Make the following resistance to ground checks on the amphenol 16 pin connector:

CONNECTOR PIN NUMBER	RESISTANCE TO GROUND
1	600Ω
1 mag on	2 K
2	0
3	300 Ω
4	Infinite
5	"
6	"
7	"
8	1 Meg.
9	7 K
10	50 K
11	15 K to 20 K
12	Infinite
13	"
14	"
15	400 Ω
16	2 Meg.
BANANA PLUG	5 K

1. ADJUST POS. RANGE

Set VERNIER and POSITION controls to mid-range. Adjust POS. RANGE control so that the start of the trace coincides with the 0 cm mark on the graticule.

2. SET TRIGGERING LEVEL CONTROL

Connect a meter from ground to the junction of the two 470 k resistors mounted on the second wafer of the TRIGGER SLOPE switch. Adjust the TRIGGERING LEVEL control to obtain a reading of zero volts. Physically center knob and tighten set screw. Leave TRIGGERING LEVEL control at zero volts during succeeding adjustments.

3. ADJUST TRIG. LEVEL CENT.

Set up test scope as follows:

<u>TIME/CM</u>	<u>1 MILLISEC</u>
<u>MULTIPLIER</u>	<u>2</u>
<u>5X MAGNIFIER</u>	<u>OFF</u>
<u>HORIZONTAL</u>	<u>INTERNAL SWEEP</u>
<u>TRIGGER SLOPE</u>	<u>-LINE</u>
<u>TRIGGERING MODE</u>	<u>AC SLOW</u>

Set up the test scope vertical amplifier to .5 VOLTS/CM AC. Use a 10X probe properly adjusted. Connect the 10X probe to pin 1 of V 7350. Set up plug-in as follows:

Use PLUG-IN EXTENSION EP 53

<u>TRIGGERING MODE</u>	<u>AC</u>
<u>TRIGGER SLOPE</u>	<u>-LINE</u>
<u>STABILITY</u>	full left (ccw)
<u>TRIGGERING LEVEL</u>	mid-range (0)

Short the center arm of the TRIGGERING LEVEL control to ground. Adjust the STABILITY and TRIGGERING LEVEL controls on the test scope for a triggered sweep. Switch the TRIGGER SLOPE switch on the plug-in, back and forth from +LINE to -LINE and at the same time adjust TRIG. LEVEL CENT. until there is no horizontal shifting of the switching portion of the multi waveform. For final adjustments switch test scope 5X MAGNIFIER ON and repeat procedure.

4. ADJUST TRIG. SENS.

Use same set-up as in step 3 with test scope 5X MAGNIFIER ON. Turn the TRIG. SENS. control to the left (ccw) until oscillation occurs at the leading and trailing edges of the multi waveform. Note the amplitude of the spike of the waveform just at the point of oscillation. Now turn the TRIG. SENS. right (cw) until this spike is slightly less than one-half of the original size.

5. ADJUST PRESET STABILITY

Set up plug-in as follows:

<u>TRIGGERING MODE</u>	<u>+LINE</u>
<u>TRIGGER SLOPE</u>	<u>AUTO</u>
<u>TRIGGERING LEVEL</u>	<u>0</u>
<u>STABILITY</u>	<u>PRESET</u>
<u>5X MAGNIFIER</u>	<u>OFF</u>

Turn the PRESET STABILITY control to the right (cw) until the sweep triggers. The center arm of the control should read about 30 volts on a meter. Now continue turning PRESET STABILITY control until the sweep free runs (trace will brighten), the center arm should be about 30 volts higher. Turn the control back until the meter reads half way between the two readings obtained.

6. CHECK ALL POSITIONS OF TRIGGERING MODE AND TRIGGER SLOPE SWITCHES EXCEPT HF SYNC

Connect a lead from VERT. SIG. OUT to TRIGGER INPUT. From the SQUARE-WAVE CALIBRATOR obtain 1 minor division of vertical deflection. With TRIGGER SLOPE set to EXT., check the trigger circuit for proper operation in AC, AC LF REJECT and AUTO positions of the TRIGGERING MODE switch. Increase the signal amplitude to 2 minor divisions and check DC for proper operation. (Slight positioning of trace may be necessary.) Switch TRIGGER SLOPE to LINE and obtain a 60 cps signal for the vertical. Check to see that the trigger circuit will work on +LINE and -LINE in all positions of the TRIGGERING MODE switch except HF SYNC.

7. ADJUST TIME BASE CAL.

Apply 1 millisecc time mark to vertical INPUT. Set TIME/DIV switch to 1 MILLISEC. Adjust TIME-BASE CAL. for one time-mark per major division. When any timing adjustments are made always make them from the 1 division line to the 9 division line on the graticule.

8. SET MAG. GAIN ADJ.

Set TIME/DIV switch to 1 MILLISEC and from the time-mark generator apply 1 millisecc and 100 μ sec markers to vertical INPUT. Turn 5X MAGNIFIER ON and set MAG. GAIN ADJ. for 5X magnification. (1 large mark every 5 divisions and 2 small marks every division.) Check magnifier linearity over the entire sweep length.

9. ADJUST MAG. CENTERING

Use same set-up as in Step 8. With 5X MAGNIFIER ON position the trace so that the first time mark falls on the center line of the graticule. Turn 5X MAGNIFIER OFF and adjust MAG CENTERING so that the first time mark again falls on the center line of the graticule. Check to see that the 5X MAGNIFIER ON and OFF positions register properly in the middle and at the end of the sweep.

10. ADJUST SAWTOOTH AMPL.

Adjust SAWTOOTH AMPL. control for approximately 10.5 divisions of horizontal deflection.

11. ADJUST HF TIMING AND CHECK ALL SWEEP RANGES

Check sweep rates as follows:

<u>TIME/DIV</u>	<u>TIME MARK GENERATOR</u>	<u>OBSERVE MARKS/DIV</u>
<u>2 SEC</u>	1 sec	2
<u>1 SEC</u>	1 sec	1
<u>.5 SEC</u>	500 millisecc	1
<u>.2 SEC</u>	100 millisecc	2
<u>.1 SEC</u>	100 millisecc	1
<u>50 MILLISEC</u>	50 millisecc	1
<u>20 MILLISEC</u>	10 millisecc	2
<u>10 MILLISEC</u>	10 millisecc	1
<u>5 MILLISEC</u>	5 millisecc	1
<u>2 MILLISEC</u>	1 millisecc	2
<u>1 MILLISEC</u>	1 millisecc	1
<u>.5 MILLISEC</u>	500 μ sec	1
<u>.2 MILLISEC</u>	100 μ sec	2
<u>.1 MILLISEC</u>	100 μ sec	1

ADJUST HF TIMING

<u>TIME/DIV</u>	<u>TIME MARK GENERATOR</u>	<u>ADJUST</u>	<u>OBSERVE</u>
<u>10 MICROSEC</u>	10 μ sec	C8100E	1 mark/div
<u>1 MICROSEC</u>	1 μ sec	C8100C	1 mark/div
<u>.2 MICROSEC</u>	10 mc	C8100A	2 cycles/div
<u>.2 MICROSEC</u>	10 mc	(<u>MAG. ON</u> check linearity)	4 cycles/10 div

CHECK HF RANGES

<u>TIME/DIV</u>	<u>TIME MARK GENERATOR</u>	<u>OBSERVE</u>
<u>50 MICROSEC</u>	50 μ sec	1 mark/div
<u>20 MICROSEC</u>	10 μ sec	2 marks/div
<u>5 MICROSEC</u>	5 μ sec	1 mark/div
<u>2 MICROSEC</u>	1 μ sec	2 marks/div
<u>.5 MICROSEC</u>	1 μ sec	1 mark/2 div

12. CHECK HF SYNC

Set up plug-in as follows:

<u>TRIGGERING MODE</u>	<u>HF SYNC</u>
<u>TRIGGER SLOPE</u>	<u>- EXT</u>
<u>TRIGGERING LEVEL</u>	full right (cw)
<u>5X MAGNIFIER</u>	<u>ON</u>

From TYPE 190 obtain approximately 2 divisions of vertical deflection at 20 mc. Adjust STABILITY control for a stable display.

13. CHECK VARIABLE TIME/DIV CONTROL AND UNCALIBRATED NEON

Check VARIABLE TIME/DIV for smooth operation and a complete range of control between the TIME/DIV steps. The UNCALIBRATED neon indicator must ignite whenever the VARIABLE TIME/DIV control is moved from a full right (cw) position.

14. CHECK SWEEP HOLD-OFF

Turn STABILITY control full right (cw). Place probe from test scope, set for AC input, on pin 1 of the 16 pin connector at the back of the plug-in. Check all ranges of the TIME/DIV switch for sufficient sweep hold-off time.

15. CHECK ALTERNATE-SWEEP OPERATION

With the CA Unit in the vertical amplifier set to ALTERNATE MODE. Check to see that the trace alternates between A and B channel each time the sweep is triggered.

16. CHECK FRONT PANEL WAVEFORMS

Set test scope for DC input. With a LX (straight thru) probe check +GATE OUT for a gate waveform of about 30 volts with its base near zero volts. SAWTOOTH OUT should be about 150 volts with its base line near zero volts.