

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 H 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:

- 1 540 Series oscilloscope
- 1 TYPE 190 CONSTANT-AMPLITUDE SIGNAL GENERATOR
- 1 TYPE 105 SQUARE-WAVE GENERATOR
- 1 INPUT CAPACITANCE STANDARDIZER (CS 47)
- 1 5:1 L Pad (B52-L5)
- 1 10:1 L Pad (B52-L10)
- 1 52-Ω TERMINATING RESISTOR (B52-R)
- 2 52-Ω Cables

The 540 Series oscilloscope should be set up as follows unless otherwise stated:

<u>HORIZONTAL DISPLAY</u>	<u>NORMAL (Type 543)</u> <u>INTERNAL SWEEP (Type 541)</u> <u>MAIN SWEEP NORMAL (Type 545)</u>
<u>TRIGGERING MODE</u>	<u>AUTOMATIC</u>
<u>TRIGGER SLOPE</u>	<u>-INT.</u>
<u>STABILITY</u>	<u>PRESET</u>
<u>TIME/CM</u>	<u>1 MILLISEC</u>
<u>MULTIPLIER</u>	<u>1</u>
<u>TYPE 105</u>	Use a 52-Ω cable, terminated with an <u>INPUT CAPACITANCE STANDARDIZER (CS 47)</u> or with a <u>10:1 L Pad</u> as indicated.
<u>TYPE 190</u>	Terminate <u>ATTENUATOR</u> box with the <u>5:1 L Pad (B52-L5)</u>

Note: A TYPE TU-50 may be used to replace the TYPE 105 and TYPE 190.

The vertical-system electrical center of the 540 Series oscilloscope should be determined in the following manner:

Using a TEST LOAD UNIT, depress the PRESS TO SHORT INPUT button and observe the vertical level of the trace. If you use a plug-in unit, jumper between pins 1 and 3 on the 16-pin connector and observe the vertical level of the trace. This level will be referred to later in the calibration procedure.

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 at the amphenol 16-pin connector:

AMPHENOL CONNECTOR PIN NUMBER	RESISTANCE TO GROUND IN Ω
1	10 K
2	0
3	10 K
4	infinite
5	infinite
6	infinite
7	infinite
8	infinite
9	55 K
10	2 K
11	12 K
12	infinite
13	infinite
14	infinite
15	75 Ω
16	infinite

PRESET CONTROLS:

<u>VERTICAL POSITION</u>	mid-range
<u>VOLTS/CM</u>	<u>.005</u>
<u>VARIABLE VOLTS/CM</u>	full right (cw)
<u>INPUT SELECTOR</u>	<u>A DC</u>
<u>GAIN ADJ.</u>	full right (cw)
<u>DC BAL. COARSE</u> and <u>FINE</u>	mid-range
VERT. POS. RANGE	mid-range
H.F. PEAKING	mid-range
L3853 and L4853	below windings
L3873 and L4873	above windings

1. CHECK DC OUTPUT LEVEL.

Measure between pin 1 and ground and pin 3 and ground of the 16 pin amphenol plug (65-70 v). Typically ≈ 60 v. S/N 101-10000

2. ADJUST DC BAL. COARSE AND FINE.

Position trace on the face of the crt with VERTICAL POSITION control. Adjust DC BAL. COARSE so that trace remains almost stationary on the screen as the VARIABLE VOLTS/CM knob is varied throughout its range. Final adjustment is made with the FINE control until trace remains stationary as the VARIABLE VOLTS/CM knob is varied throughout its range.

3. ADJUST VERT. POS. RANGE.

Set the VERTICAL POSITION knob to mid-range. Adjust VERT. POS. RANGE control to position the trace on the "vertical-system electrical center".

4. CHECK GAS AND MICROPHONICS.

Gas check: Switch the VOLTS/CM switch from .005 to .01 and observe vertical shift in trace (2.5 mm maximum).

Microphonics check: Rap lightly on the front panel of the plug-in unit and watch for excessive ringing type microphonics.

5. SET GAIN ADJ.

Set up plug-in as follows:

<u>VOLTS/CM</u>	<u>.005</u>
<u>INPUT SELECTOR</u>	<u>A DC</u>
<u>VARIABLE VOLTS/CM</u>	full right (cw)

From SQUARE-WAVE CALIBRATOR apply 20 mv to INPUT A and set GAIN ADJ. for 4 cm of vertical deflection.

6. CHECK INPUT SELECTOR SWITCH.

Position the base line of the calibrator waveform to the center graticule line. Set INPUT SELECTOR switch to A AC. The waveform should shift down so that the center graticule line is now approximately through the center of the display. With the signal applied to INPUT B, check the other half of the INPUT SELECTOR switch.

7. CHECK VOLTS/CM SWITCH STEPS.

With the signal applied to INPUT B and the INPUT SELECTOR switch in B DC, check for proper deflection.

7. (Continued)

<u>SQUARE-WAVE CALIBRATOR</u>	<u>VOLTS/CM SWITCH</u>	<u>DEFLECTION</u>
20 mv	.005	4 cm
20 mv	.01	2 cm
50.05 mv	.02	2.5 cm
.2 mv	.05	4 cm
.2 mv	.1	2 cm
.5 mv	.2	2.5 cm
2 mv	.5	4 cm
2 mv	1	2 cm
5 mv	2	2.5 cm
20 mv	5	4 cm
20 mv	10	2 cm
50 mv	20	2.5 cm

8. ADJUST INPUT CAPACITOR.

Set up plug-in as follows:

VOLT/CM .005
INPUT SELECTOR A DC

From a TYPE 105 terminated in a CS 47 apply 1 kc signal to INPUT A. Adjust 105 OUTPUT AMPLITUDE control to produce 3.5 cm of vertical deflection. Adjust input capacitor for optimum flat top (C3809).

9. ADJUST VOLTS/CM SWITCH COMPENSATIONS.

With the same setup as above operate VOLTS/CM switch as indicated below. Maintain approximately 3.5 cm of vertical deflection by adjusting the TYPE 105, AMPLITUDE control.

<u>VOLTS/CM</u>	<u>ADJ. FOR OPTIMUM SQUARE CORNER</u>	<u>ADJ. FOR OPTIMUM FLAT TOP</u>
.01	C3834	C3833
.02	C3840	C3839
.05	C3812	C3811
.5	C3818	C3817
5	C3824 - C3828	C3823

10. ADJUST HF COMPENSATIONS.

Reset scope as follows:

TIME/CM .1 MICROSEC
MULTIPLIER 2

Set up plug-in as follows:

VOLTS/CM .005
VARIABLE VOLTS/CM full right (cw)
INPUT SELECTOR A DC

10. Con't.

Apply 450 kc square-waves from TYPE 105 through 10:1 L Pad, 52 Ω cable and terminated with 52 Ω TERMINATING RESISTOR to INPUT A. Adjust TYPE 105 OUTPUT AMPLITUDE control for 3 cm of vertical deflection. Adjust controls listed below for optimum square-wave presentation.

CONTROL	SLUG STARTING POSITION	AFFECT
R3856	None	Very long time constant
C3873 and C4873	Top	Long time constant
L3874 and L4874	Top	Medium time constant
L3853 and L4853	Bottom	Short time constant

11. CHECK FREQUENCY RESPONSE.

Reset scope as follows:

<u>TRIGGERING MODE</u>	<u>AC SLOW</u>
<u>TIME/CM</u>	<u>100 MICROSEC</u>
<u>STABILITY</u>	full right (cw)

With plug-in set up as above, from TYPE 190 apply 3 cm of signal at 50 kc to INPUT A. Now adjust TYPE 190 to obtain a frequency of 15 mc (do not change TYPE 190 OUTPUT AMPLITUDE) and see that there is at least 2.1 cm of vertical deflection remaining (3 db point).

12. ADJUST INPUT CAPACITOR (Turret Attenuator units)

Set up plug-in as follows:

Volt/CM	.005
INPUT SELECTOR	<u>A DC</u>

From a TYPE 105 terminated in a CS47 apply a 1kc signal to INPUT A. Adjust 105 OUTPUT AMPLITUDE control to produce 3.5 cm of vertical deflection. Adjust C3486 to near minimum capacity and adjust C3805 for optimum flat top on the square waves. (Serials below 10382 do not have an adjustable C3805 so the level is set with ~~C3486~~ only)
C3846

13. ADJUST VOLTS/CM SWITCH COMPENSATIONS

Remove the outer knob on the turret attenuator switch to allow access to the turret trimmers. As the turret is rotated the trimmers for each range will appear behind the panel cut-out. Using the same set-up as in the preceding step, maintain about 3.5cm of amplitude from the 105 on each range and adjust the trimmers for optimum square wave response.