

# FACTORY CALIBRATION PROCEDURE

## CONTENTS:

This is the guide for calibrating new instruments in Product Manufacturing. The procedure consists of 4 sections:

### Equipment Required

Factory Test Limits - Factory Test Limits are limits an instrument must meet before leaving Manufacturing. These limits are often more stringent than advertised performance requirements. This is to insure that the instrument will meet advertised requirements after shipment, allows for individual differences in test equipment used, and (or) allows for changes in environmental conditions.

Short Form Procedure - The Short Form Procedure has the same sequence of steps and the same limits on checks or adjustments as the Main Procedure.

Main Procedure - The Main Procedure gives more detailed instructions for the calibration of the instrument. This procedure may require that some checks and adjustments be made so that performance is better than that required by the Factory Test Limits. This insures the Factory Test Limits will be met when side panels are added, permits some normal variation in test equipment and plug-in scopes, etc.

Abbreviations in this procedure will be found listed in TEKTRONIX STANDARD A-100. Definitions of terms used in this procedure may be found in TEKTRONIX STANDARD A-101.

In this procedure, all front panel control labels and Tektronix instrument names are in capital letters (VOLT/DIV, etc). Internal adjustment labels are capitalized only (Gain Adj, etc).

## CHANGE INFORMATION:

This procedure has been prepared by Product Manufacturing Staff Engineering. For information on changes made to this procedure, to make suggestions for changing this procedure, or to order additional copies: please contact PMSE, 39-307.

*This procedure is  
company confidential*

P6047

January 1969

For all serial  
numbers.



©, 1969 TEKTRONIX, INC., PO Box 500  
BEAVERTON, OREGON. All rights reserved.



EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. *TEKTRONIX Instruments*

- 1 TYPE 454 OSCILLOSCOPE
- 1 TYPE 109 PULSE GENERATOR
- 1 TYPE 113 DELAY CABLE
- 1 TYPE 130 LC METER

b. *Test Fixtures and Accessories*

- 1 CONSTANT AMPLITUDE SIGNAL GENERATOR (CASG) (067-0532-00)
- 1 Standard Amplitude Calibrator (SAC) (067-0502-00)
- 1 1000 VDC Power Supply (See note below)
- 1 BNC to Probe Adapter (012-0084-00)
- 1 BNC Female to BNC Female Adapter (103-0028-00)
- 2 GR to BNC Adapters (017-0063-00)
- 2 RG 213/U 50 $\Omega$  5ns cables
- 1 50 $\Omega$  Termination (011-0049-00)
- 1 Probe Termination (011-0049-00)
- 1 Probe Capacitance Range Checker (PCRC) (PMPE Dwg #1705-B)
- 1 GR Elbow (017-0070-00)

Note: See PMPE Drawing No. 665-A, 493-B, 494-B, 495-B, 496-B, 497-B, 352-C, 353-C, and 354-C.

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.

## FACTORY TEST LIMITS

Factory Test Limits are qualified by the conditions specified in the main body of the Factory Calibration Procedure. The numbers and letters to the left of the limits correspond to the procedure steps where the check or adjustment is made. Steps without Factory Test Limits (setups, presets, etc.) are not listed. Instruments may not meet Factory Test Limits if calibration or checkout methods and test equipment differ substantially from those in this procedure.

### 3. ATTENUATION AND COMPENSATION RANGE

- b. Attenuation Accuracy:  $\pm 2\%$
- c. Compensation Range: 15 to 20pF

### 4. HF COMPENSATION

- b. HF Compensations:  $< 3\%$  aberrations added to 454 aberrations

### 5. BANDWIDTH

- c. BANDWIDTH of P6047: no reduction of 454 bandwidth

- 6. INPUT CAPACITY: 3.5' probe 10.3pF, max  
6' probe 12pF, max

- 7. MAX INPUT VOLTAGE: 1000VDC

THE END

## SHORT FORM PROCEDURE

This instrument must meet Factory Test Limits before it leaves Manufacturing; therefore, it must be possible to inspect to these limits. Because of normal variations in test equipment and plug-in scopes, addition of side panels, etc, this procedure may require that some checks and adjustments be made so that performance is better than that required by Factory Test Limits.

1. PRELIMINARY INSPECTION
2. PRESET CONTROLS
3. ATTENUATION AND COMPENSATION RANGE
  - a. Check TYPE 454 GAIN
  - b. Check Attenuation Accuracy:  $\pm 2\%$
  - c. Check compensation Range: 15 to 20pF
4. HF COMPENSATION
  - b. Adjust HF compensations:  $< 3\%$   
aberrations added to 454 aberrations
5. BANDWIDTH
  - b. Check Bandwidth of 454
  - c. Check Bandwidth of P6047:  
no reduction of 454 bandwidth
6. INPUT CAPACITY: 3.5' probe 10.3pF, max  
6' probe 12pF, max
7. MAX INPUT VOLTAGE: 1000VDC

THE END

1. PRELIMINARY INSPECTION

Check physical appearance, workmanship, cables and connector. Check for flash, obvious scratches, bubbles or other blemishes in the finished surface. Unscrew the locking nut and remove the Compensating Box cover. Check for long ends, unsoldered joints and protruding parts. Replace the Compensating Box cover.

2. PRESET CONTROLS

Preset TYPE 454 controls

HORIZ DISPLAY	A
MAG	OFF
A TRIGGERING LEVEL	midr
A TRIGGERING SLOPE	+
A TRIGGERING COUPLING	AC
A TRIGGERING SOURCE	INT
↔ POSITION	midr
A TIME/DIV	.5mS
A SWEEP MODE	AUTO TRIG
VERTICAL MODE	CH 2
CH 1 VOLTS/DIV	20mV
CH 2 VOLTS/DIV	20mV
↑ POSITION	midr
INPUT CH 1	DC
INPUT CH 2	DC

3. ATTENUATION AND COMPENSATION RANGE*a. Check TYPE 454 GAIN*

Connect PCRC set at 15 to CH 2 of TYPE 454. Connect a 50Ω cable from the SAC OUTPUT to the PCRC input. Set the SAC AMPLITUDE to .2 VOLTS and adjust the A TRIGGERING LEVEL for a stable display. Set CH 2 GAIN for exactly 4div of deflection. Remove the 50Ω cable from the SAC and the TYPE 454.

## 3. (CONT)

*b. Check Attenuation Accuracy:  $\pm 2\%$* 

Connect a BNC to probe adapter to the SAC OUTPUT and set the SAC Amplitude Control to 2 VOLTS. Connect the P6047 to CH 2 and insert the Probe Tip into the BNC to probe adapter. Adjust C9 for a flat top on the display and check the display amplitude for 4div  $\pm 2\%$ .

*c. Check Compensation Range: 15 to 20pF*

Rotate the compensating capacitor through its range. It must have sufficient range to rolloff the waveform. Set the PCRC to 20. Again adjust the compensating cap through its range. It must have sufficient range to spike up the waveform. Remove the P6047 from CH 2 and connect it to CH 1. Set VERT MODE sw to CH 1 and set SAC AMPLITUDE to 1 VOLTS. Adjust C9 for a flat top. Remove the probe tip from the SAC.

4. HF COMPENSATION*a. Setup*

109 CHG LINE 2---GR Elbow---TYPE 113  
 109 CHG LINE 1---RG213U cable---TYPE 113  
 109 50 $\Omega$  OUTPUT---GR to BNC female  
 adapter---50 $\Omega$  Termination

Connect a BNC to probe adapter to the 50 $\Omega$  termination and insert the probe into the adapter.

*b. Adjust HF Compensations:  $\leq 3\%$   
 aberrations added to 454 aberrations*

Set TIME/DIV to .2 $\mu$ S and MAG to ON. Adjust the TYPE 109 AMPLITUDE and VOLTAGE RANGE controls for a 4div display. Adjust TRIGGERING LEVEL for a stable display.

Remove the Compensating Box cover and adjust the high frequency compensations, R4, R7, R9, and C5 for optimum response. Repeat adjustments as needed due to interaction. Aberrations of Probe must add no more than 3% to 454 aberrations. Replace the Compensating Box cover and repeat aberration check. Remove the probe from TYPE 109.

b. 454 aberrations should be monitored occasionally to make sure they do not change.

5. BANDWIDTH*a. Setup*

CASG-RG213/U cable---50 $\Omega$  termination  
---CH 1 INPUT.

*b. Check Bandwidth of TYPE 454*

Set CASG to 3.0MHz and free run 454 sweep. Set CASG Amplitude control for 4div of display on the TYPE 454. Increase frequency until the amplitude reaches 2.8div. Note frequency. Remove cable and 50 $\Omega$  termination from CH 1 INPUT.

*c. Check Bandwidth of P6047: no reduction of TYPE 454 Bandwidth*

CASG---50 $\Omega$  termination---BNC female to BNC female adapter---BNC to Probe tip adapter.

Return CASG to 3MHz set amplitude for 4div. Increase frequency until display reaches 2.8div. This frequency must equal previously noted frequency.

6. INPUT CAPACITY 3.5' probe 10.3pF, max  
6' probe 12pF, max

Connect a BNC to probe adapter to the TYPE 130 UNKNOWN L or C jack. Insert the probe tip and check input capacity. Remove the probe from the CH 1 INPUT and connect it to the PCRC.

7. MAX INPUT VOLTAGE: 1000VDC

Set PCRC to 1000/1 and set 454 VERT MODE to CH 2. Touch the probe tip to the output of the 1000VDC supply and check for 2cm shift of the trace. Check the trace for any indication of arcing. Remove the probe from the high voltage supply.

THE END