

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.

*This procedure is
company confidential*

P6049

May 1968



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. (KM)



EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. TEKTRONIX Instruments

- 1 TYPE 545B OSCILLOSCOPE (A TYPE 453 OSCILLOSCOPE may be substituted for
- 1 TYPE K PLUG-IN UNIT the TYPE 545B and TYPE K)
- 1 TYPE 109 PULSE GENERATOR
- 1 TYPE 113 DELAY CABLE
- 1 TYPE 130 L-C METER

b. Test Fixtures and Accessories

- 1 600 Volt Variable DC Supply (Dwgs #1617-C, 1421-A, Rev A)
- 1 BNC-to-Probe Tip Adapter (013-0084-00)
- 1 GR-to-BNC 50 Ω Termination (017-0083-00)
- 1 RG58C/V 50 Ω 10ns Cable (017-0501-00)
- 2 RG58C/V 50 Ω 5ns Cable (017-0512-00)
- 1 P6049 Compensation Range Checker (Dwg #1720-C, 1725-C, 1917-A, 1918-A,
1919-A, 1955B, 1956B, 1957B)
- 1 Megohm Bridge with 9M Ω Standard (Dwg #386-B, 387-B, 388-B, 397-B, 447-B,
448-B, 449-B, 641-A, 797-B)

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.

© , 1968 TEKTRONIX, INC., P. O. Box 500
BEAVERTON, OREGON. All rights reserved.

FACTORY TEST LIMITS

QUALIFICATION

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 (set-ups, 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.

2. INPUT VOLTAGE RATING

- b. No high voltage breakdown with 500VDC applied to probe input

3. INPUT COMPENSATION

- b. Range: $\leq 43\text{pf}$ to $\geq 66\text{pF}$

4. STEP RESPONSE

- c. Aberrations: $+1.5\%$, -1.5% , max;
 $< 2\%$ P-P
- d. Risetime: 3.5' cable; $\leq 17\text{ns}^*$

5. INPUT CAPACITANCE

Input Capacity: $\leq 13.5\text{pF}$

6. PROBE RESISTANCE

- b. Accuracy: $9\text{M}\Omega \pm 1\%^*$

*Not including the effect of the oscilloscope

THE END

SHORT FORM PROCEDURE

Factory TEST LIMITS are limits an instrument must meet 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, it is necessary to set up some circuits so their performance is better than required by Factory Test Limits. Therefore, the instructions given in the Factory Calibration Procedure may call for checks or adjustments which result in less error than that allowed by the Factory Test Limits.

1. PRELIMINARY INSPECTION

2. INPUT VOLTAGE RATING

- b. Check for ~~no~~ High Voltage breakdown with 600V DC applied

3. COMPENSATION RANGE

- b. Check Compensation range: ≤ 42 to $\geq 66\text{pF}$

4. STEP RESPONSE

- b. Measure Oscilloscope aberrations
- c. Check Probe aberrations: $+1.5\%$, -1.5% max; $\leq 2\%$ P-P
- d. Check risetime: 3.5 cable, $\leq 19\text{ns}$ with TYPE 453 or $\leq 20.8\text{ns}$ with TYPE K

5. INPUT CAPACITY

Check input capacity $\leq 13.5\text{pF}$

6. PROBE RESISTANCE

- b. Check precision of series resistor: $9\text{M}\Omega \pm 1\%$

THE END

1. PRELIMINARY INSPECTION

Check physical appearance, workmanship, cable, and connectors. Check for flash, obvious scratches, bubbles, or blemishes.

Remove the Compensating Box cover. Check for long ends, unsoldered joints, and protruding parts. Correct or reject any probes containing defects.

Replace the cover.

2. INPUT VOLTAGE RATING

a. Setup

Connect the P6049 Compensation Box to the Oscilloscope Vertical Input through the Compensation Range Checker.

Adjust the output of the Variable DC Supply for 600 VOLTS. Set the Oscilloscope TIME/DIV to .2mSEC and VOLTS/DIV to 10.

b. Check for no High Voltage Breakdown with 600VDC applied

Touch the P6049 tip to the output of the DC Supply. Push the PUSH TO TEST button and check the display for any indication of high-voltage breakdown.

3. COMPENSATION RANGE

a. Setup

Connect the P6049 INPUT tip through a Probe Tip-to-BNC Adapter to the Oscilloscope CAL OUT.

3a. (continued)

Set the controls as follows:

Compensation Range Checker

CAPACITY 42pF

Oscilloscope

VOLTS/DIV .5 (or 1-1)
 VARIABLE CALIBRATED
 TIME/DIV 2mSEC
 HORIZ DISPLAY A (or NORMAL)
 TRIGGERING MODE AUTO
 TRIGGER SLOPE + INT
 AMPLITUDE CALIB 2 VOLTS

b. Check Compensation Range: ≤ 42
 to $> 66\text{pF}$

Rotate the capacitor in the Compensating Box through its range. It **must** be possible to obtain a flat top on the display.

Set the Checker CAPACITY to 66pF. It must be possible to obtain a flat topped display.

Set the Checker to 47pF and adjust the compensating capacitor for a flat top on the display.

Leave the Compensation Range checker set to 47pF for the remainder of the procedure.

4. STEP RESPONSE

a. Setup

Connect the two RG8A/U 5ns cables from the TYPE 109 CHG LINE 1 and CHG LINE 2 connectors to the TYPE 113 DELAY CABLE. Connect the GR-to-BNC 50 Ω Termination to the TYPE 109 50 Ω OUTPUT.

Set the Oscilloscope TIME/DIV to .1 μ SEC and the VOLTS/DIV to 5mV.

b. Measure Oscilloscope aberrations

Connect the Oscilloscope Vertical Input to the TYPE 109 50 Ω Termination through the Compensation Range Checker and a 50 Ω BNC cable.

4b. (continued)

Adjust the TYPE 109 AMPLITUDE and VOLTAGE RANGE for a 4 division display. Note the amplitude of the display aberrations.

c. *Check Probe Aberrations: + 1.5%, - 1.5% max; <2% P-P*

Replace the 50 Ω BNC cable with the P6049 and BNC-to-Probe Tip Adapter. Readjust the TYPE 109 for a 4 division display.

Check that the pulse aberrations on the display do not change more than + and - 0.6mm (or 0.8mm P-P) from the display of step b.

d. *Check risetime: 3.5' cable, <17ns (not including the oscilloscope)*

Set the Oscilloscope for a 10nS/DIV sweep rate and check risetime from the 10% to 90% amplitude points for <17.8ns in a TYPE 453 OSCILLOSCOPE, or <20.8ns in a TYPE 545B with a TYPE K PLUG-IN UNIT.

If you are using the TYPE 453, be sure its VOLTS/DIV switch is set to 5mV when checking the system risetime.

5. INPUT CAPACITY <13.5pF

Set up the TYPE 130 L-C METER on the 30 μ F range. Touch the P6049 tip to the UNKNOWN L OR C connector. Check for a meter reading of 13.5 μ F or less.

6. PROBE RESISTANCE

a. Setup

Plug the 9M Ω Standard into the STANDARD RESISTANCE binding posts of the Megohm Bridge. Connect the P6049 Compensation Box to the Rx BNC connector and set the READ switch to NORMAL.

6. (cont'd)

b. *Check precision of series resistor: $9M\Omega \pm 1\%$*

Touch the probe tip to the Rx binding post. The meter reading should be between +1% and -1%.

Disconnect the probe from the Compensation Range Checker and Megohm Bridge.

THE END