

FACTORY CALIBRATION PROCEDURE

CONTENTS:

General	1
Equipment required	2
Factory test limits	3
Factory calibration procedure	4

INTRODUCTION:

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:

0-433

May 1967

For all serial numbers.



81A

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)



PMSE

COMPANY CONFIDENTIAL

EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

- a. *TEKTRONIX Instruments*
 - * 1 TYPE 581A OSCILLOSCOPE (Plug-in scope)
 - 1 TYPE 533A OSCILLOSCOPE (test scope)
 - 1 TYPE 1A2 PLUG-IN UNIT
 - * 1 TYPE 191 CONSTANT AMPLITUDE SIGNAL GENERATOR
 - 1 TYPE TU76 LINE VOLTAGE CONTROL UNIT
 - 1 TYPE P6011 1X PROBE
- b. *Test Fixtures and Accessories*
 - 1 CALIBRATION FIXTURE (1M1) (067-0521-00)
 - 1 50 Ω GR to BNC in line termination (017-0083-00)
 - 1 5ns cable, GR connectors (017-0502-00)
 - 1 42" 50 Ω cable, ENC (012-0057-00)
 - * 1 STANDARD AMPLITUDE CALIBRATOR (SAC) (067-0502-00)
 - 1 DC VOLTAGE BRIDGE (DCVB) (067-0543-00)
- c. *Miscellaneous Equipment*
 - 1 20,000 Ω /VDC Multimeter

* This equipment must be traceable to the 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.

© , 1967 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 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

2. RESISTANCE CHECKS

3. PRESETS

4. +75V SUPPLY

Regulation: 75V $\pm 2\%$, max over 105 VAC line to 125 VAC line
Ripple: 5mV, max

5. OUTPUT DC LEVEL

- b. Adjust output DC level, R25, for 49V $\pm 1V$, max

6. DC BALANCE

- b. Adjust DC balance, R15, for 0V $\pm 50mV$, max

7. ALTERNATE TRACE

Display: two traces

* 8. GAIN ADJUST

Range + & -10%, min
Error: $\pm 2\%$, max

9. LF RESPONSE

Overshoot, ringing and tilt
1.5% P-P, max

10. HF COMPENSATION

Overshoot, ringing and tilt
1.5% P-P, max

11. RISETIME

- b. Measure risetime 6ns, max from the 10% to the 90% amplitude points

* 12. BANDWIDTH

52 MHz or more at -3dB

THE END

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

1. PRELIMINARY INSPECTION

Check for unsoldered joints, rosin joints, poor lead dress, long leads and wiring errors. Check for loose hardware and protruding parts. Correct all defects found.

2. RESISTANCE CHECKS

Use the multimeter X10k scale to measure the resistance from the amphenol connectors to ground as in the following table:

Approx Resistance of Input Connector		
Pin Number	Neg lead to gnd	Pos lead to gnd
1	9k	1 meg Ω
2	0 Ω	0 Ω
3	9k	1 meg Ω
4, 5, 6, 7	inf	inf
8	275k	inf
9	30k Ω	inf
10	15k	65k
11	27k	100k
12	1 meg	1 meg
13	inf	inf
14	115k	250k
15	13k	inf
16	inf	inf

Approx Resistance of Output Connector		
Pin Number	Neg lead to gnd	Pos lead to gnd
1	30k Ω	inf
2	15k	65k
3	27k	100k
4	1 meg	1 meg
5	115k Ω	250k Ω
6	inf	inf
7	60k	inf
8	inf	inf
9	3k Ω	3k Ω
10	0 Ω	0 Ω
11	3k Ω	3k Ω
12, 13, 14	inf	inf
15	6k Ω	inf
16	inf	inf

Measure between pins of the output connector as follows:

Pin Numbers	Approx Resistance
12 to 13	45 Ω
5 to 6	inf

3. PRESETS

a. Preset TYPE 81A

Preset C20, C30, R20 and R30 to midrange.
Preset Gain (R46), DC Bal (R15) and Output
DC Level (R25) to midrange.

b. Preset TYPE 581A

STABILITY	cw
TRIGGERING LEVEL	0
TRIGGERING SOURCE	INT AC
TRIGGER SLOPE	+
HORIZONTAL DISPLAY	INTERNAL SWEEP
TIME/CM	1mSEC
5X MAG	OFF

Remove bottom and left side panels and
install the TYPE 81A in the plug-in
compartment.

c. Preset 1M1

TEST FUNCTION	COMMON MODE
---------------	-------------

Plug the 1M1 into the TYPE 81A.

Set the TYPE TU76 output to 117 VAC and
connect the TYPE 581A power cord to the
TYPE TU76 outlet. Turn the TYPE 581A
POWER ON.

4. +75V POWER SUPPLY

Regulation: 75V $\pm 2\%$, max over 105 VAC
line to 125 VAC line
Ripple: 5mV, max

Check the +75V supply at the junction
of R76 and C76. Use the multimeter for
voltage measurement and the test
scope for ripple measurement. Check
voltage and ripple with the 1M1 TEST
FUNCTION switch at HIGH LOAD while
varying the TYPE 76TU from 105 VAC to
125 VAC line. Again check voltage and
ripple with the 1M1 TEST FUNCTION switch
at LOW LOAD while varying the TYPE 76TU
from 105 VAC to 125 VAC line. Return
the line to 117 VAC.

5. OUTPUT DC LEVEL*a. Setup*

Connect a test lead from pin 9 of the TYPE 81A output amphenol connector to the DCVB \pm INPUT binding post. Connect a second test lead from the TYPE 581A ground to DCVB COMMON binding post. Connect a 50 Ω cable from DCVB DIFFERENCE OUTPUT to test scope vertical input. Set the DCVB RANGE to 110V and READOUT to 4-9-0.

*b. Adjust output DC level, R25, for
49V \pm 1V, max*

Adjust R25 for a null on the test scope.

6. DC BALANCE*a. Setup*

Move the DCVB COMMON test lead from TYPE 581A ground to TYPE 81A output amphenol connector pin 11. Change the DCVB RANGE to 1.1V and READOUT to 0-0-0.

*b. Adjust DC Balance, R15, for
0V \pm 50mV, max*

Adjust R15 for a null indication on the test scope. Remove the DCVB connections from TYPE 81A.

7. ALTERNATE TRACE

Display:
two traces

Change the 1M1 TEST FUNCTION switch to ALTERNATE. Check for a display of two horizontal traces in all TYPE 581A TIME/CM positions from 10mSEC to .05 μ SEC.

8. GAIN ADJUST Range: + & -10%, min
Error: $\pm 2\%$, max

Change the 1M1 TEST FUNCTION to GAIN SET. Connect a 50 Ω cable from SAC OUTPUT to 1M1 EXT INPUT. Set the SAC MODE to \square and AMPLITUDE to 50 VOLTS. Rotate the Gain Adj, R46 from full ccw to full cw and check for a minimum range of 1.8cm to 2.2cm of deflection. Center the display.

Adjust R46 for exactly 2cm of deflection. Remove the SAC connection from 1M1 EXT INPUT.

9. LF RESPONSE Overshoot, ringing and
tilt: 1.5% P-P, max

Set the 1M1 TEST FUNCTION to +PULSE and REPETITION RATE to LOW. Set the TYPE 581A TIME/CM to .1mSEC and STABILITY to PRESET. Center the display and adjust the 1M1 AMPLITUDE for 2cm of vertical deflection. Check the square-wave response.

10. HF COMPENSATION Overshoot, ringing and
tilt: 1.5% P-P, max

Change the 1M1 REPETITION RATE to HIGH. Change the TYPE 581A TIME/CM to 1 μ SEC. Adjust C30, R30, C20 and R20 for optimum square-wave response.

10. C30 and R20 will have a greater effect on the level of the display. C20 and R30 will have a greater effect on the leading edge of the display. Check the level with TYPE 581A TIME/CM set to 1 μ SEC and check the leading edge with TYPE 581A TIME/CM set to .05 μ SEC.

11. RISETIME

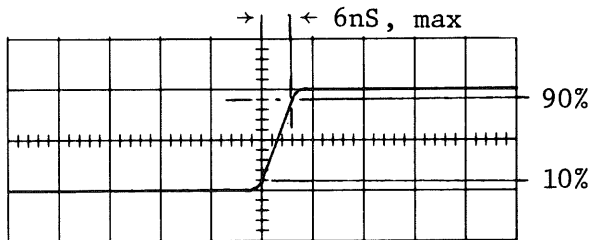
a. Setup

Set the TYPE 581A TIME/CM to .05 μ SEC and 5X MAG ON. Adjust the 1M1 AMPLITUDE for a 2cm display.

11. (cont'd)

- b. Measure risetime: 6ns, max from the 10% to the 90% amplitude points

Use the TRIGGERING LEVEL to position the display as far to the right as possible. Adjust the HORIZONTAL POSITION to position the display to a point where the center graticule line crosses the display 2mm above the baseline. Measure the rise-time from the center graticule line to the 1.8cm amplitude point on the display. See illustration below:



12. BANDWIDTH

52 MHz or more at -3dB

Remove the 1M1 from the TYPE 81A and install a TYPE 1A2. Set the TYPE 1A2 MODE to CH 1, VOLTS/CM to .05 and VARIABLE cw (CALIBRATED). Connect TYPE 191 OUTPUT -- 5ns cable -- 50Ω GR to BNC in-line termination -- TYPE 1A2 INPUT 1.

Set the TYPE 191 FREQUENCY RANGE to 50 kHz, AMPLITUDE RANGE to 50-500mV and AMPLITUDE to obtain 3cm of deflection. Change the FREQUENCY RANGE to 42-100 and adjust the vernier frequency dial for a 2.1cm display. Read the 3dB down frequency from the vernier frequency dial.

THE END