

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

410
PULSE SENSOR
015-0102-00

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. (CS)



EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. *TEKTRONIX Instruments*

1 TYPE 410 PHYSIOLOGICAL MONITOR

b. *Test Fixtures and Accessories*

1 Pulse Simulator (067-0586-99)
1 410 Test Power Supply (067-0550-99)
1 410 Patient Cable Assembly (012-0120-00)

c. *Other Equipment*

1 20,000 Ω /VDC Multimeter

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.

3. NOISE

b. Noise: $\leq 1.5\text{mV}$

4. ZENER DIODE REGULATION

b. Zener diode regulation: $\pm 3.5\text{cm}$

5. OUTPUT WAVEFORM

b. Output amplitude: $\geq 15\text{mV}$

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. PRESETS

- a. Preset TYPE 410
- b. Preset 410 Test Power Supply

2. RESISTANCE

- a. Check overload diodes for $<100\Omega$
- b. Check sensor load resistance for $>1k\Omega$

3. NOISE

- a. Setup
- b. Check noise: $\leq 1.5mV$

4. ZENER DIODE REGULATION

- a. Setup
- b. Check zener diode regulation: $\pm 3.5cm$

5. OUTPUT WAVEFORM

- a. Setup
- b. Check output amplitude: $\geq 15mV$
- c. Check output waveform polarity

THE END

1. PRESETS

a. Set TYPE 410 controls as follows:

SWEEP SPEED	50mm/s
INPUT SELECTOR	AUX
VERTICAL SIZE	CAL
POSITION	midr
LOUDNESS	ccw

Connect Patient Cable to TYPE 410 INPUT.

b. Set 410 Test Power Supply controls as follows:

POWER ON	ON
BATT VOLTS MODE	VAR
BATT VOLTS VARIABLE	LO
METER SELECTOR	OFF

2. RESISTANCE

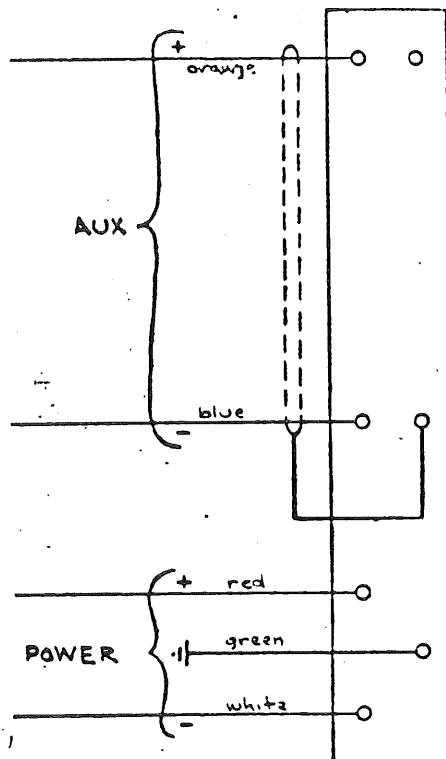
a. Check overload diodes

With multimeter range at Ω X10, measure resistance between + and - AUX pins on the Pulse Sensor plug; resistance must be less than 100Ω . Reverse meter leads, and again measure resistance between + and - AUX pins; resistance must be less than 100Ω .

b. Check sensor load resistance

With multimeter range at Ω X1k, measure resistance between + and - POWER pins on Pulse Sensor plug. Resistance should be greater than $1k\Omega$.

2. 7 Pin Plug (Front View):



3. NOISE

a. Setup

Connect Pulse Sensor to TYPE 410 Patient Cable. Hold face of Pulse Sensor against dark felt pad.

3,4. The Pulse Sensor photocell must be isolated from light and vibration for these steps.

b. Check noise: $\leq 1.5mV$

Position TYPE 410 trace to graticule center and check that vertical deflection is no more than 1.5mV ($\leq 3mm$).

Change 410 Test Power Supply BATT VOLTS to HI, and repeat check after trace has stabilized.

4. ZENER DIODE REGULATION

a. Setup

Change TYPE 410 SWEEP SPEED to BATTERY CHECK. Set 410 Test Power Supply BATT VOLTS VARIABLE ccw. Note position of spot. Turn BATT VOLTS VARIABLE cw to position spot 1cm to the right of noted position. Allow spot to stabilize.

b. Check zener diode regulation: $\pm 3.5cm$

Quickly, but smoothly, turn 410 Test Power Supply BATT VOLTS VARIABLE ccw to L0. Spot will move to left, but must not move more than 3.5cm vertically.

5. OUTPUT WAVEFORM

a. Setup

Place Pulse Sensor in energized Pulse Simulator, so photocell and bulb are exposed to interior of fixture; be sure Sensor is properly seated in Simulator. Change TYPE 410 SWEEP SPEED to 50mm/s, and 410 TEST Power Supply BATT VOLTS MODE to CAL.

5. (cont'd)

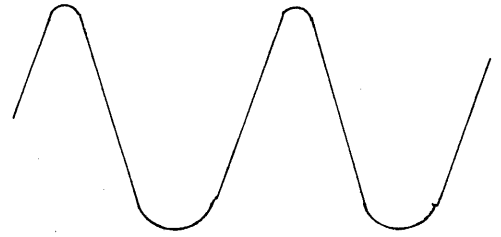
b. Check output amplitude: $\geq 15\text{mV}$

Check for simulated pulse signal amplitude of at least 15mV ($\geq 3\text{cm}$).

c. Check output waveform polarity

Check that top of simulated pulse signal is narrower than bottom of simulated pulse signal; see figure. An inverted waveform indicates wrong polarity of Pulse Sensor.

5c. Approximate waveshape of simulated pulse signal.



THE END

