

EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. TEKTRONIX Instruments

TYPE 547 OSCILLOSCOPE
TYPE 1A5 PLUG-IN UNIT (Differential)
TYPE 109 PULSE GENERATOR
TYPE 113 DELAY CABLE
TYPE 130 LC METER

b. Test Fixtures and Accessories

HV Power Supply, 20kV	Dwg. #233-A
HV Pulser, 20kV	Dwg. #127-A
Input C Adapter	Dwg. #1720-C
Divider, 1000:1, Precision	067-0529-00
Adapter, GR to BNC	017-0063-00
Cable, 50 Ω Coax, BNC	012-0057-00
T-Connector, GR	017-0069-00
Termination, 50 Ω , GR	017-0080-00

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

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. ATTENUATION RATIO

- b. 1000:1 attenuation accuracy:
within 2%

3, 7. FREQUENCY COMPENSATION

- b. Max aberration: +5%, -5%, 8% P-P

4. HIGH VOLTAGE

- a. No arcing, ionization, etc.
at 20kV
- b. <2% change in atten ratio after
20kV pulse have been applied

6. PROBE-COMPENSATION RANGE

- b. Compensation can be adjusted to
match oscilloscope Input C be-
tween 12pF and 50pF

7. RISETIME

- c. Risetime (not including the scope):
10' cable: $\leq 7\text{ns}$
25' cable: $\leq 40\text{ns}$

8. INPUT CAPACITANCE: $\leq 3\text{pF}$

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

2. ATTENUATION RATIO

- b. Adjust R117 for 1000:1 attenuation

3. LOW FREQUENCY COMPENSATION

- b. Adjust C113, C114, C115 max aberration: +5%, -5%; 7% P-P

4. HIGH VOLTAGE

- a. Check for 20kV breakdown: no arcing, ionization, etc.
- b. Check for $\leq 2\%$ change in attenuation after applying 20kV pulses

5. FINAL ASSEMBLY

Fit cover and handle to probe barrel; readjust C113, C114, C115 (Step 3b)

6. PROBE-COMPENSATION RANGE

- b. Check range: $\leq 12\text{pF}$ to $\geq 50\text{pF}$

7. RISE TIME

- b. Adjust High Freq Comp (R112)
max aberration: +5%, -5%; 7% P-P
- c. Check risetime: $\leq 7\text{ns}$ for the 10' P6013A alone ($\leq 10\text{ns}$ for the system if 547/1A5 risetime is 8ns).
Risetime of 20' P6013A: $\leq 40\text{ns}$

8. INPUT CAPACITANCE: $\leq 3\text{pF}$

THE END

1. PRELIMINARY*a. Set up equipment*

Connect one arm of a GR T-connector to the TYPE 106 HI-AMPLITUDE OUTPUT.

Connect the following equipment to the leg of the GR T-connector:

GR-to-BNC Adapter
1000:1 Divider (067-0529-00)
BNC 50 Ω cable
TYPE 1A5 B INPUT

Set the controls as follows:

TYPE 106	
AMPLITUDE	Adj for 100V
REPETITION RATE	100Hz
MULTIPLIER	1
Oscilloscope	
VOLTS/CM	1mVOLTS
DISPLAY	A-B
A & B Vert Input	DC-coupled
V _C POLARITY	0
TIME/CM	1mSEC X1
Triggering	Stable display

b. Assemble probe body

Install the end caps and resistor assembly in the probe barrel, using one screw in each cap. Preset the capacitance prongs in the barrel to the outer ends of the spiral slots.

Slide the plastic handle onto the cable, attach the screw-on Input tip, and connect the Compensation Box cable to the probe body's BNC connector.

2. ATTENUATION RATIO

a. Connect probe

Connect the P6013A Compensation Box to the TYPE 1A5 A INPUT. Insert the probe Input tip into the arm of the T-connector. Ground the probe case to the TYPE 106 ground.

b. Adjust Atten Adj (R117): 1000:1

Set R117 for a null display. (Ignore the aberrations above and below the baseline.)

3. LOW FREQUENCY COMPENSATION

a. Setup

Change the settings of the following controls:

TYPE 106

REPETITION RATE 1kHz

Oscilloscope

VOLTS/CM 50mVOLTS

DISPLAY A-V_C

b. Adjust Low Freq Comp (C113, C114, C115) max aberration: -5%, +5%; 7% P-P

Adjust C113, C114, and C115 for a level top and a square corner on the square-wave display.

Check the display at TIME/CM settings of 2mSEC and .1mSEC; touch up the adjustments as necessary.

If a dip or rise appears on the waveform beyond the portion compensated by the Compensation Box, rotate the prong assembly to center the screw in the adjustment slot and readjust C113, C114, and C115. If necessary, remove the screw and rotate the nose assembly within the barrel to the next position.

4. HIGH VOLTAGE

a. Check for arcing, ionization

Set the controls as follows:

HV Power Supply	
OUTPUT	20kV
Oscilloscope	
VOLTS/CM	10
TIME/CM	1mSEC

Connect the P6013A Input tip to the Power Supply Output and turn on the power. Check the display for indications of arcing or ionization.

Turn off the power and disconnect the probe from the High Voltage terminal.

b. Check for resistor breakdown

Connect the P6013A Input tip to the High-Voltage Pulser and apply 20kV pulses for several minutes. Check the display occasionally for indication of high-voltage breakdown.

The next probe to be calibrated can be preassembled during this period to save time.

Recheck the attenuation ratio as directed in Step 2. If the baseline separation has increased to 3cm or more, reapply the 20kV pulses and check the attenuation ratio again.

Reset R117, if necessary, to obtain a nulled display.

5. FINAL ASSEMBLY

Insert the remaining screws in the probe barrel and fit the ground strap, outside cover, and handle to the probe barrel.

Touch the probe tip to the TYPE 106 OUTPUT, connect the probe ground to the TYPE 106 ground, and readjust C113, C114, C115 for a flat-topped display.

6. PROBE-COMPENSATION RANGE

a. Setup

Connect the INPUT C ADAPTER
between the P6013A Compensation
Box and the TYPE 1A5 INPUT.
Set the controls as follows:

Oscilloscope	
TIME/CM	1mSEC
VOLTS/CM	50mVOLTS
DISPLAY	A-V _c

TYPE 106	
REPETITION	
RATE	1kHz
AMPLITUDE	Fully cw

b. Check compensation range: *<12pF to >50pF*

Set the Adapter to the 12pF
position and check that C113 can
be adjusted to obtain a flat-
topped display.

Repeat the above procedure for the
50pF position.

Remove the Adapter and readjust
C113 for a flat-topped display.

7. RISETIME

a. Setup

Connect the TYPE 113 DELAY CABLE
to the TYPE 109 CHG LINE connectors.
Connect the P6013A Input tip to the
TYPE 109 50 Ω OUTPUT through a GR
50 Ω Termination. Ground the probe
case to the TYPE 109 ground.

7a. (cont'd)

Set the controls as follows:

TYPE 109

AMPLITUDE 50 Volts

POLARITY +

Oscilloscope

TIME/CM .5 μ SEC

VOLTS/CM 10mVOLTS

- b. *Adjust High Freq Comp (R112)*
max aberration: -5%, +5%, 7%
P-P

Adjust R112 for a level square-wave display.

- c. *Check risetime: ≤ 7 ns (for the 10' probe only; ≤ 10 ns for the system if 547/1A5 risetime is 8ns). Check for ≤ 40 ns risetime with 20' probe.*

Change the Oscilloscope TIME/CM to .1 μ SEC and set the SWEEP MAGNIFIER to X10.

Check the system risetime: ≤ 10 ns with 10' probe (if the risetime of the 547/1A5 is 8ns) or ≤ 40 ns for the system with the 20' probe.

8. INPUT CAPACITANCE ≤ 3 pF

Set up the TYPE 130 LC METER on the 10 μ F Range. Touch the P6013A Input tip to the UNKNOWN L OR C connector. Check for a meter reading of 3 μ F or less.

THE END