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).

This procedure is company confidential

P6046

March 1968

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

AMPLIFIER FOR P6046
TYPE 547 OSCILLOSCOPE
TYPE 1A5 PLUG-IN UNIT (Differential)
TYPE 647A OSCILLOSCOPE
TYPE 10A2A PLUG-IN UNIT (Vertical)
TYPE 11B2A PLUG-IN UNIT (Time-Base)
TYPE 106 SQUARE WAVE GENERATOR
TYPE 191 CONSTANT AMPLITUDE SIGNAL GENERATOR
TYPE 130 LC METER

b. Test Fixture and Accessories

MΩ bridge with 9MΩ Standard Dwg #386-B, 387-B, 388-B, 397-B
Low Frequency Sine Wave Generator (LFSWG) 067-0542-00
Standard Amplitude Calibrator (SAC) 067-0502-99
GR 50Ω 10:1 Attenuator (2 ea) 017-0078-00
GR 50Ω 5:1 Attenuator 017-0079-00
GR-to-BNC 50Ω Termination 017-0083-00
GR 5ns Coaxial Cable 017-0502-00
BNC 50Ω Coaxial Cable 012-0057-00
P6046 Accessories:
- Grounding tips (2 ea) 010-0363-00
- BNC-to-Single/Dual Tip Adapter Dwg #1778-A
- Calibration Shield 067-0563-00
- Calibration Fixture Dwg #B-1943

CAUTION: Applying more than 25V (AC + Peak DC) to the P6046 input tips will destroy the input FET transistors. Be sure a common ground system is used on all test equipment (including the soldering iron) and turn the signal amplitude controls to minimum before connecting such equipment to the P6046 INPUT tips.

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.

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. FET DRAIN VOLTS

a. Accuracy: 10.5VAC ±0.25V

4. INPUT LEAKAGE CURRENT

b. Input Gate leakage: ≤0.3nA

5. DEFLECTION FACTOR

b. Accuracy: within 2.5%

6. DYNAMIC RANGE

b. Compression-expansion: ≤6% for a 10cm display

7. TRANSIENT RESPONSE

b. max aberrations: +4%, -4%, ≤5% P-P (at 5mV/DIV, 50mV/DIV)

8-9. OVERDRIVE

8b. DC shift due to overdrive: ≤1.5%
9b. Overdrive recovery: within 10mV in 0.1μs

10. NOISE LEVEL

b. Random noise level: ≤270μV

11. BANDWIDTH

b. HF response: -3dB at ≥100MHz
c. LF response: -3dB at ≤20Hz; -3dB at ≤2Hz with Atten Head

12. COMMON MODE REJECTION

b. 50kHz CMRR: ≥12,500
c. DC-coupled, 18MHz, 42MHz, 50MHz CMRR: ≥1100:1
AC-coupled, 18MHz, ≥1100:1, 40-50MHz, ≥550:1

13-16. ATTENUATOR HEAD

13b. Accuracy: within 2%
14b. DC rejection: ≥4000:1
15b. Transient response; max aberrations: +5%, -5%, ≤8% P-P
16b. CMRR at 40kHz: ≥150:1
CMRR at 1MHz: ≥80:1

17. INPUT RESISTANCE

b. P6046 input resistance: 1MΩ ±1%

18. INPUT CAPACITANCE

b. P6046 input capacitance: ≤10pF
c. Attenuator head input capacitance: ≤3pF

19. DC BALANCE

a. Max trace shift when mVOLT/DIV changed from 200 to 5: ≤1cm

THE END

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

a. Inspect and preset P6046
b. Preset controls
c. Check cable-to-connector continuity
d. Check voltages
e. Warmup: at least 15 minutes

2. INPUT FET DRAIN VOLTS

b. Adjust R125 (Drain Volts) for 10.5VDC (between C209 and ground)

3. GAIN-SWITCHING DC BALANCE

a. Preadjust R235 (Gain-Switching DC Bal) (Final adj is made in Step 16)
b. Adjust Atten Bal

4. INPUT FET GATE CURRENT

b. Check Input Gate current: 0.25nA (2.5mm)

5. DEFLECTION FACTOR

b. Adjust R155 (Probe Gain): 4cm display
c. Check gain switching accuracy: within 2%

6. COMPRESSION-EXPANSION

b. ≤6% for a 10cm display

7. TRANSIENT RESPONSE

b. Adjust C155 (Transient Response): max aberrations, +4%, -4%, ≤5% P-P

8. OVERDRIVE DC SHIFT

b. Check DC shift due to overdrive: ≤1.5%

9. OVERDRIVE RECOVERY

b. Check overdrive recovery: within 10mV in 0.1μs

10. NOISE LEVEL

b. Check random noise: ≤270 μV

11. BANDWIDTH

b. Check HF response of P6046 and AMPLIFIER (not including scope) ≤3dB down at 100MHz
c. Check LF response: basic, ≤20Hz; with Atten Head, ≤2Hz

12. COMMON MODE REJECTION

b. Adjust 50kHz CMRR (R120 & C107): ≥12,500:1 (0.4cm)
c. Adjust HF CMRR (C209, 18MHz; R209, 42MHz; C245, 50MHz): DC-coupled, ≥1100:1 (1.8cm)
c. Check AC-coupled CMRR: 18MHz ≥1000:1, 40MHz, 50MHz, ≥550:1

13. ATTENUATOR HEAD ACCURACY

b. Check Attenuator accuracy: within 2%

14. ATTENUATOR HEAD DC REJECTION

b. ADJUST R105 (DC CMRR)

15. ATTENUATOR HEAD TRANSIENT RESPONSE

b. Adjust + & - COMP and wiring: max aberrations, + or - 4%, $\leq$7% P-P

16. ATTENUATOR HEAD CMRR

a. Adjust + & - COMP: $\geq$150:1 at 40kHz
$\geq$80:1 at 1MHz

17. INPUT RESISTANCE

b. Check P6046 input resistance: 1MΩ ±1%

18. INPUT CAPACITANCE

b. Check P6046 input capacitance $\leq$10pF

c. Check Attenuator head input capacitance: $\leq$3pF

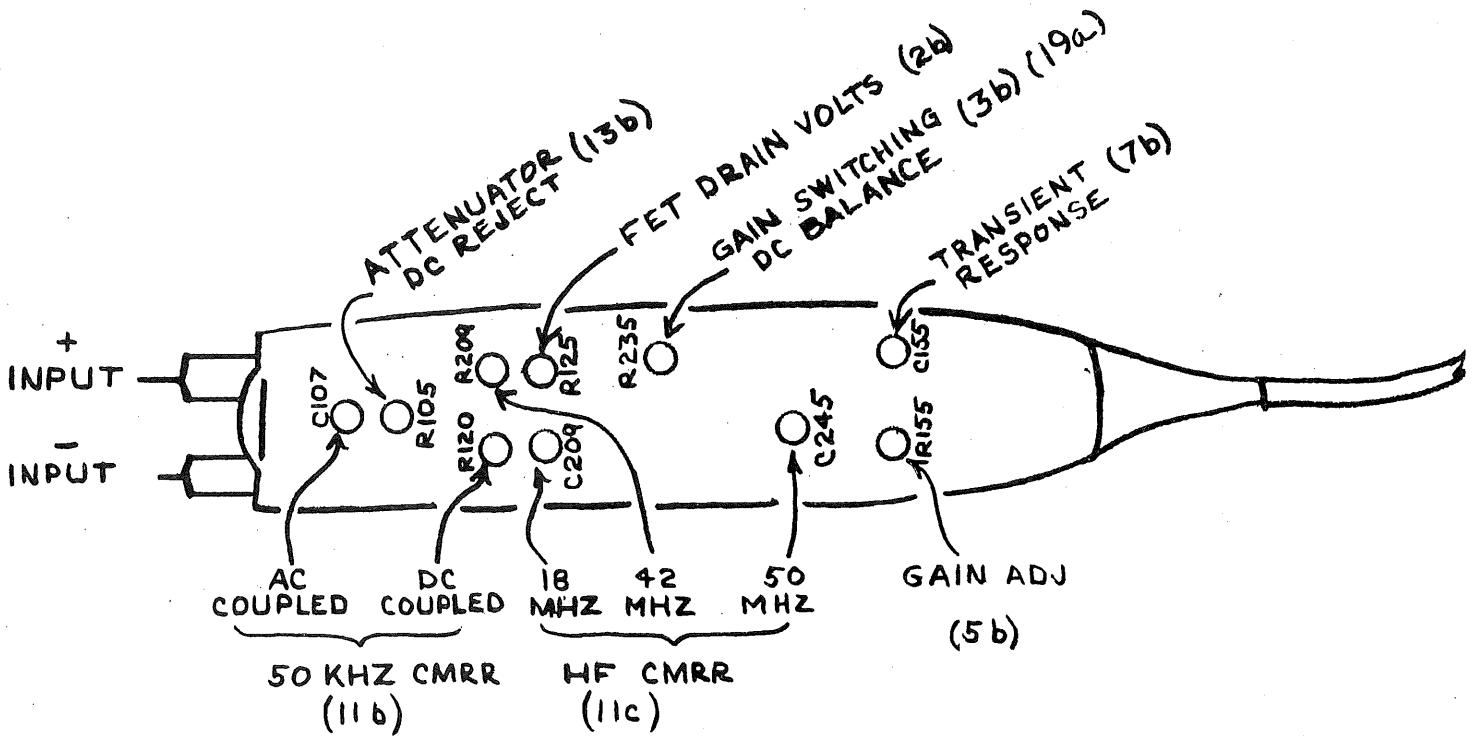
19. FINAL ADJUSTMENTS

a. Readjust DC Bal (R235) and ATTEN BAL: $\leq$0.8cm trace shift (200-5 mVOLTS/DIV)

b. Install top cover

c. Recheck 50MHz CMRR (C245): $\geq$1,250:1

THE END



1. PRELIMINARY

a. Inspect and Preset P6046 PROBE

Mount the probe circuit board in the calibration fixture. Inspect the probe internal components for mechanical damage. Preset the internal adjustments to midrange. Set the probe AC-DC switch to AC.

b. Preset Oscilloscope Controls

TYPE 1A5

POSITION	Midrange
A INPUT	DC
B INPUT	GND
VOLTS/CM	20mV
VARIABLE	CALIBRATED
DISPLAY	A-B
PROBE LIGHT	Push to ON

TYPE 547

TRIGGERING (Time Base A)	
LEVEL	0
MODE	AUTO STAB.
SLOPE	+
COUPLING	AC
SOURCE	NORM
TIME/CM	.5mSEC
HORIZONTAL DISPLAY	A
SWEEP MAGNIFIER	X1 OFF
HORIZONTAL POSITION	Midrange
AMPLITUDE CALIB.	OFF

c. Check Cable Connector

Using the Ω X10 scale of the ohmmeter, check that the cable connector is properly wired to the cable:

Pin	Lead	Function
A, B	coax shield	Ground
C	lower coax	- Output
J	upper coax	+ Output
D	Blue	Gain switching signal
E	Red	+20.6V supply
F	Green	+50V supply
H	not used	-------
K	Brown	-50V supply

1. (continued)

d. Check Voltages

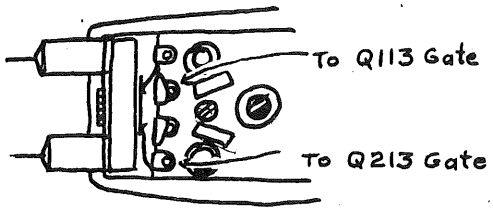
Connect the P6046 cable to the TYPE 1A5 and check the voltages at the following points in the P6046:

Location	Approx Voltage
Brown lead	-50V
Green lead	+50V
Red lead	+20.6V
Blue lead	+6.2V
Coax (2) center	+0.5V
Q113 and Q213 Gates	0 V

e. Warmup

Allow the P6046 to warmup at least 15 minutes before making any final adjustments.

Before power is applied to the P6046, be sure the front and back spacers on the circuit board are connected together through the calibration fixture or through the metallized probe covers.



2. INPUT FET DRAIN VOLTS

a. Setup

Ground both input tips of the P6046 and set the probe AC-DC switch to DC.

b. Adjust FET Drain Volts (R125): 10.5VDC

Connect the DC Voltmeter between ground and the adjusting screw of C209. Adjust R125 for a voltmeter reading of 10.5VDC.

Disconnect the voltmeter leads from the P6046.

3. GAIN-SWITCHING DC BALANCE

a. Setup

Set the TYPE 1A5 VOLTS/CM to .2V and adjust vertical POSITION to center the trace.

Change VOLTS/CM to 10mV RETAIN and adjust PROBE STEP ATTEN BAL to return the trace to graticule center. Repeat several times, until no further adjustment is necessary.

The STEP ATTEN BAL adjustment should be rechecked prior to each critical DC-level measurement which requires VOLTS/CM switching, unless directed otherwise.

b. Adjust Gain Switching DC Bal (R235)

Set the TYPE 1A5 VOLTS/CM to 1mV and adjust R235 to position the trace to graticule center.

A slight amount of drift may be present at 1mV/CM.

Repeat Steps a and b until the trace stays within 5mm of graticule center when the VOLTS/CM control is rotated from 1mV through .2V.

Final adjustment of R235 will be made in Step 19a.

4. INPUT FET GATE CURRENT

a. Setup

Set the VOLTS/CM to 1mV. (Readjust PROBE STEP ATTEN BAL if necessary.)

Be sure the probe AC-DC switch is set to DC.

b. Check Input Gate Current $\leq$0.25nA

Remove and replace the -INPUT grounding tip, checking for 2.5 or less shift (indicating $\leq$0.25nA gate current).

Repeat the above procedure for the +INPUT.

5. DEFLECTION FACTOR

a. Setup

Set the controls on the TYPE 1A5 and SAC as follows:

TYPE 1A5

VOLTS/CM	20mV
POSITION	trace centered

SAC

AMPLITUDE	.1 VOLTS
MODE	SQUARE WAVE
OUTPUT SELECTOR	Up

CAUTION: Breakdown voltage between the two tips or between either tip and ground is ±25 volts, DC + peak AC volts.

5a. (cont'd)

Connect the P6046 ground lead to the SAC ground. Connect the SAC to the + INPUT through a BNC cable and the BNC-to-Single Tip Adapter.

b. Adjust X1 Gain (R155), Range: + and - 10%

Check the display amplitude as R115 is rotated through its range: ≤4.5cm to ≥5.5cm.

Adjust R155 for 5cm separation between the centers of the two traces.

c. Check 1/10 Gain Accuracy: within 2%

Set the VOLTS/CM to 20mV-RETAIN and check for 5cm ±1mm separation.

Disconnect the P6046 cable and ground from the TYPE 1A5 and SAC. Use of the TYPE 1A5 has been completed.

6. COMPRESSION-EXPANSION

a. Measure TYPE 10A2A Atten error

Set the TYPE 10A2A VOLTS/CM to .01. Apply a 50mV SAC signal to the TYPE 10A2A CH 2 INPUT. Adjust the TYPE 10A2A GAIN for a 5div square wave display.

Change the SAC to .1 VOLTS and the TYPE 10A2A VOLTS/CM to .02. If the display amplitude is not exactly 5cm, record the error in mm.

b. Check P6046/AMPLIFIER compression-expansion: ≤6% for a 10cm display

Connect the P6046/AMPLIFIER between the SAC and the TYPE 10A2A. Set the AMPLIFIER mVOLTS/DIV to 200 and apply a 1VOLT SAC signal. Note the display amplitude.

6b. (cont'd)

Change the TYPE 10A2A VOLTS/CM to .02 and apply a 2 VOLT SAC signal. The display amplitude should not change more than 3mm ± the attenuator error measured in step 6a.

Return the TYPE 10A2A VOLTS/CM to .01.

7. TRANSIENT RESPONSE

a. Setup

Install the Calibration Shield and move the P6046 cable to the AMPLIFIER FOR P6046 Input connector. Connect the output of the AMPLIFIER to the Input of the TYPE 10A2A. Set the TYPE 10A2A VOLTS/CM to .01 DC-coupled.

The TYPE 10A2A VOLTS/CM should be set at .01 throughout most of this procedure. The AMPLIFIER mVOLTS/DIV switch will be used to set the vertical deflection, unless the procedure calls for a specific change in the TYPE 10A2A VOLTS/CM setting.

Adjust the AMPLIFIER ATTEN BAL for minimum trace shift when the mVOLTS/DIV switch is rotated between 200 and 2.

Set the TYPE 106 as follows:

REPETITION RATE	100kHz
HI AMPLITUDE-FAST RISE	FAST RISE
+ TRANSIENT AMPLITUDE	ccw

Connect the P6046 ground lead to the TYPE 106 ground. Connect the following equipment to the TYPE 106 FAST RISE + OUTPUT in the order listed below:

5ns GR cable
10:1 GR Attenuator
GR-to-BNC 50Ω Termination
BNC-to-Single Tip Adapter
P6046 + INPUT

Set the mVOLTS/DIV to 5 and adjust the TYPE 106 + TRANSIENT AMPLITUDE for a 5cm display. Adjust the TYPE 11B2A for a triggered .1μSEC/DIV display centered on the graticule.

CAUTION: Never connect the P6046 to the HI AMPLITUDE OUTPUT of the TYPE 106 without using a 50Ω termination. The unterminated switching transients will exceed the probe's maximum input voltage.

7. (cont'd)

b. Adjust P6046 Transient Response (C155): max aberration, +4%, -4%; ≤5% P-P, not including the TYPE 10A2A aberrations

Adjust C155 for optimum transient response (optimum squareness and 2 mm or less overshoot, rounding, or tilt at the upper left corner of the square wave).

Change the mVOLTS/CM to 200 and remove the 10:1 GR Attenuator. Adjust the TYPE 106 AMPLITUDE for a 5cm display and check aberration.

8. OVERDRIVE DC SHIFT

a. Setup

Set the AMPLIFIER mVOLT/DIV to 200 and change to the HI AMPLITUDE OUTPUT of the TYPE 106. Adjust the TYPE 106 AMPLITUDE for a 5cm display.

b. Check DC shift due to overdrive: ≤1.5%

Set mVOLTS/DIV to 10. Ground the input of the BNC-to-Single Tip Adapter and recheck the ATTEN BAL adjustment. Position the trace to graticule center.

Reconnect the Adapter to the GR-to-BNC Termination and check vertical positon of the trace after 1 second for ≤1.5cm shift.

Invert the connection between the Adapter and the P6046 tips to apply the signal to the -Input and repeat the check.

9. OVERDRIVE RECOVERY TIME

a. Setup

Change the Adapter position to apply the signal to the +Input tip. Set the TYPE 11B2A TIME/CM to 0.1μSEC and set the AMPLIFIER mVOLTS/DIV to 100.

Connect the TYPE 106 TRIGGER OUTPUT to the TYPE 11B2A EXT TRIG, set the 11B2A Triggering to EXT, and adjust the TYPE 106 and TYPE 11B2A for a stable 5cm display.

Position the leading edge of the step to the 2cm line of the graticule (see Fig. A).

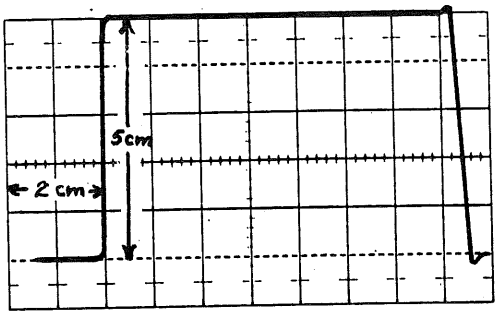


Fig A

Remove the 10:1 Attenuator, change the mVOLTS/DIV to 10 and adjust the TYPE 10A2A VERTICAL POSITION to position the trailing edge of the square wave to the center of the graticule (See Fig, B).

b. Check overdrive recovery: within 10mV in 0.1μs

Check that the trace is not more than 1cm from graticule center at the 3cm line (see Fig. B).

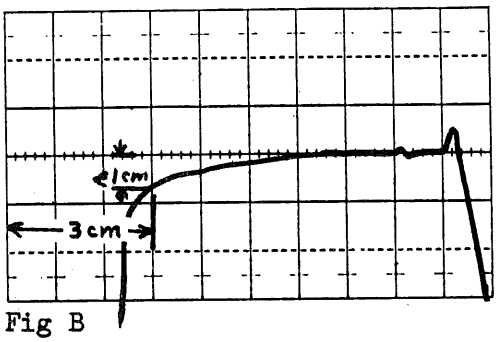


Fig B

10. NOISE LEVEL

a. Setup

Connect the following equipment to the TYPE 106 + OUTPUT in the order listed:

One 5:1 GR Attenuator
Two 10:1 GR Attenuators
5ns GR cable
GR-to-BNC 50Ω Termination
BNC-to-Single Tip Adapter
P6046 INPUT

Turn the TYPE 106 + TRANSITION AMPLITUDE control fully cw and adjust the Oscilloscope controls for a stable 5μSEC/CM display centered on the graticule. Adjust FOCUS and ASTIGMATISM for optimum trace focus at the center of the graticule.

10. (cont'd)

b. Check Noise Level: ≤270μV

Turn the Oscilloscope TRIGGERING LEVEL cw. Two traces should appear on the CRT. Turn the TYPE 106 + TRANSITION AMPLITUDE ccw until the dark area between the two traces just disappears. Remove both 10:1 Attenuators, switch mVOLTS/DIV to 10 and check the display for 2.7cm or less trace separation.

11. BANDWIDTH

a. Setup

Connect the P6046 ground lead to the TYPE 191 ground. Connect the following equipment to the TYPE 191 OUTPUT in the order listed:

5ns GR cable
GR-to-BNC 50Ω Termination
BNC-to-Single Tip Adapter
P6046 Input tips

Set the controls as follows:

AMPLIFIER
mVOLTS/DIV 1

TYPE 191
FREQUENCY 50kHz ONLY
AMPLITUDE Adjust for a 4cm display

b. Check HF response: ≥100MHz, not including the effect of the oscilloscope

Calculate the bandwidth requirement of the P6046/AMPLIFIER/10A2A/647A System when the P6046/AMPLIFIER bandwidth is 100MHz (see NOTES column).

Increase the signal frequency until the dispaly amplitude is 2.8cm. Check that the TYPE 191 FREQUENCY setting is equal to or exceeds the bandwidth calculated for the system.

Repeat the procedure with the mVOLTS/DIV set to 50.

The -3dB bandwidth of a system is calculated from the relationship:

$$\frac{1}{(BW_{sys})^2} = \frac{1}{(BW_1)^2} + \frac{1}{(BW_2)^2} + \cdots$$

As an example, to satisfy the 100MHz bandwidth requirement of the P6046 (and AMPLIFIER) when checked with a 110MHz 10A2A/647A:

$$\frac{1}{(BW_{sys})^2} = \frac{1}{100^2} + \frac{1}{110^2}$$

(cont'd on the next page)

11. (cont'd)

c. Check AC-Coupled LF Response: Basic, ≤20Hz; with Atten Head, ≤2Hz

Connect the P6046 ground lead to the LFSWG ground. Connect the following equipment to the LFSWG OUTPUT in the order listed:

BNC 50Ω cable
BNC 50Ω 10:1 Attenuator
BNC-to-Single Tip Adapter
P6046 Input tips

Set the controls as follows:

Oscilloscope	
TIME/CM	50mSEC
LFSWG	
FREQUENCY	20Hz
AMPLITUDE	4cm display

Change the P6046 AC-DC switch to AC. Check for at least 2.8cm display amplitude.

Remove the 10:1 BNC Attenuator and install the Attenuator Head between the Adapter and the P6046 INPUT tips. Set the controls as follows:

P6046	
AC-DC	DC
Oscilloscope	
TIME/CM	5 SEC
LFSWG	
FREQUENCY	2Hz
AMPLITUDE	4cm display

Change the P6046 AC-DC switch to AC. Check for at least 2.8cm display amplitude.

Return the AC-DC switch to DC.

11b (cont'd)

or

$$BW_{sys} = \frac{(100)\ (110)}{\sqrt{100^2 + 110^2}}$$

$$= \frac{11000}{\sqrt{10000 + 11700}} = 74MHz$$

(The above example shows a scope bandwidth of 110MHz; the actual bandwidth of your oscilloscope will have to be measured and substituted in the calculation to determine the system requirement for the equipment you are using.)

11c. To confirm the frequency, check for 1 cycle/cm at 50mSEC/CM.

12. COMMON MODE REJECTION

a. Setup

Ground both tips of the Probe and touch up the adjustment of the AMPLIFIER ATTEN BAL.

Connect the following equipment to the TYPE 191 OUTPUT:

5ns GR cable
GR-to-BNC 50Ω Termination
BNC-to-Dual Tip Adapter
P6046 INPUT

b. Adjust 50kHz CMRR (R120 & C107): ≥12,500:1

Adjust the TYPE 191 controls to provide a 50kHz 5 volt P-P signal.

Make a rough adjustment of R120 at a mV/DIV setting of 20 for minimum display amplitude; then change to 1mVOLT/DIV for a final adjustment of R120 giving ≤0.4cm display amplitude (ignore noise amplitude).

Adjust R235 (Gain Switching Bal) to keep the trace on the screen while adjusting R120.

Use EXT TRIGGER when adjusting C107.

Switch the P6046 AC-DC switch to AC and adjust C107 for the same display as was seen with the AC-DC switch set to DC. Return the AC-DC switch to DC.

c. Adjust HF CMRR: DC-coupled, ≥1100:1 at 18MHz, 42MHz, 50MHz; AC-coupled, ≥1100:1 at 18MHz, ≥550:1 at 40MHz, 50MHz

Change the amplitude of the TYPE 191 signal to 2V P-P and adjust C209, R209, and C245 for minimum deflection as indicated in the following table:

TYPE 191 FREQUENCY	Adjust
18MHz	C209
42MHz	R209
50MHz	C245

CAUTION: 10.5VDC is present on the adjustment screw of C209.

There may be some interaction between the three adjustments, so repeat until no improvement can be seen. Maximum common-mode signal deflection at the three frequencies is 1.8cm P-P.

12. (cont'd)

Switch the AC-DC switch to AC. Recheck Common Mode Rejection as indicated in the following table:

TYPE 191 FREQUENCY	MAXIMUM DISPLAY AMPLITUDE
18MHz	1.8cm
40MHz	3.6cm
50MHz	3.6cm

Readjust C107 (Step 12b) and C245 (Step 12c) if necessary; then recheck DC CMRR.

13. ATTENUATOR HEAD ACCURACY

a. Setup

Connect the P6046 ground lead to the SAC ground. Connect the following equipment to the SAC OUTPUT:

BNC cable
BNC-to-Single Tip Adapter
Dual Attenuator Head
P6046 INPUT

Set the SAC for a 0.2V square-wave signal. Return the P6046 mV/DIV switch to 5.

b. Check Attenuator Accuracy: within 2%

Check for a display amplitude of 4cm ±0.8mm (ignore any random noise present). If the signal amplitude of the display is out-of-tolerance, recheck the setting of R155 (Step 5) and ATTEN BAL.

Rotate COMP, checking for a normal effect on the square wave response.

Invert the BNC-to-Single Tip Adapter to apply the signal to the -INPUT tip and repeat the above checks.

14. ATTENUATOR HEAD DC REJECTION

a. Setup

Change the SAC to 50 VOLTS. Move the Adapter to the BNC-to-Dual tip position. Set the Oscillscope POSITION and TRIGGER LEVEL controls for a centered stable display.

b. Adjust DC CMRR (R105)

Adjust R105 for minimum amplitude between the trailing edges of the signal displayed on the CRT, ignoring the aberrations at the leading edges of the pulses. Make the final adjustment with mVOLTS/DIV set to 1.

15. ATTENUATOR HEAD TRANSIENT RESPONSE

a. Setup

Set the TYPE 106 HI AMP-FAST RISE switch to HI AMPLITUDE. Connect the following equipment to the HI AMPLITUDE OUTPUT of the TYPE 106:

5ns GR cable
GR-to-BNC 50Ω Termination
BNC-to-Single Tip Adapter
P6046 Attenuator Head
P6046 INPUT

Set the P6046 mVOLTS/DIV to 5 and adjust the TYPE 106 AMPLITUDE for a 4cm display.

b. Adjust Transient Response:
max aberrations: +4%, -4%, ≤7% P-P

Adjust + COMP and position the wire paralleling the Attenuator Head + INPUT resistor for the best square wave response on the upper left corner of the square wave. Check the aberrations for +4%, -4% maximum, or ≤7% P-P.

15b. (cont'd)

Invert the BNC-to-Single Tip Adapter to apply the signal to the -INPUT tip.

Adjust -COMP and position the -INPUT wire for the best square wave response on the lower left corner of the square wave.

16. ATTENUATOR HEAD CMRR

a. Adjust CMRR

Move the Adapter to the BNC-to-Dual Tip position. Turn the TYPE 106 AMPLITUDE fully cw and very lightly touch up + and -COMP to reduce the spike on the front corner of the pulse to minimum. Recheck + INPUT Transient Response, Step 14b, if the setting of +COMP is changed.

b. Check CMRR: *≥150:1 at 40kHz*
≥80:1 at 1MHz

To avoid probe damage when the TYPE 106 is used during calibration of the next probe, turn the AMPLITUDE control fully ccw before disconnecting the cable.

Connect the following equipment to the LFSWG OUTPUT:

BNC cable
BNC-to-Dual Tip Adapter
P6046 Attenuator Head
P6046 INPUT

Set the controls as follows:

LFSWG	
AMPLITUDE	100 VOLTS
FREQUENCY	40kHz
AMPLIFIER	
mVOLTS/DIV	200
Oscilloscope	
TIME/CM	10μSEC
TRIGGERING	Stable display

Readjust -COMP for minimum display amplitude.

Check for a display amplitude of 3.3cm or less, not including random noise.

Change the LFSWG FREQUENCY to 1MHz and check for a display amplitude of 6cm or less.

17. INPUT RESISTANCE

a. Setup

Plug the 1MΩ Standard into the STANDARD RESISTANCE binding posts of the Megohm Bridge. Connect the BNC-to-Single Tip Adapter to the R_X BNC connector and set the READ switch to NORMAL.

b. Check Input Resistance: 1MΩ ±1%

Connect the P6046 Input tip to the Adapter and check for a meter reading between +1% and -1%.

Reverse the probe connection to check the input resistance of the other tip.

18. INPUT CAPACITANCE

a. Setup

Connect the P6046 ground lead to the ground connection on the TYPE 130. Set up the front panel controls of the TYPE 130 for the 30μμF range.

b. Check P6046 Input Capacitance: ≤10pF

Touch each P6046 Input tip in turn to the TYPE 130 UNKNOWN L OR C connector and check for a meter reading of 10μμF or less.

c. Check Attenuator Input Capacitance: ≤3pF

Set up the TYPE 130 for a reading on the 10μμF range. Attach the Attenuator Head to the P6046 Input tips and check each Attenuator Input for an input capacitance of ≤3pF.

Disconnect the Attenuator Head from the P6046 Input tips and reconnect the P6046 cable to the AMPLIFIER.

19. FINAL ADJUSTMENTS

a. Readjust R235: ≤0.8cm trace shift from reference level (200-5mV/DIV)

R235 was preadjusted in Step 3a.

Touch up the settings of R235 (Gain Switching DC Bal) and ATTEN BAL for less than 0.8cm of trace shift from the reference level when the mVOLTS/DIV switch is rotated from 200 to 5.

b. Install Top Cover

Disconnect the Probe cable from the AMPLIFIER. Remove the Calibration Shield and install the AC-DC switch detent spring and the top cover. Be sure that the strain relief is properly seated and that the Probe cable wires are not pinched between the covers of the probe case.

c. Recheck 50MHz CMRR (C245): ≥1100:1

Reconnect the P6046 cable to the AMPLIFIER. Allow the Probe temperature to stablize at least 10 minutes. Recheck 50MHz CMRR as directed in Step 12 and readjust C245 if necessary.

THE END