

FACTORY CALIBRATION PROCEDURE

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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:

0-107

November 1966

For all serial numbers.



114

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. (MC)



PMSE

COMPANY CONFIDENTIAL

EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. TEKTRONIX Instruments

- 1 TYPE 547 OSCILLOSCOPE with
- 1 TYPE 1A1 PLUG-IN UNIT and
- 1 TYPE P6028 X1 PASSIVE PROBE (test scope)
- * 1 TYPE 184 TIME-MARK GENERATOR
- 1 TYPE 191 CONSTANT AMPLITUDE SIGNAL GENERATOR
- 1 TYPE 1S1 SAMPLING UNIT
- 1 TYPE 76TU Line-Voltage Control Unit

b. Test Fixtures and Accessories

- 3 50 Ω Coax cables, BNC (012-0057-00)
- 2 50 Ω Terminations, BNC (011-0049-00)
- 1 50 Ω 10:1 Attenuator, BNC (011-0059-00)
- 2 GR to BNC female adapters (017-0065-00)
- 1 50 Ω Termination, GR to BNC (mid-line) (017-0083-00)
- * 1 STANDARD AMPLITUDE CALIBRATOR (SAC) (067-0502-00)

c. Other 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.

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FACTORY TEST LIMITS

QUALIFICATION

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1. PRELIMINARY INSPECTION

2. PRESET CONTROLS

3. RESISTANCE CHECKS

4. POWER SUPPLIES

- b. Adjust the +25V supply, R290: 25V
- c. Check the +35V supply: 35V \pm 5V
- d. Check 230V primary winding
- e. Check +25V supply ripple: \leq 10mV

5. PULSE PERIOD

- b. Adjust Period Cal, R125: accuracy \pm 2%
- c. Check VARIABLE range: \geq 10:1
- * d. Check Accuracy 10ms to 10 μ s: \pm 2%
- * e. Adjust fast period, C115F: accuracy \pm 2%
- f. Check jitter: \leq 0.05% of PERIOD

6. PULSE WIDTH

- b. Adjust Width Cal, R180: accuracy \pm 2%
- * c. Check width 1ms to 1 μ s: accuracy \pm 2%
- * d. Adjust 100ns width, C195F: accuracy \pm 2%
- e. Check VARIABLE range: \geq 10:1
- f. Check jitter: \leq 0.05% of WIDTH

7. SQUARE WAVE MODE

- * b. Check repetition rate accuracy: \pm 4% of PERIOD, except 1 μ s \pm 8%

8. AMPLITUDE

- * a. Check 3 TO 10V range: variable from \leq 3V to \geq 10V into 50 Ω
- * b. Check 1 TO 3V range: variable from \leq 1V to \geq 3V into 50 Ω

9. PULSE ABERRATION

- b. Check pulse aberration: 4% PTP

10. WIDTH>PERIOD

- b. Check WIDTH>PERIOD light: lit prior to period error.
- c. Check WIDTH>PERIOD tracking: light on or off as dictated by control settings.

11. EXTERNAL TRIGGER INPUT

- b. Check HF triggering: \leq 2V at 2 MHz

12. TRIGGER OUTPUT

- a. Check trigger slope: trigger on indicated slope
- * b. Check trigger amplitude: 3V \pm 1V
- * c. Check trigger amplitude into 50 Ω : .4 to .7V

13. PULSE RISETIME/FALLTIME

- * b. Check positive risetime and falltime: \leq 10nsec
- * c. Check negative risetime and falltime: \leq 10nsec

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

1. PRELIMINARY INSPECTION*a. General*

Check for unsoldered joints, rosin joints, improper lead dress and long ends. Check for loose hardware and protruding parts. Check controls for smooth mechanical operation, proper indexing, and knob spacing from front panel. Correct all defects found.

b. Check fuse

Check for the correct fuse.

115V: 159-0029-00 .3A 3ag Slo-Blo

230V: 159-0054-00 .15A 3ag Slo-Blo

2. PRESET CONTROLS*a. Preset TYPE 547*

TIME BASE A

TRIGGERING LEVEL	cw
MODE	AUTO STABILITY
SLOPE	+
COUPLING	AC
SOURCE	INT NORM
TIME/CM	.1 μ SEC
VARIABLE	CALIBRATED

MAIN TIME BASE (B)

TRIGGERING LEVEL	centered
MODE	AUTO STABILITY
SLOPE	+
COUPLING	AC
SOURCE	LINE
TIME/CM	10mSEC
VARIABLE	CALIBRATED

HORIZONTAL DISPLAY	B
SWEEP MAGNIFIER	X1 OFF

b. Preset TYPE 1A1

	<u>CHANNEL 1</u>	<u>CHANNEL 2</u>
POSITION	centered	centered
NORM-INVERT	NORM	NORM
VARIABLE VOLTS/CM	CALIB	CALIB
VOLTS/CM	2	.005
INPUT SELECTOR	DC	AC
MODE	CH 2	

2b. (cont'd)

Connect a X1 probe to the TYPE 1A1 CHANNEL 2 input. Turn on test scope.

c. Preset TYPE 114

PERIOD	1 μ S
VARIABLE	CAL
WIDTH	100nS
VARIABLE	CAL
AMPLITUDE	+3 TO 10V
VARIABLE	clockwise
POWER	switch down (off)
TRIGGER	LEADING EDGE

All internal adjustments midr

d. Leave controls and adjustments for any step, as they were in the step preceding unless noted otherwise.

3. RESISTANCE CHECKS

Check resistance of power supplies to GND.

<u>Supply</u>	<u>Check point</u>	<u>approx resistance</u>
115VAC	T281 term 1 thru 4	inf
115VAC	T281 term 6 thru 7	300 Ω
+25V	outer shell of C298	100 Ω
+3V	junction of D209 & R209	3k Ω
+35V unreg	C298	1k Ω

3. Connect the negative lead of the multimeter to ground. (The lead marked "common" on the meter is not necessarily the negative lead. If in doubt, check with another meter or a scope.)

4. POWER SUPPLIES

a. Setup

Connect the multimeter common lead to the outside shell of C283. Connect the positive lead to the outside shell of C298. Plug the TYPE 114 into the TYPE 76TU, set the TYPE 76 TU to 115V.

4. POWER SUPPLY WARM-UP

A minimum warm-up time of five minutes is required. This requirement is normally met by readjusting the +25V supply at the end of step 4.

4. (cont'd)

b. Adjust the +25V supply, R290: 25V

Turn TYPE 114 POWER switch on. Check that power light lights. Check multimeter reading for approximately 25 volts. Rotate the WIDTH VARIABLE control cw until the WIDTH> PERIOD light is lit then rotate the control ccw until the light extinguishes.

Connect a 50 Ω coax cable to the TYPE 114 OUTPUT, thru a GR to BNC female adapter and a GR to BNC 50 Ω Termination to the test scope TYPE 1A1 CHANNEL 1 input.

Adjust R290 for a meter reading of 25 volts.

c. Check the +35V supply: 35V \pm 5V

Change the voltmeter positive lead to the positive terminal of C298 and check for 35 volts \pm 5 volts.

d. Check 230V primary winding

Connect the multimeter leads to terminals 9 and 11 of T281. With the multimeter set to an appropriate AC scale, note the voltage reading. Change the Line Voltage selector switch (on the TYPE 114 rear panel) to 230V and check for half the voltage noted above. Return Line Voltage selector switch to 115V and disconnect the multimeter.

e. Check +25V supply ripple: \leq 10mV

Connect the test scope X1 PROBE to the outside shell of C298. Set the variable line voltage source to 94.5V and check for \leq 10mV, 60 or 120 Hz ripple.

Set line voltage to 137.5V and check for \leq 10mV of 60 or 120 Hz ripple.

Set variable line voltage control to 115 VAC and remove the X1 probe from C298 and the TYPE 1A1 CHANNEL 2 INPUT. Reconnect the multimeter between C283 and C298. Adjust R290, for 25V. Change TYPE 1A1 MODE switch to CH 1. Remove the meter leads from C283 and C298.

e. RIPPLE

Various transients will be noted on the +25 volt supply. For purposes of supply regulation check only 60 and 120 Hz ripple.

5. PULSE PERIOD

a. Setup

Set the VARIABLE WIDTH to CAL, the PERIOD to 1mS and WIDTH to 1 μ S. Set the TYPE 547 MAIN TIME BASE (B) TRIGGERING SOURCE to INT NORM and TIME/CM to 1mSEC. Connect the TYPE 184 MARKER OUTPUT to the TYPE 1A1 CHANNEL 2 input with a 50 Ω coax cable and 50 Ω Termination. Set the CHANNEL 2 VOLTS/CM to .2 and the TYPE 184 for 1mS markers. Change the TYPE 1A1 MODE switch to ALT. Adjust the TYPE 547 B TRIGGERING LEVEL for a stable display. With the TYPE 1A1 POSITION controls, position one trace over the other.

b. Adjust Period Cal, R125: accuracy $\pm 2\%$

Adjust R125 to superimpose the TYPE 114 marker pulses and the time markers; ± 2 mm.

c. Check VARIABLE range: $>10:1$

Set the TYPE 1A1 MODE to CH1. Rotate the VARIABLE PERIOD cw. Change the TYPE 547 B TIME/CM to .1 SEC. Change the TYPE 114 PERIOD to 10mS. Check for >1 marker/cm, return the TYPE 114 VARIABLE PERIOD to CAL.

* d. Check accuracy 10mS to 10 μ S: $\pm 2\%$

Set the TYPE 1A1 MODE to ALT and check for superimposed markers, ± 2 mm, using the following table.

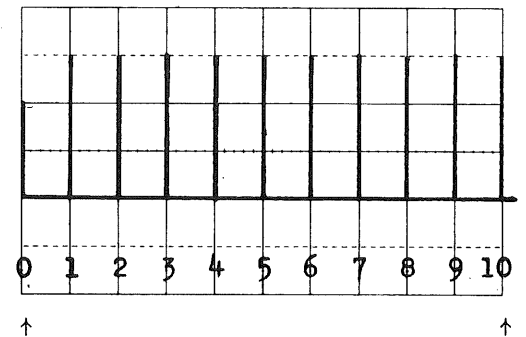
<u>PERIOD</u>	<u>WIDTH</u>	<u>TIME/CM</u>	<u>TYPE 184</u>
10mS	1 μ S	10mSEC	10mS
1mS	1 μ S	1mSEC	1mS
100 μ S	1 μ S	.1mSEC	.1mS
10 μ S	100nS	10 μ SEC	10 μ S

* e. Adjust fast period, C115F
accuracy $\pm 2\%$

Set the B TIME/CM to 1 μ SEC. Set the TYPE 184 and TYPE 114 PERIOD to 1 μ S. Adjust C115F to superimpose the markers, ± 2 mm.

b. DETERMINING PERIOD ACCURACY

The period accuracy of the TYPE 114 is measured between the number 0 and number 10 time markers.



5. (cont'd)

f. Check jitter: $\leq 0.05\%$ of PERIOD

Set the TYPE 547 B TIME/CM switch to .1mSEC. Set the HORIZONTAL DISPLAY to B INTENS BY A. Set the TYPE 114 PERIOD to 100 μ S and the WIDTH to 1 μ S. Change the TYPE 1A1 MODE to CH 1.

Adjust the TYPE 547 B TRIGGERING LEVEL for a stable display. Set the DELAY-TIME MULTIPLIER to 1.00 and turn the INTENSITY control ccw until the intensified portion of the trace is visible. With the DELAY-TIME MULTIPLIER, set the intensified portion of the sweep on the number one pulse. Set the HORIZONTAL DISPLAY to A DLY'D and turn the INTENSITY control cw until the display is visible.

Adjust the DELAY-TIME MULTIPLIER until the leading edge of the pulse is at graticule center. Set the SWEEP MAGNIFIER to X2. Check for ≤ 1 cm of jitter.

6. PULSE WIDTH

a. Setup

Turn TYPE 547 SWEEP MAGNIFIER to X1 OFF and the HORIZONTAL DISPLAY to B. Set the B TIME/CM to .2mSEC. Set the TYPE 1A1 MODE switch to ALT and the TYPE 184 to .1mS.

Set the TYPE 114 PERIOD and WIDTH to 1mS. Check that the VARIABLE WIDTH control is in the CAL position. Adjust the VARIABLE PERIOD cw until the WIDTH>PERIOD light extinguishes. Adjust the TYPE 547 B TRIGGERING LEVEL for a stable display. Adjust the TYPE 114 VARIABLE AMPLITUDE control and the TYPE 1A1 CHANNEL 1 POSITION control for a 5cm display centered on the graticule. Use the TYPE 1A1 CHANNEL 2 POSITION control to position the top of the time markers to the graticule center line.

*b. Adjust the Width Cal, R180:
accuracy $\pm 2\%$*

Adjust R180, for a positive pulse width of 1msec, 10 time markers ± 1 mm.

6. (cont'd)

* c. Check WIDTH 1mS to 1 S: accuracy $\pm 2\%$

Using the following table, check the settings of the WIDTH switch. Readjust TRIGGERING LEVEL as necessary for a stable display.

WIDTH	TIME/CM	TYPE 184	Number of marks	Max Error
1mS	.2mSEC	.1mS	10	1mm
100 μ S	20 μ SEC	10 μ S	10	1mm
10 μ S	2 μ SEC	1 μ S	10	1mm
1 μ S	.2 μ SEC	1 μ S	10	1mm

Change PERIOD to 100 μ S.
Change PERIOD to 10 μ S.

* d. Adjust 100nS WIDTH, C195F: accuracy $\pm 2\%$

Set the TYPE 114 WIDTH switch to 100nS, PERIOD to 1 μ S.

Set the TYPE 547 B TIME/CM to .1 μ SEC and set the SWEEP MAGNIFIER to X5. Adjust the TYPE 114 VARIABLE AMPLITUDE and the TYPE 1A1 CHANNEL 1 POSITION control for 5cm of pulse amplitude centered on the graticule. Adjust the TRIGGERING LEVEL as necessary during this step. Use the TYPE 1A1 CHANNEL 2 POSITION control to position the top of the time markers to graticule center line.

Adjust C195F for 100nS width ± 1 mm.

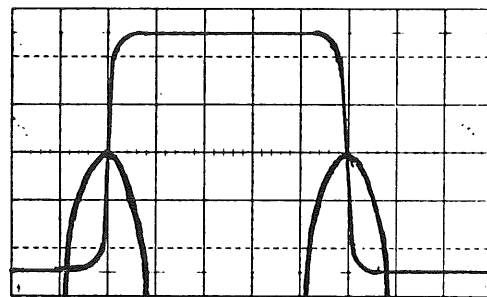
e. Check VARIABLE range: $\geq 10:1$

Set the TYPE 114 WIDTH to 100 μ S, PERIOD to 10mS and the VARIABLE PERIOD to CAL. Set the TYPE 547 SWEEP MAGNIFIER to X1 OFF, and TIME BASE B TIME/CM to .2mSEC. Set the TYPE 184 for .1mS markers and adjust the B TRIGGERING LEVEL for a stable display. Rotate the VARIABLE WIDTH cw, check for a smooth operation of the control, check for a pulse width of at least 1ms; ten time markers. Return the VARIABLE WIDTH to the CAL position. Set TYPE 1A1 MODE to CH 1.

f. Check jitter: $\leq 0.05\%$ of WIDTH

Set the TYPE 547 TIME BASE B TIME/CM to .1mSEC and adjust the B TRIGGERING LEVEL for a stable display. Set the HORIZONTAL DISPLAY to B INTENS BY A. Set the DELAY TIME MULTIPLIER to a point where the intensified portion of the sweep falls on the falling portion of the pulse. Approx 1.00 on the DELAY TIME MULTIPLIER dial.

d. At 100nS WIDTH the risetime and falltime of the pulse becomes a significant portion of the pulse width, measurement is made at 50% amplitude.



6f. (cont'd)

Set the HORIZONTAL DISPLAY to A DLY'D and the SWEEP MAGNIFIER to X2. Adjust the DELAY TIME MULTIPLIER to place the falling portion of the pulse at the graticule center line. Check for $\leq 1\text{cm}$ of jitter. Return SWEEP MAGNIFIER to X1 OFF.

7. SQUARE WAVE MODE

a. Setup

Set the TYPE 114 WIDTH switch to SQUARE WAVE. Set the TYPE 547 B TIME/CM to 1mSEC, HORIZONTAL DISPLAY to B and TYPE 1A1 MODE to ALT. Center the square-wave on the graticule with the TYPE 1A1 CHANNEL 1 POSITION control. Change the TYPE 184 to 1mS and position the tops of the time markers to the graticule center line with the TYPE 1A1 CHANNEL 2 POSITION control.

- * *b. Check SQUARE WAVE period accuracy:
 $\pm 4\%$ of PERIOD switch setting, except
 $1\mu\text{S} \pm 8\%$*

Check the period accuracy of the SQUARE WAVE mode by checking for 10 time markers/cycle using the following table:

<u>PERIOD</u>	<u>TIME/CM</u>	<u>TYPE 184</u>	<u>Max error</u>
10mS	1mSEC	1mS	4mm
1mS	.1mSEC	.1mS	4mm
100 μS	10 μSEC	10 μS	4mm
10 μS	1 μSEC	1 μS	4mm
1 μS	.1 μSEC	.1 μS	8mm

8. AMPLITUDE

- * *a. Check 3 TO 10V range: variable from
 $\leq 3\text{V}$ to $\geq 10\text{V}$ into 50Ω*

Remove the 50Ω coax cable and 50Ω Termination from the TYPE 1A1 INPUT 1. Connect a 50Ω coax cable from the SAC OUTPUT to the TYPE 1A1 INPUT 1. Set the TYPE 1A1 MODE to CH 1 and the TYPE 547 B TIME/CM to 1mSEC. Check the gain of the TYPE 1A1 CHANNEL 1 with the VOLTS/CM switch at 1 and at 2. Disconnect the SAC from the TYPE 1A1 and reconnect the TYPE 114.

8a. (cont'd)

Set the TYPE 547 B TIME/CM to 1 μ SEC. Rotate the TYPE 114 VARIABLE AMPLITUDE control ccw, check for smooth mechanical and electrical operation. Set the TYPE 1A1 CHANNEL 1 VOLTS/CM to 1 and check for 3cm or less of vertical deflection. Set the TYPE 1A1 CHANNEL 1 VOLTS/CM switch to 2. Rotate the TYPE 114 VARIABLE AMPLITUDE cw and check for 5cm or more of vertical deflection.

Change the AMPLITUDE switch to -3 TO 10V. Adjust the TYPE 1A1 CHANNEL 1 POSITION control to return the display to the graticule. Check for 5cm or more of vertical deflection. Rotate the TYPE 114 VARIABLE AMPLITUDE ccw. Set the TYPE 1A1 CHANNEL 1 VOLTS/CM switch to 1 and check for 3cm or less of vertical deflection.

- * b. *Check 1 TO 3V range: variable from $\leq 1V$ to $\leq 3V$ into 50Ω*

Change the TYPE 114 AMPLITUDE switch to -1 TO 3V. Rotate the VARIABLE AMPLITUDE cw. Check for 3cm or more of vertical deflection. Rotate the TYPE 114 VARIABLE AMPLITUDE ccw. Set the TYPE 1A1 CHANNEL 1 VOLTS/CM to 0.5. Check for 2cm or less of vertical deflection.

Change the TYPE 114 AMPLITUDE switch to +1 TO 3V. Return the display to the graticule with the POSITION control. Check for 2cm or less of vertical deflection. Set the TYPE 1A1 CHANNEL 1 VOLTS/CM switch to 1. Rotate the TYPE 114 VARIABLE AMPLITUDE cw. Check for 3cm or more of vertical deflection.

9. PULSE ABERRATION*a. Setup*

Set the TYPE 1A1 CHANNEL 1 VOLTS/CM to 2, and set the TYPE 114 AMPLITUDE switch to +3 TO 10V. Adjust the TYPE 114 VARIABLE AMPLITUDE for 5cm of display and set the WIDTH to 100nS. Set the B TIME/CM to .2 μ SEC and adjust TRIGGERING LEVEL for a stable display. Adjust the TYPE 114 VARIABLE WIDTH for 2 symmetrical cycles in 10cm.

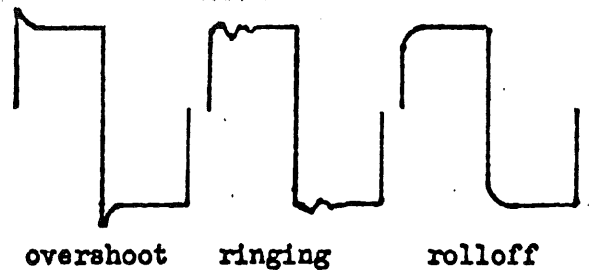
9. (cont'd)

b. Check pulse aberration: $\leq 4\%$ PTP

With the TYPE 1A1 CHANNEL 1 POSITION control, center the display on the graticule. Check pulse aberrations, 2mm max.

Change the TYPE 114 AMPLITUDE switch to -3 TO 10V. Recenter the display. Check aberrations of the negative going pulse, 2mm max.

9b. Aberrations



10. WIDTH>PERIOD

a. Setup

Set the TYPE 114 AMPLITUDE switch to +3 TO 10V. Set the TYPE 547 B TIME/CM switch to 1μSEC and adjust B TRIGGERING LEVEL for a stable display.

b. Check WIDTH>PERIOD light:
lit prior to period error

Check the display for 1 pulse/cm. Rotate the VARIABLE WIDTH cw until the display is no longer 1 pulse/cm. The WIDTH>PERIOD light must be lit. Continue rotating the VARIABLE WIDTH control clockwise, check to see that the WIDTH>PERIOD light stays lit. Return the VARIABLE WIDTH to CALIBRATED.

c. Check WIDTH>PERIOD tracking:
light on or off as dictated by the control settings.

Use the following table to check WIDTH>PERIOD light operation.

<u>PERIOD</u> <u>switch</u>	<u>VARIABLE</u> <u>PERIOD</u>	<u>WIDTH</u> <u>switch</u>	<u>VARIABLE</u> <u>WIDTH</u>	<u>WIDTH>PERIOD</u> <u>light</u>
10mS	CAL	1mS	cw	lit
10mS	cw	1mS	cw	off
1mS	cw	1mS	CAL	off
1mS	CAL	1mS	CAL	lit
1mS	CAL	100μS	CAL	off
1mS	CAL	10μS	CAL	off
1mS	CAL	1μS	CAL	off
1mS	CAL	100nS	CAL	off
1μS	CAL	100nS	cw	lit
1μS	CAL	1μS	cw	lit
1μS	CAL	10μS	CAL	lit
1μS	CAL	100μS	CAL	lit
1μS	CAL	1mS	CAL	lit
1μS	CAL	1mS	cw	lit
1μS	cw	1mS	CAL	lit

11. EXTERNAL TRIGGER INPUT

a. Setup

Connect the TYPE 191 to the TYPE 114 EXTERNAL TRIGGER INPUT with a 50 Ω coax cable and a 50 Ω Termination. Set the TYPE 191 to provide 1.0V PTP of 2 MHz signal. Connect a 50 Ω coax cable from the TYPE 114 TRIGGER OUTPUT to the TYPE 547 B TRIGGER INPUT.

b. Check HF Triggering: $\leq 2V$ at 2 MHz

Set the TYPE 114 PERIOD to EXTERNAL TRIGGER and the WIDTH to 100nS. Set the TYPE 547 B TIME/CM to .5 μ SEC. Increase the TYPE 191 AMPLITUDE until a display appears. Adjust the TYPE 547 TRIGGERING LEVEL as required. Check for 1 pulse/cm.

Remove the TYPE 191 coax cable and 50 Ω Termination from the TYPE 114 EXTERNAL TRIGGER INPUT and connect them to the TYPE 1A1 CHANNEL 2 input. Set the CHANNEL 2 VOLTS/CM to .5. Change the TYPE 1A1 MODE switch to CH 2. Check for an amplitude of 2V or less. Set the TYPE 1A1 MODE switch to CH1.

12. TRIGGER OUTPUT

a. Check trigger slope: trigger on indicated slope

Change the TYPE 114 PERIOD to 1 μ S. Set the VARIABLE PERIOD to CAL and the VARIABLE WIDTH for a square-wave. Connect a coax cable from the TYPE 114 TRIGGER OUTPUT to the TYPE 547 B TRIGGER INPUT. Set the B TRIGGERING SOURCE to EXT. Adjust TRIGGERING LEVEL if necessary. Check to see that the display is triggered on the leading edge of the pulse.

Change the TYPE 114 TRIGGER switch to TRAILING EDGE, check that the display is triggered on the trailing edge of the pulse.

** b. Check trigger amplitude: 3V \pm 1V*

Remove the coax cable and 50 Ω Termination from the TYPE 1A1 CHANNEL 1 input. Remove the TRIGGER OUTPUT coax cable from the TYPE 547 B TRIGGER INPUT and install it on the TYPE 1A1 CHANNEL 1 input. Set the VOLTS/CM to 1. Change the TYPE 547 B TRIGGERING SOURCE to INT NORM and adjust the TRIGGERING LEVEL for a stable display. Measure the trigger pulse amplitude, 3V \pm 1V.

12. (cont'd)

- * c. *Check trigger amplitude into 50Ω:
.4 to .7V*

Install a 50Ω Termination between the TRIGGER OUTPUT coax cable and the TYPE 1A1 CHANNEL 1 input. Set the VOLTS/CM to .2. Measure the trigger pulse amplitude .4 to .7V (2 to 3.5cm). Remove the coax cable from the TYPE 114 TRIGGER OUTPUT and the TYPE 1A1 CHANNEL 1 input.

13. PULSE RISETIME AND FALLTIME

a. *Setup*

Remove the TYPE 1A1 from the test scope and install the TYPE 1S1 in its place.

Set the TYPE 1S1 controls as follows:

TIME POSITION	cw
FINE	cw
SMOOTHING	cw
SAMPLES/CM	midr
DISPLAY MODE	NORMAL
mVOLTS/CM	200
VARIABLE	CAL
TIME/CM	5nSEC
VARIABLE	CAL
VERT POSITION	midr
DC OFFSET	midr
TRIGGER SENSITIVITY	midr
RECOVERY TIME	midr
TRIGGER SOURCE	+INT

Connect a patch cord from the TYPE 1S1 HORIZ OUTPUT to the TYPE 547 HORIZ INPUT. Set the TYPE 547 HORIZONTAL DISPLAY to EXT X10, the B TRIGGERING LEVEL full cw and the TRIGGERING MODE to TRIG. Apply 10nS~ from the TYPE 184 to the TYPE 1S1 SIGNAL IN with a 50Ω coax cable and a BNC female to GR adapter.

Adjust the TYPE 1S1 TRIGGER SENSITIVITY and RECOVERY TIME as necessary throughout this step to obtain a stable display. Set the SAMPLES/CM for a compromise between minimum display flicker (maximum display repetition rate) and maximum dot density. Adjust the TYPE 547 EXT HORIZ VAR 10-1 to obtain a display of 1 cycle/2cm. Remove the TYPE 184 coax cable from the BNC female to GR adapter.

13. (cont'd)

- * b. *Check positive pulse risetime and falltime: 10ns or less*

Connect a 50 Ω coax cable and a 10X Attenuator from the TYPE 114 OUTPUT to the BNC female to GR adapter on the TYPE 1S1 SIGNAL IN. Adjust the TYPE 114 VARIABLE AMPLITUDE for a 5cm display (10V) on the test scope. Center the display with the TYPE 1S1 VERT POSITION. Measure the risetime between the 10 and 90% points, 10ns or less. Change the TYPE 1S1 TRIGGER SOURCE to -INT. Measure the falltime between the 10 and 90% points, 10ns or less.

- * c. *Check negative pulse risetime and falltime: 10ns or less*

Change the TYPE 114 AMPLITUDE to -3 TO 10. Adjust the TYPE 114 VARIABLE AMPLITUDE and TYPE 1S1 VERT POSITION for a 5cm display centered on the graticule. Measure the negative going risetime, 10ns or less. Change the TYPE 1S1 TRIGGER SOURCE to +INT and measure the positive going falltime, 10ns or less.

THE END

b. Measuring risetime

