FACTORY CALIBRATION PROCEDURE

CONTENTS:

INTRODUCTION:

1S2

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:

0-347
June 1966

For all serial numbers.

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.

EQUIPMENT REQUIRED:

The following equipment is necessary to complete this procedure:

a. TEKTRONIX Test Equipment

* 2	TYPE 544, 546, 547 SERIES OSCILLOSCOPE
* 1	TYPE W PLUG-IN UNIT
1	TYPE P6023 10X probe (010-0168-00)
1	TYPE P6028 1X probe (010-0074-00)
1	TYPE P6034 10X probe (010-0110-00)
1	TYPE P6035 100X probe (010-0111-00)
1	TYPE 1S1 PLUG-IN UNIT
1	TYPE 106 SQUARE-WAVE GENERATOR
* 1	TYPE 184 TIME MARK GENERATOR
1	TYPE 191 CONSTANT AMPLITUDE SIGNAL GENERATOR
1	TYPE 111 PULSE GENERATOR (067-0517-00) mod kit
1	TYPE 76 TU LINE VOLTAGE CONTROL UNIT
1	TYPE 113 Delay Cable

b. Test Fixtures and Accessories

1	GR 874 WN Short-Circuit Termination (017-0087-00)
1	GR 874-L20
2	50Ω 5nsec connecting cables (017-0502-00)
3	50Ω 10nsec connecting cables (017-0501-00)
1	50Ω 2nsec connecting cable (017-0505-00)
1	Flexible plug-in extension (012-0038-00) (pin 16, should be coaxial connected)
* 1	50Ω AMPLITUDE CALIBRATOR (modified) (067-0508-00)
1	TUNNEL DIODE PULSE GENERATOR (067-0513-00)
1	111 VARIABLE ATTENUATOR (067-0511-00)
* 1	STANDARD AMPLITUDE CALIBRATOR (SAC) (067-0502-00)
1	GR to BNC male adapter (017-0064-00)
1	50Ω 2:1 ATTENUATOR (017-0046-00)
1	50Ω 5:1 ATTENUATOR (017-0045-00)
4	50Ω 10:1 ATTENUATORS (017-0044-00)
2	50Ω GR elbows (017-0070-00)
1	50Ω Termination (017-0081-00)
1	50Ω power divider (017-0082-00)
* 1	DC Voltage Bridge (DCVB) (067-0543-99)
* 1	50Ω ±.1% wire wound Terminator (067-0120-00)

b. 50Ω AMPLITUDE CALIBRATOR must be modified to increase output frequency. C25, change to .0033μFd. C60, change to 68pF.

(continued)

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.

EQUIPMENT REQUIRED: (continued)

c. Other Equipment

1 20,000Ω/VDC meter (VOM)
1 Polarad 1107 Signal Generator (or equivalent)

* This equipment must be traceable to NBS for instrument certification.

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. PRESET CONTROLS

3. RESISTANCE

4. SETUP

5. POWER SUPPLIES

a. Set supply voltages, accuracy: ±3%
b. Set 5.8 RMS volt supply, accuracy: 5.35V ±10%
c. Check power supply ripple and regulation

Supply	Ripple
-19	5mV
+19	10mV
-136	5mV

6. CONTROL TD BIAS

7. INT TRIG LEVEL

8. RAMP AMPLITUDE AND DURATION

9. MANUAL SCAN

10. SWEEP START AND DURATION

a. Set Sweep Start: -1V ±5%
b. Set Sweep Length: 10.4V ±.1V

11. SWEEP TIME AND SINGLE SWEEP

12. COMPARATOR FIRING LEVEL

13. MEMORY GATE WIDTH

14. AVALANCHE AND STROBE PULSES

15. MEMORY BALANCE

16. BRIDGE BALANCE

17. BRIDGE VOLTS 2 VOLTS min

18. VARIABLE BALANCE AND OFFSET RANGE

* 19. GAIN AND UNITS/DIV ACCURACY

b. Set VERT GAIN and check range: + & - 10%
c. Check vertical UNITS/DIV accuracy: ±2%

20. VARIABLE UNITS/DIV RANGE

0.5:1 to 1:2.5

* 21. OFFSET OUTPUT RANGE AND ACCURACY

a. Check offset accuracy: ±1%
c. Check offset range: + & - 2 VOLTS min

22. OUTPUT DC LEVEL 67.5V ±2.5V

23. UHF SYNC

* 24. TIMING

a. Set Sampler Ramp Timing, Accuracy: ±2%
b. Adjust C585B Accuracy: ±2%
c. Check 1µS RANGE Accuracy: ±2%
d. Check MAGNIFIER accuracy: ±2%
e. Check MAGNIFIER VARIABLE Range: 3:1

* 25. POSITION

b. Check incremental accuracy: ±1%

* 26. DIELECTRIC

a. Check POLYETHLYENE accuracy: ±3%
b. Check TFE accuracy: ±3%
c. Check AIR accuracy: ±3%
d. Check PRESET range: 7.8 to 8.4 divisions

27. 1V PULSER

c. Check Pulser Risetime: 1.1nS max
d. Set Pulse Amplitude: 5 volts @ VERT OUTPUT ±1%
f. Check Jitter: 20ps max
f. Set Blowby, aberration: ±1%

28. .25V PULSER

c. Set .25V Pulse Amplitude: 5 volts @ VERT OUTPUT ±1%

28. (cont'd)

d. Check Jitter: 20ps max

29. DOT TRANSIENT RESPONSE 20% min

30. TRANSIENT RESPONSE AND RISETIME

a. Set Transient Response and check aberrations: + & - 5% max first .5ns after leading edge; + & - 1% max after first .5ns
b. Check TDR risetime: 140ps max
c. Check 1V Pulser Aberrations: + & -2% max first 5ns after leading edge; + & - 1% max after first 5ns
d. Check Sampler Risetime: 95ps max

31. INTERNAL REFLECTIONS 10% max

32. PULSE TRIGGERING

Jitter: 100pS max

33. VERTICAL REBALANCE

34. TANGENTIAL NOISE 2mV max

35. INVERTER ZERO

36. PULSE POSITION

37. UHF SYNC Jitter: 20ps max

38. EXT TRIG
Jitter: 100ns max @ 350 kHz
100ps max @ 100 MHz

39. EXT HORIZ $\leq$2V div to $\geq$15 V/DIV

40. READOUT

THE END

1. PRELIMINARY INSPECTION

a. Make general inspection

Check for unsoldered joints, rosin joints, lead dress and long leads. 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. Align POSITION dial

Loosen set screw on shaft of POSITION control and align so dial reads 9.95 at the full cw position.

2. PRESET CONTROLS

a. Preset plug-in scope controls

HORIZONTAL DISPLAY	EXT X10
A & B TRIGGERING MODE	TRIG
A & B TRIGGERING LEVEL	full cw

b. Preset TYPE 1S2 controls

OFFSET	midr
FINE	midr
VERTICAL UNITS/DIV	.5
VARIABLE	CAL
DISPLAY MODE	MAN
MODE	EXT TRIG
MAGNIFIER	X1, CAL
RANGE	1KM 10μS
POSITION	0.00
HORIZONTAL UNITS/DIV	TIME
ρ VOLTS	VOLTS
MANUAL SCAN	full ccw
UHF SYNC OR TRIGGER SENS	full cw
DIELECTRIC	POLYETHYLENE
RESOLUTION	NORMAL

c. Internal adjustments

Set R131 full ccw. All other adjustments midr.

3. RESISTANCE

a. Check Amphenol resistance

Connect the common lead of the VOM to the TYPE 1S2 Chassis ground and measure the DC resistance of the Amphenol connector.

3a. (cont'd)

Pin	Approximate Resistance
1	26K
2	0
3	25K
4	inf
5	inf
6	inf
7	inf
8	2.3K
9	16K
10	15K
11	35K
12	200K
13	inf
14	inf
15	600Ω
16	230K

b. Check power supply resistance

Measure resistance of the +19 volt power supply: 280Ω. Measure resistance of the -19 volt power supply: 340Ω.

4. SETUP

a. Make setup

Connect the TYPE 1S2 to the TYPE 547 using the special flexible extension, connect TYPE 547 to TYPE 76 TU and turn POWER ON. Set TYPE 76 TU for 115 VAC as read on meter.

b. Set horizontal sensitivity

Connect a 5 volt signal from the SAC to TYPE 547 HORIZ INPUT. Set HORIZ INPUT VAR 10-1 for exactly 5cm horizontal deflection. Remove SAC signal and connect patch cord from 1S2 HORIZ OUTPUT to TYPE 547 HORIZ INPUT. Set UHF SYNC OR TRIGGER SENS to midr.

4b. Use OFFSET and Offset Range, R396 to position display vertically for this adjustment.

5. POWER SUPPLIES

a. Set supply voltages Accuracy: ±3%

Connect the DCVB to pin 5 of T810. Adjust R867 for -19 volts. Reverse meter leads and connect to emitter of Q827. Adjust R827 for +19 volts. Set the DCVB to measure -136 volts and connect to the collector of Q887 and adjust R887 for -136 volts.

b. Set 5.8 RMS volt supply, accuracy: 5.35V ±10%

Connect the VOM to the emitter of Q847 and adjust R848 for a reading of 5.35 average DC volts.

b. 5.35 volts as read on an averaging DC meter computes to 5.8 volts RMS.

c. Check power supply ripple and regulation

Connect the DCVB to the supply indicated and measure ripple as follows, while varying line voltage source from 103 to 127 VAC.

Supply	Ripple
-19	5mV
+19	10
-136	5mV

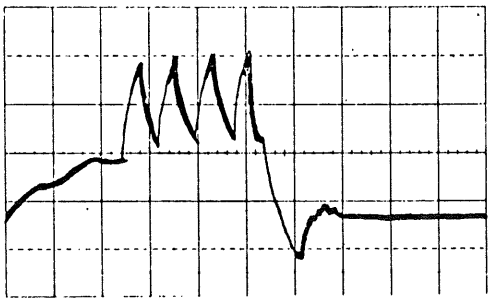
6. CONTROL TD BIAS

Set TYPE 1S2 UHF SYNC OR TRIGGER SENS to the center of its rotation and connect a X10 probe from the test scope to TP 545. Adjust Control TD Bias, R544 for a free running waveform and back off the adjustment approximately 30°.

7. INT TRIG LEVEL

Set UHF SYNC OR TRIGGER SENS full cw and connect a X10 probe from the test scope to TP525. Adjust Int Trig Level R523 to obtain display of four pulses as illustrated.

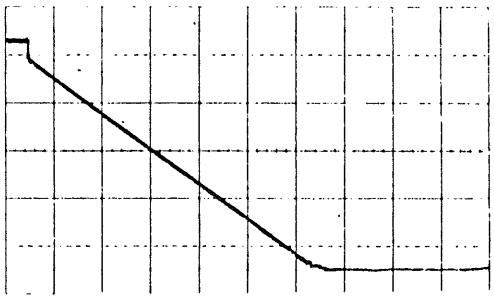
7. (cont'd)



.2μs/cm

8. RAMP AMPLITUDE AND DURATION

Set MANUAL SCAN full cw, UHF SYNC OR TRIGGER SENS full cw and externally trigger the test scope using the X1 probe connected to TP545. Connect a X10 probe to the junction of T675 and D673 and observe negative ramp as illustrated.



Switch RANGE to 1μS and observe a waveform similiar to that above but approximately 10 times shorter in duration.

Switch RANGE to .1μS and observe a waveform similiar to that above but approximately 10 times shorter in duration.

Connect X10 probe to the junction of anode D603 and Q614 collector and observe a negative ramp in all positions of the RANGE switch approximately 1.7V in amplitude.

8 & 9. Not necessary for instrument calibration but may be helpful as trouble shooting aids.

9. MANUAL SCAN

Connect the X10 probe to TP673 (test scope ext trig'd from TP545) and rotate MANUAL SCAN through its range. Check for a DC level shift of about 8 volts.

Rotate POSITION through its range and note a DC level change of about 7 volts.

10. SWEEP START AND LENGTH

10. It is necessary that the P6023 Probe be properly compensated for this adjustment. Use SAC and TYPE W to set DC attenuation.

a. Set Sweep Start: -1V ±5%

Switch DISPLAY MODE to normal and connect the P6023 to the coax leading to the VARIABLE MAGNIFIER, R641. Set the TYPE W to measure -1 volt using the comparison voltage and adjust Sweep Start Level, R753 to place bottom of waveform at -1 volt.

b. Set Sweep Length: 10.4V ±.1V

Set TYPE W to measure +9.4 volts and adjust Sweep Length R787 to set P to P waveform amplitude at 10.4 volts.

11. SWEEP TIME AND SINGLE SWEEP

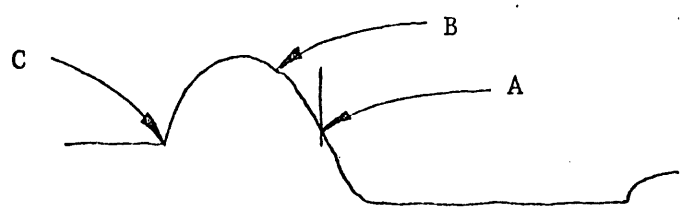
Note the duration of the waveform on the test scope; should be approximately 12ms. Switch RESOLUTION to HIGH and note duration of the ramp: approximately 0.8s. Switch DISPLAY MODE to SINGLE SWEEP and push START button. Observe a single sawtooth on the test scope.

12. COMPARATOR FIRING LEVEL

12. Adjustment of R588 in Step 24 will cause some interaction and this step may have to be repeated.

Set DISPLAY MODE to MANUAL SCAN and the MANUAL SCAN control full ccw. Set RANGE to 10μS and connect the X10 probe to TP673. Externally trigger the test scope from TP545 and slowly adjust Comparator Level R677 from ccw to cw until a spike appears at point A as on the diagram below. Continue turning R677 cw just enough to move the spike up to point B. Further cw adjustment of R677 will cause spike to jump to point C.

12. (cont'd)

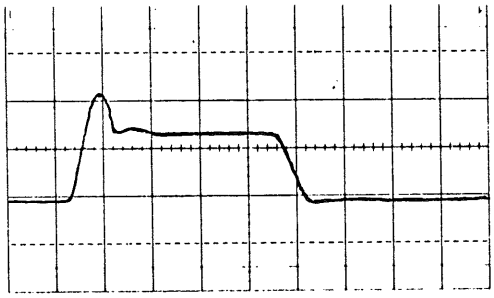


10μs/cm

Adjust R677 to place spike at point B.

13. MEMORY GATE WIDTH

Connect the X10 probe to TP200 and observe a positive 12 volt spike. Externally trigger the test scope from this test point and connect the X10 probe to TP235. Adjust R204 for a 400ns pulse width as illustrated.



0.1μs/cm

14. AVALANCHE AND STROBE PULSES

a. Set Avalanche Pulse amplitude

Remove the TYPE W from the test scope and insert the TYPE 1S1. Externally trigger the TYPE 1S1 using a P6035 100X probe connected to TP200 of the 1S2. Remove the cover from the Avalanche circuit of the TYPE 1S2 and connect a P6034 10X probe throught a GR 10:1 attenuator from TYPE 1S1 SIGNAL IN to the junction of C134 and R144.

14a. (cont'd)

Adjust Avalanche volts R131 for maximum pulse amplitude as seen on the test scope/1S1 (not free-running). Pulse amplitude should be equal to or greater than 60V.

b. Check Strobe Pulses and Preset R140

Touch the P6034 tip to either side of the strip line and observe a strobe pulse of an approximate four volts amplitude. Set Snap-Off Current, R140, for maximum strobe amplitude. Touch the probe to the other side of the strip line and again observe a strobe pulse equal in amplitude but opposite in polarity to that of the first.

15. MEMORY BALANCE

a. Zero OFFSET OUTPUT

Remove the TYPE 1S1 and reinsert the TYPE W. Externally trigger the TYPE 547 from TP200 and connect the X10 probe to X1 OFFSET OUTPUT. Set the FINE and OFFSET for zero volts DC level.

b. Set Memory Balance

Connect the X10 probe to TYPE 1S2 VERT OUTPUT and adjust Memory Gate Bal R247 for zero volts DC level.

16. BRIDGE BALANCE

Set VERTICAL UNITS/DIV to .005 and set Bridge Balance R360 to bring trace to center of screen.

17. BRIDGE VOLTS

2 volts, min

Connect the X10 probe to the + bridge volts lead and adjust Bridge Volts R367 for 2 volts DC level. Connect the X10 probe to the - bridge volts lead and check for -2 volts. Disconnect probes.

17. Bridge volts can be measured at the shielded cable going to the sampler board. The red lead is negative and the black lead is positive.

18. VARIABLE BALANCE AND OFFSET RANGE

18a & b. Vert Output must be held at zero volts DC for step 18.

a. Set Variable Balance

Set DISPLAY MODE to NORMAL and adjust Offset Range R396 to observe trace on screen. With X1 OFFSET OUTPUT at zero volts adjust Variable Bal R388 for no trace shift on the screen as VARIABLE UNITS/DIV is rotated through its range.

b. Set Offset Range

Adjust Offset Range R396 to set trace at center of graticule.

19. GAIN AND UNITS/DIV ACCURACY

a. Set Volts Cal

Terminate THRU SIGNAL CHANNEL 50Ω in 50Ω ±.1% and set VERTICAL UNITS/DIV to .2. Connect the P6023 probe from VERT OUTPUT to TYPE W and apply 1.2 volts signal to THRU SIGNAL CHANNEL 50Ω from the 50Ω AMPLITUDE CALIBRATOR. Externally trigger the TYPE 1S2 from the 50Ω AMPLITUDE CALIBRATOR TRIGGER OUTPUT and measure the pulse amplitude with the TYPE W using the slide back technique. Adjust Volts Cal R356 for 6 volts pulse amplitude as read on the test scope.

b. Set VERT GAIN and check range: + & - 10%

Rotate the VERT GAIN through its entire range and check for a gain range of + & - 10%. Adjust VERT GAIN for 6cm deflection.

c. Check VERTICAL UNITS/DIV accuracy: ±2%

Check VERTICAL UNITS/DIV accuracy referring to the table below:

AMPLITUDE CALIBRATOR	VERTICAL UNITS/DIV	deflection
2 V	.5	4cm
1.2	.2	6cm
.6	.1	6cm
.3	.05	6cm
.12	.02	6cm
.06	.01	6cm
.03	.005	6cm

20. VARIABLE UNITS/DIV RANGE 0.5:1 to 2.5:1

Set 50Ω AMPLITUDE CALIBRATOR to 1.2 VOLTS and VERTICAL UNITS/DIV to .5. Rotate VARIABLE full ccw and note deflection: 1.2cm max. Rotate VARIABLE full cw and note deflection: 6.0cm min. Return VARIABLE to CAL.

21. OFFSET OUTPUT RANGE AND ACCURACY

a. Check OFFSET accuracy: ±1%

Preset the TYPE W as follows:

COMPARISON VOLTAGE	0.00
V_C RANGE	-11
DISPLAY	A-V_C
INPUT ATTEN	1
MILLIVOLTS/CM	20

Connect the X1 probe to A input and set the AC-DC-GND switch to GND. Position the test scope trace to the center graticule line and switch the A input to DC. Connect the X1 probe to the TYPE 1S2 X1 OFFSET OUTPUT and set FINE OFFSET for zero volts.

Set 50Ω AMPLITUDE CALIBRATOR VOLTS to 2. Use OFFSET to bring bottom of waveform to center of the graticule and use TYPE W COMPARISON VOLTAGE to measure DC level of X1 OFFSET OUTPUT: 2 volts ±1% (1%/cm).

b. Check OFFSET range: + & - 2V min

Turn OFFSET through its range and monitor the X1 OFFSET OUTPUT with test scope. Check for +2V minimum at the cw extreme and -2V minimum at the ccw extreme.

Remove 50Ω AMPLITUDE CALIBRATOR connections.

22. OUTPUT DC LEVEL 67.5V ±2.5V

Connect the meter from pins 1 and 2 of the TYPE 1S2 Amphenol connector to ground and measure the DC level during sweep time of the TYPE 1S2. (Set RESOLUTION to HIGH for this check.) Check for 67.5V ±2.5V.

23. UHF SYNC

Set POSITION to 0.10, RANGE to .1μS and MAGNIFIER to X1. Set MODE UHF SYNC and TRIGGER SENS full cw. Connect the GR elbows from TYPE 1S2 EXT TRIG INPUT to THRU SIGNAL CHANNEL 50Ω. Adjust UHF Sync Sens R481 for approximately 30mV + and - spikes approximately 10ns apart.

Continue adjusting R481 for a smooth decrease in the number of spikes as UHF SYNC OR TRIGGER SENS is turned ccw.

24. TIMING

a. Set Sampler Ramp Timing Accuracy: ±2%

Set RANGE to 10μs, set MODE to EXT TRIG and from TYPE 184 apply 1μS markers to THRU SIGNAL CHANNEL 50Ω. Connect the GR elbows to EXT TRIG INPUT from THRU SIGNAL CHANNEL 50Ω and adjust Sampler Ramp Timing R588 for 1 marker/cm. Check adjustment of R677 as in step 12.

b. Adjust C585B Accuracy ±2%

Switch RANGE to .1μS and TYPE 184 to 10nS. Adjust C585B for 1 marker/cm.

c. Check 1μS Range Accuracy ±2%

Set RANGE to 1μS and from the TYPE 184 apply .1μS markers. Check for 1 marker/cm ± that specified.

d. Check MAGNIFIER Accuracy ±2%

Referring to the table below check MAGNIFIER accuracy to be within specified limits.

24d. (cont'd)

TYPE 184	RANGE	MAGNIFIER	Cycles/cm
1μS	10μs	X1	1
.5μS	10μs	X2	1
.1μS	10μs	X5	2
.1μS	10μs	X10	1
50nS	10μs	X20	1
20nS	10μs	X50	1
10nS	10μs	X100	1

e. Check MAGNIFIER VARIABLE range: 3:1 min

Set the TYPE 184 for 1μS markers, TYPE 1S2 RANGE to 10μs and MAGNIFIER to X1. Set MAGNIFIER VARIABLE full cw and check for at least 3cm between markers. Return VARIABLE to CAL and MAGNIFIER to X100.

25. POSITION

25. Set MAGNIFIER to X1 for rough adjustment. Increase magnification as adjustment is refined.

a. Set Position Cal

Set TYPE 184 for 5μS markers and turn the POSITION dial ccw from the full cw position until the first marker lines up with the 1cm graticule line. Note dial reading. Turn the dial five major divisions ccw and adjust R661 to place leading edge of mark behind the 1cm graticule line. Repeat adjustment as necessary to compensate for interaction.

b. Check incremental accuracy: ±1%

Set TYPE 184 for 1μS markers and set POSITION full cw. Turn POSITION ccw until marker is observed. Place marker behind the 1cm graticule line and note dial reading. Continue turning dial ccw and note dial reading when next marker crosses the 1cm graticule line. Must be 1 major dial division ±10 minor div. Check complete range of dial in a like manner.

26. DIELECTRIC

a. Check POLYETHYLENE dielectric, Accuracy: ±3%

Set RANGE to 1μS and MAGNIFIER to X2. From the TYPE 184 apply 50nS marker to TYPE 1S2. Set HORIZONTAL UNITS to DISTANCE and measure distance between 1st and 9th marker: 7.86cm ±3mm.

b. Check TFE dielectric, accuracy: ±3%

Switch DIELECTRIC to TFE and measure distance between 1st and 9th marker: 8.27cm ±3.4mm.

c. Check AIR dielectric, accuracy: ±3%

Switch DIELECTRIC to AIR and measure distance between the 1st and 7th markers: 8.9cm ±3mm.

d. Check PRESET range 7.8 to 8.4cm

Switch DIELECTRIC to PRESET and turn PRESET full ccw, measure distance between 1st and 7th marker: 8.9cm ±3mm. Turn PRESET full cw. Measure distance between 1st and 9th marker: 7.8 to 8.4cm. Remove TYPE 184 connections.

27. 1V PULSER

a. Set pulser bias

Switch HORIZONTAL UNITS/DIV to TIME. Set POSITION to 0.00 and ρ-VOLTS to ρ. Set MODE to INT PULSE (1.0V, 1ns), VERTICAL UNITS/DIV to .2 and from the 1.0V 1ns PULSE SOURCE connect the 2 GR elbows to THRU SIGNAL CHANNEL 50Ω. Terminate THRU SIGNAL CHANNEL 50Ω in 50Ω (017-0081-00). Adjust 100mA TD Bias, R411 for a positive step.

b. Set pulse level

Temporarily remove the GR elbows and observe the level of the baseline. Reconnect the elbows and adjust Output DC Level R443 to place the pulse start at this level.

c. Check pulser risetime: 1.1nS max

Set RANGE to .1μS and MAGNIFIER to X20. Check pulse risetime to be within specified limits.

27. (cont'd)

d. Set pulse amplitude: 5 volts at VERT OUTPUT ±1%

Set MAGNIFIER to X1. Connect the X10 probe from the TYPE W to the TYPE 1S2 VERT OUTPUT. Use OFFSET to place pulse baseline at the zero volt level on test scope. Use TYPE W V_C to measure pulse amplitude and adjust 1 (one) volt ρ Cal R351 for 5 volts amplitude.

e. Check jitter: 20pS max

Set VERTICAL UNITS/DIV to .005, RANGE to .1μs and MAGNIFIER to X100. Measure pulse jitter to be less than 20ps.

f. Set blowby, common aberrations: ±1% max

Set VERTICAL UNITS/DIV to .02, MAGNIFIER to X1, RANGE to 1μS and adjust C128 and R129 for optimum flat top. Set RANGE to 10μS, RESOLUTION to HIGH and check for optimum flat top. Return RESOLUTION to NORMAL.

28. .25V PULSER

a. Set pulser bias

Switch MAGNIFIER to X1, VERTICAL UNITS/DIV to .2 and MODE to INT PULSE .25V. Remove the GR elbows from the 1V pulser and attach to the .25V 50pS pulser and THRU SIGNAL CHANNEL 50Ω. Terminate THRU SIGNAL CHANNEL 50Ω with 50Ω (017-0081-00). Adjust .25V Pulser Bias, R433 for a positive step.

b. Set pulse level

As in step 27b, adjust Output DC Level, R439 to place the pulse start at zero volts.

c. Set .25V pulse amplitude: 5 volts at VERT OUTPUT ±1%

Set RANGE to 10μS. Connect the X10 probe from the TYPE W to TYPE 1S2 VERT OUTPUT. Use OFFSET to place pulse baseline at the zero volt level on test scope. Use TYPE W V_C to measure pulse amplitude and adjust .25 volt ρ Cal, R353 for 5 volts amplitude.

d. Check jitter: 20ps max

Set VERTICAL UNITS/DIV to .005, RANGE to .1μS and MAGNIFIER to X100. Measure pulse jitter to be less than 20ps.

29. DOT TRANSIENT RESPONSE — 20% minimum

Set the ρ-VOLTS to VOLTS. Set VERTICAL UNITS/DIV to .05, RANGE to 10μS and MAGNIFIER to X1. Adjust Avalanche Volts R131 and Memory Gate Width R204 for maximum separation between the pulse baseline and the first dot of the positive transition. Separation must be equal to or greater than 20% of total pulse height (≥1cm).

30. TRANSIENT RESPONSE AND RISETIME

a. Set transient response and check aberrations: + & - 5% max first .5ns after leading edge; + & - 1% max after first .5ns

Return the ρ-VOLTS to ρ. Observe the leading edge and adjust Snap Off Current, R140 for minimum risetime. Check aberrations to be within that specified.

b. Check TDR Risetime: 140ps max

Connect a 20cm airline to the upper THRU SIGNAL CHANNEL 50Ω connector. Connect a GR short to the other end of the airline. Set POSITION to 0.0, RANGE to .1μSEC, HORIZONTAL UNITS/DIV to TIME, MAGNIFIER to X100, and MODE to INT PULSE. Adjust POSITION to display the falling portion of the reflected waveform and measure risetime to be less than 140ps.

c. Check 1V pulser aberrations: + & - 2% max first 5ns after leading edge; + & - 1% max after first 5ns

Reconnect the GR elbows to the 1V pulser, terminate the lower THRU SIGNAL CHANNEL 50Ω and check for 1V pulser aberrations to be less than that specified.

d. Check Sampler Risetime: 95ps max

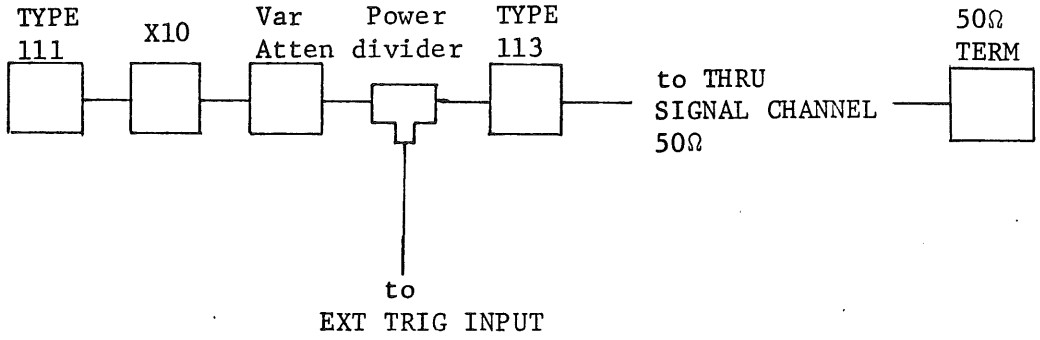
Remove GR elbows and connect the 30ps TUNNEL DIODE PULSE GENERATOR through a 20cm airline to the upper THRU SIGNAL CHANNEL 50Ω. Connect a 5nS GR cable from the TUNNEL DIODE PULSE GENERATOR PRETRIGGER to TYPE 1S2 EXT TRIG INPUT, trigger the display and position on screen. Check for less than 95ps risetime.

31. INTERNAL REFLECTIONS 10% max

Connect GR elbows to the .25V pulser and THRU SIGNAL CHANNEL 50Ω. Set RANGE to .1μS and MAGNIFIER to X10. Connect the 20cm airline to the upper THRU SIGNAL CHANNEL 50Ω and use POSITION to observe and measure the aberration 3nS after the reflected pulse leading edge. Check aberration to be less than 10% of the reflected pulse amplitude. Remove the GR elbows and airline.

32. PULSE TRIGGERING Jitter: 100ps max

Set MAGNIFIER to X100 and RANGE to .1μS. Set TYPE 1S2 MODE to EXT TRIG and make setup as follows.



Set the VAR ATTEN for a 50mV signal. Set VERTICAL UNITS/DIV to .005, observe pulse leading edge and check for less than 100ps jitter. Remove cables from TYPE 1S2.

33. VERTICAL REBALANCE

a. Bridge Bal

Set X1 OFFSET OUTPUT as close to zero as possible with the TYPE W. Set MODE to .25V INT PULSE and ρ-VOLTS to ρ. Set VERTICAL UNITS/DIV to .005 and adjust Bridge Bal, R360, to set trace to graticule center.

b. Memory Gate Bal

Return VERTICAL UNITS/DIV to .5. Adjust Memory Gate Bal for no trace shift while switching RESOLUTION from NORMAL to HIGH. Repeat parts a and b of this step until interaction is eliminated.

34. TANGENTIAL NOISE 2mV, max

Connect the 50Ω AMPLITUDE CALIBRATOR -- 50Ω 10nS cable -- 10X attenuator -- 111 VARIABLE ATTENUATOR -- TYPE 1S2 THRU SIGNAL CHANNEL 50Ω. Terminate the THRU SIGNAL CHANNEL 50Ω with 50Ω. Set the 50Ω AMPLITUDE CALIBRATOR to .12 VOLTS and trigger the TYPE 1S2 externally from the AMPLITUDE CALIBRATOR.

Using the 111 VARIABLE ATTENUATOR, set display for a 1:1 signal to noise ratio. Switch AMPLITUDE CALIBRATOR to 1.2 and divide displayed signal amplitude by 10. Must be 2mV max.

35. INVERTER ZERO

Set MAGNIFIER VARIABLE full cw and HORIZONTAL UNITS/DIV to DISTANCE. Set left edge of sweep to the zero cm graticule line. Ground the center tap of the MAGNIFIER VARIABLE, connect the VOM across the PRESET control contacts. Set TYPE 1S2 POSITION to 0.00, DIELECTRIC to PRESET, MAGNIFIER to X100 and PRESET full cw (screwdriver adjustment). Adjust Inverter Zero, R681 for zero volt reading on meter. Remove ground and set MAGNIFIER VARIABLE to CAL.

36. PULSE POSITION

36. It may be necessary to readjust R677, as in step 12, in order to place start of pulse at the 1cm graticule line.

a. Set 10μS Pulse Position

Connect the GR elbows to the .25V Pulser Output and to THRU SIGNAL CHANNEL 50Ω terminated in 50Ω. Adjust R621 for pulse to start at the 1cm graticule line.

b. Set 1μS Pulse Position

Set RANGE to 1μS and adjust C615f to place start of pulse at the 1cm line.

c. Set .1μS Pulse Position

Set RANGE to .1μS and adjust C615H to place pulse at the 1cm line.

37. UHF SYNC Jitter: 20ps max

Apply a 5 gHz signal from the Polarad 1107 to the lower THRU SIGNAL CHANNEL 50Ω and connect the 2:1 GR attenuator and 2nS cable from EXT TRIG INPUT to THRU SIGNAL CHANNEL 50Ω. Set VERTICAL UNITS/DIV to .2, MODE to UHF SYNC and set UHF SYNC OR TRIGGER SENS for stable display. Set the 5 gHz oscillator amplitude for 3cm of displayed signal. Check for 20ps or less jitter. Remove 5 gHz signal.

37. It may be necessary to readjust R481 for minimum jitter.

38. EXT TRIG Jitter: 100ns max @ 350 kHz
100ps max @ 100 MHz

Connect a 500mV 350 kHz signal from the TYPE 191 to THRU SIGNAL CHANNEL 50Ω and connect the 2ns cable directly from THRU SIGNAL CHANNEL 50Ω to EXT TRIG INPUT. Set UHF SYNC OR TRIGGER SENS for stable display and check for less than 100ns jitter. Set TYPE 191 to supply 500mV of 100 MHz signal and check for less than 100ps jitter.

39. EXT HORIZONTAL ≤2V/div to ≥15V/div

Set DISPLAY MODE to EXT HORIZ and apply 2 volts from the SAC to EXT HORIZ INPUT. Set the EXT HORIZ ATTEN fully cw. Check for 1cm deflection or more. Set EXT HORIZ ATTEN full ccw and set SAC for 100V. Check for 6.66cm or less horizontal deflection.

40. READOUT

Referring to table below for control settings, check front panel readout:

HORIZONTAL UNITS/DIV	MAGNIFIER	RANGE	Readout
TIME	X1	10μS	1000nS
TIME	X2	10μS	500nS
TIME	X5	10μS	200nS
TIME	X10	10μS	100nS
TIME	X20	10μS	50nS
TIME	X50	10μS	20nS
TIME	X100	10μS	10nS
TIME	X100	1μS	1nS
TIME	X100	.1μS	100pS
DISTANCE	X100	.1μS	1cm
DISTANCE	X100	1μS	10cm
DISTANCE	X100	10μS	1 m

40. (cont'd)

Set MAGNIFIER VARIABLE to uncalibrated and check that UNITS light goes out.

THE END