FACTORY CALIBRATION PROCEDURE

CONTENTS:

INTRODUCTION:

561A

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:
0-305
April 1967

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.

ABBREVIATIONS:

a or amp	ampere
ac	alternating current
approx	approximately
b	base
c	collector
ccw	counterclockwise
cm	centimeter
coax	coaxial
cps	cycles per second
crt	cathode ray tube
cs	ceramic strip
cw	clockwise
db	decibel
dbm	db referred to 1 mw
dc	direct current
dec	decoupled
div	division
e	emitter
fil	filament
freq	frequency
gc	gigacycles per second
gnd	chassis ground
h	henry
hf	high frequency
hv	high voltage
or inf	infinity
int	intercal
k	kilo (10^3)
kΩ or k	kilohm
kc	kilocycles per second
lf	low frequency
M	mega (10^6)
m	milli (10^{-3})
ma	millampere
max	maximum
mc	megacycles per second
megΩ or meg	megohm
mh	millihenry
midr	midrange or centered
min	minimum
mm	millimeter
msec	millisecond
mv	millivolt
μ	micro (10^{-6})
μf	microfarad
μh	microhenry
μsec	microsecond
μv	microvolt
NBS	National Bureau of Standards
n	nano (10^{-9})
nsec	nanosecond
Ω	ohm
p	pico (10^{-12})
pf	picofarad (μμf)
piv	peak inverse voltage
pot	potentiometer
ptp	peak-to-peak
reg	regulated
RM	rackmount
SAC	Standard Amplitude Calibrator
sec	second
sn	serial number
SSWC	Standard Square-Wave Calibrator
term	terminal
tc	teracycles per second
unreg	unregulated
v	volt
vac	volts, ac
vdc	volts, dc
var	variable
w	watt
xfmr	transformer
Z	impedance
#	number
+	plus
-	minus
±	plus or minus
+ and -	plus and minus
Bxxx	bulb (number xxx)
Cxxx	capacitor (number xxx)
Dxxx	diode (number xxx)
Fxxx	fuse (number xxx)
Jxxx	jack (number xxx)
Kxxx	relay (number xxx)
Lxxx	inductor or coil (number xxx)
Qxxx	transistor (number xxx)
Rxxx	resistor (number xxx)
SWxxx	switch (number xxx)
Txxx	transformer (number xxx)
Vxxx	vacuum tube (number xxx)

FACTORY TEST LIMITS

QUALIFICATION

Factory test limits are qualified by the conditions specified in the main body of the calibration procedure. The numbers listed beside 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.

NOT INTENDED FOR INCOMING INSPECTION

We initially calibrate the instrument to factory test limits. These limits usually are tighter than advertised performance requirements, thus helping to insure the instrument will meet or be within advertised performance requirements after shipment and during subsequent recalibrations. Instruments that have left our factory may not meet factory test limits but should meet catalog or instruction manual performance requirements.

1. EQUIPMENT REQUIRED

2. PRELIMINARY INSPECTION

3. TYPE 561A PRESETS

4. RESISTANCE CHECKS

5. POWER SUPPLIES

5b. Low voltage adjustments: ±.5%, max.
5c. Regulation: ±1%, max.
5d. Ripple maximums:

supply	full load	no load
-100 v	5 mv	5 mv
+125 v	10 mv	5 mv
+300 v	80 mv	20 mv
-12.21 v	3 mv	3 mv; min loading, 150 ma

6. CALIBRATOR

6b. Accuracy: ±2%, max.
6b. 100 mv into 50 Ω: ±2%, max.
6c. Symmetry: ±20%, max.
6d. Risetime: 4 μSEC or less

7. INTENSIFIED PULSE CIRCUIT

D838-D839 junction .3 to .6V

8. HIGH VOLTAGE, FOCUS

8a. -3300: ±2%, max.
8a. Regulation: ±2%, max.
8b. Focus — no voltage variation

9. ALTERNATE SWEEP

10. DUAL-TRACE BLANKING

11. EXTERNAL CRT CATHODE INPUT

5V causes intensity modulation

12. SCALE ILLUM, ALIGN CRT

13. CRT COMPRESSION, EXPANSION

13b. Total: 1/2 minor div, max.

14. INT TRIGGER, CRT

15. GEOMETRY

15a. Horiz geometry: 1/2 minor div, max. total
15b. Vert geometry: 1/2 minor div, max.

16. VERT SENSITIVITY, CRT ELECTRICAL CENTER

16a. Vert sensitivity: 18.5 to 20.5 v/div
16b.

If the crt vertical deflection factor is not more than:	The vertical centering error may be as much as
19.50 v/div	±2.5 minor div, max
19.75 v/div	±2.25 minor div, max
20.00 v/div	±2.0 minor div, max
20.25 v/div	±1.75 minor div, max
20.50 v/div	±1.5 minor div, max

17. VERT COMPENSATION

17b. Flat topped square wave ± a trace width.

18. HORIZ COMPENSATION

18b. Flat topped square wave ± a trace width.

19. HORIZ SENSITIVITY, ELECTRICAL CENTER

19b. Horiz sensitivity: 17.5 to 19.25 v/div.
19c. CRT electrical center: .8 major div, max.

20. LINE TRIGGER

21. CRT INTENSIFIED CIRCUIT

CALIBRATION

1. EQUIPMENT REQUIRED

a. Test scope

1	TEKTRONIX TYPE 540B series oscilloscope
1	TEKTRONIX TYPE H PLUG-IN UNIT
1	TEKTRONIX TYPE P6006 10X PROBE

b. Test equipment

1	TEKTRONIX TYPE 2A60 AMPLIFIER
1	TEKTRONIX TYPE 2B67 TIME BASE
1	TEKTRONIX TYPE 105 SQUARE WAVE GENERATOR
1	TEKTRONIX TYPE 180A TIME MARK GENERATOR
1	TEKTRONIX TYPE 3B1 TIME BASE UNIT
2	TEKTRONIX TYPE TU-4 TEST LOAD UNITS
1	TEKTRONIX TYPE 3M1 CAPACITANCE STANDARDIZER
1	TEKTRONIX TYPE 2A63 DIFFERENTIAL AMPLIFIER UNIT (optional for TYPE RM561A, not needed for TYPE 561A)

c. Test accessories

1	10:1 50Ω Attenuator (011-0059-00)
1	50Ω TERMINATION, BNC (011-0049-00)
1	Standard 50Ω TERMINATION (067-0120-00) checked to ±.2% or better
1	5:1 ATTENUATOR, 50Ω, BNC (011-0060-00)
3	50Ω cables with BNC connectors (012-0057-00)

d. Miscellaneous equipment

1	20,000Ω per volt multimeter Triplett 630, Simpson 262 or equivalent
1	TEKTRONIX TYPE 76 TU variable line voltage control with meter
1	STANDARD SQUARE-WAVE CALIBRATOR (special)

NOTES

1. SUBSTITUTE EQUIPMENT

Substitute equipment may be used, however the user must determine that the substitute equipment is equivalent and must determine proper control settings, etc. It is assumed that all equipment listed is within its manufacturer's specifications. If there is any doubt, the test equipment should be calibrated before it is used. All substitutions at the factory must be approved by the plant staff engineer

1c. BNC connectors

BNC connectors are assumed on all equipment. If equipment used is fitted with other types of connectors, adapters, not listed, may be required.

NOTES

2. PRELIMINARY INSPECTION

a. 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. TYPE RM561A: Check rack securing knobs for correct direction of travel during rotation. Check that fan screen is securely mounted against back panel.

c. Fuse

Fuse - TYPE RM561A

117 v operation:159-0005-00 3 a mdx slo-blo
234 v operation:159-0041-00 1.25 a mdx slo-blo
F720
(-12 v, internal):159-0023-00 2 a mdx slo-blo

Fuse - TYPE 561A

117 v operation:159-0005-00 3 a mdl slo-blo
234 v operation:159-0003-00 1.6 a mdx slo-blo
F720
(-12 v, internal):159-0023-00 2 a mdx slo-blo

d. CRT

Loosen crt neck clamp. Insert crt into indicator until crt is flush with light shield. Check that aluminum tape is not exposed in the graticule light opening.

Level the crt by adjusting support bracket. Check neck pin connection tightness.

Note crt serial number on IBM card.

Check crt for mechanical defects: phosphor defects, scratches, cracks around neck pins, etc.

Install graticule cover.

e. HV shield(s)

Install HV shield(s).

2d. CRT

Do not reject crt without the authorization of a trained crt checker, or without reference to crt data.

3. TYPE 561A PRESETS

a. External controls

FOCUS	ccw
INTENSITY	ccw
ASTIGMATISM	ccw
SCALE ILLUM	mid r
POWER	on
CALIBRATOR	OFF
TRACE ALIGNMENT	mid r

b. Internal adjustments

Geometry R865	ccw
High Voltage R841	ccw
low voltage adjustments	mid r
All other internal adjustments	mid r

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

3b. Presetting internal adjustments

(1) Presetting internal adjustments is helpful for "first-time" calibration but is usually unnecessary for re-calibration. If controls are preset a 100% recalibration must be performed. Don't preset internal adjustments unless certain a "start from scratch" policy is best.

4. RESISTANCE CHECKS

a. Check resistance to ground

supply	approx resistance
117 v ac (POWER switch on, instrument not connected to line voltage)	inf
-100 v	10K
+125 v	15K
+300 v	60K
-12.21 v	135 Ω (common lead to gnd)
+6 v unreg	75Ω (common lead to gnd)

b. Terminal 18-19 continuity

Connect an ohmmeter between terminals 18 on both Amphenol connecting plugs and check continuity. Repeat procedure for terminals number 19. Check for inf resistance between terminals 18 and 19.

c. Turn POWER switch OFF.

4. RESISTANCE CHECKS

The TYPE 561A should not be connected to the 117 vac line voltage while resistance checks are being made, do not connect instrument to line voltage until instructed to do so.

5. POWER SUPPLIES

a. Setup

Insert both TYPE TU-4's in TYPE 561A (or TYPE RM561A) and connect a 50 Ω cable between one TYPE TU-4's ripple and dc error connector and the TYPE H unit INPUT A. Set both TYPE TU-4's to 561 indicator; -100 v, full load.

Set test scope VOLTS/CM to .005; INPUT SELECTOR, DC, INPUT A; TIME/CM to .5 mSEC; TRIGGERING TO +LINE, AUTO. Connect TYPE 561A to TYPE 76 TU variable line voltage, SOURCE set to 117 vac and turn POWER ON. Allow 10 minutes warm-up time before proceeding.

b. Low voltage adjustments ±.5%, max

All regulated low voltage supplies must be adjusted within ±.5% of the rated values under full load.

Depress the push for gnd ref on TYPE TU-4 to obtain a zero error reading on the test scope. Push the push to remove ripple button to remove the supply ripple and set the TYPE 561A -100 Volts, R616, for zero error indication on test scope.

Repeat this procedure for adjustment of +125 Volts R656, +300 Volts R676, and -12.21 Volts R730. Recheck adjustments.

c. Regulation

Set TYPE 76 TU for 105 vac, check power supply voltages. Set TYPE 76 TU for 125 vac, check power supply voltages.

All regulated low voltage supplies must maintain regulation with ±1% of nominal values when the line voltage is varied from 105 to 125 vac under full and no load conditions (min load of 150 ma for -12.21 v supply).

d. Check ripple to following maximums

supply	full load	no load
-100 v	5 mv	5 mv
+125 v	10 mv	5 mv
+300 v	80 mv	20 mv
-12.21 v	3 mv	3 mv; min loading 150 ma

e. Line polarity neons at 117 vac

Check polarity of line to plug-in socket. Upper neon on and lower neon off indicates correct line polarity. If both neons are on line polarity is reversed. Check both sides of indicator.

5a. Test-load functions

(1) Each TYPE TU-4 is capable of half loading the supplies when set to full load. To check the supplies under full load conditions set both TYPE TU-4's to full load. Conversely, for low load conditions set both TYPE TU-4's to no load.

(2) The push to remove ripple button removes ripple so that a more accurate reading may be obtained.

(3) The push for gnd ref button will give a zero reference on test scope.

5b. Percent error

(1) Each div on the test scope (supply level compared to zero reference) represents a .5% error in supply voltage when TYPE H UNIT is at .005 volts/cm.

Note: +125 Volts R656 should be adjusted before -12.21 Volts R730 and +300 Volts R676.

5c. -12.21 v loading

In order to check the -12.21 v supply under min load conditions both TU-4's should be set to no load and an external resistor connected between -12.21 v supply and gnd. The resistor, approx 80 Ω, should be picked so as to draw -150 ma.

5d. Ripple

When measuring ripple, release the push to remove ripple button and read ripple on test scope: 1 cm = 10 mv with .01 v/cm test scope sensitivity setting.

6. CALIBRATOR

a. Setup

Connect SSWC as described at end of procedure, leave test scope AMPLITUDE CALIBRATOR OFF for a dc output. Connect TYPE 561A CAL OUT to SSWC UNK IN using a 50Ω cable. Ground TYPE 561A V884 pin 8. Connect SSWC OUTPUT to test scope INPUT A using 50Ω cable. Set SSWC to 100 v, MIXED, ON. Set TYPE H INPUT SELECTOR to INPUT A AC.

b. Accuracy ±2%, max

Check CALIBRATOR accuracy as follows:

TYPE 561A CALIBRATOR VOLTS	SSWC VOLTS	test scope VOLTS/CM	deflection max
100	100	.01	adjust to 0 with Cal Adj R871
.1	.1	.005	.4 cm
50	50	.5	2 cm
20	20	.2	2 cm
10	10	.1	2 cm
5	5	.05	2 cm
2	2	.02	2 cm
1	1	.01	2 cm
.5	.5	.005	2 cm
.2	.2	.005	.8 cm

The combined error of the .1 volts position and any one following output position must not exceed 2%.

Check for 100 mv signal into SPECIAL 50Ω TERMINATION with STANDARD TYPE 561A CALIBRATOR at .5 VOLTS.

.5	.1	.005	.4 cm

Remove V884, pin 8 gnd strap. Remove TYPE 561A CALIBRATOR signal from SSWC.

6b. Interpreting display

(1) The test scope display is a 60 cps square wave: one half of each cycle is the standard calibrator dc reference (accurate); the other half is the TYPE 561A CALIBRATOR dc reference (unknown accuracy).

(2) The amplitude of the display is the voltage difference between an accurate dc reference and a dc reference of unknown accuracy (the TYPE 561A CALIBRATOR).

(3) TYPE 561A CALIBRATOR % error =

$$\frac{\text{voltage difference} \times 100}{\text{TYPE 561A CALIBRATOR setting}}$$

(4) Example:

	case 1	case 2
SSWC:	100 volts	20 volts
TYPE 561A CALIBRATOR setting:	100 VOLTS	20 VOLTS
Test scope vert sensitivity:	5 v/cm	.1 v/cm
Test scope vert deflection:	1 cm	2 cm

Case 1: % error $= \frac{5 \times 100}{100} = 5\%$

Case 2: % error $= \frac{.2 \times 100}{20} = 1\%$

(5) In the table of step 6b, we've worked out the settings so that the deflection listed is the maximum allowable to remain within factory test limits.

The following is step 6b for the TYPE RM561A.

TYPE RM561A CALIBRATOR	SSWC	CM	test scope deflection max
100 VOLTS	100 v	.01	adjust to 0 with Cal Adj R871
10 VOLTS	10 v	.1	2 cm
1 VOLTS	1 v	.01	2 cm
.1 VOLTS	.1 v	.005	.4 cm
10 mVOLTS	10 mv	.005	min*
1 mVOLTS	1 mv	.005	min*

*For greater accuracy use a TYPE 2A63 to check these positions.

Check for 100 mv signal into special standard 50Ω TERMINATION with TYPE 561A CALIBRATOR at 1 VOLTS.

1 VOLTS	.1	.005	.4 cm

Remove V884, pin 8 gnd strap. Remove calibrator signal.

c. Check Calibrator Symmetry ±20%, max

Set voltmeter on a suitable range to measure 40 to 60 vdc. Connect voltmeter between V884, pin 7 and gnd. Note voltage a CALIBRATOR is turned through all of the steps: 40 to 60 v. Remove meter.

d. Check Calibrator Risetime 4μSEC or less

TYPE 561A CAL OUT -- 50Ω cable -- test scope TYPE H INPUT A.

Set TYPE 561A CALIBRATOR to .5 v. Set test scope VOLTS/CM to .1; TRIGGERING MODE to +INT; TIME/CM to 2μSEC. Adjust STABILITY and TRIGGERING LEVEL for as much of the leading edge as possible without getting over 4 mm of jitter. Check the displayed waveform for a risetime of 4μSEC or less.

7. INTENSIFIED PULSE CIRCUIT

D838 - D839 junction .3 to .6 v, max

Connect meter to D838 - D839 junction. Note meter reading: +.3 to +.6 v, max.

Remove meter.

Note: If the reading exceeds +.6 v, any sweep unit with an intensifying circuit could be damaged.

8. HIGH VOLTAGE, FOCUS

a. HV Adj R841 -3300: ±2%, max
regulation: ±2%, max

Set voltmeter on a suitable range to measure -3300 vdc. Connect voltmeter from gnd to the crt filament end of R851 (100 k). Adjust HV Adj R841 for -3300 v.

Position trace off the crt. Set INTENSITY max cw. Check hv supply for regulation by varying line voltage from 105 to 125 v ac at full load and no load, must regulate to ±2% max.

Set line voltage at 117 vac.

b. FOCUS no voltage variation

Vary FOCUS over its range while noting meter. Voltage should not vary.

Remove meter. Turn INTENSITY to mid r, position the trace to the middle of the crt.

9. ALTERNATE SWEEP

Remove the left TYPE TU-4 and insert a TYPE 2B67. Set right TYPE TU-4 to dual trace. Set TYPE 2B67 for freerun. Adjust INTENSITY for a trace of normal brilliance and FOCUS and ASTIGMATISM for a well defined trace. Check for a display of two traces. Interchange TYPE TU-4 and TYPE 2B67 and again check for two traces displayed. Reset TYPE TU-4 to normal.

10. DUAL-TRACE BLANKING

a. Setup

TYPE 105 -- 50 Ω TERMINATION -- 50 Ω cable -- signal input, TYPE TU-4.

b. Dual-trace blanking, left side only

Adjust TYPE 105 for 1 cm display of 100 kc signal. Adjust TYPE 561A INTENSITY for normal trace intensity. Connect a jumper from the TYPE TU-4 signal input to the TYPE TU-4 Z axis input. Set the CRT CATHODE SELECTOR to CHOPPED BLANKING. Upper portion of the crt display must disappear and the lower portion will get brighter. Remove TYPE 105 signal and TYPE TU-4 jumper.

NOTES

11. EXTERNAL CRT CATHODE INPUT

5 v causes intensity modulation

Remove EXT CRT CATHODE gnd strap from scope rear. Insert a 5 v CALIBRATOR signal to EXT CRT CATHODE. Set CRT CATHODE SELECTOR to EXT CRT CATHODE and check the sweep for intensity modulation. Remove the signal and replace the gnd strap. **Return CRT CATHODE SELECTOR switch to CHOPPED BLANKING.**

12. SCALE ILLUM, ALIGN CRT

a. SCALE ILLUM

Rotate SCALE ILLUM through its range. Check for open spots and for brightest graticule lights when SCALE ILLUM is cw.

b. Align trace

Set TYPE 2B67 TIME/CM to 1 mSEC and TRIGGER LEVEL to FREE-RUN. Adjust FOCUS and ASTIGMATISM for well defined trace. Adjust TRACE ALIGNMENT to align trace with the center horiz graticule line.

13. CRT COMPRESSION, EXPANSION

a. Setup

TYPE 105 -- 50Ω TERMINATION (if needed) -- 50Ω cable -- signal input, TYPE TU-4.

b. Compression, expansion

total: 1/2 minor div, max

Adjust TYPE 105 for exactly 2 div display at graticule center. Position top of display to top graticule line. Note compression or expansion. Position bottom of display to bottom graticule line. Note compression or expansion; total must not exceed 1/2 minor div. Remove TYPE 105 signal.

Remove TU-4 and insert 2A60.

14. INT TRIGGER, CRT

a. INT TRIGGER

Connect a jumper between CAL OUT and TYPE 2A60 input.

Trigger on 2 mm CALIBRATOR waveform. Remove signal, trace should disappear. Exchange plug-ins and recheck trigger. Exchange plug-ins once again. Leave signal disconnected.

b. CRT

Check crt for double-peaking, phosphor spots, cathode interface, etc.

14b. Do not reject a crt without the authorization of a trained crt checker or without reference to crt data.

15. GEOMETRY

a. Horiz geometry 1/2 minor div, max total

Set TYPE 2B67 TIME/DIV to 1mSEC and TRIGGER LEVEL, FREE-RUN. Recheck trace alignment. Position the trace from top to bottom of graticule area and check for horizontal bowing or deviation from horizontal line: 1/2 minor div, max total.

b. Vert geometry 1/2 minor div, max

Connect TYPE 180A 1000 μSEC and 100 μSEC markers to TYPE 2A60 input. Adjust TYPE 2B67 TRIGGERING LEVEL for stable display and adjust timing, if needed, using the VARIABLE TIME/DIV control on TYPE 2B67. Adjust TYPE 2A60 for markers reaching from bottom to top of graticule. Adjust ASTIGMATISM and FOCUS for well defined trace. Max deviation of vertical trace from vertical graticule line, top to bottom, is 1/2 minor div. Remove TYPE 180A signal.

16. VERTICAL SENSITIVITY, CRT ELECTRICAL CENTER

a. Vertical sensitivity 18.5 to 20.5 v/div

Connect a meter across vertical deflection plates. Set trace to top graticule line, note meter reading. Set trace to bottom graticule line, reverse meter polarity, note meter reading. Total swing over 8 div must be between 148 to 164 v.

b. Crt electrical center — up to .5 major div, max

Short the vertical crt plates (use non-magnetic metal). Note distance of trace from crt graticule center:

If the crt vertical deflection factor is not more than:	The vertical centering error may be as much as:
19.50 v/div	±2.5 minor div, max.
19.75 v/div	±2.25 minor div, max.
20.00 v/div	±2.0 minor div, max.
20.25 v/div	±1.75 minor div, max.
20.50 v/div	±1.5 minor div, max.

17. VERT COMPENSATION

a. Setup

Install a TYPE 3M1 CAPACITANCE STANDARDIZER in the left compartment.

SSWC CAL OUT -- 50Ω cable -- TYPE 3M1 -- TYPE 561A

TYPE 2B67 presets: SLOPE, +; COUPLING, AC SLOW; SOURCE, INT. Set test scope AMPLITUDE CALIBRATOR to some setting other than OFF.

b. Crt Plate Compensation C760 — ± a trace width

Set SSWC to 50 v. Adjust TYPE 2B67 TRIGGERING LEVEL for a stable display. Adjust Crt Plate Compensation, C760, for a flat topped square wave ± a trace width.

17b. Note: If C760 does not have enough range check its location in the circuit. It is possible to have it connected two ways. Either way is acceptable.

18. HORIZ COMPENSATION

a. Setup

Interchange TYPE 2B67 and TYPE 3M1.

b. Crt Plate Compensation C761

Adjust TYPE 2B67 TRIGGERING LEVEL for a stable display if required. Adjust Crt Plate Compensation C761 for a flat topped square wave ± a trace width.

Remove SSWC signal from TYPE 3M1.

19. HORIZ SENSITIVITY, ELECTRICAL CENTER

a. Setup

Change TYPE 3M1 for TYPE 2A60.

b. Horiz sensitivity 17.5 to 19.25 v/div

Connect a meter across horizontal deflection plates. Set trace to left vert graticule line, note meter reading. Set trace to right line. Reverse meter polarity and note meter reading. Total swing over 10 cm must be between 175 to 192.5v.

c. Crt electrical center .8 major div, max

Short the horiz crt plates (use non-magnetic metal). Note distance of the trace from crt graticule center: .8 major div, max.

20. LINE TRIGGER

Connect a 10X probe to TYPE 2A60 input. Connect the probe to the ac line at the fuse holder. Check for proper TYPE 2B67 ±trigger phasing. Reverse plug-ins and repeat check. Remove probe.

21. CRT INTENSIFIED CIRCUIT

a. Setup

Install a TYPE 3B1 into right hand compartment.

TYPE 3B1 presets: TIME/DIV to 1 mSEC and DELAYED SWEEP to .1 mSEC, MODE to NORM, and NORMAL SWEEP TRIGGERING COUPLING to AUTO. The sweep should appear on the crt.

b. Check intensified

Set 3B1 mode to INTEN and check for an intensified portion of the sweep.

THE END.

SPECIAL TEST EQUIPMENT

Special test equipment, if mentioned, is not available from Tektronix unless it's listed also in our current catalog. This special equipment is used in our test department to speed calibration.

Usually you can either duplicate its function with standard equipment in your facility, devise alternate approaches, or build the special test equipment yourself.

USE OF STANDARD CALIBRATOR

The standard calibrator, when calibrated, is traceable to NBS and is used to guarantee tolerances of vertical amplifiers and calibrators of Tektronix oscilloscopes.

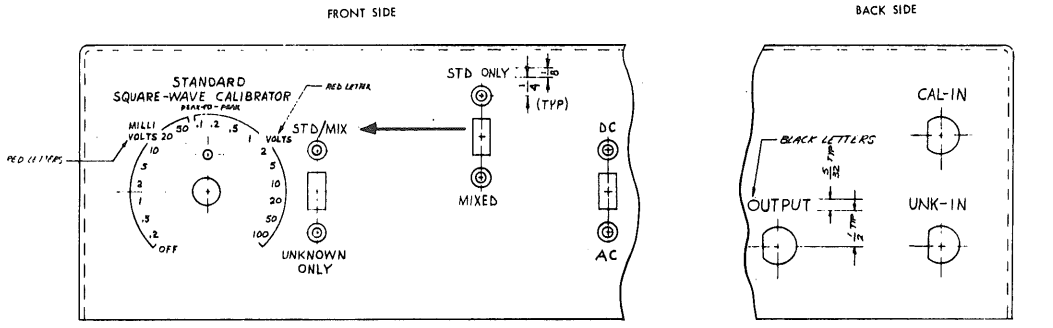
The circuit consists of a chopper and a divider network of 0.1% accurate resistors. The divider network provides a standard voltage output when loaded with 1 meg and when an accurate +100 v is applied to the input. The chopper allows the voltage output of the standard calibrator to switch between a known voltage and an unknown voltage. The difference between these voltages may then be determined by monitoring the output with an ac coupled scope.

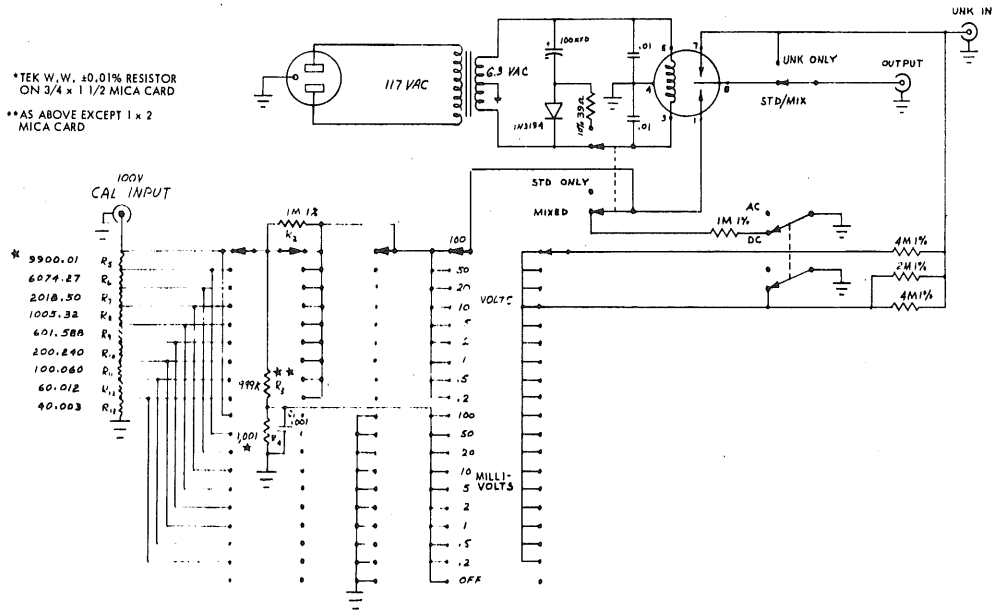
You must take the hum level of the standard calibrator into account when checking divider accuracy at low levels (.1 v and below). Measure the error introduced by hum level by turning both the standard calibrator and the calibrator of the scope under test to off. Observe the vertical displacement (hum level) and subtract this, when appreciable, from other readings.

Leave the standard calibrator in NORMAL when not in use.

STANDARD CALIBRATOR:

Dwgs 600-B, 7-10-61 (front and rear panels); 601-B, 7-10-61 (schematic); 918-A, (parts).





STANDARD SQUARE-WAVE CALIBRATOR

PARTS LIST:

Amount	Description	Part No.
3	Amphenol jacks	131-081
1	Motor base plug	131-102
1	Octal socket	136-011
6	6-32 kep nuts	210-457
9	6-32 BHS	211-507
2	DPDT slide switch	260-447
1	SPDT " "	260-449
1	19 pos. 3 sec. rotary switch	260-253
2	.01 μfd 150 V discap	283-003
2	1 meg 1/2 watt 1% resistor	309-014
1	2 " " " " "	309-023
2	4 " " " " "	309-093
1	100 μfd 15 V capacitor	290-099
1	IN3194 diode	152-066
1	39 Ω 1/2 watt 10% resistor	302-390
1	.001 μfd discap 500 V	283-000
11	Special Tek w.w.	See Dwg. 601-B
1	Large black knob	366-060
1	Grommet	348-002
1	"	348-003
4	Rubber foot	348-013
1	7-Notch ceramic strip	124-089
2	Nylon spacer	361-008
6	6-32 x 1/4 FHS (Phillips)	211-541
6	#6 Lockwasher (Int.)	210-006
6	6-32 hex nut	210-401
1	James model C-1800 chopper	---
1	Stancor P-6134 transformer	---

HOOK UP OF STANDARD SQUARE-WAVE CALIBRATOR (SSWC)

Turn the TYPE 545B on its left side and remove bottom and right side panels. Disconnect both white, with yellow stripe, wires from R885 (9.5 kΩ) on the AMPLITUDE CALIBRATOR switch. Disconnect the switch end of R898 (100 Ω) and connect the wires previously removed from the switch to the free end of R898.

Replace the oscilloscope bottom panel and insert the plug-in to be used. Set AMPLITUDE CALIBRATOR to OFF and connect a cable from the CAL OUT connector to the CAL IN connector of the SSWC.

Turn the oscilloscope power on and allow a 10 minute warm up. Set SSWC to 100 v and attach a 1 mΩ resistor across the OUTPUT connector. Set the oscilloscope Cal Adj control for exactly 100 v across the 1 mΩ resistor. Remove the resistor. If the oscilloscope plug-in is changed, the above 100 v adjustment must be repeated.

Replace the side panel and set oscilloscope upright on the bench.

The SSWC switch will now control the voltage at its OUTPUT connector and the TYPE 545B AMPLITUDE CALIBRATOR switch will cause the SSWC output voltage to be dc (OFF) or a square-wave (some position other than OFF).