INSTRUMENT REFERENCE BOOK

for the Tektronix type

564

storage oscilloscope

For all serial numbers

NEW INSTRUMENT TRAINING PACKAGE

Most of the information here is a duplication of material already existing in the 564 IRB.

Because some Field Engineers and Field Maintenance Engineers want personal copies of the information and because we have never produced what might be called a formal New Instrument Training Package on the 564, this is it!

Additional material of this kind on the 564 will be piped only into the 564 IRB's.

John Mulvey

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CORRESPONDENCE:

Send address changes or other correspondence to:

Tektronix, Inc.
Field Information
P. O. Box 500
Beaverton, Oregon

UPDATING:

We'll update this book as new information becomes available, sending it out as supplements issued at irregular intervals.

SUPPLEMENTS:

Supplements contain either additional pages or replacement pages. Throw away old pages that have been outdated and superseded by replacement pages.

SUPPLEMENT COVER LETTER:

The first page of each supplement is the supplement cover letter. It has several purposes:

1. Tells what IRB the supplement is to be filed in.
2. Summarizes the supplement's new information.
3. Tells how to file the information.
4. Contains a supplement code (to the left of "file" at the upper right-hand corner).

IS THIS IRB UP-TO-DATE?

Often you'll want to know whether or not you've received all of the supplements for this book or whether or not the page you're looking at is the latest one available.

Missing supplements:

You'll never know if a new supplement is on the way or in process, of course, but you can tell when you've missed a supplement:

1. Save the supplement cover letters (section G is a handy spot).
2. Occasionally cross-check the "supplements issued" information (next column) with the supplement codes on your cover letters. You can order missing supplements from us; specify the supplement code and the date.

Outdated pages:

Cross-check the page in doubt with the "current pages" information (next column). You can order updated pages from us; specify the IRB and the page number.

SUPPLEMENTS ISSUED:

The last supplement brings this book current through all FQD's, all FEI's, through FMR 169 8-8-62, ADR 104 5-25-62 and through the 1-25-63 FEN.

**A double asterisk indicates the supplement is current or partially current for this IRB.

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**Z10	7-26-62	**CR1	1-18-63

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TYPE 564 (A-2127-2)

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This cover sheet identifies unnumbered pages.

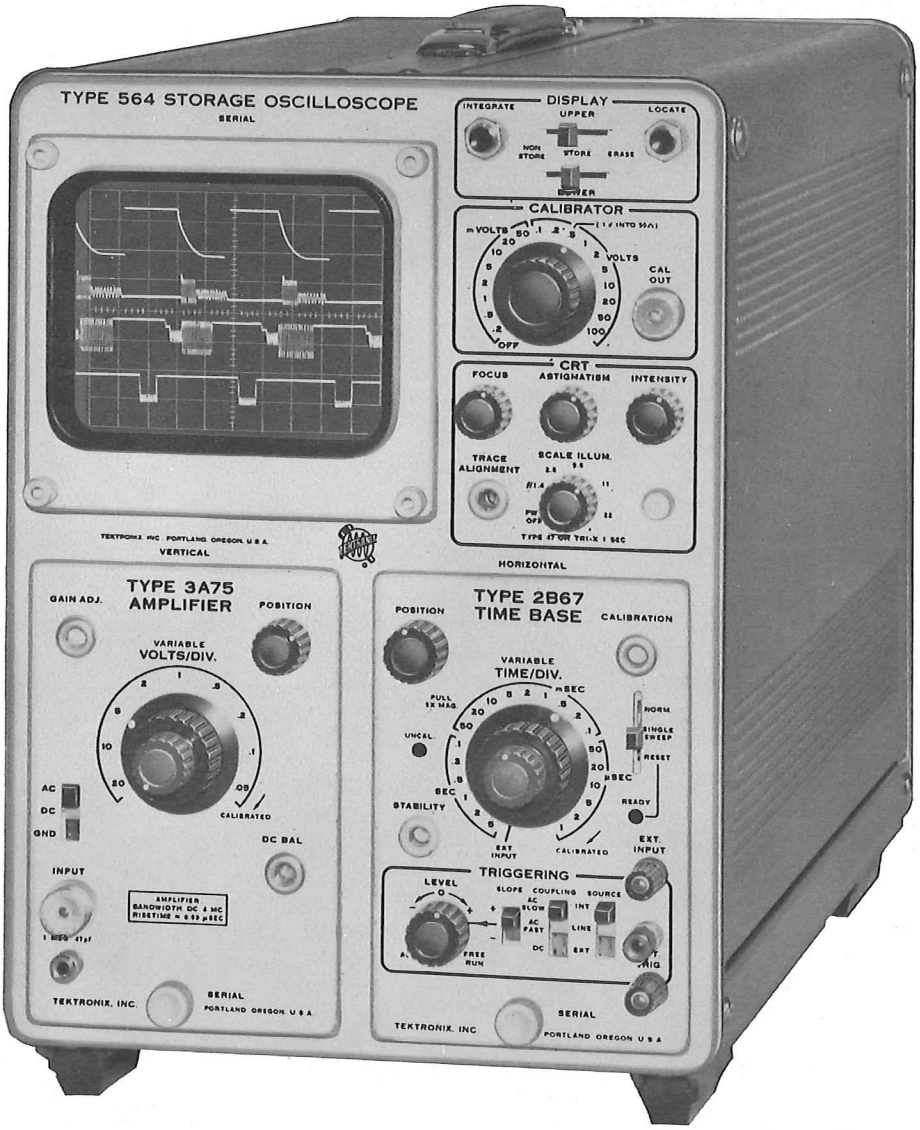
Do not separate from attached information.

tentative

NEW STORAGE OSCILLOSCOPE

LOW-COST SPLIT SCREEN

TEKTRONIX TYPE 564

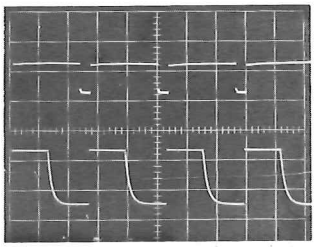


SPLIT-SCREEN DISPLAYS — with a single control for each half — in either storage or non-storage operation.

TEKTRONIX, INC.

TRANSITION FROM ENGINEERING MODEL TO PRODUCTION MODEL MAY REQUIRE MINOR SPECIFICATION CHANGES. FINAL SPECIFICATIONS WILL BE RELEASED LATER.

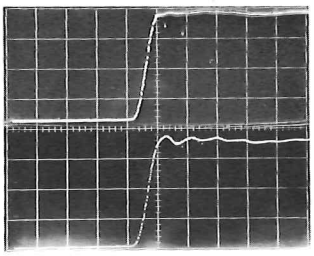
FOR STORAGE AND NON-STORAGE DISPLAYS



INPUT-OUTPUT WAVEFORMS

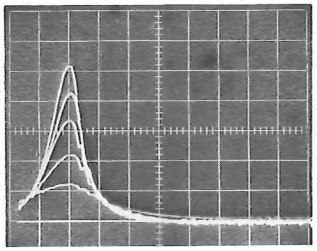
Display shows ability of the Type 564 to store similar waveforms for easy comparison.

Upper trace shows the trigger input to a multivibrator. Lower trace shows the output.



LOW-REPETITION-RATE SAMPLING

Display shows ability of the Type 564 (with sampling plug-in units) to record complete sampling waveforms at low repetition rates. Upper trace is stored. Lower trace is not stored. This capability for storing low-repetition-rate waveforms allows observation and analysis of the **entire sampled display** at one time.



SHOCK TEST

Display shows ability of the Type 564 to store consecutive events for comparison or photography. Waveforms indicate shock imparted by dropping sub-table weight of 5 lbs. from different heights. Drop of 5″ = 50.5 g's; 10″ = 92.5 g's; 15″ = 142 g's; 20″ = 181 g's; 25″ = 214 g's. Sweep Speed is 2 msec/cm. Accelerometer is ENDEVCO MODEL 2215.

CONVENIENT FEATURES

INDIVIDUAL CONTROLS FOR SPLIT-SCREEN DISPLAYS—include one for upper-half crt displays and erasure and one for lower-half crt displays and erasure. On either half, the control **left** permits non-storage operation . . . the control **center** permits storage operation . . . and the control **right** with spring return, erases the displays.

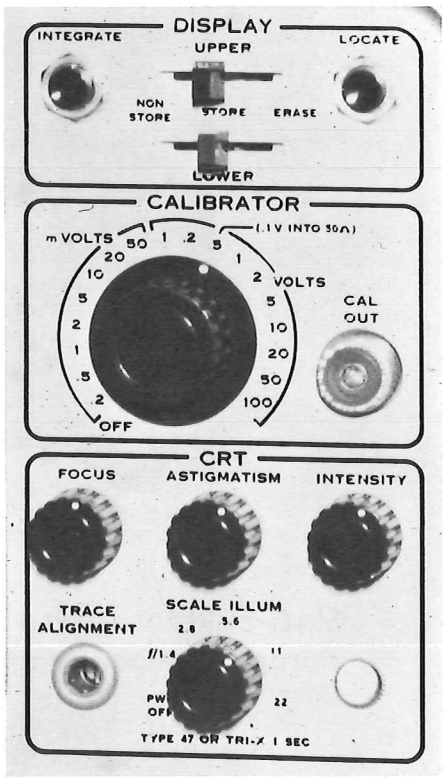
LOCATE BUTTON—when depressed, permits viewing starting point of the next trace to be stored. If it appears that the next trace will overlap the last stored trace, the starting point can be moved up or down by using the vertical position control.

INTEGRATE BUTTON—when depressed, permits storage display of repetitive high-speed signals faster than 25 centimeters per millisecond. Using the integration technique (storing charges from **repetitive** traces) permits storage displays much faster than stated writing rate of the crt.

OTHER CRT DISPLAY CONTROLS include those for changing focus, astigmatism, trace intensity, and scale illumination of the 8-cm by 10-cm display area, plus an adjustment for trace alignment.

CALIBRATOR—provides a convenient means for checking calibration of the amplifier and time-base units. The calibrator has 18 voltage settings, 1-2-5 sequence, from 0.2 millivolt to 100 volts, peak-to-peak—approximately 5 microsecond risetime at line frequency. The 0.5-volt position (providing 0.1 volt into 50 ohms) can be used for calibrating the sampling plug-in units.

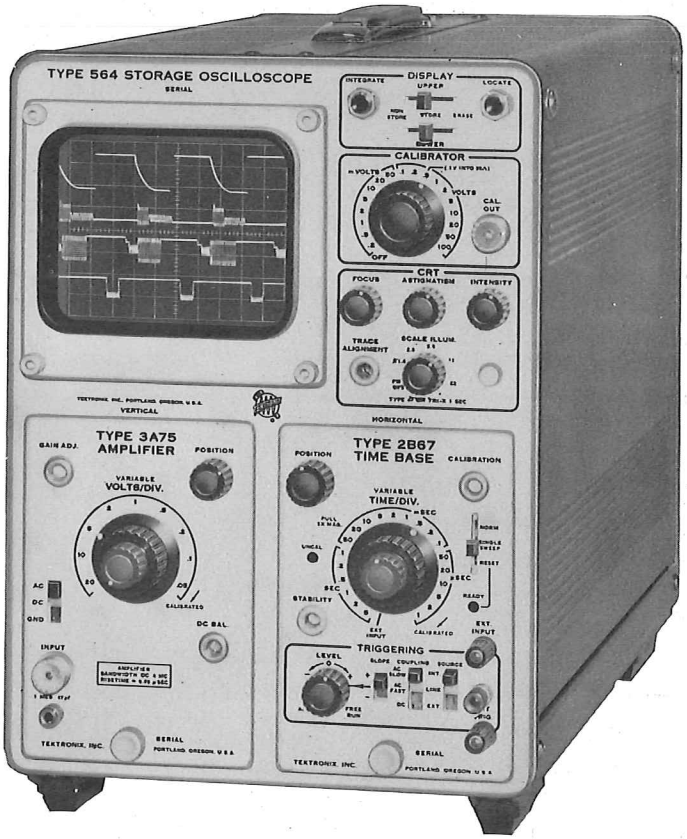
PLUG-IN COMPARTMENTS—accept the 2-Series and 3-Series Amplifier and Time-Base Units—which drive the crt deflection plates directly. The compartments can accept identical plug-ins for matched X-Y displays.



TEKTRONIX TYPE 564 SPLIT-SCREEN OSCILLOSCOPE

Highly versatile, the new Type 564 Oscilloscope features independent control of either half of the unique split-screen crt. Thus, the full screen can be used for storage or non-storage displays. Or, one-half of the screen can be used for storage displays with the other half used for non-storage displays, or as a preview area.

Accepting a wide range of vertical and time-base plug-in units, the Type 564 permits the type of performance demanded for particular applications. And, with approximately two-thirds of the circuitry housed within the plug-ins, servicing is easy and down-time is minimized.



Small-Size—only 14½" high by 10" wide by 21⅛" deep. Light Weight—less than 40 pounds, with plug-ins.

FOR STORAGE AND NON-STORAGE DISPLAYS

The Type 564 has display capabilities for upper-half, lower-half, or full-screen storage or non-storage (with conventional crt operation in the non-storage mode).

The storage capability lends itself to single-shot displays at slow or medium speeds . . . and repetitive displays at fast speeds using the integration technique.

Single-trace writing speed is faster than 25 centimeters per millisecond. On repetitive traces, the integrate feature provides an increase in stored writing rate. For example, it is possible to increase the stored writing rate by at least 10X on 12 repetitive traces. Storage time can be more than one hour; erase time approximately 250 milliseconds.

PLUG-IN UNIT CHARACTERISTICS

The Type 564 has display capabilities for differential, multi-trace, wide-band, delaying sweep, and sampling applications. Type and degree of performance depend upon 2-Series and 3-Series Amplifier and Time-Base Units used. The Type 3A75 Amplifier Unit and Type 2B67 Time-Base Unit appear in the illustration in a full-screen-storage display. Main characteristics of these two units—and nine other presently available plug-ins—appear in a chart on the back page.

CRT CHARACTERISTICS

Rugged electrically and mechanically—because of its rectangular design and ceramic construction—the new split-screen tube is comparable to conventional Tektronix crt's.

The flat-face storage tube is the direct viewing, bistable type and has a parallel-ground glass face with full 8-cm by 10-cm display area.

Type 564 Storage Oscilloscope (without plug-in units)	$950
Type 3A75 50 mv/cm Amplifier Unit	$175
Type 2B67 Time-Base Unit with single sweep	$175

PLUG-IN UNIT CHARACTERISTICS

2-SERIES AND 3-SERIES PLUG-IN UNITS

A wide range of performance characteristics is provided by available plug-in units— from the simple single-channel Type 2A60 Amplifier to the dual-channel 0.4-nsec-risetime Type 3S76 Sampling Unit. Also, the two latest plug-ins, the Type 3A1 Amplifier Unit and the Type 3B3 Time-Base Unit provide high-sensitivity wide-band dual-trace operation combined with calibrated sweep delay.

X-Y DISPLAYS: Types 2A60, 2A63, 3A72, 3A74 and 3A75 Amplifier Units operate equally well in the vertical and horizontal compartments of the Type 564, permitting X-Y displays using any combination of these plug-in units.

For medium and high-frequency X-Y operation, use of two units of the same type is recommended. Deflection-plate capacitances of the 564 are carefully standardized to minimize high frequency phase-shift between two plug-ins of the same type when operated X-Y.

STORAGE OF SAMPLED DATA: When used with Types 3S76 and 3T77 Sampling Plug-ins, flicker-free storage of low repetition rate, fast-rise signals can be achieved. A sampled and stored reference signal can be placed on one-half the screen, and subsequent signals can be compared on the other half of the screen.

AMPLIFIER UNITS

TYPE	INPUT (ac or dc coupled)	† PASSBAND (3-db down)	SENSITIVITY	PRICE
2A60	1 megohm paralleled by 47 pf 600 volts max.	dc—1 Mc.	50 mv/cm—50 v/cm, 4 decade steps, with variable control.	$105
2A63 (50:1 rejection ratio)		dc—300 kc.	1 mv/cm—20 v/cm, 1-2-5 sequence, with variable control.	$130
3A1—Dual Trace (Identical Channels)		dc—10 Mc. (each channel)	10 mv/cm—10 v/cm, 1-2-5 sequence, with variable control. 6 cm Linear scan.	$410
3A72—Dual Trace (Identical Channels)		dc—650 kc. (each channel)	10 mv/cm—20 v/cm, 1-2-5 sequence, with variable control.	$250
3A74—Four Trace (Identical Channels)		dc—2 Mc. (each channel)	20 mv/cm—10 v/cm, 1-2-5 sequence, with variable control.	$550
3A75		dc—4 Mc.	50 mv/cm—20 v/cm, 1-2-5 sequence, with variable control.	$175
3S76—Dual Trace Sampling (for use with 3T77)	50 ohms dc-coupled	equivalent dc-to-875 Mc. (0.4-nsec risetime)	2 mv/cm—200 mv/cm, 1-2-5 sequence, with variable control.	$1100

TIME-BASE UNITS

TYPE	SWEEP FEATURES	TRIGGERING	PRICE
* 2B67	1 μsec/cm to 5 sec/cm, 1-2-5 sequence, variable between rates. 5X Magnifier. Single Sweep.	Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Automatic or Free-Run; ± Slope.	$175
3B1	Normal and Delayed Sweeps—0.5 μsec/cm to 1 sec/cm, 1-2-5 sequence. 18 calibrated delay settings, 0.5 μsec to 10 sec, variable between rates uncalibrated.	Internal or External; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same features (except no Automatic) for Delayed Sweep.	$475
3B3	Normal and Delayed Sweeps—0.5 μsec/cm to 1 sec/cm, 1-2-5 sequence. Continuously variable calibrated delay from 0.5 μsec to 10 sec. Single Sweep for main sweep.	Internal, External, Line; Amplitude-Level Selection; AC or DC-Coupling; Automatic; ± Slope; for Normal Sweep. Same features (except no Line or Automatic) for Delayed Sweep.	$525
3T77 Sampling Sweep (for use with 3S76)	Equivalent to 0.2 nsec/cm to 10 μsec/cm, 1-2-5 sequence, variable between rates. 10X Magnifier.	Internal or External ± Slope.	$650

†Passband characteristics pertain to non-storage mode.

*Same as former Type 67 with addition of single-sweep feature.

U.S. Sales Prices f.o.b. Beaverton, Oregon

Tektronix, Inc. / P. O. BOX 500 · BEAVERTON, OREGON / Mitchell 4-0161 · TWX—503-291-6805 · Cable: TEKTRONIX.
OVERSEAS DISTRIBUTORS IN 27 COUNTRIES AND HONOLULU, HAWAII.

Tektronix Field Offices are located in principal cities throughout the United States. Please consult your Telephone Directory.
Tektronix Canada Ltd: Montreal, Quebec • Toronto (Willowdale) Ontario • *Tektronix International A. G.*, Terrassenweg 1A, Zug, Switzerland.

A-2127-2
(replaces A-2127-1)

Printed in U. S. A.

1/63

NEW CRT NOMENCLATURE FOR INTERNAL GRATICULE -- FOURTH DIGIT ADDED

January 11, 1963

We've added a fourth digit to the crt nomenclature to identify graticule type. The new numbering system went into effect with crt's produced in late December 1962, on.

T5640P-	No internal graticule
T5641P-	Internal graticule
T5642P-	Any other possible graticule configu-
etc.	ration we may come up with.

HISTORY PARTS LIST

CONTENTS:

564

TENTATIVE

Publication:
061-609
November 1962

For all serial numbers.

ABBREVIATIONS:

cer	ceramic
comp	composition
emc	electrolytic, metal cased
gmv	guaranteed minimum value
h	henry
k	kilo (10^3)
k	kilohm
m	milli (10^{-3})
ma	milliamp
meg	megohm
mh	millihenry
mpt	metalized, paper tubular
mt	mylar, tubular
mv	millivolt
μ	micro (10^{-6})
μf	microfarad
μh	microhenry
μsec	microsecond
n	nano (10^{-9})
nsec	nano second
Ω	ohm
p	pico (10^{-12})
pbt	paper, "bathtub"
pcc	paper covered can
pf	picofarad ($\mu\mu$f)
piv	peak inverse voltage
pmc	paper, metal cased
poly	polystyrene
prec	precision
pt	paper, tubular
ptm	paper, tubular molded
sn or S/N	serial number
tub	tubular
v	working volt, dc
var	variable
w	watt
WW	wire wound

SPECIAL NOTES AND SYMBOLS:

±	approximate serial number
X000	part first added at this serial number
000X	part removed after this serial number
*000-000	asterisk preceding Tektronix part number indicates manufactured by or for Tektronix, also Tektronix reworked or checked components
mod w/	modify with _____. Simple replacement is not recommended. Replace with part listed for later instruments and also modify the circuit symbol numbers listed after mod w/

ELECTRICAL PARTS LIST

Values are fixed unless marked Variable.

Ckt. No.	Tektronix Part Number	Description	S/N Range
		BULBS	
B601	150-001	Incandescent, G.E. #47	Graticule Light
B602	150-001	Incandescent, G.E. #47	Graticule Light
B603	152-018	Incandescent, G.E. #12	Pilot Light
B856	150-025	Neon, NE-2E	
B857	150-025	Neon, NE-2E	
B903	150-028	Neon, NE-83	
		CAPACITORS	

Tolerance ±20% unless otherwise indicated.
Tolerance of all electrolytic capacitors are as follows (with exceptions):

3V - 50V = -10%,+250%
51V - 350V = -10%,+100%
351V - 450V = -10%,+50%

C611	285-510	.01 µf	MT	400 v
C616	285-510	.01 µf	MT	400 v
C640A,B	*290-060	160 µf x 10 µf	EMC	350 v
C642A,B	*290-061	160 µf x 10 µf	EMC	350 v
C644	*290-133	2 x 125 µf	EMC	350 v
C646	*290-040	2 x 40 µf	EMC	250 v
C650	285-510	.01 µf	MT	400 v
C667	290-002	8 µf	EMT	450 v
C670	285-510	.01 µf	MT	400 v
C720	290-166	2 x 2000 µf	EMC	25 v

CAPACITORS (Cont'd.)

C732	290-099	100 µf	EMT		15 v
C737	283-026	.2 µf	Disc Type		25 v
C757	290-015	100 µf	EMT		25 v
C760	281-027	.7-3 pf	Tub.	Var.	
C761	281-027	.7-3 pf	Tub.	Var.	
C762	283-003	.01 µf	Disc Type		150 v
C801	283-006	.02 µf	Disc Type		600 v
C803	283-000	.001 µf	Disc Type		500 v
C807	285-502	.001 µf	MT		1000 v
C822	283-071	.0068 µf	Disc Type		5000 v
C830	283-036	.0025 µf	Disc Type		6000 v
C832	283-036	.0025 µf	Disc Type		6000 v
C837	283-036	.0025 µf	Disc Type		6000 v
C841	285-519	.047 µf	MT		400 v
C842	283-071	.0068 µf	Disc Type		5000 v
C848	285-501	.001 µf	PTM		600 v
C853	283-036	.0025 µf	Disc Type		6000 v
C876	290-025	6.25 µf	EMT		300 v
C878	281-523	100 pf	Cer.		350 v
C884	281-524	150 pf	Cer.		500 v
C897	283-000	.001 µf	Disc Type		500 v
C904	290-025	6.25 µf	EMT		300 v
C916	285-527	.1 µf	MPT		600 v
C918	285-527	.1 µf	MPT		600 v
C935	290-164	1 µf	EMT		150 v

DIODES

D640A,B,C,D	152-047	Silicon	1N2862 (or equal)
D642A,B,C,D	152-047	Silicon	1N2862 (or equal)
D644A,B,C,D	152-047	Silicon	1N2862 (or equal)
D646	152-047	Silicon	1N2862 (or equal)
D720	152-035	Silicon	1N1563A
D721	152-035	Silicon	1N1563A
D762	152-008	Germanium	T12G
D763	152-061	Silicon	6061
D838	152-047	Silicon	MR187
D839	152-047	Silicon	MR187
D908	152-066	Silicon	1N3194
D911	152-066	Silicon	1N3194
D916	152-066	Silicon	1N3194
D918	152-066	Silicon	1N3194
D920	152-066	Silicon	1N3194
D926	152-066	Silicon	1N3194
D935	152-066	Silicon	1N3194
D937	152-094	Zener	3/4M 50Z10

FUSES

F601	159-005	3 Amp	3AG	Slo-Blo	117 v oper. 50 & 60 cycle
F601	159-034	1.6 Amp	3AG	Slo-Blo	234 v oper. 50 & 60 cycle
F720	159-023	2 Amp	3AG	Slo-Blo	

INDUCTORS

L860	*108-255	Beam Rotator on form 276-069

RESISTORS

Resistors are fixed, composition, ±10% unless otherwise indicated.

R601†	**311-340	50 Ω		Var.	WW	SCALE ILLUM.
R602	308-142	30 Ω	3 w		WW	5%
R609	302-106	10 meg	1/2 w			
R610	302-104	100 k	1/2 w			
R611	302-102	1 k	1/2 w			
R612	302-272	2.7 k	1/2 w			
R616	311-015	10 k		Var.	WW	-100 VOLTS
R617	308-186	80 k	1/2 w		WW	1%
R618	308-226	10 k	1/2 w		WW	1%
R619	302-224	220 k	1/2 w			
R624	302-473	47 k	1/2 w			
R625	302-222	2.2 k	1/2 w			
R626	302-184	180 k	1/2 w			
R627	302-102	1 k	1/2 w			
R628	308-176	4 k	20 w		WW	5%
R632	302-102	1 k	1/2 w			
R633	302-473	47 k	1/2 w			
R635	301-302	3 k	1/2 w			5%
R640	304-100	10 Ω	1 w			
R642	304-100	10 Ω	1 w			
R644	304-100	10 Ω	1 w			
R646	304-101	100 Ω	1 w			
R650	309-101	330 k	1/2 w		Prec.	1%
R651	309-162	250 k	1/2 w		Prec.	1%
R652	302-102	1 k	1/2 w			

†Ganged with SW601. Furnished as a unit.
**New item.

RESISTORS (Cont'd.)

R653	302-225	2.2 meg	1/2 w			
R654	302-474	470 k	1/2 w			
R655	302-685	6.8 meg	1/2 w			
R656	311-068	500 k	.2 w	Var.		+125 VOLTS
R657	302-684	680 k	1/2 w			
R658	302-273	27 k	1/2 w			
R659	302-333	33 k	1/2 w			
R663	302-102	1 k	1/2 w			
R664	302-102	1 k	1/2 w			
R666	308-176	4 k	20 w		WW	5%
R667	308-176	4 k	20 w		WW	5%
R670	309-156	1.024 meg	1/2 w		Prec.	1%
R671	309-053	333 k	1/2 w		Prec.	1%
R672	302-102	1 k	1/2 w			
R673	302-105	1 meg	1/2 w			
R675	302-825	8.2 meg	1/2 w			
R676	311-068	500 k	.2 w	Var.		+300 VOLTS
R677	304-224	220 k	1 w			
R678	302-394	390 k	1/2 w			
R679	302-333	33 k	1/2 w			
R730	311-068	500 k	.2 w	Var.		-12.2 VOLTS
R731	309-104	2.05 k	1/2 w		Prec.	1%
R732	310-115	15 k	1 w			1%
R733	302-564	560 k	1/2 w			
R734	302-334	330 k	1/2 w			

RESISTORS (Cont'd.)

R735	302-272	2.7 k	1/2 w			
R737	302-151	150 Ω	1/2 w			
R744	308-231	220 Ω	3 w		WW	5%
R754	302-471	470 Ω	1/2 w			
R759	302-104	100 k	1/2 w			
R762	316-473	47 k	1/4 w			
R763	316-105	1 meg	1/4 w			
R764	302-105	1 meg	1/2 w			
R781	316-470	47 Ω	1/4 w			
R782	316-470	47 Ω	1/4 w			
R783	316-470	47 Ω	1/4 w			
R784	316-470	47 Ω	1/4 w			
R801	306-681	680 Ω	2 w			
R802	302-562	5.6 k	1/2 w			
R803	306-273	27 k	2 w			
R806	302-104	100 k	1/2 w			
R807	302-472	4.7 k	1/2 w			
R813	302-101	100 Ω	1/2 w			
R815	302-474	470 k	1/2 w			
R816	302-102	1 k	1/2 w			
R831	302-104	100 k	1/2 w			
R832	302-106	10 meg	1/2 w			
R833	311-043	2 meg		Var.		INTENSITY
R834	302-105	1 meg	1/2 w			
R835	310-591	30 meg	2 w			5%

RESISTORS (Cont'd.)

R836	302-223	22 k	1/2 w			
R837	302-471	470 Ω	1/2 w			
R838	301-242	2.4 k	1/2 w			5%
R839	302-104	100 k	1/2 w			
R840	301-125	1.2 meg	1/2 w			5%
R841	311-042	2 meg	2 w	Var.		HIGH VOLTAGE
R842	310-595	12 meg	2 w		Prec.	5%
R844	311-121	5 meg		Var.		FOCUS
R846	302-225	2.2 meg	1/2 w			
R847	302-103	10 k	1/2 w			
R848	302-334	330 k	1/2 w			
R849	302-223	22 k	1/2 w			
R851	302-104	100 k	1/2 w			
R852	302-273	27 k	1/2 w			
R853	302-471	470 Ω	1/2 w			
R854	302-105	1 meg	1/2 w			
R860	311-317	2 x 1 k		Var.		TRACE ALIGNMENT
R861	302-680	68 Ω	1/2 w			
R864	311-206	250 k		Var.		ASTIGMATISM
R868	302-564	560 k	1/2 w			
R870	301-393	39 k	1/2 w			5%
R871	311-159	20 k		Var.		CAL. AMPL.
R872	301-154	150 k	1/2 w			5%
R873	302-103	10 k	1/2 w			

RESISTORS (Cont'd.)

R876	301-153	15 k	1/2 w			5%
R877	301-183	18 k	1/2 w			5%
R878	301-564	560 k	1/2 w			5%
R879	301-124	120 k	1/2 w			5%
R883	305-223	22 k	2 w			5%
R885	309-121	9.5 k	1/2 w		Prec.	1%
R886	309-119	6.375 k	1/2 w		Prec.	1%
R887	309-117	2.1 k	1/2 w		Prec.	1%
R888	309-116	1.025 k	1/2 w		Prec.	1%
R889	309-113	610 Ω	1/2 w		Prec.	1%
R890	309-073	200 Ω	1/2 w		Prec.	1%
R891	309-112	100 Ω	1/2 w		Prec.	1%
R892	309-067	60 Ω	1/2 w		Prec.	1%
R893	309-066	40 Ω	1/2 w		Prec.	1%
R896	309-045	100 k	1/2 w		Prec.	1%
R897	309-112	100 Ω	1/2 w		Prec.	1%
R898	309-112	100 Ω	1/2 w		Prec.	1%
R899	*308-090	1/4 Ω	1 w		WW	
R903	302-333	33 k	1/2 w			
R904	311-026	100 k	2 w	Var.		STORAGE LEVEL
R906	311-374	250 k		Var.		NON-STORAGE LEVEL
R908	302-224	220 k	1/2 w			
R909	302-684	680 k	1/2 w			
R911	302-224	220 k	1/2 w			
R912	302-684	680 k	1/2 w			

RESISTORS (Cont'd.)

R914	316-102	1 k	1/4 w		
R916	316-103	10 k	1/4 w		
R918	316-103	10 k	1/4 w		
R920	302-104	100 k	1/2 w		
R924	302-224	220 k	1/2 w		
R926	302-104	100 k	1/2 w		
R928	302-224	220 k	1/2 w		
R930	311-350	500 k		Var.	COVERAGE 1
R931	302-104	100 k	1/2 w		
R932	302-333	33 k	1/2 w		
R933	316-472	4.7 k	1/4 w		
R935	302-154	150 k	1/2 w		
R937	302-103	10 k	1/2 w		
R938	311-023	50 k	2 w	Var.	COVERAGE 2
R940	311-018	20 k	2 w	Var.	GEOMETRY
R941	302-822	8.2 k	1/2 w		
R944	311-068	500 k	.2 w	Var.	FLOOD-GUN BIAS B
R946	311-068	500 k	.2 w	Var.	FLOOD-GUN BIAS A

SWITCHES

	Unwired	Wired		
SW601†	** 311-340			PWR. OFF
SW854	260-449		Slide	CRT CATHODE SELECTOR
SW868	**260-508		Push-Button	LOCATE (Trace)
SW870	*260-253	*262-497	Rotary	CALIBRATOR
SW910	**260-510		Lever	UPPER (Display)

†Ganged with R601. Furnished as a unit.
**New item.

SWITCHES (Cont'd.)

SW911	**260-510	Lever	LOWER (Display)
SW948	**260-507	Push-Button	INTEGRATE

THERMAL CUTOUTS

TK601	260-157	Thermal Cutout 160°

TRANSFORMERS

T601	***120-296	Low Voltage
T801	*120-275	High Voltage

TRANSISTORS

Q624	151-087	J3138
Q734	151-040	2N1302
Q744	151-042	2N1378
Q757	151-060	2N1545

ELECTRON TUBES

V609	154-291	OG3
V627	154-307	7233
V634	154-187	6DJ8
V654	154-022	6AU6
V667	154-020	6AS7
V674	154-022	6AU6
V800	154-167	6CZ5
V814	154-046	12BH7A

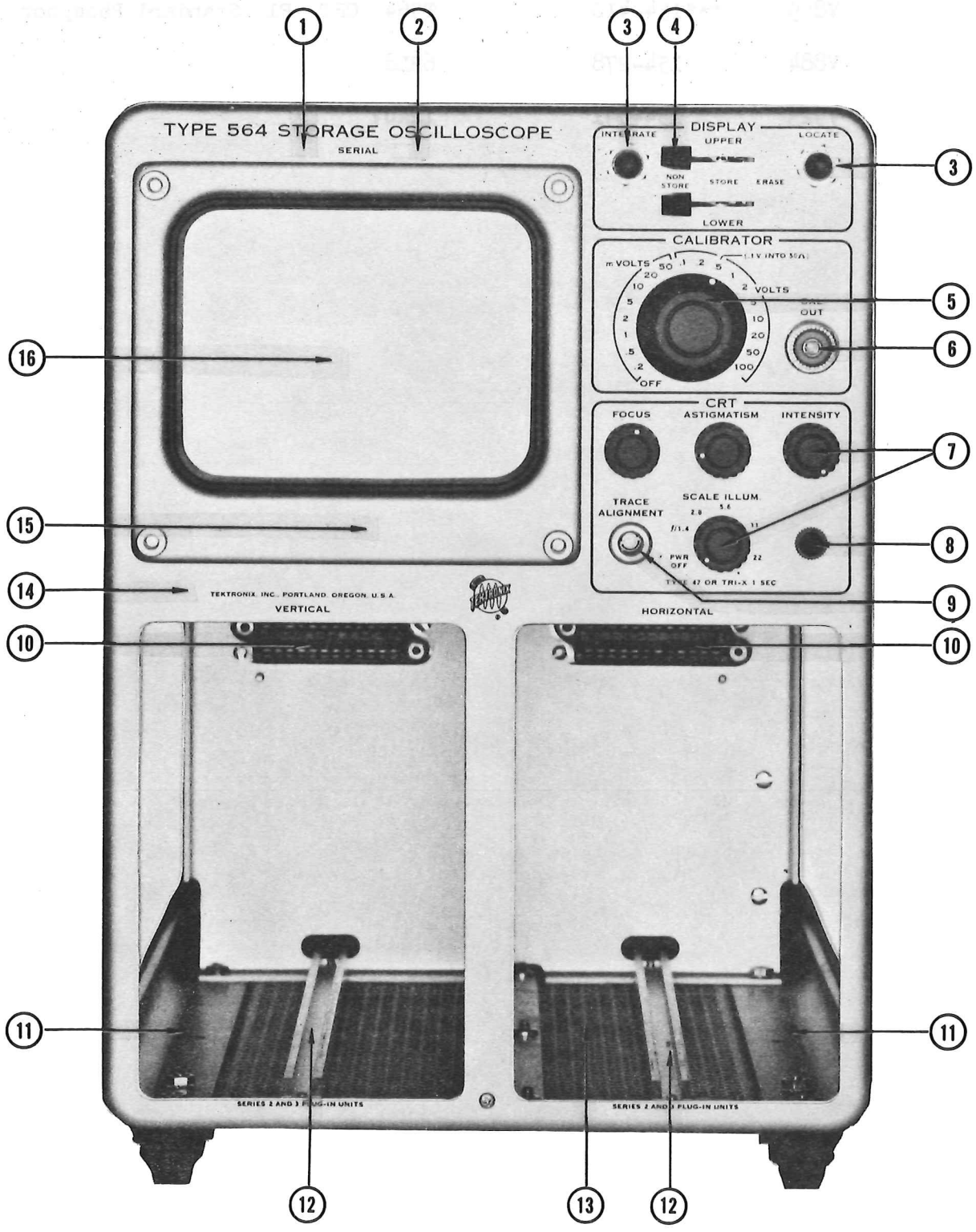
**New Item.
***New Tek-made item.

ELECTRON TUBES (Cont'd.)

V822	154-051	5642	
V832	154-051	5642	
V859	***154-410	T564 CRT P1	Standard Phosphor
V884	154-278	6BL8	
V923	154-041	12AU7	

***New Tek-made item.

FRONT


TYPE 564 STORAGE OSCILLOSCOPE
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FOCUS
ASTIGMATISM
INTENSITY
TRACE ALIGNMENT
SCALE ILLUM
PWR OFF
TEKTRONIX, INC., PORTLAND, OREGON, U.S.A.
VERTICAL
HORIZONTAL
SERIES 2 AND 3 PLUG-IN UNITS
SERIES 2 AND 3 PLUG-IN UNITS
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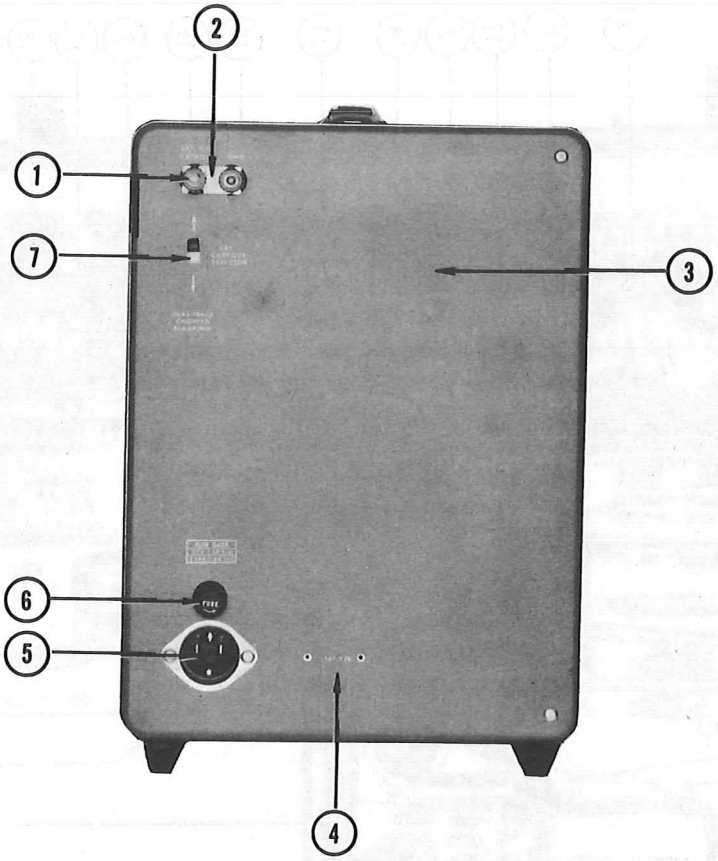
FRONT

Ref.	Part No.	Quan.	Description
1.	334-829	1	Tag, Serial, Blank
2.	334-679	1	Tag, Serial Number
3.	210-413	2	Nut, Switch Mounting
	210-840	2	Washer
	210-012	2	Lockwasher
	210-207	2	Solder Lug
4.	366-215	2	Knob, Lever Switch
5.	366-117	1	Knob, Large Charcoal
	210-413	1	Nut, Pot
	210-012	1	Lockwasher
6.	131-064	1	Connector, Coaxial
	406-244	1	Bracket, Coaxial Insulator
	210-224	1	Solder Lug
	210-812	2	Washer, Fiber
	210-004	2	Lockwasher
	210-406	2	Nut
7.	366-148	4	Knob, Small Charcoal
	210-413	4	Nut, Pot
	210-840	4	Washer
	210-013	4	Lockwasher
	210-207	2	Solder Lug
8.	136-047	1	Socket, Pilot Light Holder
9.	358-010	1	Bushing, Panel
	210-013	1	Lockwasher
	210-494	1	Nut
10.	131-148	2	Connector, Female Amph.
	211-014	4	Screw
	166-029	4	Tube, Aluminum Spacer
	210-004	4	Lockwasher
	210-406	4	Nut
11.	122-107	2	Angle, Aluminum Frame
	212-039	8	Screw
	210-458	8	Nut
12.	351-038	2	Guide, Plug-in Rail
	211-541	4	Screw

FRONT (Cont.)

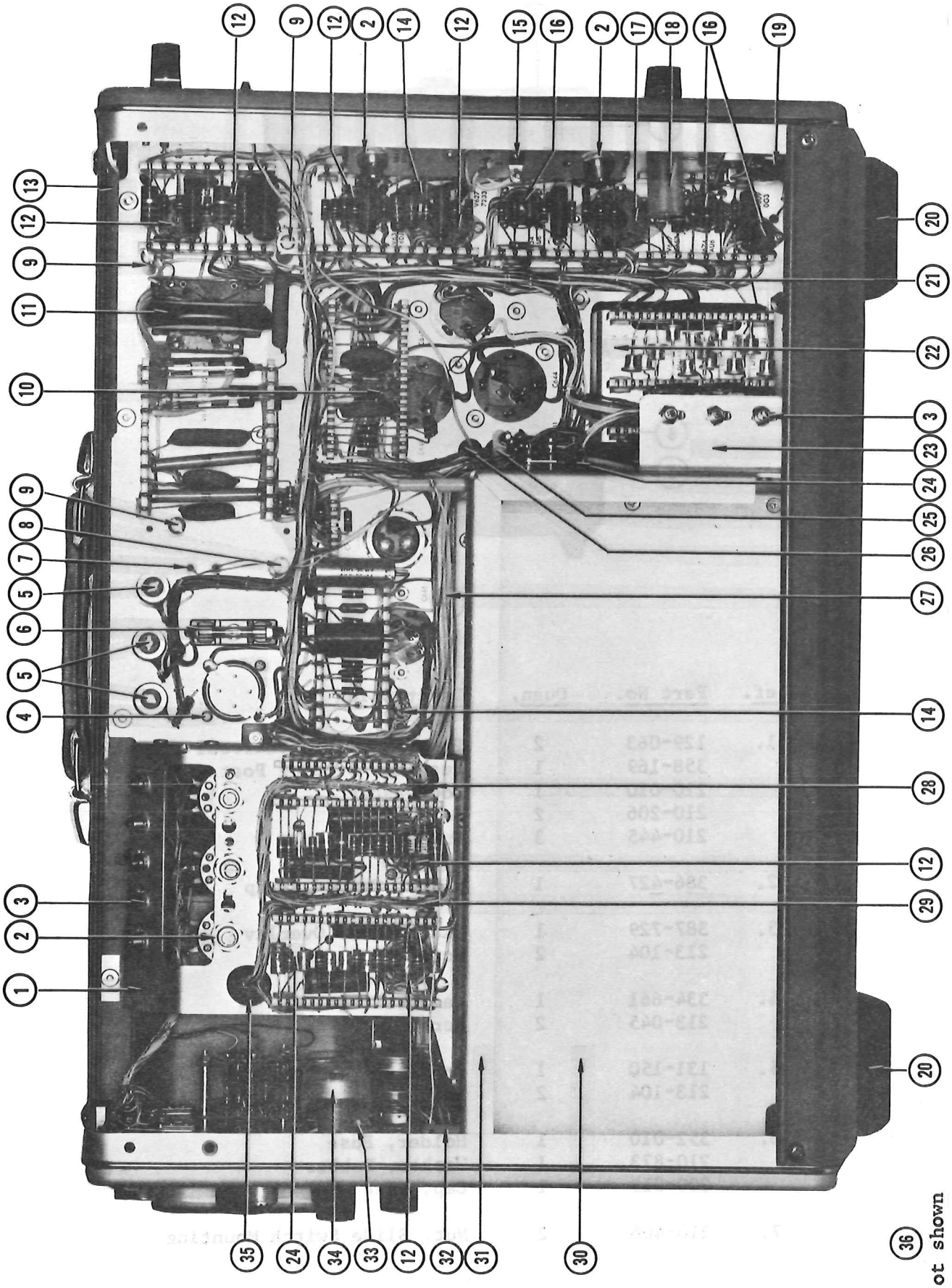
Ref.	Part No.	Quan.	Description
13.	387-723	1	Plate, Bottom Cover
	212-039	4	Screw
	210-458	2	Nut
14.	333-720	1	Front Panel
	004-160	1	Protective Cover
15.	200-426	1	Cover, Graticule
	210-571	4	Nut, Graticule Cover
	337-540	1	Shield, Reflector (located under graticule cover)
	352-049	1	Holder, Reflector Shield
16.	331-097	1	Graticule

REAR



Ref.	Part No.	Quan.	Description
1.	129-063	2	Post, Binding, Charcoal
	358-169	1	Bushing, Binding Post
	210-010	1	Lockwasher
	210-206	2	Solder Lug
	210-445	3	Nut
2.	386-427	1	Plate, Ground Strap
3.	387-729	1	Plate, Rear Overlay
	213-104	2	Screw
4.	334-661	1	Tag, Voltage
	213-045	2	Screw
5.	131-150	1	Connector, Motor Base
	213-104	2	Screw
6.	352-010	1	Holder, Fuse
	210-873	1	Washer, Rubber
	200-015	1	Cap, Fuse
7.	210-406	2	Nut, Slide Switch Mounting

RIGHT SIDE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RIGHT SIDE

Ref.	Part No.	Quan.	Description
1.	441-464	1	Chassis, Calibrator
	211-510	1	Screw, Chassis to Top Rail
	211-507	5	Screw, Chassis to Chassis & Plug-in Housing
	210-457	2	Nut
2.	210-413	5	Nut, Pot
	210-840	5	Washer
	210-012	5	Lockwasher
3.	210-583	8	Nut, Mini. Pot
	210-940	8	Washer
	210-223	3	Solder Lug
	210-046	2	Lockwasher
4.	213-044	2	Screw, Thermo Cut-out Mounting
5.	212-037	3	Screw, Resistor Mounting
	210-808	3	Washer, Centering
	210-462	3	Nut, Resistor Mounting
	212-004	3	Screw, Resistor to Chassis
6.	352-031	1	Holder, Fuse
	211-510	1	Screw
	210-006	1	Lockwasher
	210-407	1	Nut
7.	348-031	2	Grommet, Plastic Snap-in
8.	385-137	1	Rod, Delrin
	213-041	1	Screw
9.	385-097	2	Rod, Nylon
	385-124	1	Rod, Aluminum
	210-006	1	Lockwasher
	211-507	3	Nut
	337-529	1	Shield, H.V. (not shown)
	211-507	3	Screw, Shield to Rods
	210-803	1	Washer
	343-001	1	Cable Clamp
	214-210	1	Solder-Spool Assembly
	361-007	1	Spacer
10.	343-043	2	Clamp, Neon
11.	346-001	1	Strap, Transformer
	210-004	2	Lockwasher
	210-406	2	Nut

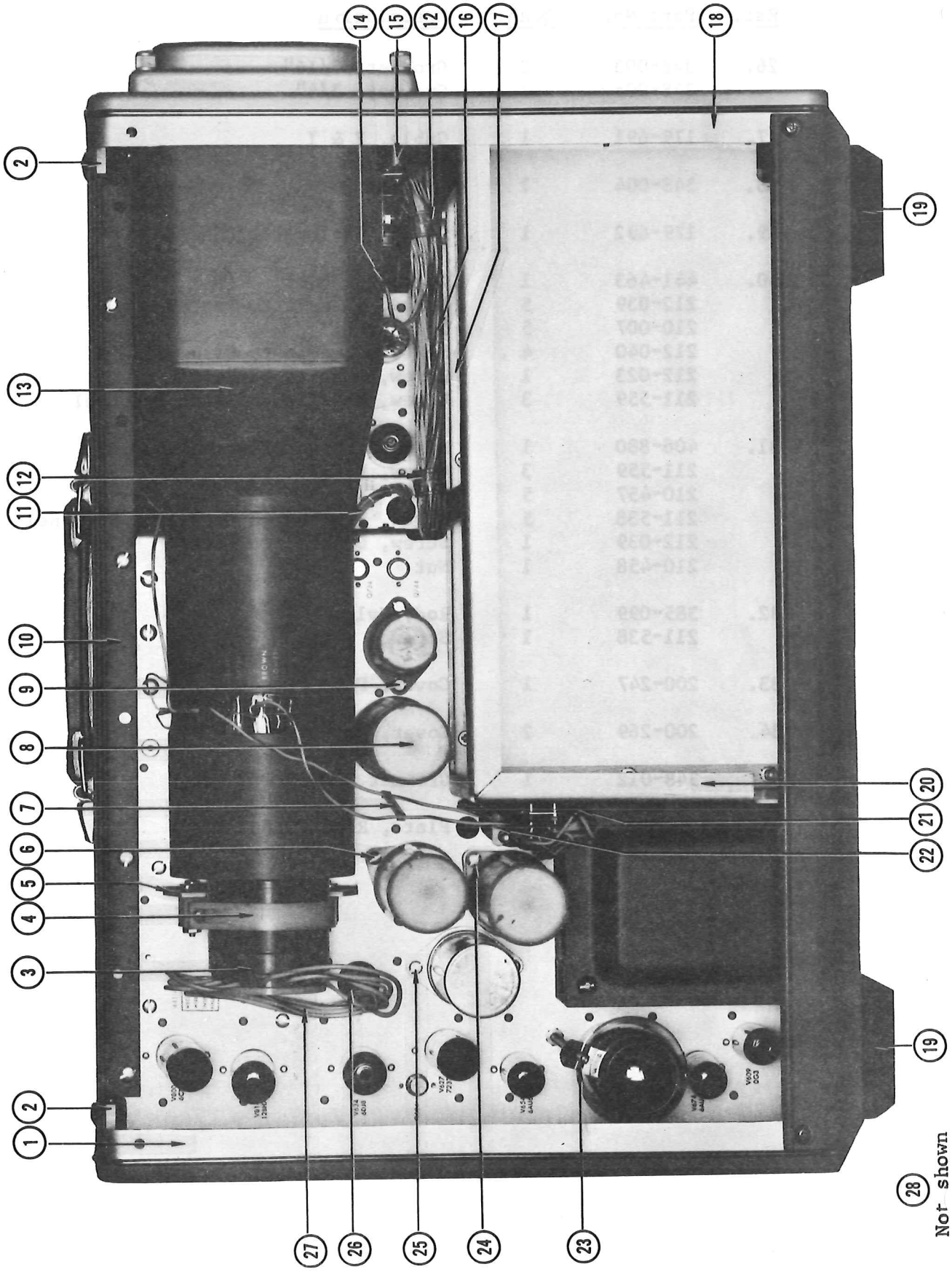
RIGHT SIDE (Cont.)

Ref.	Part No.	Quan.	Description
12.	136-015	6	Socket, Tube
	213-044	12	Screw
13.	387-726	1	Plate, Gusset
	212-023	2	Screw, Plate to Rail
	211-538	2	Screw, Plate to Rear Subpanel
	210-457	2	Nut
14.	136-095	3	Socket, Transistor
	213-113	6	Screw
15.	211-510	2	Screw, Transistor Mounting
	210-006	1	Lockwasher
	210-202	1	Solder Lug
	210-407	2	Nut
16.	136-008	3	Socket, Tube
	213-044	6	Screw
17.	136-013	1	Socket, Tube
	211-538	2	Screw
	210-006	2	Lockwasher
	210-407	2	Nut
18.	200-237	1	Cover, Fuse
19.	343-008	1	Clamp, Capacitor
	210-863	1	Washer
	210-006	1	Lockwasher
	210-407	1	Nut
20.	348-042	2	Foot, Rubber
	212-071	4	Screw
	210-458	4	Nut
21.	179-689	1	Cable, Power Chassis
22.	406-881	1	Bracket, Transformer
	210-564	4	Nut, Transformer Mounting
	210-010	4	Lockwasher
23.	406-893	1	Bracket, Pot
	211-507	2	Screw
24.	210-201	2	Solder Lug
	213-044	2	Screw
25.	352-015	1	Holder, Nylon
	213-045	1	Screw

RIGHT SIDE (Cont.)

Ref.	Part No.	Quan.	Description
26.	348-003	2	Grommet, 5/16"
	348-006	1	Grommet, 3/4"
27.	179-691	1	Cable, F & I
28.	348-004	1	Grommet
29.	179-692	1	Cable, Calibrator Chassis
30.	441-463	1	Chassis, Power
	212-039	5	Screw, Chassis to Bottom
	210-007	5	Lockwasher
	212-040	4	Screw, Chassis to Back Plate
	212-023	1	Screw, Chassis to Rail
	211-559	3	Screw, Chassis to Front Subpanel
31.	406-880	1	Bracket, Right Plug-in Housing
	211-559	3	Screw, Bracket to Chassis
	210-457	5	Nut
	211-538	5	Screw, Bracket to Chassis & Subpanel
	212-039	1	Screw, Bracket to Bottom
	210-458	1	Nut
32.	385-099	1	Rod, Nylon
	211-538	1	Screw
33.	200-247	1	Cover, Pot
34.	200-269	2	Cover, Pot
35.	348-012	1	Grommet
36.	387-725	1	Plate, Right Side

LEFT SIDE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LEFT SIDE

Ref.	Part No.	Quan.	Description
1.	387-727	1	Plate, Rear Subpanel
2.	381-073	2	Bar, Retaining
3.	136-147	1	Socket, CRT, Assembly
	Available Separately:		
	387-393	1	Plate, Socket Back
	213-086	2	Screw
4.	354-147	1	Ring, CRT Clamping
	211-560	1	Screw, Clamping
	210-407	1	Nut
	211-576	2	Screw, Ring to Nut
	210-949	2	Washer, Flat
	214-207	1	Nut, CRT Securing
5.	406-878	1	Bracket, CRT
	211-507	2	Screw
6.	211-543	2	Screw, Capacitor Mounting
	210-006	2	Lockwasher
	210-407	2	Nut
	386-254	1	Plate, Fiber Flange
	200-258	1	Cover, Capacitor
7.	344-047	1	Clip, Deflection
8.	200-261	1	Cover, Capacitor
	210-952	1	Washer, Insulating
9.	211-534	2	Screw, Capacitor Mounting
	210-006	2	Lockwasher
	210-407	2	Nut
	386-252	1	Plate, Fiber Flange
	200-256	1	Cover, Capacitor
10.	381-213	1	Bar, Handle
	212-039	4	Screw
11.	179-705	1	Cable, 5 Pin Connector
12.	343-006	2	Cable Clamp
	211-538	2	Screw
	210-803	2	Washer
	210-006	2	Lockwasher
	210-407	2	Nut

LEFT SIDE (Cont.)

Ref.	Part No.	Quan.	Description
13.	337-551	1	Shield, CRT
	406-877	1	Bracket, Top CRT Shield
	406-875	1	Bracket, Bottom CRT Shield
	211-510	4	Screw, Brackets to Shield
	211-538	4	Screw, Brackets to Subpanel
14.	352-044	1	Holder, Coil Form
	211-011	1	Screw
	210-004	1	Lockwasher
	210-406	1	Nut
15.	136-152	2	Socket, Lamp
	211-538	2	Screw
	210-803	2	Washer
	210-457	2	Nut
16.	179-690	1	Cable, 110 Volt
17.	384-611	1	Rod, Spacer
18.	387-724	1	Plate, Front Subpanel
19.	348-042	2	Foot, Rubber
	212-071	4	Screw
	210-458	4	Nut
20.	406-879	1	Bracket, Left Plug-in Housing
	211-538	2	Screw, Bracket to Subpanel
	210-457	2	Nut
	211-541	3	Screw, Bracket to Chassis
	212-039	1	Screw, Bracket to Bottom
	210-458	1	Nut
21.	210-201	1	Solder Lug
	213-044	1	Screw
22.	352-015	1	Holder, Nylon
	213-045	1	Screw
23.	343-074	1	Clamp, Tube
	355-070	1	Stud, Tube Clamp
	210-008	2	Lockwasher
	210-409	2	Nut
24.	211-532	2	Screw, Capacitor Mounting
	210-006	2	Lockwasher
	210-407	2	Nut
	432-044	1	Base, Capacitor Mounting
	386-254	1	Plate, Fiber Flange
	200-259	1	Cover, Capacitor

LEFT SIDE (Cont.)

Ref.	Part No.	Quan.	Description
25.	211-534	2	Screw, Capacitor Mounting
	210-407	2	Nut
	386-255	1	Plate, Metal Flange
26.	348-012	1	Grommet
27.	179-704	1	Cable, CRT
28.	387-725	1	Plate, Left Side

TECHNICAL DATA

TEKTRONIX
T564

1/11/63

The Tektronix Type T564 is a 4 x 5 inch rectangular flat-faced cathode-ray tube with electrostatic focus and deflection. The T564 is designed primarily for use in the Tektronix 564 storage oscilloscope.

MECHANICAL SPECIFICATIONS:

Overall length	16-1/2" ±1/8 inches
Greatest width of bulb	5-5/16"
Greatest height of bulb	4-5/16"
Neck pin diameter	0.040 ±0.002 inches
Base	JEDEC NO. B14-38
Bulb to gun alignment	±3°
Bulb to base alignment	See outline drawing

ELECTRICAL DATA:

Writing gun:

Heater voltage	6.3 volts RMS
Heater current	0.6 ±10% amperes RMS

Capacitance, interelectrodes (typical values)

Grid No. 1 to all other electrodes	7.8 μμf
Cathode to all other electrodes	4.6 μμf
DJ1 to DJ2	2.8 μμf
DJ1 to all other electrodes except DJ2	2.7 μμf
DJ2 to all other electrodes except DJ1	2.5 μμf
DJ3 to DJ4	1.25 μμf
DJ3 to all other electrodes except DJ4	2.5 μμf
DJ4 to all other electrodes except DJ3	3.2 μμf
BJ2 to all other electrodes	8.6 μμf

Deflection polarity

Positive voltage on DJ1 deflects beam toward pin No. 1

Positive voltage on DJ3 deflects beam toward pin No. 4

Geometry (measured under typical operating conditions):

Minimum useful scan DJ1-DJ2	8 cm
Minimum useful scan DJ3-DJ4	10 cm
Minimum quality screen area	8 x 10 cm
Trace orthogonality	90° ±1°
Centering of undelfected spot with respect to Geometric center	
Horizontal	5 mm
Vertical	3 mm
(Deflection electrodes connected to Grid No. 5)	
Raster distortion	1.3% Max.

Viewing gun:

Heater voltage	12.6 volts DC
Heater current (total)	0.3 ±10% amperes DC
Capacitance, interelectrodes (typical values)	
A Grid No. 1 to all other electrodes	16.4 μμf
B Grid No. 1 to all other electrodes	17.4 μμf
Grid Nos. 2 and 3 to all other electrodes	75.6 μμf
Grid No. 4 to all other electrodes	100 μμf
Grid No. 5 to all other electrodes	150 μμf
Grid No. 6 to all other electrodes	125 μμf
Grid No. 7 to all other electrodes	240 μμf
STB No. 1 to all other electrodes	162 μμf
STB No. 2 to all other electrodes	165 μμf
STB No. 1 to STB No. 2	19 μμf
STB No. 2 to STB No. 1	19 μμf

MAXIMUM RATINGS:

Writing gun (all measurements taken with respect to the writing gun cathode)

Accelerator and deflection system (Screen, 1st anode, blanking plates, 2nd anode deflection plates, isolation shield[1])	4000 volts Max.
Focus electrode:	
Voltage range	0 to 4000 volts
Maximum current to focus electrode	±10 μa
Peak voltage between electrodes:	
Plate-to-plate	500 volts Max.
Plate to all other electrodes in the accelerator and deflection system	500 volts Max.
Between any two electrodes in the accelerator and deflection system	500 volts Max.
Grid No. 1 voltage	
Negative bias value	150 volts Max.
Positive bias value	0 volts Max.
Positive peak value	2 volts Max.
Peak heater - cathode voltage	
Heater negative with respect to cathode	125 volts Max.
Heater positive with respect to cathode	125 volts Max.
Maximum electrode power dissipation	
1st anode and blanking plate	3 watts

Viewing gun (all measurements taken with respect to the viewing gun cathode)

STB No. 1 and STB No. 2 voltage	
Bias value	500 volts Max.
Peak value	1000 volts Max.
Accelerator and collimation system (Anode and collimation electrodes G3, G4, G5, G6, G7)	500 volts Max.

Peak voltage between electrodes

Between any two electrodes in the acceleration and collimation systems-------	500 volts Max.

Collimation electrodes, G3, G4, G5, G6, G7

Maximum current to any electrode----------	±5 mA
Maximum current to all electrodes----------	±10 mA

Grid No. 1 voltage

Negative bias value----------	-300 volts Max.
Positive bias value----------	0 volts Max.
Positive peak value----------	2 volts Max.

Peak heater - cathode voltage

Heater negative with respect to cathode------	125 volts Max.
Heater positive with respect to cathode------	125 volts Max.

Maximum electrode power dissipation

Collimation electrodes G3, G4, G5, G6, G7----	2 watts Max.
STB No. 1, STB No. 2----------	7.5 watts Max.

Writing gun - viewing gun bias

Viewing gun cathode positive with respect to writing gun cathodes----------	3500 volts Max.

PICAL OPERATING CONDITIONS:

Writing gun (all measurements taken with respect to the writing gun cathode)

Electrode designation	Symbol	
Isolation shield voltage------	Eg6	3500 volts DC[1]
Average of deflection plates--		3500 volts DC
Accelerator voltage		
Grid No. 5(astigmatism)--	Eg5	3350 to 3650 volts DC
Grids No. 2 and 3 (1st anode) and Blanking plate	Eg2,3) Bj1)	3500 volts DC

Deflection factors (nominal)

DJ1-DJ2	19.5 volts/cm
DJ3-DJ4	18.4 volts/cm

Useful scan

DJ1-DJ2	8 cm
DJ3-DJ4	10 cm

Deflection blanking voltage (BJ1 to BJ2)

For visual cut-off at I_k = 200 μA	±88 volts

Viewing gun (all measurements taken with respect to the viewing gun cathode)

Electrode designation	Symbol	
Storage target backplate No. 1 Storage target backplate No. 2	STB 1) STB 2)	145 to 355 volts
Collimator voltage		
Grid No. 7	Evg 7	10 to 75 volts
Grid No. 6	Evg 6	70 to 125 volts
Grid No. 5	Evg 5	125 to 240 volts
Grid No. 4	Evg 4	245 volts
Grid No. 3 Grid No. 2	Evg 3) Evg 2)	125 to 245 volts[2]
Grid No. 1 voltage (control)	Evg 1	0 to -100 volts[3]
Useful coverage		8 x 10 cm

Writing gun - viewing gun bias

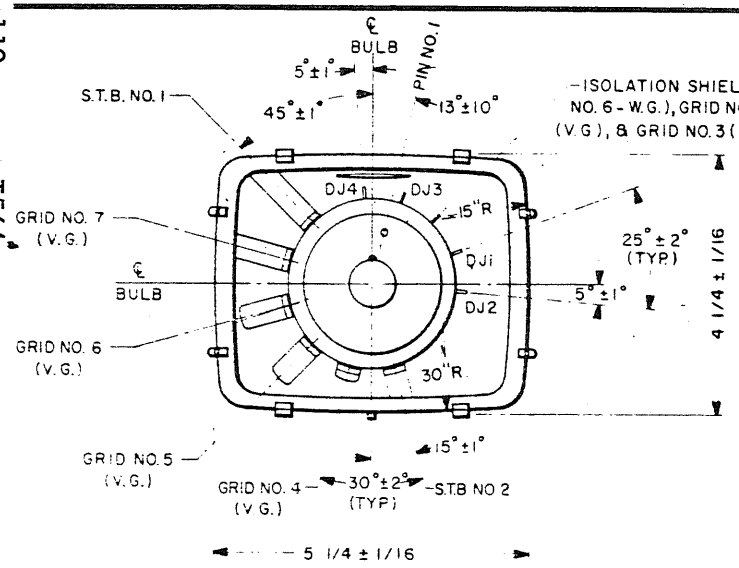
Viewing gun cathode positive with respect to writing gun cathode	3300 volts

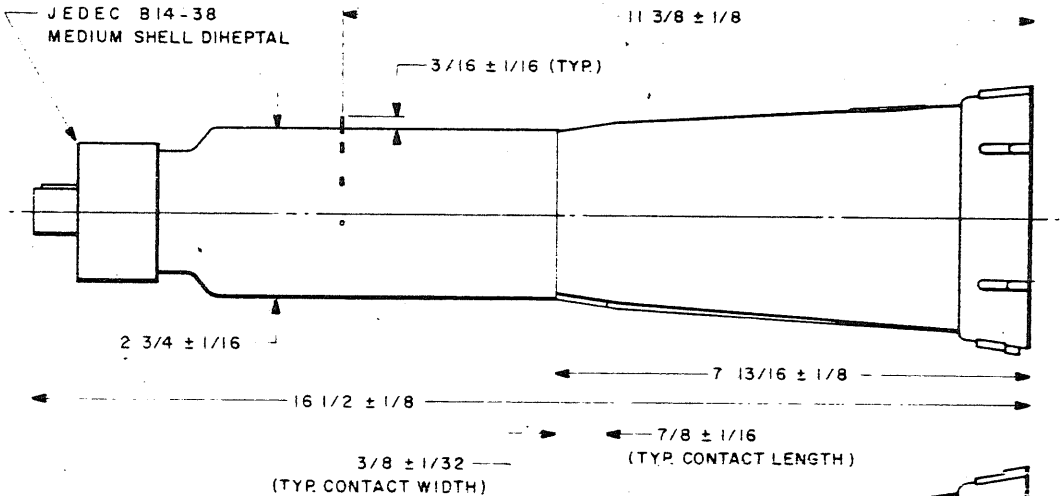
NOTES:

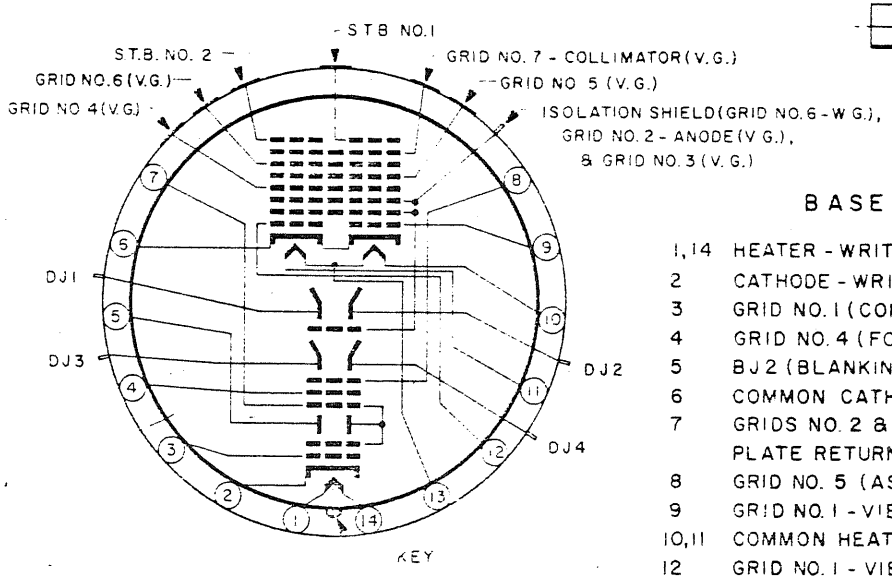
1. The writing gun isolation shield, viewing gun anode, and collimation Grid No. 3 are internally connected.

2. Their potential is adjusted to optimize writing gun geometry, and collimation is adjusted with Evg 4, 5, 6, 7, with respect to this geometry adjust.

3. Grid No. 1 bias is adjusted to get precise coverage of the tube faceplate.







BASE SCHEMATIC

BASE CONNECTIONS

1,14	HEATER - WRITING GUN
2	CATHODE - WRITING GUN
3	GRID NO. 1 (CONTROL) - WRITING GUN
4	GRID NO. 4 (FOCUS) - WRITING GUN
5	BJ 2 (BLANKING PLATE) - WRITING GUN
6	COMMON CATHODES - VIEWING GUNS "A" & "B"
7	GRIDS NO. 2 & 3 (FIRST ANODE) & BJ1 (BLANKING PLATE RETURN) - WRITING GUN
8	GRID NO. 5 (ASTIGMATISM) - WRITING GUN
9	GRID NO. 1 - VIEWING GUN "B"
10,11	COMMON HEATERS - VIEWING GUNS "A" & "B"
12	GRID NO. 1 - VIEWING GUN "A"
13	INTERNAL CONNECTION - DO NOT USE

MARK	DATE	DESCRIPTION	BY	APPR

CATHODE-RAY TUBE DIVISION
TEKTRONIX, INC.
PORTLAND, OREGON, U.S.A.

TUBE TYPE: T 564

DATE: 10/3/62
MOD.

MAINTENANCE SPARES LIST

564

Publication:
061-775
January 1963

This is a list of parts in a kit designed to maintain one instrument on an emergency basis. Order kits through your nearest Tektronix Field Office; specify:

060-622 564 maintenance spares kit

ABBREVIATIONS:

cer	ceramic
comp	composition
emc	electrolytic, metal cased
emt	electrolytic, metal tubular
gmv	guaranteed minimum value
h	henry
k	kilo (10^3)
k	kilohm
m	milli (10^{-3})
ma	milliamp
meg	megohm
mh	millihenry
mpt	metalized, paper tubular
mt	mylar, tubular
mv	millivolt
μ	micro (10^{-6})
μf	microfarad
μh	microhenry
μsec	microsecond
n	nano (10^{-9})
nsec	nano second
Ω	ohm
p	pico (10^{-12})
pbt	paper, "bathtub"
pcc	paper covered can
pf	picofarad ($\mu\mu$f)
piv	peak inverse voltage
pmc	paper, metal cased
poly	polystyrene
prec	precision
pt	paper, tubular
ptm	paper, tubular molded
sn or S/N	serial number
tub	tubular
v	working volt, dc
var	variable
w	watt
WW	wire wound

NOTES:

qty in kit: Quantity of parts in kit. Quantity is each, unless noted otherwise.

qty in inst: Total number of parts, of that Tek number, that are used in the instrument. Quantity is each, unless noted otherwise.

*running spare: An asterisked item indicates the item is a "running spare" as defined by Signal Corps drawing SC-D-93392; i.e., a plug-in part or a part that doesn't require a soldering iron for installation.

MAINTENANCE SPARES LIST

qty in kit	Tek number	qty in inst	description			
B BULBS:						
*1	150-001	2	#47	incandescent		
*1	150-018	1	#12	incandescent		
1	150-025	2	NE-2E	neon		
1	150-028	1	RT2-32-1A		neon	
C CAPACITORS:						
1	285-501	1	.001 μf	600 v	mt	
1	285-502	1	.001 μf	1000 v	mt	
1	285-510	4	.01 μf	400 v	mt	
1	285-519	1	.047 μf	400 v	mt	
1	285-527	2	.1 μf	600 v	mpt	
D DIODES:						
1	152-008	1	T12G	germanium		
1	152-035	2	1N1563A			
1	152-061	1	6061	silicon	100 ma	
2	152-066	23	1N3194	silicon		
1	152-094	1	zener	3/4 w	50 v	10%
F FUSES:						
*5	159-005	1	3 Amp	3AG	Slo-Blo	
*5	159-023	1	2 Amp	3AG	Slo-Blo	
*5	159-034	1	1.6 Amp	3AG	Slo-Blo	
L INDUCTORS:						
1	108-255	1	Beam rotator			
Q TRANSISTORS:						
*1	151-040	1	2N1302			
*1	151-042	1	2N1378			
1	151-060	1	2N1545			
*1	151-087	1	J3138			

*running spare

qty in kit	Tek number	qty in inst	description				
R RESISTORS:							
1	308-090	1	1/4 Ω	1 w	10%	WW	
1	308-142	1	30 Ω	3 w	5%	WW	
1	308-176	3	4 k	20 w	5%	WW	
1	308-186	1	80 k	1/2 w	1%	WW	
1	308-226	1	10 k	1/2 w	1%	WW	
1	308-231	1	220 Ω	3 w	5%	WW	
1	309-045	1	100 k	1/2 w	1%	prec	
1	309-053	1	333 k	1/2 w	1%	prec	
1	309-066	1	40 Ω	1/2 w	1%	prec	
1	309-067	1	60 Ω	1/2 w	1%	prec	
1	309-073	1	200 Ω	1/2 w	1%	prec	
1	309-101	1	330 k	1/2 w	1%	prec	
1	309-104	1	2.05 k	1/2 w	1%	prec	
1	309-112	3	100 Ω	1/2 w	1%	prec	
1	309-113	1	610 Ω	1/2 w	1%	prec	
1	309-116	1	1.025 k	1/2 w	1%	prec	
1	309-117	1	2.1 k	1/2 w	1%	prec	
1	309-119	1	6.375 k	1/2 w	1%	prec	
1	309-121	1	9.5 k	1/2 w	1%	prec	
1	309-156	1	1.024 meg	1/2 w	1%	prec	
1	309-162	1	250 k	1/2 w	1%	prec	
1	310-115	1	15 k	1 w	1%	prec	
1	310-591	1	30 meg	2 w	5%	prec	
1	310-595	1	12 meg	2 w	5%	prec	
1	311-015	1	10 k	WW	var		
1	311-018	1	20 k	comp	var		
1	311-023	1	50 k	comp	var		
1	311-026	1	100 k	comp	var		
1	311-042	1	2 meg	comp	var		
1	311-043	1	2 meg	comp	var		
1	311-068	5	500 k	.2 w	20%	comp	var
1	311-121	1	5 meg	comp	var		
1	311-159	1	20 k	10%	comp	var	
1	311-206	1	250 k	20%	comp	var	
1	311-317	1	2 x 1 k	20%	comp	var	
1	311-340	1	50 Ω	10%	WW	var	
1	311-350	1	500 k	3/4 w	10%	comp	var
1	311-374	1	250 k	20%	comp	var	

qty in kit	Tek number	qty in inst	description
T TRANSFORMER:			
1	120-275	1	HV power supply
V TUBES:			
*1	154-020	1	6AS7G
*1	154-022	2	6AU6
*1	154-041	1	12AU7
*1	154-046	1	12BH7
1	154-051	2	5642
*1	154-167	1	6CZ5
*1	154-187	1	ECC88/6DJ8
*1	154-278	1	ECF/80
*1	154-291	1	0G3
*1	154-307	1	7233
*1	154-410	1	7548

*running spare

FIELD RECALIBRATION PROCEDURE

CONTENTS:

564

INTRODUCTION:

This recalibration procedure is intended for Tektronix Field Repair Center use.

The specifications listed are factory specs and not guaranteed unless they also appear as catalog or instruction manual specs.

Publication:
061-666
November 1962

Special equipment has been kept to a minimum, depending on availability and recal time saved vs production, distribution cost and complexity.

For all serial numbers.

The recalibration steps were designed to make the procedure as simple and as fast as possible, and yet complete enough for a first-time recalibration. To accomplish this, each step was arranged in two parts -- Setup and Adjustment; detailed setup procedures were replaced in many cases with general statements. Block diagrams or circuit diagrams were included in certain steps to help locate the adjustment and show what the adjustment does to produce the desired results to aid in troubleshooting. A simplified adjustment procedure was called out next to each adjustment on the block diagram or circuit diagram to help speed up the recal once a person becomes familiar with the instrument, and waveforms were shown where needed.

The blank column on the right of the page is for notes on troubleshooting hints and general information concerning the recal. It will be filled in as we receive feedback from the Field or further information from the factory.

The "Certification Procedure" shows what part of the instrument may be certified and what is required to perform the certification. Forms may be obtained from Customer Service.

A Recal check sheet has been included for those persons who have become familiar enough with the recal procedure to use it.

Since this procedure is for the Field, we hope all Field personnel will help us improve it. Address your communications to *Field Technical Support.* No suggestions will go unnoticed.

ABBREVIATIONS:

a	amp
ac	alternating current
approx	approximately
b	base
bulb	light, lamp, etc.
c	collector
ccw	counterclockwise or full counterclockwise
cer	ceramic
cm	centimeter
comp	composition (resistor)
cps	cycles per second
crt	cathode ray tube
cw	clockwise or full clockwise
db	decibel
dc	direct current
div	division
e	emitter
emc	electrolytic, metal cased (capacitor)
fil	filament
freq	frequency
gmv	guaranteed minimum value (capacitor)
gnd	chassis ground
h	henry
hv	high voltage
inf	infinity
int	internal
k	kilo (10^3)
k	kilohm
m	milli (10^{-3})
ma	milliamp
max	maximum
mc	megacycle
meg	megohm
mh	millihenry
midr	midrange or centered
min	minimum
mm	millimeter
mpt	metalized, paper tubular (capacitor)
msec	millisecond
mt	mylar, tubular (capacitor)
mv	millivolt
μ	micro (10^{-6})
μf	microfarad
μh	microhenry
μsec	microsecond
n	nano (10^{-9})
nsec	nanosecond
Ω	ohm
p	pico (10^{-12})
pbt	paper, "bathtub" (capacitor)
pcc	paper covered can (capacitor)
pf	picofarad ($\mu\mu$f)
piv	peak inverse voltage
pmc	paper, metal cased (capacitor)
poly	polystyrene
pot	potentiometer
prec	precision (resistor)
pt	paper, tubular (capacitor)
ptm	paper, tubular molded (capacitor)
ptp	peak-to-peak
sec	second
sn	serial number
term	terminal
tub	tubular (capacitor)
unreg	unregulated
v	volt
var	variable
w	watt
WW	wire wound
x-former	transformer

CIRCUIT SPECIFICATIONS:

Factory circuit specifications are not guaranteed unless they also appear as catalog or instruction manual specs. Factory specs are usually tighter than advertised specs. This helps insure the instrument will meet or exceed advertised specifications over several years use.

The numbers listed beside the specifications are the calibration procedure steps where the check or adjustment is made.

POWER SUPPLIES:

1e All supplies must regulate under full load and no load conditions as the line voltage is varied from 105 to 125 v ac. Ripple and tolerance specifications are as follows:

SUPPLY	TOLERANCE adj.	RIPPLE (MAX) Full Load	RIPPLE (MAX) No Load
-100.0 v	±0.5%	5 mv	5 mv
+125.0 v	±0.5%	10 mv	5 mv
+300.0 v	±0.5%	80 mv	5 mv
- 12.2 v	±0.5%	5 mv	5 mv

CALIBRATOR:

3c Calibrator symmetry must be within ±20% at line voltages from 105 to 125 v ac.

3d Accuracy must be within ±2% at all calibrator positions.

CATHODE RAY TUBE:

4c Electrical center:
±0.3 cm of vertical graticule center
±0.6 cm of horizontal graticule center

8e Geometry: Vertical line may have ±1% (1.3 mm) max tilt in 8 cm of vertical deflection. Vertical bowing of the horizontal trace must not exceed 1.0 mm.

8f Focus: Vertical lines 1 mm apart and focused in the center must not overlap anywhere within the middle 8.8 horizontal cm of graticule.

9f Vertical sensitivity: 18.5 v/div to 20.5 v/div.

10d Horizontal sensitivity: 17.5 v/div to 19.3 v/div.

11d, 11e Bandwidth: At least 1 mc with Type 60 Plug-in.

18e Writing rate (R_W): At least 25 cm/ms (in store position).

RECALIBRATION PROCEDURE:

NOTES

EQUIPMENT REQUIRED

1 Type 531 Oscilloscope with Type H Plug-in, or equivalent
1 Type 180A Time-Mark Generator
1 Type 190 Constant Amp. Sig. Generator
1 Type 105 Square-Wave Generator
1 Type 60 or 2A60 Plug-in
1 Type 67 or 2B67 Plug-in
1 Type 3B1 Plug-in (not essential)
1 Type TU-75 or TU-76 Line Voltage Control (Special, FMS)
2 Type TU-4 Test Load Units (Special, FMS)
1 561 CRT Capacitance Standardizer (Special, FMS)
1 50Ω 10XT Attenuator (TEK 011-031)
1 50Ω Terminator (TEK 011-045)
1 50Ω Coax Cable (TEK 012-001)
1 Voltmeter, 20,000Ω/volt, 3% accuracy

BASIC FRONT PANEL CONTROLS

Type 564

CALIBRATOR - - - - -	OFF
INTENSITY - - - - -	CCW
DISPLAY - - - - -	NON-STORE

1. LOW VOLTAGE POWER SUPPLIES

Setup

a) Insert a TU-4 test load into each plug-in compartment.
b) Set test loads as follows:

SUPPLY SEL. - - -	-100
POSITION - - -	mid-range
LOAD - - -	NO LOAD
INDICATOR - - -	561

c) Connect shielded cable from RIPPLE and PERCENT DC ERROR connector of either test load to H unit input (.01v/cm, dc).
d) Find zero reference on test scope by pushing PUSH FOR GND REF on test load.

RECALIBRATION

NOTES

1. Low Voltage Power Supplies (con'd)

Adjustment

e) Check tolerance of voltages by pushing PUSH TO REMOVE RIPPLE button on the test load and noting the deviation of the test scope trace from zero reference. If voltage is out of tolerance, set for zero indication on test scope with indicated adjustment.

SUPPLY SEL.	TOLERANCE	RIPPLE (MAX) Full Ld	RIPPLE (MAX) No Ld	Adj.
-100.0 v	±0.5%, ±0.5 cm	5 mv	5 mv	-100.0 v (R616)
+125.0 v	±0.5%, ±0.5 cm	10 mv	5 mv	+125.0 v (R656)
+300.0 v	±0.5%, ±0.5 cm	80 mv	5 mv	+300.0 v (R676)
- 12.0 v	±0.5%, ±0.5 cm	5 mv	5 mv	-12.2 v (R730)

Check each supply for regulation and ripple as line voltage is varied from 105 to 125 v ac under no load and full load conditions.

For full load conditions both test load units must be switched to FULL LOAD and vice versa.

Check line indicating neons on test load front panels. With upper neons only on, line polarity is correct. If both upper and lower neons are lit, line polarity is reversed.

2. HIGH VOLTAGE ADJ

Setup

a) Connect DC voltmeter to CRT cathode.

Junction of R852 (27 k) and C854 (.0025 µf), at notch 12 of top ceramic strip near hv cover.

Adjustment

b) Set High Voltage Adj (R841) for a reading of -3300 v on the meter.

c) Defocus spot and check regulation with INTENSITY cw.

3. SET CALIBRATOR AMPLITUDE AND CHECK CAL ATTENUATORS

Setup

a) With CALIBRATOR turned off, connect voltmeter to pin 7, V884.

The lower lead on rear wafer of Cal switch is the same point as pin 7, V884.

3. (con't'd)

Adjustment

b) Adjust Cal Amp (R871) for +100 v on the voltmeter.

c) Turn CALIBRATOR on. The voltmeter must now read between 40 and 60 volts to be within the 20% calibrator symmetry spec at line voltages from 105 to 125 v ac.

d) Connect the CAL OUT to the test scope INPUT and check all positions of the CAL switch for within ±2% accuracy.

4. CRT ELECTRICAL CENTER

Setup

a) Turn the INTENSITY control cw until a dot appears on the CRT. Adjust FOCUS.

b) Short the vertical deflection plates together and the horizontal deflection plates together.

Check

c) The spot should be centered within ±0.3 cm vertically and ±0.6 cm horizontally.

5. CRT ALIGNMENT

Setup

a) Remove the right-hand test load and install a Type 67 plug-in.

b) Obtain a trace on the CRT.

Adjustment

c) Adjust TRACE ALIGNMENT so trace is parallel to center horizontal graticule line.

6. ALTERNATE SWEEP

Setup

a) Set vertical test load to DUAL TRACE.

b) Obtain a trace on CRT.

Check

c) Check for alternate sweep operation.

7. DUAL TRACE BLANKING

Setup

a) Connect a jumper between the SIGNAL INPUT and Z AXIS INPUT of the TU-4.
b) Switch TU-4 from DUAL TRACE to NORMAL.
c) Apply 1 cm of 100 kc square wave from the 105, unterminated, to the SIGNAL INPUT.

Check

d) Set CRT CATHODE SELECTOR switch to DUAL TRACE CHOPPED BLANKING while observing the CRT display. The upper portion of the square wave should disappear while the lower part gets brighter.

8. GEOMETRY AND CRT CHECK

Setup

a) Replace TU-4 in left plug-in compartment with a Type 60.
b) Set Type 67 to 1 msec/cm.
c) Apply 1 msec and 100 μs time markers from the 180 and obtain a stable display of 6 cm amplitude.
d) Adjust FOCUS and ASTIGMATISM controls for the sharpest display.

Adjustment

e) Short CRT vertical plates together, then measure voltage to ground (approx. 180 v). Connect meter to arm of Geometry Adj (R940) and set to voltage observed above.

R940 sets flood gun anodes to average of CRT vertical deflection plate voltage.

f) Check focus for no overlapping of time markers within the middle 8.8 horizontal cm of the graticule.

1.3 mm max tilt or bowing of vertical trace in 8 cm of deflection. 1 mm max bowing of horizontal trace.

9. CRT VERTICAL COMPENSATION AND SENSITIVITY

Setup

a) Install a CRT capacitance standardizer behind the Type 60. Apply 6 cm of 10 kc square wave from the 105. The 105 should be terminated in a 50 Ω 10XT, 50 Ω cable and 50 Ω terminator, in that order.
b) Set the Type 67 for a stable display.

Adjustment

c) Despress INTEGRATE button and adjust C760 for best square wave display on the CRT.

d) Remove the input signal and connect a voltmeter across the vertical deflection plates.

e) Note the change in meter reading while moving the trace 6 cm.

f) Divide the change in meter reading by 6 to find the vertical sensitivity. It must be between 18.5 v/div and 20.5 v/div.

Before adjusting C760, check that vertical deflection plate leads are uniformly spaced (3/4 in.). Depressing the INTEGRATE button presents the proper load to the CRT vertical deflection plates for setting C760.

10. CRT HORIZONTAL COMPENSATION AND SENSITIVITY

Setup

a) Interchange plug-ins. The 67 will be in the left side and the Type 60 with capacitance standard will be in the right side.

b) Connect the voltmeter across the horizontal deflection plates.

Adjustment

c) Note the change in meter reading as the trace is moved 10 cm.

d) Divide the change in meter reading by 10 to find the horizontal sensitivity. It must be between 17.5 v/cm and 19.3 v/cm.

e) Remove the voltmeter from the horizontal plates and apply 8 cm of 10 kc square wave to the Type 60 input.

f) Set Type 67 for a stable display.

g) Adjust C761 for best square wave. (no need to depress INTEGRATE)

Before adjusting C761, check that horizontal deflection plate leads are uniformly spaced (1/2 in.).

11. FREQUENCY RESPONSE

Setup

a) Remove the CRT capacitance standardizer and re-insert the Type 60 in the right-hand plug-in box.

b) From a Type 190 terminated in 50 Ω, apply 200 mv (4 cm) of 50 kc signal to the Type 60 input.

Check

c) Change the 190 to 1.0 mc. Don't change the 190 amplitude.

d) There must be at least 2.8 cm of deflection on the CRT (-3 db point).

e) Reverse plug-ins and check response of other axis, using same procedure.

12. LINE TRIGGER PHASING

Setup

a) Connect an X10 probe to the Type 60 input.
b) Touch the other end of the probe to the ac line leading to the fuse holder.
c) Set the 67 TRIGGER on '+' Line.
d) Adjust TRIGGER LEVEL for a stable display.

Check

e) Switch TRIGGER SLOPE from '+' to '-' and check display for triggering on proper slope.
f) Reverse plug-ins and repeat above operation.
g) Re-install the Type 60 in left compartment and 67 in right compartment.

With the sweep plug-in in the left compartment, the trace moves from bottom to top of the screen and '+' slope of waveform is to the right.

13. EXT CRT CATHODE

Setup

a) Remove ground strap from EXT CRT CATHODE input on scope rear.
b) Apply 10v of CAL signal from test scope to EXT CRT CATHODE.
c) Set CRT SELECTOR switch to EXT CRT CATHODE.
d) Set Type 67 TIME/CM to 1ms.

Check

e) Check trace for intensity modulation.

14. CRT INTENSIFIED CIRCUIT (see Step 15)

Setup

a) Remove Type 67 and replace with a 3B1.
b) Set the 3B1 TIME/DIV and DELAY TIME RANGE to 1msec.
c) Set 3B1 MODE switch to NORM and NORMAL SWEEP TRIGGERING to AUTO. There should be a sweep on the CRT.

Check

d) Set 3B1 MODE switch to INTEN.
e) Check for an intensified portion of the sweep display.

15. CRT INTENSIFIED CIRCUIT (alternate method)

If a 3B1 is not available, the INTENSIFIED CIRCUIT can be checked by the following method:

Setup

a) Turn the 564 power off and remove the Type 67 plug-in.

Adjustment

b) Use VOM in X10 position and measure the forward resistance from pin 14, right hand interconnecting socket to junction of D838, D839. Should be about 35 Ω.

D838, D839 are located on ceramic strips directly below high voltage cover. Some Preproduction instruments may have R837 (470 Ω) located between D838 and D839. If so, this is an error. Correct as per schematic and proceed with Step b.

c) Check reverse resistance for open circuit (VOM, X100k).

d) Measure forward resistance from GND to junction of D838, D839. Should be about 35 Ω.

e) Check reverse resistance from D838, D839 junction to GND. Should be about 2.4k.

f) Under operation (67 installed) check voltage at junction of D838, D839 for approximately 0.5 v.

STORAGE CIRCUIT

IMPORTANT: Be certain to press and release ERASE occasionally during any check or adjustment of the storage circuit to assure proper appearance.

Do not use old tentative schematic for reference because of circuit changes.

If instrument appears to function erratically in STORE position, problem may be poor contact between CRT and contacts on inside of CRT shield. Slight CRT re-alignment may cure problem.

16. A AND B FLOOD GUN BIAS

Setup

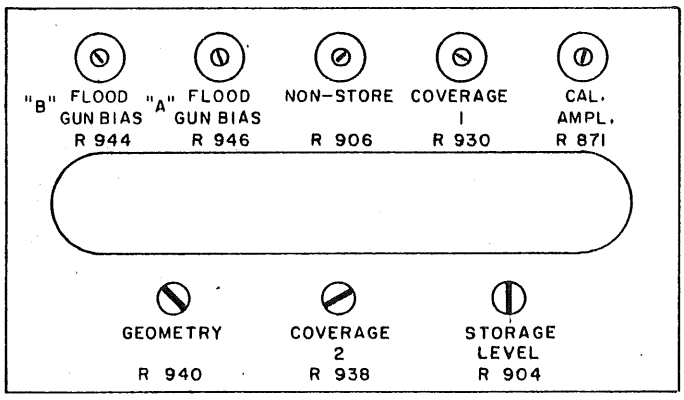
a) Replace Type 3B1 with a Type 67.

b) Set DISPLAY switches to STORE.

c) Set TRIGGERING LEVEL for no sweep.

Adjustment

d) Hold DISPLAY switches in ERASE position and adjust A and B Flood Gun Bias (R946-R944) for most uniform (brightest) screen coverage.



PORTION OF CAL CHASSIS

RECALIBRATION

NOTES

STORAGE CIRCUIT (con'd)

17. COVERAGE 2

Setup

a) Set DISPLAY switches to STORE.
b) Connect meter to arm of Coverage 2 (R938).

Adjustment

c) Adjust Coverage 2 to just below the point where a definite increase is noted in background brightness. Nominally 130-150 v.

The effect of this adjustment may be easier to see if you depress ERASE while adjusting Coverage 2.

18. STORAGE LEVEL

Setup

a) Set DISPLAY switches to NON-STORE. Display 100 μsec markers from 180. With VARIABLE, set TIME/DIV to 40 μsec/cm (4 markers in 10 cm). Obtain stable display.
b) Remove input signal. TRIGGER SOURCE to INT, free run, INTENSITY full cw, focus trace.
c) Set TRIGGERING LEVEL to "0". DISPLAY switches to STORE. Turn Storage Level (R904) ccw. Connect voltmeter between ground and V923, pin 3.

The speed of the beam at this point is 25 cm/ms. Do not change TIME/DIV controls.

CAUTION: Set meter for 300 v range.

Adjustment

The object of the following adjustment is to find the "stable range" of the storage tube and then to set the "operating level" midway between those points.

d) Alternately cause a "single sweep" (by rotating the TRIGGER LEVEL knob about the zero level) and increase Storage Level (R904) until one "single trace" will store anywhere (when positioned vertically to various points) within the 8 x 10 cm graticule area, with maximum "breaks" in the trace of 1 mm. This point will be called the "Writing Threshold" (WT). ERASE, then check to see that Storage Level is WT. Record this voltage as WT.

Single sweep can be effected using a Type 2B67 if available.

The following is a typical example of results for Step 18 for a new CRT. As the CRT ages, higher readings may be obtained when properly adjusted.

Writing Threshold	(WT)	175
Fade-Positive	(FP)	225
Operating Level	(OL)	200
(midway between WT and FP)		

18. Adjustment (con'd)

e) Continue to increase Storage Level until single trace appears to blend into background or until two single traces (0.025 in. apart) appear to run together, causing poor resolution. Record this voltage as FP. Turn Storage Level (R904) ccw midway between WT and FP. Record this voltage as OL.

With R904 set at proper OL, the 564 (with tin oxide CRT screen) should at least meet the 25 cm/ms Writing Rate (R_W) spec when focused at max intensity.

Typically, for a tin oxide screen, the R_W is approximately 33 cm/ms (three 100 µs markers in 10 cm) when focused at max intensity.

If desired, R_W can be increased by turning R904 toward the FP voltage, but with reduced contrast.

19. COVERAGE 1

Setup
a) Set TRIGGERING LEVEL for no sweep.
b) Set DISPLAY switches to STORE.
c) Connect meter to juncture of R931 (100 k) and R932 (33 k).

Located on Cal chassis near V884.

Adjustment
d) Adjust Coverage 1 (R930) for best overall appearance of screen. Nominally 75 v.

20. NON-STORAGE LEVEL

Setup
a) Set UPPER DISPLAY switch to NON-STORE.
b) TRIGGERING LEVEL to FREE RUN.
c) Set trace to non-storing half of CRT screen.
d) Set INTENSITY full cw and adjust FOCUS.

Adjustment
e) Press and release LOWER ERASE.
f) Adjust Non-Storage Level (R906) for best screen division between "stored" and "non-stored" halves.

Non-Storage Level should be adjusted to a point below WT, so CRT screen will not store a repetitive trace in NON-STORE position, yet as high as possible to reduce voltage across gap between upper and lower screen halves.

g) Set DISPLAY switches to NON-STORE. CRT should go dark immediately. If it doesn't, or background level is too bright, adjust NON-STORE (R906) slightly ccw until it does.

21. LOCATE

Setup
a) Set DISPLAY switches to NON-STORE.
b) TRIGGERING LEVEL to FREE RUN.
c) Set start of trace to first graticule line.

RECALIBRATION	NOTES
21. LOCATE (con'd)	
Check	
d) Press LOCATE to check that start of trace moves into preview area at left side of screen then intensifies.	The LOCATE switch (when pressed slowly) should have a stepping sequence, where the start of trace moves to left before intensifying.
22. INTEGRATE	
Setup	
a) Set TRIGGERING LEVEL for no sweep.	
b) Set DISPLAY switches to STORE.	
Check	
c) Press INTEGRATE to check that screen appears dark, similar to NON-STORE position.	INTEGRATE may be checked further by decreasing INTENSITY until a "single sweep" will not store. Then depress INTEGRATE while several "single sweeps" are actuated, thus allowing the energy of several sweeps to combine to produce a trace.
d) Check all functions of DISPLAY controls.	

CERTIFICATION PROCEDURE

The following portion of the 564 may be certified:

FUNCTION	CALIBRATION STEP NO.	STANDARD TEST EQUIPMENT
Square-Wave Calibrator 100 volts to 0.1 volt	3	Standard Calibrator from (FMS)

In order for the certification to be valid, the following conditions will have to exist:

1) The STANDARD CALIBRATOR used will have to be traceable to NBS and have a certificate on file verifying its certification.

2) Record of customer's instrument certification must be recorded and placed on file. The record should include the bench numbers or description and s/n of the standard test equipment used to certify the 564.

3) A certificate (TEK 001-810) should be filled out and returned to the customer with the instrument. The instrument as whole is considered certified.

CALIBRATION CHECK SHEET

1. Check Power Supplies:

	Tolerance	Ripple	Adjust
-100.0 v	____	____	____
+125.0 v	____	____	____
+300.0 v	____	____	____
- 12.2 v	____	____	____

2. High Voltage Adj ____ R841
3. Calibrator ____
4. CRT Elect. Center ____
5. CRT Alignment ____
6. Alternate Sweep ____
7. Dual Trace Blanking ____
8. CRT Check:
   a) Geometry, 1.3 mm tilt in 8 cm ____
      1 mm max bowing in 8 x 10 cm area ____
   b) Focus, middle 8.8 cm ____
9. CRT Vertical Compensation ____
   CRT Vertical Sensitivity
   18.5 v/cm to 20.5 v/cm ____
10. CRT Horizontal Compensation ____
    CRT Horizontal Sensitivity
    17.5 v/cm to 19.3 v/cm ____
11. Frequency Response, 1 mc both sides ____
12. Line Trigger Phasing, right side ____
    left side ____
13. Ext CRT Circuit ____
14 or 15. CRT Intensified Circuit ____
16. A and B Flood Gun Bias ____
17. Coverage 2 ____
18. Storage Level. WT____ FP____ OL ____
19. Coverage 1 ____
20. Non-Storage Level ____
21. Locate ____
22. Integrate ____

FACTORY CALIBRATION PROCEDURE

CONTENTS:

564

INTRODUCTION:

This isn't a field recalibration procedure as is the procedure in your instruction manual. This is a guide in calibrating brand-new instruments, just assembled instruments that have never been turned on before. Therefore it calls out many procedures and adjustments that are rarely required for subsequent recalibration.

Publication:
061-570
January 1963

Supersedes
July 1962

For all serial numbers.

Even though we wrote this procedure primarily for our own factory test department, it's valuable to others also if used with some caution:

1. 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.

2. **Factory circuit specifications** are not guaranteed unless they also appear as catalog or instruction manual specifications. Factory circuit specs usually are tighter than advertised specs. This helps insure the instrument will meet or exceed advertised specs after shipment and during subsequent field recalibrations over several years of use. Your instrument may not meet factory circuit specs but should meet catalog or instruction manual specs.

3. **Presetting internal adjustments,** if mentioned, usually is unnecessary. This is helpful for "first-time" calibration only. If internal adjustments are preset, you'll have to perform a 100% recalibration. So don't preset them unless you're certain a "start-from-scratch" policy is the best.

4. **Quality control men steps.** Factory calibration procedures are for our test department calibrators who first calibrate the instrument. Quality control men then check the initial calibration and perform additional fine points such as trimming resistor leads, installing shields, etc. In some cases a factory calibration procedure instructs the calibrator not to perform these fine points. You'll ordinarily have to include these fine points in your calibration.

In this procedure, all front panel controls for the instrument under test are in capital letters (SENSITIVITY) and internal adjustments are capitalized only (Gain Adj).

ABBREVIATIONS:

a	amp
ac	alternating current
approx	approximately
b	base
bulb	light, lamp, etc.
c	collector
ccw	counterclockwise or full counterclockwise
cer	ceramic
cm	centimeter
comp	composition (resistor)
cps	cycles per second
crt	cathode ray tube
cw	clockwise or full clockwise
db	decibel
dc	direct current
div	division
e	emitter
emc	electrolytic, metal cased (capacitor)
fil	filament
freq	frequency
gmv	guaranteed minimum value (capacitor)
gnd	chassis ground
h	henry
hv	high voltage
inf	infinity
int	internal
k	kilo (10^3)
k	kilohm
m	milli (10^{-3})
ma	milliamp
max	maximum
mc	megacycle
meg	megohm
mh	millihenry
mid r	midrange or centered
min	minimum
mm	millimeter
mpt	metalized, paper tubular (capacitor)
msec	millisecond
mt	mylar, tubular (capacitor)
mv	millivolt
μ	micro (10^{-6})
μf	microfarad
μh	microhenry
μsec	microsecond
n	nano (10^{-9})
nsec	nanosecond
Ω	ohm
p	pico (10^{-12})
pbt	paper, "bathtub" (capacitor)
pcc	paper covered can (capacitor)
pf	picofarad ($\mu\mu$f)
piv	peak inverse voltage
pmc	paper, metal cased (capacitor)
poly	polystyrene
pot	potentiometer
prec	precision (resistor)
pt	paper, tubular (capacitor)
ptm	paper, tubular molded (capacitor)
ptp	peak-to-peak
sec	second
sn	serial number
term	terminal
tub	tubular (capacitor)
unreg	unregulated
v	volt
var	variable
w	watt
WW	wire wound
x-former	transformer

TYPE 564 OSCILLOSCOPE
FACTORY CALIBRATION PROCEDURE
(Tentative)

The following instruments and equipment are needed:

1	V.O.M.	
1	Type 60 Plug-In	
1	Type 3B1 Plug-In (Optional)	
1	Type 67 Time Base	
2	Type TU-4 Test Loads	
1	Type 190 Constant Amplitude Signal Generator	)
1	Type 180 Time Mark Generator	) TU-50
1	Type 105 Square Wave Generator	)
2	5:1 T Pad (B52T5)	
1	CRT Capacitance Standardizer	
1	52 Ω Terminating Resistor	
1	8 cm Graticule Plate	
1	Calibrated Photometer	
1	Type 531 Oscilloscope with Type H Plug-In or equivalent	

Type 105 - use a 52 Ω cable terminated with a 52 Ω terminating resistor
Type 190 - Attenuator head should be terminated with a 5:1 T Pad (B52T5)

The CRT Capacitance Standardizer is in the form of an adapter. It is mounted between the Indicator connecting plug and a Type 60 Plug-In. The Standardizer is set by a special method not outlined in this calibration procedure.

PRELIMINARY INSPECTION:

Check for long ends, unsoldered joints, wire dress and check controls for smooth mechanical operation. Set Type 564 controls as follows:

FOCUS	Mid-range	ASTIGMATISM	Mid-range
DISPLAY	Non-storage	ALIGNMENT	Mid-range
INTENSITY	ccw	CALIBRATOR	OFF
POWER	OFF		

All internal adjustments to Mid-range.

1. CHECK POWER SUPPLY RESISTANCE TO GROUND:

Supply	Approx. Res.	Supply	Approx. Res.
-100 v	10 k	+65 Unreg.	10 k
+125	15 k	+190 v Unreg.	5.5 k
+300	60 k	+380 v Unreg.	65 k
*-12 v	*135 Ω	+475 v Unreg.	35 k
*+6 v	*75 Ω		

* Common (+) lead connected to ground.

2. CHECK VOLTAGES, RIPPLE AND REGULATION:

Insert TU-4 Test Loads into plug-in compartments. Set the Test Loads as follows: SUPPLY, -100 v; POSITION, Mid-range; LOAD, FULL LOAD; INDICATOR, 564. Turn POWER ON.

Connect a shielded cable from the RIPPLE and DC ERROR CONNECTOR of either TEST LOAD to the INPUT on Type H Unit. Set Type H VOLTS/DIV to .01 and the INPUT SELECTOR to DC. Type 531 TIME/CM to 5 msec, +LINE, AUTO. Each Test Load is capable of half-loading the supplies when the LOAD switch is on FULL LOAD, therefore, in order to check the supplies under full load conditions for regulation both TEST LOADS should be switched to FULL LOAD. The PUSH TO REMOVE RIPPLE button removes the ripple so that a more accurate reading may be obtained. By depressing the PUSH FOR GROUND REFERENCE button, a zero error reading may be obtained on the test scope.

Set the -100 v Adj. for a zero indication on the test scope. Each division on the test scope represents a 1% error in supply voltage. When switching the test load to the other supplies, the display must be adjusted within ±.5 divisions (±.5%) of the zero reference.

Check each supply for regulation and ripple as the line voltage is varied from 105 to 125 v AC under full and no load conditions. Re-adjust the line voltage to 117 v AC. Make certain +475 v unregulated is present.

3. CHECK LINE POLARITY NEONS:

Check to see if UPPER NEON is on in test load units. UPPER NEON, ON, with LOWER NEON, OFF indicates correct line polarity to interconnecting plugs. If both neons are on, line polarity is reversed. Check both sides of Indicator.

4. SET CAL. AMP:

With the CALIBRATOR OFF, adjust Cal. Amp. for 100 v at pin No. 7 of V884. Turn CALIBRATOR ON: voltage must read between 40 and 60 volts with any setting of the calibrator voltage switch. Calibrator symmetry ±20%.

5. SET HIGH VOLTAGE:

Connect a voltmeter to the CRT filament end of R853 (100 k). Set the HV Adj. for -3300 v. Remove the voltmeter connections. With the INTENSITY control set at maximum intensity position (cw), check HV supply for regulation as the line voltage is varied from 105-125 v AC. Re-adjust the line voltage to 117 v AC.

6. CHECK ALTERNATE SWEEP:

Remove the right hand Test Load and install a Type 67. Set 67 TRIGGER LEVEL to FREE RUN and Test Load to DUAL TRACE and check for dual trace. Interchange Type 67 and Test Load Unit. Check alternate sweep operation.

7. CHECK DUAL TRACE BLANKING FROM PLUG-IN: (Left side only)

Apply a 100 kc signal from Type 105 to SIGNAL INPUT conn. on Test Load. Set Type 105 amplitude control to obtain one major division of display on CRT. Adjust intensity control for normal intensity. Connect a jumper from the SIGNAL INPUT to the Z AXIS

INPUT. With the CRT CATHODE SELECTOR set at DUAL TRACE CHOPPED BLANKING, the upper portion of the CRT display should disappear while the lower portion gets brighter. Remove the signal from the input.

8. CHECK SCALE ILLUM CONTROL AND SET CRT ALIGNMENT:

Install bezel and tighten CRT clamp. Check the SCALE ILLUM control to see that there are no open spots in the pot and that the lights are brightest when the control is full right (cw). With the Type 67 set at 1 msec/DIV and the TRIGGER LEVEL to FREE RUN, position the trace on the CRT and set the ALIGNMENT control to align the trace with the horizontal graticule lines.

9. CHECK CALIBRATOR VOLTAGE STEPS:

Check calibrator voltage steps against a known accurate Type 63 or a test scope vertical amplifier.

CALIB.	VOLTS/DIV	DEFL.	CALIB.	VOLTS/DIV	DEFL.
100 v	20 v	5 div	.1 v	20 mv	5 div
50 v	10 v	5 div	50 mv	10 mv	5 div
20 v	5 v	4 div	20 mv	5 mv	4 div
10 v	2 v	5 div	10 mv	2 mv	5 div
5 v	1 v	5 div	5 mv	1 mv	5 div
2 v	.5 v	4 div	2 mv	1 mv	2 div
1 v	.2 v	5 div	1 mv	1 mv	1 div
.5 v	.1 v	5 div	.5 mv	1 mv	.5 div
(.1 v into 50 Ω)					
.2 v	50 mv	4 div	.2 mv	1 mv	.2 div

10. CHECK VERTICAL SENSITIVITY AND VERTICAL CRT ELECTRICAL CENTER:

Remove Type 63 (if it was used in the previous step) and install Type 60 into the left-hand compartment. Connect a meter across vertical deflection plates. Set trace to an extreme graticule line. Note meter reading. Move trace 8 divisions, note meter reading. Divide the difference in meter readings by 8 and this will be its vertical sensitivity. It must be between 18.5 V/DIV and 20.5 V/DIV. Connect a shorting strap to the vertical CRT plates. The trace must be within .3 major divisions of graticule center. With shorting strap in place, measure voltage from plates to ground. Adjust G2, 3 to this.

11. CHECK GEOMETRY: (use the 8 cm graticule plate)

Apply 1 msec markets to INPUT. Set Type 67 to 1 msec/DIV and adjust TRIGGERING LEVEL for stable display. Adjust the amplitude until the markers reach from the top to the bottom of the graticule. Adjust the ASTIG. control in conjunction with the FOCUS control for fine trace. Check Geometry.

12. ADJUST VERTICAL CRT PLATES COMPENSATIONS AND CHECK INTERNAL TRIGGERING:

Install a CRT Capacitance Standardizer in the left-hand compartment behind a Type 60 Plug-In. Apply a 10 kc signal from Type 105 to INPUT (use 4 major divisions of display). Set Type 67 for +SLOPE, AC COUPLING and INT SOURCE. Adjust the TRIG. LEVEL for a stable display. Press INTEGRATE button; set CRT plate compensation, C760, for

best square wave. Check internal trigger lead by switching AC-DC-GND switch to GND. The sweep should disappear.

13. CHECK HORIZONTAL SENSITIVITY AND HORIZONTAL CRT ELECTRICAL CENTER:

Interchange plug-ins so that the Type 67 is now in the left-hand compartment and the Type 60 in the right. Connect a meter across the horiz. defl. plates. Repeat procedure for checking sensitivity in Step No. 10, but use ten divisions. Horiz. sens. must be between 17.5 V/Div. and 19.3. Connect a shorting strap to the horiz. CRT plates. The trace must be within .6 major div. of graticule center.

14. ADJUST HORIZONTAL CRT PLATES COMPENSATIONS AND CHECK INTERNAL TRIGGERING:

Install a CRT Capacitance Standardizer in the right-hand compartment behind a Type 60 Plug-In. Apply a 10 kc signal from Type 105 to INPUT (use 4 major div. of display). Set Type 67 for +SLOPE, AC COUPLING and INT. SOURCE. Adjust the TRIG. LEVEL for a stable display. Set CRT plate compensation, C761, for best square wave. Check internal trigger lead by switching AC-DC-GND to GND. The sweep should disappear.

15. CHECK FREQUENCY RESPONSE:

With a Type 60 in the right-hand compartment, set the VOLTS/DIV switch to .05 and the AC-DC-GND to DC. Apply 200 mv of 50 kc signal from Type 190 to the INPUT (four maj. div.). Tune Type 190 to 1 mc. Do not change Type 190 OUTPUT AMPLITUDE. There must be at least 2.8 maj. div. of defl. remaining. (3 db point) Reverse plug-ins, checking response on other axis using same procedure.

16. CHECK LINE TRIGGER PHASING (both compartments):

Connect a 10X probe to the Type 60 INPUT. Connect the probe to the AC line at the fuse holder. Check that the Type 67 triggers on the proper phase ±.

17. CHECK EXTERNAL CRT GRID INPUT:

Remove EXT CRT CATHODE ground strap from rear of scope and insert a 10 v signal from test scope SQUARE WAVE CALIBRATOR to EXT CRT CATHODE. Set the CRT CATHODE SELECTOR to EXT CRT CATHODE and check the sweep for intensity modulation. Remove the signal and replace the ground strap.

18. CHECK CRT INTENSIFIED CIRCUIT:

Remove the Type 67 Plug-In from the right-hand compartment and install a Type 3B1 Plug-In. Set the Type 3B1 as follows: TIME/DIV and DELAY TIME RANGE, 1 mSEC; MODE switch at NORM and NORMAL SWEEP TRIGGERING COUPLING, AUTO. The sweep should appear on the CRT. Set the MODE to INTEN and check for an intensified portion of the sweep.

Where 3B1 is not available, check anode of D835 for .3 volt.

STORAGE CIRCUIT

1. Depress ERASE button. Adjust flood gun grids for most uniform (brightest) coverage of screen. R935-937. Release button.

2. Adjust wall band 5 (R938) until a definite increase is noted in background brightness (≈150 v).

3. Attach common lead of meter to ground; VOA lead to lowest notch on strip at rear of cal. chassis. Set DISPLAY switches to STORAGE. Adjust storage level pot to OL given on CRT data card. (If OL data is not available, procedure is:) 564 set as in Cal. Procedure. Intensity, full cw. 2B67, 40 μsec/cm; SINGLE SWEEP; FREE RUN: Main storage level, ccw.

   NOTE: To arrive at 40 μsec/cm in step 3, use four 100 μsec markers (from type 180) for 10 cm.

   Alternately depress SINGLE SWEEP and increase STORAGE LEVEL pot, R904, until one single trace will store anywhere in usable portion of screen with maximum "breaks" of 1 mm.

   Record meter reading as WT. Continue procedure until single trace appears to blend into background or spread causing poor resolution .025". Record this voltage as FP.

4. Adjust pot ccw until reading is halfway between WT and FP. This is recommended OL.

5. Adjust wall band 6 and 7 for best appearance of screen (No. 6, ≈75 v; No. 7 ≈50 v).

6. Turn 1/2 screen display to NON STORAGE. Press and release ERASE. Adjust NON STORAGE pot, R906, for best screen division between "stored" and "non-storage" halves. Make sure repetitive sweep will not store in non-store position.

   NOTE: When making any adjustment of storage circuit, No. 1 through No. 7 above, the ERASE button should be pressed after each change to assure proper appearance.

   NOTE: If wall bands 2 and 3 are changed, the store level may have to be readjusted.

7. Check all functions of DISPLAY and ERASE controls.

8. Set start of free running trace to left graticule mark. Turn sweep off (single sweep 2B67). Press LOCATE button. Stationary dot should appear to left of first graticule mark.

9. Press INTEGRATE button. Screen should appear completely dark, much like NON STORE.

CAPABILITIES

FEATURES AND LIMITATIONS

December 28, 1962

Writing rate: 200,000 cm/sec--decreases with age

We've built several T564's with an initial writing rate of 200,000 cm/sec but this writing rate decreases progressively with age:

mode	writing rate decrease
non-stored	least
stored - not written	appreciable
stored - written	greatest

It's possible to retrieve some of the writing rate loss by operating the tube for an hour with the back plate voltage advanced to maximum.

Life: 6 months

We're trying to be conservative in our expectations of operating life at this time because we haven't sufficient operation time on these tubes. We had 400 hours on one tube, when the test ended with a catastrophic failure, but we did learn something:

Beginning with a stored writing rate of 200 cm/ms and periodically recovering writing rate by operating the tube for an hour with back plate voltage advanced to maximum, the defined end point of 25 cm/ms occurred in 6 months by extrapolation from 400 hours.

Warranty -- a problem

The results of the life test imply that under our standard warranty we'd have to replace the crt at least once during the warranty period. Marketing is extremely reluctant to assign a limit of 6 months to the warranty on the storage feature.

Double screen causes problems

If you make a practice of storing in one half and operating conventionally in the other, the half used for storage will eventually decrease in writing rate to the extent that the Operating Level must be raised too high for satisfactory operation of the non-stored half. We may be able to correct this by providing separate Operating Level adjustments on each half.

LOCATE button -- a big convenience

Don't overlook the convenience of the LOCATE button. It allows the spot to appear at the left edge of the crt, after which you can position the beam vertically before storing a trace.

Programmable erase -- relay best bet for now

The only convenient (for us) programmable erase method at this time is to mount an old-fashioned electro-mechanical relay in the scope. A relay can be wired up for a relatively low voltage remote control but piping the 400 volts around creates a safety hazard as well as cross talk and time constant problems. An electronic solution is the most desirable and we'll probably have to design one in time.

INTEGRATE button increases writing rate

The INTEGRATE button opens the flood-gun cathode circuits:

a. Writing is stored more effectively on repetitive traces.
b. Stored writing rate of repetitive traces becomes more than ten times as fast.

When the crt stored writing rate has decreased well below the 25 cm/ms figure, it's still possible to store a single trace in the integrate position and read it out. You can probably more than double the single-shot writing rate by holding down the INTEGRATE button a half-minute or so before the event is recorded (an extra thumb is useful).

016-217 bezel, for adapting C-12, C-13 and C-19 cameras to 8 x 10 cm rectangular crt scopes

Plastic insert for glass-envelope crt's

A hard plastic insert in the bezel provides an ambient light seal for glass-envelope rectangular crt's--remove it when the bezel is used on scopes equipped with ceramic-envelope crt's.

564 rectangular ceramic crt. Use 016-217 bezel, remove plastic insert.

The plastic insert will butt against the face plate of a ceramic-envelope crt and prevent the bezel from seating flush to the scope front panel. If you then try to bring the bezel into contact with the scope front panel by tightening the bezel mounting nuts, you'll exert excessive and dangerous pressure against the crt faceplate.

Removing plastic insert

Use a small blunt probe or screwdriver to remove the plastic insert. Looking at the front of the bezel, insert the tool through the small rectangular openings and gently apply pressure to the plastic retaining ears. You can reinstall the plastic insert if you ever need to.

PLUG-IN COMPATIBILITY

May 11, 1962

The following plug-ins are directly compatible with the 564:

2A50	63	3A74
51	67	3S76
59	3C66	3T77
2A61	72	3B1
60	75	3A1

STORAGE DISCUSSION

Non Store:

In the NON STORE position the scope behaves like the 561A. The back plates are held about 100 volts above ground and the flood guns remain operating.

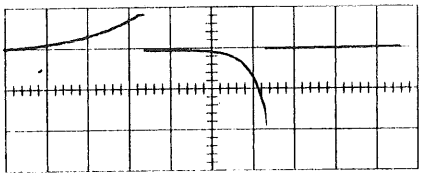
Store:

When the display is changed to STORE, the back plates are reduced to zero momentarily, then rise to the operating level (OL) which is around 200 volts.

Erase:

The ERASE position is spring-loaded and first lifts the back plates to more than 400 volts, then, as the switch flips back, the back plates fall to zero and RC back up to around 200 volts for the STORE position. While the switch is in the STORE position momentarily, the last two collimator rings (coverage) rise to approximately 60 volts.

Depending on the particular CRT, the non-storage level will vary between 100 and 115 volts. The operating level will vary between 150 and 200 volts.



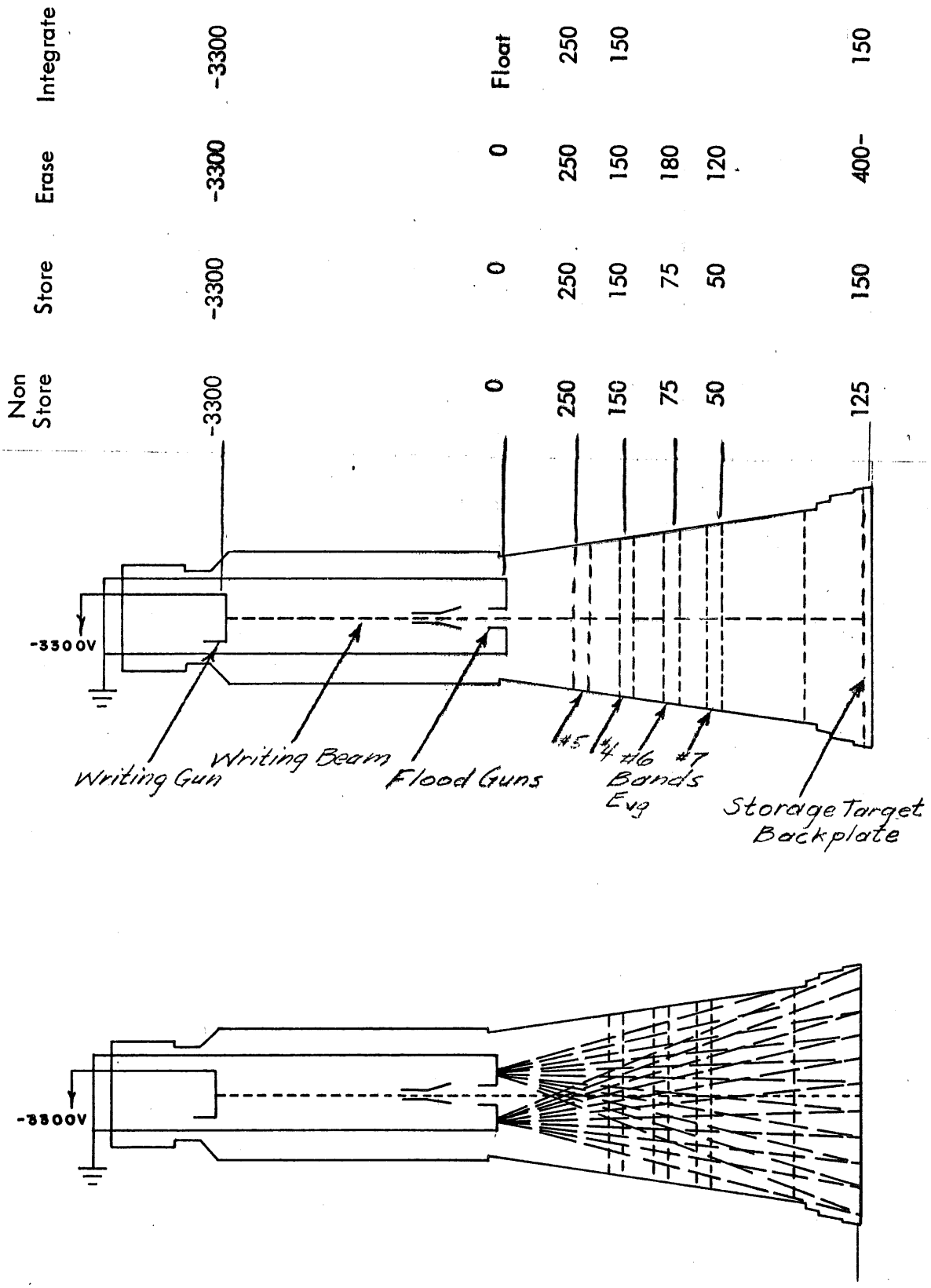
Erase-cycle characteristics; pulse applied to back plate. 200 volts/div; 50 ms/div.

Locate:

When you push the LOCATE button, you remove +125 v from one deflection blanking plate; this unblanks the beam. You also connect +335 v to R763 and R764, which allows the left-hand deflection plate to assume a small positive increment in addition to the left-hand reference point determined by the position control. A non-storing margin remains on the left-hand edge of the CRT. If the trace is positioned just to the edge of the store area, the LOCATE spot will appear about 1/8 inch to the left.

STORAGE TUBE NOMENCLATURE

Nomenclature	Abbrev.	Definition
Background Light Level	BL	The average brightness of the light emitted by the storage target when completely erased, with the storage target backplate set at a given voltage.
Brightness Uniformity Ratio	BR	The ratio of the brightest to the dimmest spot when the target is fully written.
Collimation Lenses		An electrostatic low-voltage lens used to adjust the trajectories of the viewing-gun electrons.
Contrast Ratio	CR	The ratio of stored brightness to background light level, with the storage target backplate set at a given voltage.
Fade Positive	FP	The storage-target-backplate voltage at which an unwritten area fades up as bright as a written area anywhere within the quality area.
Operating Level	OL	A point within the operating range where the tube gives optimum performance; usually the midpoint of the operating range.
Operating Range	OR	The storage-target-backplate voltage range within which information can be stored at writing speeds in excess of a specified value (fade positive minus writing threshold).
Retention Threshold	RT	The lowest storage-target-backplate voltage at which written information can be stored anywhere within the quality area.
Stable Range	SR	The storage-target-backplate voltage range within which information can be stored (fade positive minus retention threshold).
Storage Target	ST	A film having the ability to store information when bombarded by an electron beam.
Storage Target Backplate	STB	A conductive surface physically supporting, and electrically coupled to, the storage target.
Stored Brightness	SB	The average brightness of stored information, with the storage target backplate set at a given voltage.
Viewing Gun	VG	A low-energy electron gun giving a wide-angle beam used to irradiate the entire screen in the storage mode.
Writing Gun	WG	A high-energy electron gun giving a narrow focused beam. This beam can be electrostatically deflected and is used to write the information to be stored.
Writing Speed	WS	The speed, in cm/sec, at which the writing beam will register stored information when scanning the storage target, with the storage target backplate set at a given bias within the stable range.
Writing Threshold	WT	The lowest storage-target-backplate voltage at which a signal of fixed writing speed can be completely stored.



This is only a schematic, not an accurate representation.
See also Technical Data, T564 for typical operating ranges.

STORAGE MODE TECHNICAL DISCUSSION

Certain added elements of the CRT make storage possible: the flood guns, wall bands, storage target backplate, and the storage target. When the correct voltage is applied to each of these elements, the CRT becomes a storage tube. When these voltages are changed, the CRT reverts to a conventional type.

Storage Target Backplate

This is a transparent conductive coating on the inside of the CRT faceplate that is divided into upper and lower halves by a narrow insulating line. When both DISPLAY switches are in STORE, a store voltage is applied to both halves and a low background illumination is seen. If either switch is moved to NON STORE, the voltage on the nonstored half drops to a nonstore value and the background illumination on that half disappears. If either switch is moved to ERASE, the erased half becomes uniformly bright until the switch is released.

Storage Target (viewing screen)

The storage target is a special insulating layer containing phosphor.

Flood Guns

The flood guns are a high current source of low-velocity electrons. When the target and wall band voltage are properly adjusted, the electrons from these flood guns are directed to cover the CRT faceplate evenly. This results in a slight background illumination.

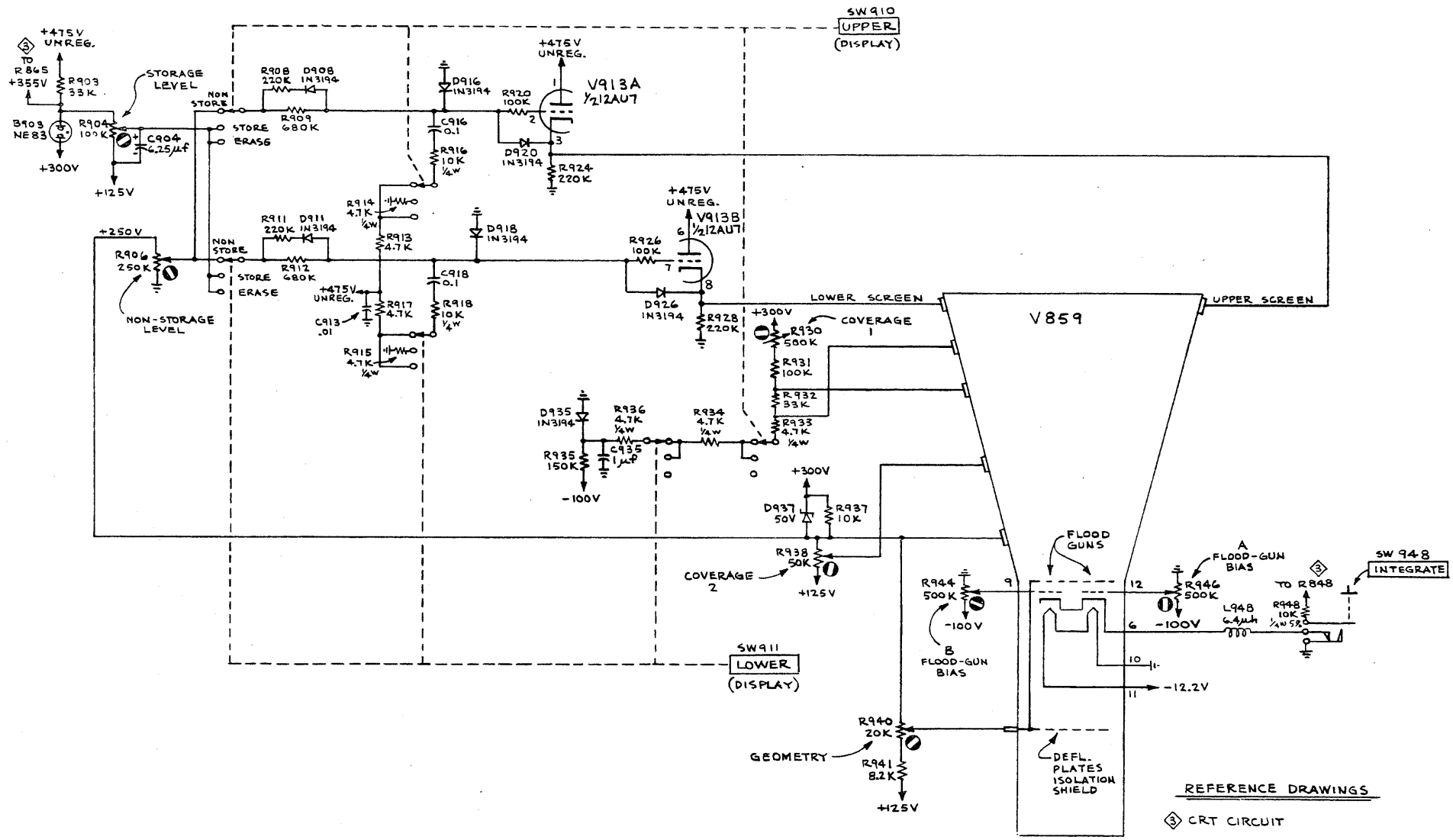
Wall Bands

The voltages applied to the wall bands control and shape the flood gun electron beam for even illumination of the storage target.

Integrate

Two things happen when the INTEGRATE button is pushed. First, the flood gun cathodes are ungrounded, and second, R848 in the CRT high voltage circuit is grounded. This causes the flood guns to cut off, and also adjusts the high voltage to compensate for the change in deflection sensitivity when the flood guns are turned off. The flood guns introduce a loading effect on the deflection plates because the deflection plates capture some of the electrons from the flood guns. The loading will affect the vertical system more critically because of the location of the vertical plates, also the load on the vertical plates will change somewhat with different plugs. Consequently the high voltage shift cannot compensate both vertical and horizontal optimum.

NOTE! If you display an integrated trace and then superimpose a regular stored-mode trace, they will not coincide.



12-19-62 564 STORAGE SYSTEM

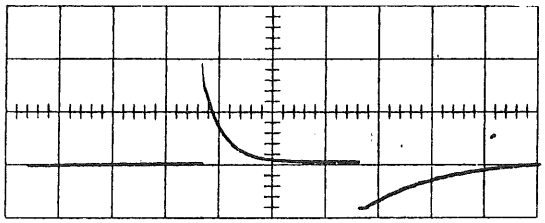
Storage Tube Circuits

Almost all of the circuits that control the storage tube are voltage dividers that need no description. The exception is the upper and lower screen voltage. Since the target current changes as the CRT is written (stored), the voltage to the CRT must be stabilized. Two cathode followers with large cathode resistors serve as constant voltage sources for both upper and lower screens.

The grid-driving voltage for both cathode followers comes from R904 (STORAGE LEVEL) which is connected between +125 and +355 volt sources.

When the display switch is moved to NON STORE, the grid driving voltages for the cathode followers comes from R906 (NON STORAGE LEVEL) which is connected between a +250 volt source and ground.

When either DISPLAY switch is moved to ERASE, a large positive pulse couples through C916 and C918 and drives the upper and lower screen through the cathode followers. At the same time, voltage on grid no. 6 is lifted from around 75 volts to around 150 volts,



Erase-cycle characteristics; pulse applied to back plate. 200 volts/div; 50 ms/div.

grid no. 7 is lifted from about 40 volts to about 125 volts. Note that these bands draw some current through R930, etc. The result is that the flood guns increase current and the screen becomes fully written. When either DISPLAY lever is released from the ERASE position, a negative going pulse is applied to the appropriate screens and the screen returns to a condition where storage is possible (operating level). At the same time the correct voltage is returned to the wall bands.

Locate

When you push the LOCATE button, you remove +125 v from one deflection blanking plate; this unblanks the beam. You also connect +335 v to R763 and R764, which allows the left-hand deflection plate to assume a small positive increment in addition to the left-hand reference point determined by the position control. A non-storing margin remains on the left-hand edge of the CRT. If the trace is positioned just to the edge of the store area, the LOCATE spot will appear about 1/8 inch to the left.

SCHEMATICS

564

TENTATIVE

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January 1963

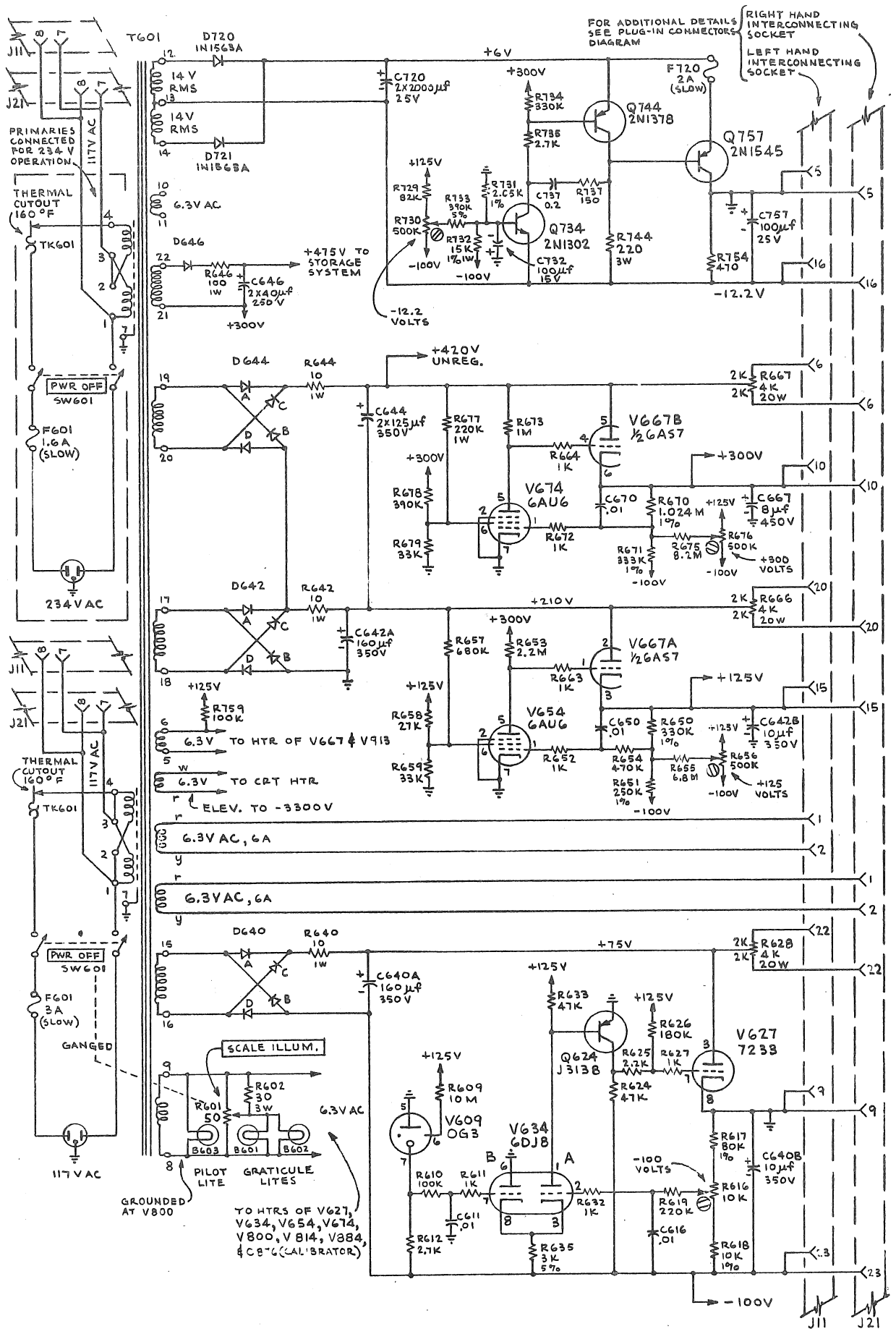
Supersedes
September 1962

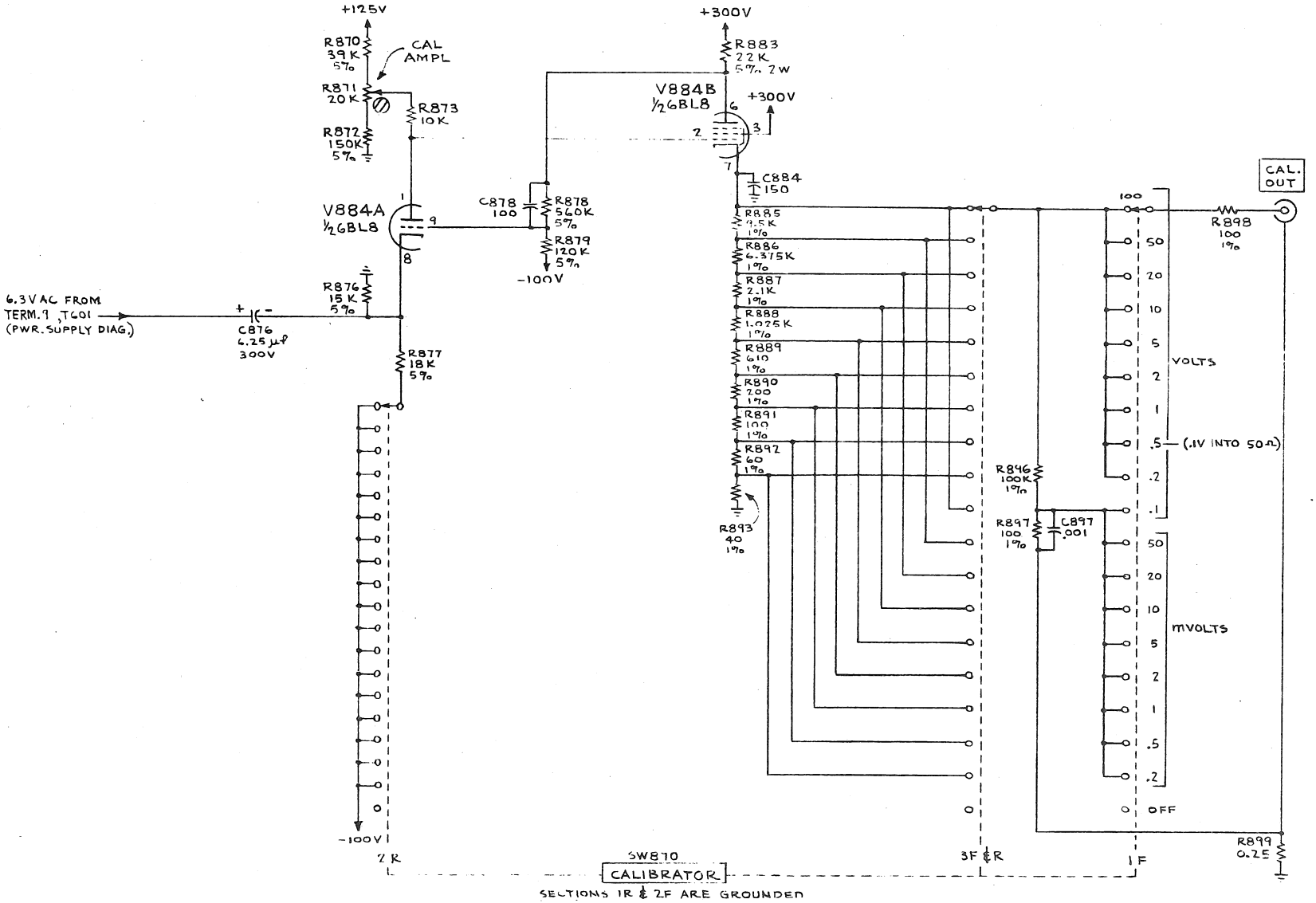
For all serial numbers.

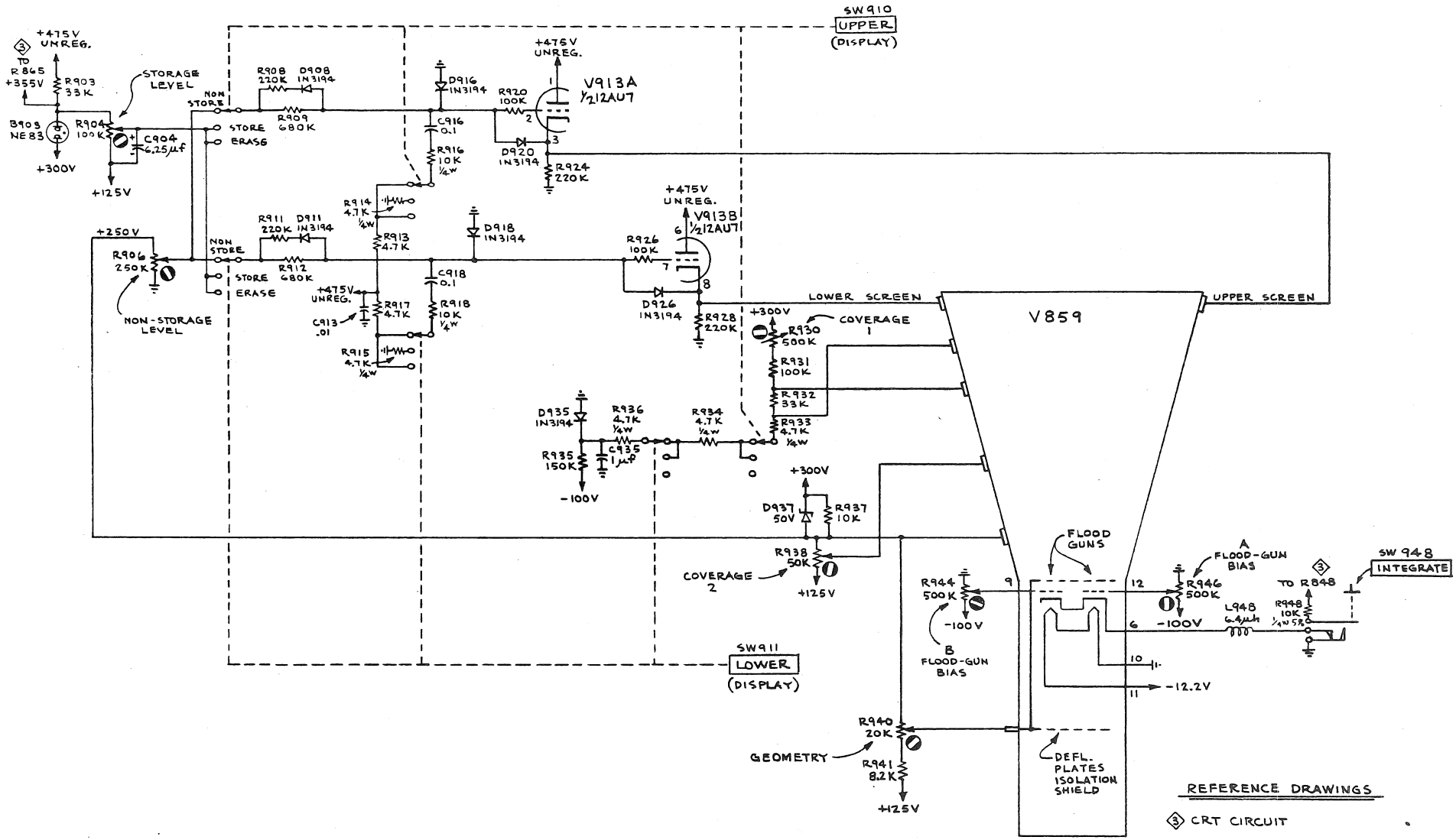
CONTENTS:

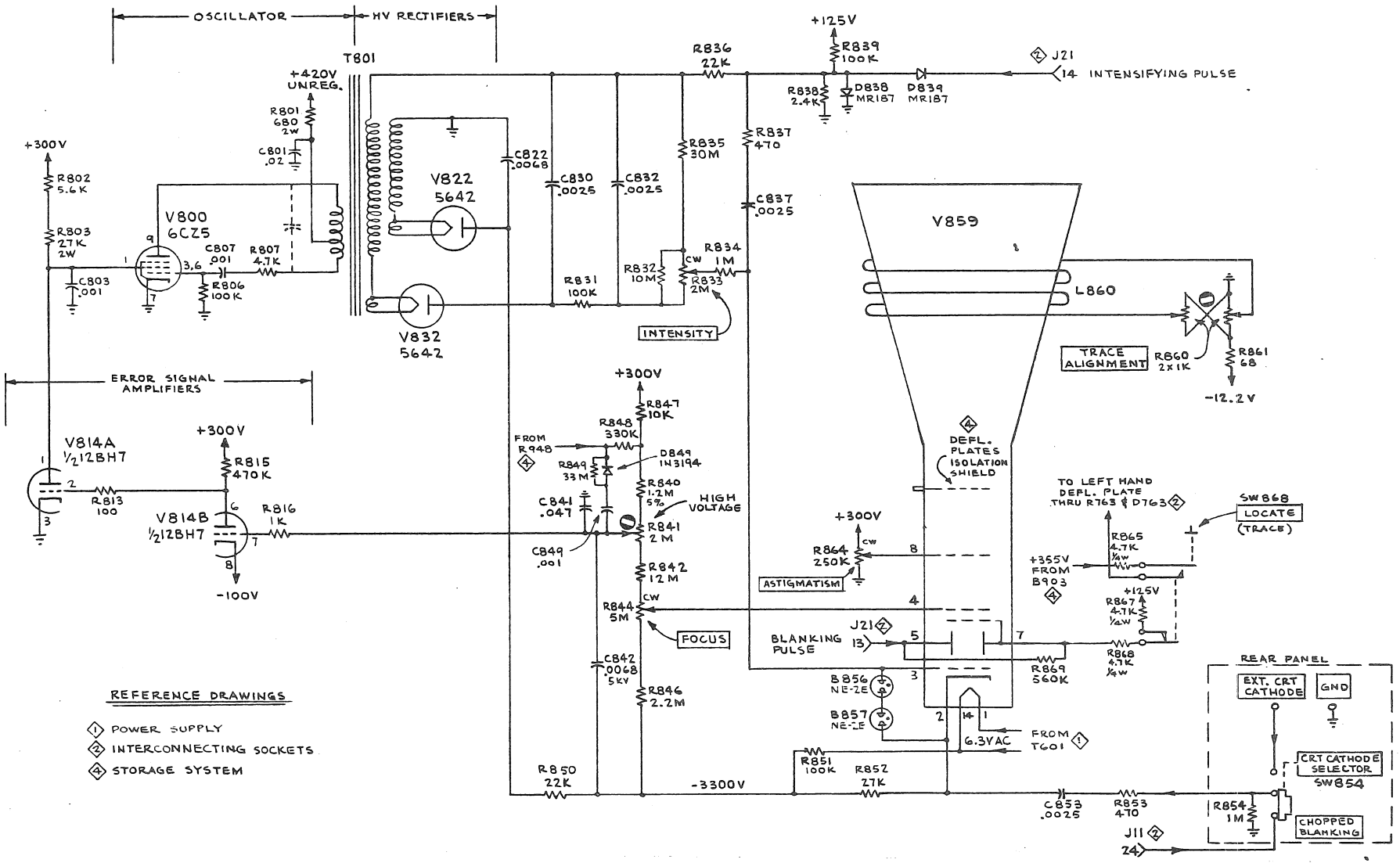
ABBREVIATIONS:

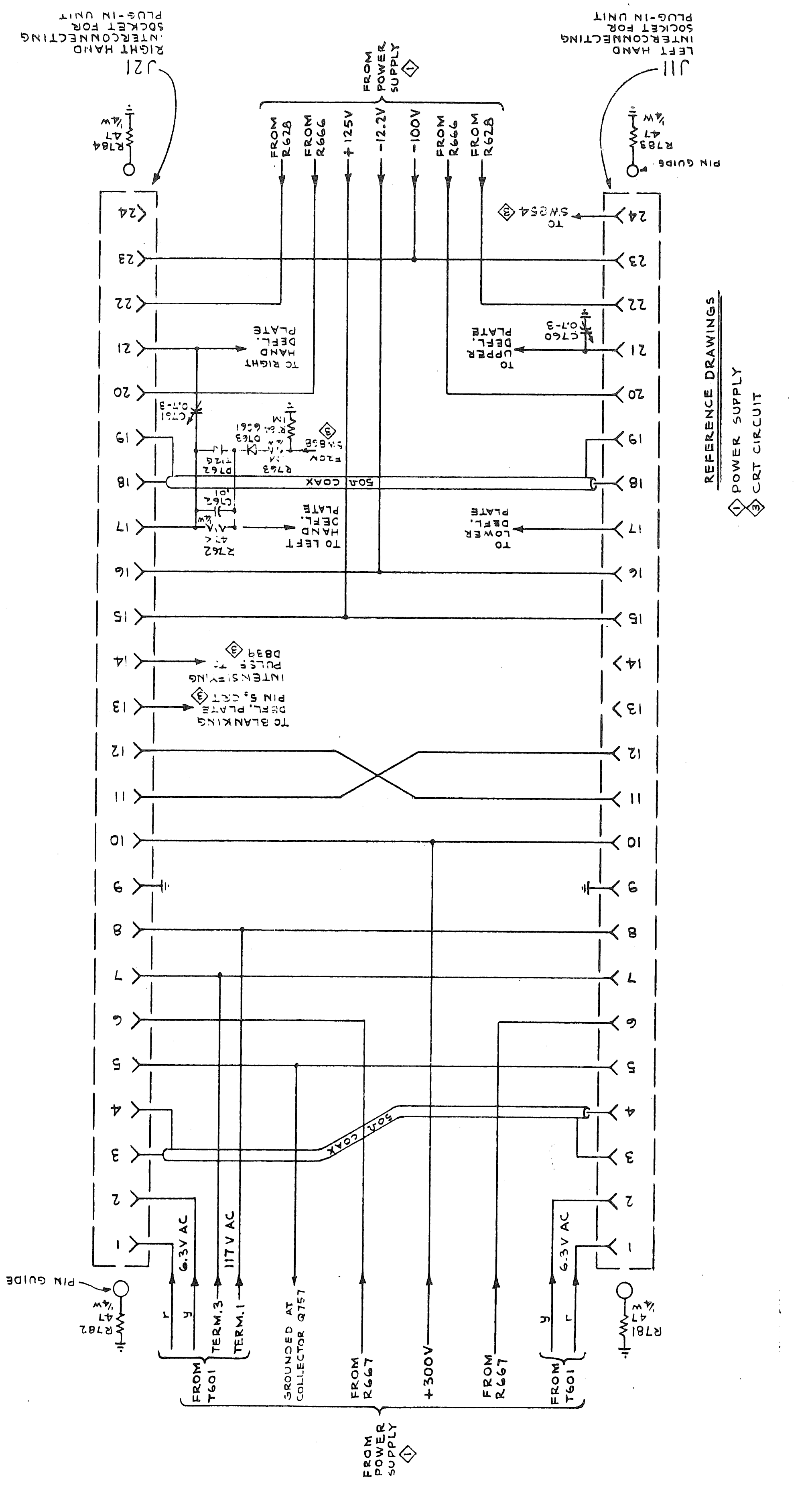
cer	ceramic
comp	composition
emc	electrolytic, metal cased
gmv	guaranteed minimum value
h	henry
k	kilo (10^3)
k	kilohm
m	milli (10^{-3})
ma	milliamp
meg	megohm
mh	millihenry
mpt	metalized, paper tubular
mt	mylar, tubular
mv	millivolt
μ	micro (10^{-6})
μf	microfarad
μh	microhenry
μsec	microsecond
n	nano (10^{-9})
nsec	nano second
Ω	ohm
p	pico (10^{-12})
pbt	paper, "bathtub"
pcc	paper covered can
pf	picofarad ($\mu\mu$f)
piv	peak inverse voltage
pmc	paper, metal cased
poly	polystyrene
prec	precision
pt	paper, tubular
ptm	paper, tubular molded
sn or S/N	serial number
tub	tubular
v	working volt, dc
var	variable
w	watt
WW	wire wound


T601
D720 IN1563A
D721 IN1563A
14 V RMS
14V RMS
6.3V AC
PRIMARIES CONNECTED FOR 234 V OPERATION
117V AC
THERMAL CUTOUT 160°F
TK601
PWR OFF SW601
FG01 1.6A (SLOW)
234 V AC
C720 2X2000µf 25V
+6V
+300V
R734 330K
Q744 2N1378
R735 2.7K
Q757 2N1545
+125V
R729 82K
R733 390K 5%
R731 2.05K 1%
C737 0.2
R737 150
R730 500K
R732 15K 1% 1W
Q734 2N1302
C732 100µf 15V
R744 220 3W
-100V
R754 470
C757 100µf 25V
-12.2V
-12.2 VOLTS
F720 2A (SLOW)
FOR ADDITIONAL DETAILS SEE PLUG-IN CONNECTORS DIAGRAM
RIGHT HAND INTERCONNECTING SOCKET
LEFT HAND INTERCONNECTING SOCKET
D646
R646 100 1W
C646 2X40µf 250V
+300V
+475V TO STORAGE SYSTEM
D644
R644 10 1W
+420V UNREG.
C644 2X125µf 350V
R677 220K 1W
R673 1M
V667B ½6AS7
R664 1K
R667 2K 4K 20W
R678 390K
V674 6AU6
C670 .01
R670 1.024M 1%
C667 8µf 450V
R679 33K
R672 1K
R671 333K 1%
R675 8.2M
R676 500K
+300 VOLTS
D642
R642 10 1W
C642A 160µf 350V
+210V
R657 680K
R653 2.2M
V667A ½6AS7
R663 1K
R666 2K 4K 20W
R658 27K
V654 6AU6
C650 .01
R650 330K 1%
C642B 10µf 350V
R659 33K
R652 1K
R654 470K
R651 250K 1%
R655 6.8M
R656 500K
+125 VOLTS
R759 100K
6.3V TO HTR OF V667 & V913
6.3V TO CRT HTR
ELEV. TO -3300V
6.3V AC, 6A
6.3V AC, 6A
D640
R640 10 1W
C640A 160µf 350V
+75V
R628 2K 4K 20W
R633 47K
Q624 J313B
R626 180K
R625 2.7K
R627 1K
V627 7233
R624 47K
SCALE ILLUM.
R602 30 3W
R601 50
B603
B601
B602
6.3V AC
PILOT LITE
GRATICULE LITES
GROUNDED AT V800
TO HTRS OF V627, V634, V654, V674, V800, V814, V884, & CB-6 (CALIBRATOR)
V609 OG3
R609 10M
V634 6DJ8
R610 100K
R611 1K
R632 1K
R617 80K 1%
C640B 10µf 350V
-100 VOLTS
R616 10K
R619 220K
C611 .01
C616 .01
R612 2.7K
R635 3K 5%
R618 10K 1%
-100V
J11
J21


+125V
R870 39K 5%
CAL AMPL
R871 20K
R873 10K
R872 150K 5%
V884A ½6BL8
C878 100
R878 560K 5%
R879 120K 5%
-100V
6.3V AC FROM TERM. 9 ,TG01 (PWR. SUPPLY DIAG.)
C876 6.25 µf 300V
R876 15K 5%
R877 18K 5%
+300V
R883 22K 5% 2W
V884B ½6BL8
+300V
C884 150
R885 4.5K 1%
R886 2.375K 1%
R887 2.1K 1%
R888 1.025K 1%
R889 610 1%
R890 200 1%
R891 100 1%
R892 60 1%
R893 40 1%
R896 100K 1%
R897 100 1%
C897 .001
R898 100 1%
R899 0.25
CAL. OUT
100
50
20
10
5
2
1
.5
.2
.1
VOLTS
(.1V INTO 50Ω)
50
20
10
5
2
1
.5
.2
mVOLTS
OFF
-100V
2 R
SW870
CALIBRATOR
3F & R
1 F
SECTIONS 1R & 2F ARE GROUNDED


SW910
UPPER
(DISPLAY)
+475V UNREG.
TO R865 +355V
R903 33K
STORAGE LEVEL
B909 NE83
R904 100K
C904 6.25μf
+300V
+125V
NON STORE
STORE ERASE
R908 220K
D908 IN3194
R909 680K
D916 IN3194
R920 100K
V913A
½12AU7
C916 0.1
R916 10K ¼W
D920 IN3194
R924 220K
+475V UNREG.
R914 4.7K ¼W
R913 4.7K
D918 IN3194
+250V
R906 250K
NON-STORAGE LEVEL
R911 220K
D911 IN3194
R912 680K
C918 0.1
R917 4.7K
R918 10K ¼W
C913 .01
R915 4.7K ¼W
V913B
½12AU7
R926 100K
D926 IN3194
R928 220K
LOWER SCREEN
UPPER SCREEN
V859
+300V
COVERAGE 1
R930 500K
R931 100K
R932 33K
R933 4.7K ¼W
D935 IN3194
R936 4.7K ¼W
R934 4.7K ¼W
C935 1μμf
R935 150K
-100V
D937 50V
R937 10K
R938 50K
COVERAGE 2
+125V
SW911
LOWER
(DISPLAY)
FLOOD GUNS
A FLOOD-GUN BIAS
R944 500K
R946 500K
-100V
B FLOOD-GUN BIAS
L948 6.4μh
R948 10K ½W 5%
TO R848
SW 948
INTEGRATE
-12.2V
R940 20K
GEOMETRY
R941 8.2K
+125V
DEFL. PLATES ISOLATION SHIELD
REFERENCE DRAWINGS
③ CRT CIRCUIT


OSCILLATOR
HV RECTIFIERS
T801
+420V UNREG.
+300V
R801 680 2W
C801 .02
R802 5.6K
R803 27K 2W
C803 .001
V800 6CZ5
C807 .001
R807 4.7K
R806 100K
V822 5642
V832 5642
C822 .0068
C830 .0025
C832 .0025
R831 100K
R832 10M
R833 2M
R834 1M CW
INTENSITY
R835 30M
R836 22K
R837 470
C837 .0025
+125V
R839 100K
R838 2.4K
D838 MR187
D839 MR187
J21
14 INTENSIFYING PULSE
V859
L860
TRACE ALIGNMENT
R860 2x1K
R861 68
-12.2V
ERROR SIGNAL AMPLIFIERS
V814A 1/2 12BH7
V814B 1/2 12BH7
+300V
R815 470K
R813 100
R816 1K
-100V
+300V
R847 10K
R848 330K
FROM R948
D849 1N3194
R849 33M
R840 1.2M 5%
HIGH VOLTAGE
C841 .047
R841 2M
C849 .001
R842 12M
R844 5M CW
FOCUS
C842 .0068 5KV
R846 2.2M
R850 22K
-3300V
DEFL. PLATES ISOLATION SHIELD
+300V
R864 250K CW
ASTIGMATISM
TO LEFT HAND DEFL. PLATE THRU R763 & D763
SW868
LOCATE (TRACE)
R865 4.7K 1/2W
+355V FROM B903
+125V
R867 4.7K 1/2W
J21
13 BLANKING PULSE
R868 4.7K 1/2W
R869 560K
B856 NE-2E
B857 NE-2E
6.3VAC
FROM T601
R851 100K
R852 27K
C853 .0025
R853 470
J11
24
REAR PANEL
EXT. CRT CATHODE
GND
CRT CATHODE SELECTOR SW854
R854 1M
CHOPPED BLANKING
REFERENCE DRAWINGS
1 POWER SUPPLY
2 INTERCONNECTING SOCKETS
4 STORAGE SYSTEM


REFERENCE DRAWINGS
1 POWER SUPPLY
3 CRT CIRCUIT