INSTRUCTION MANUAL

Serial Number _

Type 3B3 Plug-In Unit

Tektronix, Inc.
S.W. Millikan Way ● P. O. Box 500 ● Beaverton, Oregon ● Phone MI 4-0161 ● Cables: Tektronix

070-365

863


TYPE 3B3 TIME BASE
DELAYED SWEEP TRIGGERING
LEVEL
PULL EXT. TRIG. ATTEN.
SLOPE
COUPLING
SOURCE
AC
DC
INT.
EXT.
EXT. TRIG.
POSITION
(PULL 5X MAG.)
VARIABLE
TIME/DIV. AND DELAY TIME RANGE
UNCAL.
MODE
TRIG.
INTEN.
NORM.
INTEN.
DLY'D SWP.
DLY'D SWP.
mSEC
uSEC
SEC
DELAYED SWEEP
PULL TO UNLOCK
CALIB.
DELAY TIME
READY
NORMAL OR DELAYING
SWEEP TRIGGERING
SLOPE
COUPLING
SOURCE
NORM.
AUTO.
INT.
EXT. TRIG.
SINGLE SWEEP
AC
RESET
DC
EXT.
LEVEL
PULL EXT. TRIG. ATTEN.
SERIAL
SWEEP CAL.
TEKTRONIX, INC.
ORTLAND, OREGON, U.S.A.

SECTION 1
CHARACTERISTICS

General

The Type 3B3 Time Base Unit is a plug-in time base generator designed for use with Tektronix Types 561A, RM561A, 564, 567 and RM567 Oscilloscopes. The Type 3B3 provides normal or delayed sweeps at 20 calibrated rates from 0.5 microseconds per division to 1 second per division. In delayed sweep operation, the Type 3B3 gives continuous calibrated sweep delay from 0.5 microsecond to 10 seconds after receipt of a triggering impulse.

Sweep Rates

Both normal and delayed sweep rates from 0.5 microsecond per division to 1 second per division in 20 calibrated steps. A variable control provides uncalibrated sweep rates between steps and also extends the slower rate to approximately 2.5 seconds per division. Calibrated sweep rates for both normal and delayed sweeps are typically within 1%, and in all cases within 3% of the TIME/DIV. and DELAY TIME RANGE switch settings.

Sweep Magnification

The display can be magnified 5 times, extending both the normal and delayed sweep rates to 0.1 microsecond per division. Sweep rate accuracy with the 5X magnification remains within 5% of the TIME/DIV. and DELAY TIME RANGE switch settings.

Sweep Delay

The calibrated sweep delay is continuously variable from 0.5 microsecond to 10 seconds. Delay accuracy is 1% of full scale reading, and delay time linearity is within 0.2% of full scale from 5 microseconds to 2 seconds of delay. Time jitter is less than 1 part in 20,000 of the maximum available delay interval.

Single Sweep

All modes of operation can be displayed as a single sweep for photographic recording.

Triggering Modes, Normal Sweep

Automatic (15 cps to 10 mcs), ac- or dc-coupled, + or — slope, internal or external source.

Triggering Modes, Delayed Sweep

Ac- or dc-coupled, + or — slope, internal or external source.

Internal Triggering Requirements, Either Time Base

Internal triggering with signals in the frequency range from dc to 5 mc requires a trigger amplitude of 0.2 major divisions of vertical deflection. Above 5 mc, the trigger requirements increase, and at 10 mc, a trigger amplitude of 0.5 major division of vertical deflection is required.

External Triggering Requirements, Either Time Base

External triggering with signals in the frequency range from dc to 5 mc requires a trigger amplitude of 0.5 volts. Above 5 mc the trigger requirements increase and at 10 mc, a trigger amplitude of 1.25 volts is required. Maximum triggering signal is 15 volts direct, or 150 volts through internal attenuator (operated by front panel switch). If ac coupling is used, up to 500 volts total, dc and ac peak combined, may be applied so long as the ac component does not exceed 150 volts.

Construction

Aluminum-alloy chassis. Front panel photo-etched and anodized.

Weight

5 pounds 4 ounces.

SECTION 4
CIRCUIT DESCRIPTION

General

The Type 3B3 is a conventional time-base unit with delayed sweep. The simplified block diagram of Fig. 4-1 shows the relationship of the major circuits. The schematic diagrams at the rear of the manual should be referred to when studying this circuit description.

The Normal Sweep Trigger circuit receives a signal from either the Vertical Amplifier plug-in or from an external source. The circuit converts the signal to a trigger pulse for the Normal Sweep Generator. This trigger pulse switches a tunnel diode in the Normal Sweep Generator and starts the sweep ramp. When the ramp voltage reaches a preset point (normal sweep length), the ramp ends and the crt beam (now blanked) returns to its starting point. A holdoff period delays the start of the next sweep. When this period ends, the next trigger pulse starts another sweep.

The start of the delayed sweep is controlled by the normal sweep rate and the setting of the DELAY TIME control. The delayed sweep rate is set by the DELAYED SWEEP control.

The sweep ramp from both sweep generators passes to the MODE switch. If this switch is set to NORM., INTEN., or TRIG. INTEN., the normal sweep passes to the Horizontal Amplifier. In the DLY'D SWP or TRIG. DLY'D SWP positions of the MODE switch, the delayed sweep passes to the Horizontal Amplifier.

The Horizontal Amplifier converts the sweep ramp to a push-pull output and applies it to the horizontal deflection plates of the crt.

The Delayed Sweep Trigger circuit operates only when the MODE switch is in the TRIG. INTEN. or TRIG. DLY'D SWP position. This circuit is identical to the Normal Sweep Trigger circuit and uses a signal from either the Vertical Amplifier or an external source.

The trigger pulse formed by the Delayed Sweep Trigger circuit passes to the Delayed Sweep Generator and starts the delayed sweep ramp. The ramp ends when it reaches a preset point (delayed sweep length). During the ramp run-up a positive pulse is coupled to the crt grid to intensify the display.

The two INTEN. positions of the MODE switch show an intensified area of the display that represents both the delayed sweep duration and its position with respect to the start of the normal sweep.

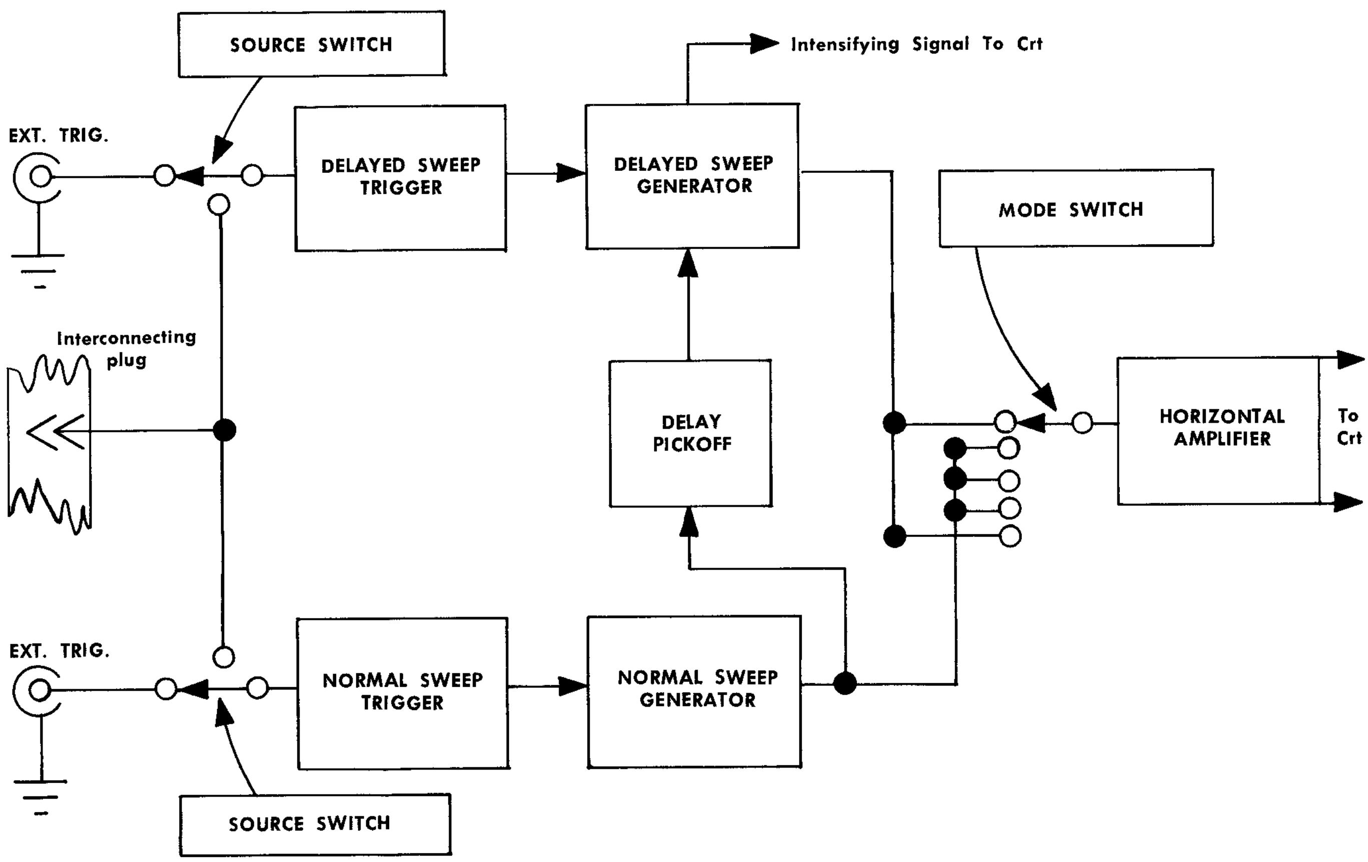


Fig. 4-1. Simplified Block Diagram of Type 3B3.

Normal Sweep Trigger

The trigger signal (internal or external) enters the circuit through the SOURCE switch and passes to the COUPLING switch. The COUPLING switch passes the signal through a capacitor in the AUTO or AC positions; in the DC position the capacitors are bypassed. R9 and R10 attenuate the signal about 25% and present a high impedance load to the signal source.

When the SOURCE switch is in the EXT. position and the PULL EXT. TRIG. ATTEN. switch is pulled out, R7 is paralleled across R10 and the network becomes an approximate 10 to 1 attenuator. C7 and C9 are frequency compensating capacitors. Neon bulb B10 provides overload protection against high signal voltages. V13 is a long-tailed cathode follower that couples the signal through diode D15 to the SLOPE switch. Diodes D15 and D16 protect transistors Q24 and Q34 from excessive positive voltages. The SLOPE switch directs the signal to either Q24 or Q34 depending on its setting. Q24 and Q34 are a comparator with the signal applied to one base and a dc voltage (set by the LEVEL control) on the other base. Diodes D24 and D34 prevent emitter to base breakdown of Q24 and Q34. When the signal equals the level voltage, tunnel diode D35 switches. The pulse from D35 is amplified by Q44 and applied to T101. This transformer couples the pulse to the Normal sweep generator.

Normal Sweep Generator

With the COUPLING switch in AC or DC position, sweep ramp generation starts when a trigger pulse coupled through T101 causes tunnel diode D105 to switch to its high state. This puts a positive pulse on the base of Q114. Q114 turns on hard and its collector voltage goes negative. This negative change drops the voltage on the plates of V152 and the tube cuts off. When V152 cuts off, the timing capacitor C160 starts to change toward —100 volts through the timing resistor R160. As the grid of V161A starts to drop, its plate voltage starts to rise. The resulting positive swing is coupled through D162 and V161B to the top of C160. This increases the potential to which C160 is trying to charge. The effect is to straighten out the charging curve by increasing the charging voltage with each increment of charge on the capacitor. The positive swing at the top of the timing capacitor also tends to keep the lower side from dropping. This keeps the voltage across R160 essentially constant, providing a constant-current charging source for the timing capacitor. The result is an extremely linear sawtooth ramp at the cathode of V161B, which is then applied to the horizontal amplifier.

The sweep ramp ends when the voltage applied to the base of Q145 reaches approximately +4 volts. Fig. 4-2 shows the waveform on the base of Q145 with the condition of associated diodes. Fig. 4-3 shows the condition of D105 (tunnel diode) during a sweep cycle.

The sweep ramp voltage at the arm of the NORMAL SWEEP LENGTH control (R168) starts at about —38 volts. D171 is back-biased and the ramp voltage cannot reach the base of Q145. As the voltage reaches +2 volts, D171 is forward-biased and the ramp voltage is applied to the base of Q145.

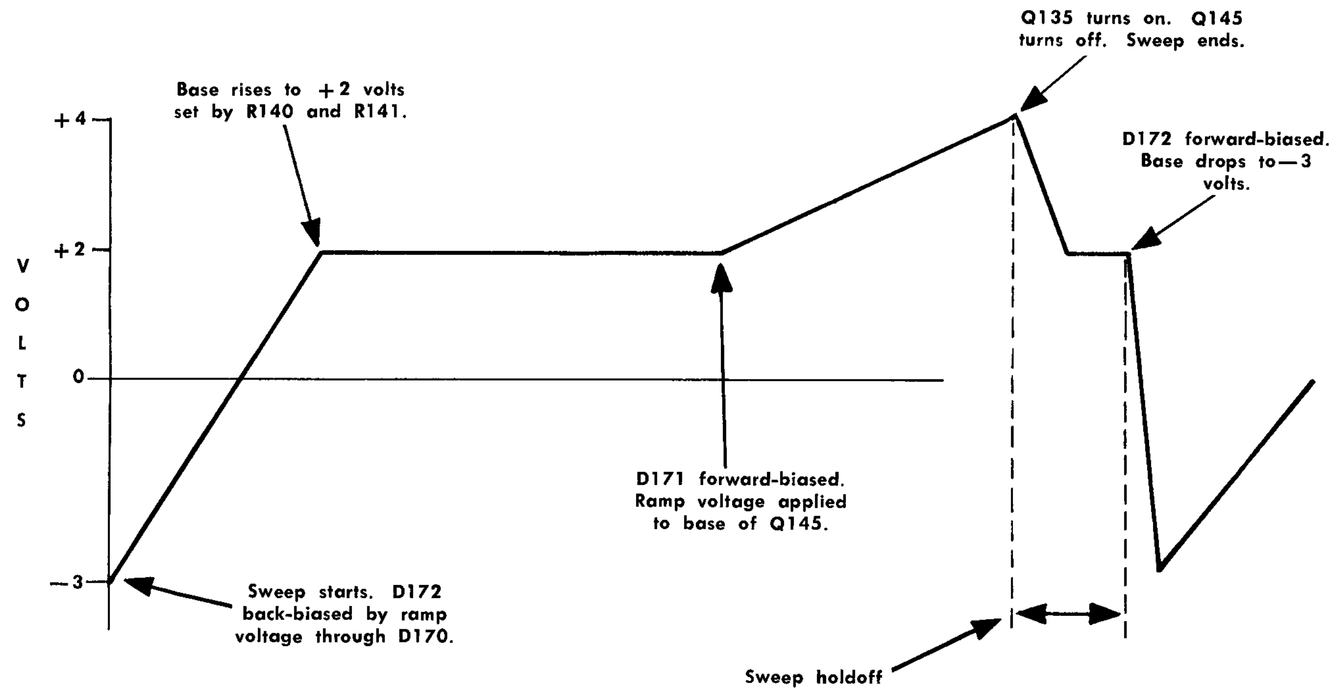


Fig. 4-2. Waveform at base of Q145 with condition of associated diodes.

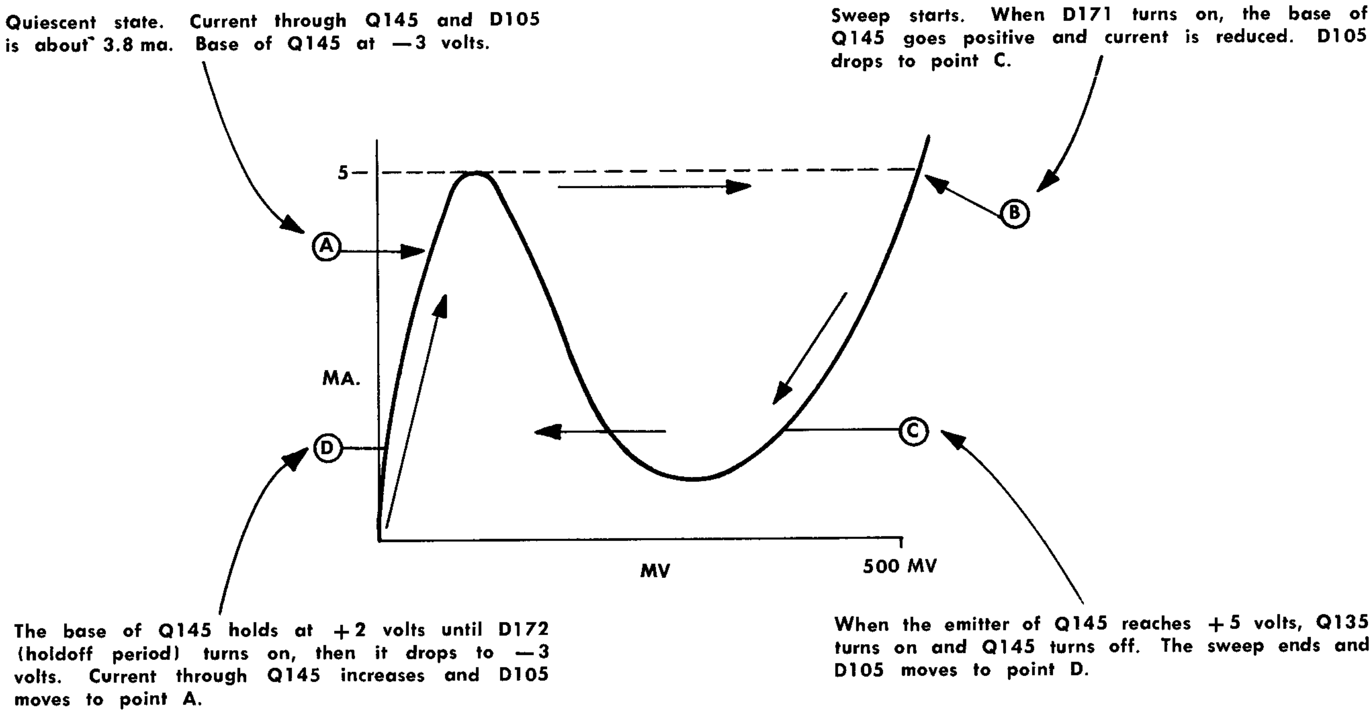


Fig. 4-3. Condition of Tunnel Diode D105 during sweep and holdoff periods

The voltage at the emitter of Q145 follows the base voltage in a positive direction. When the emitter rises to +5 volts, Q135 turns on. This quickly drops the emitter of Q145 to —0.5 volt and it turns off. When Q145 turns off, the current source for D105 is removed and the tunnel diode switches to its low state. This negative change turns Q114 off and allows the plates of V152 to go positive. V152B conducts and timing capacitor C160 discharges through V152B and the cathode resistors of V161B, ending the sweep ramp.

Sweep Holdoff Period

A holdoff period is necessary between each sweep to prevent display jitter. This is done by preventing the sweep from being retriggered until the whole system is again stable and the electron beam is at the left side of the crt. The holdoff period is developed by the charge and discharge of holdoff capacitor C170. The circuit works as follows: During sweep run-up, the sweep voltage charges C170 through D170. When the sweep ends, C170 discharges exponentially. When the capacitor charge drops to about —3 volts, D172 becomes forward biased and this voltage is applied to the base of Q145. Current through Q145 increases, which causes tunnel diode D105 to move to its ready state (point A on Fig. 4-3). A trigger can now start another sweep.

Automatic Sweep

If the COUPLING switch is set to AUTO., transistor Q124 provides an additional source of current for Q145. This added current switches D105 (at the end of the holdoff period) and the sweep free-runs. (See Fig. 4-4).

To trigger in the AUTO. position, a positive trigger pulse from T101 is applied through D119 to a monostable multivibrator consisting of transistors Q115 and Q125. The trigger pulse (applied to the base of Q125) turns on Q125 and the collector voltage of Q125 drops to —5 volts. This negative change back biases D125 and removes Q124 as a current source for Q145. The circuit is now set for normal triggered operation. If a trigger pulse does not switch D105 within about 60 milliseconds, the monostable circuit will reset itself, turn Q124 back on, and free-run the sweep.

The trigger pulse that turned on Q125 is of short duration. Transistor Q125 would normally stay on for the period of the pulse width. However, C115 (in the collector circuit of Q125), prevents the rapid change of voltage. Instead, the RC voltage rise takes about 60 milliseconds. At that time D125 becomes forward biased and the sweep free runs. Because of this reset feature of the AUTO. circuit, the sweep will not trigger at a repetition rate slower than about 15 cps. The use of Q115 and Q125 in a monostable multivibrator assures rapid turn-on of Q125.

Single Sweep

Transistors Q135 and Q145 form a bistable multivibrator. When the Single Sweep control is pushed to RESET, —100 volts is applied through a differentiating network to the base of transistor Q145. Transistor Q145 is biased into conduction, cutting off transistors Q134 and Q135 and biasing tunnel diode D105 at the ready point. The cutting off of

Q134 removes the shunt path from around the READY lamp B134, and B134 lights. With the arrival of a trigger pulse, tunnel diode D105 is biased to its high state and triggers the Miller runup circuit. As the Miller circuit runs up, the rising positive voltage is coupled back through diode D171 to the base of Q145, eventually cutting off Q145. When Q145 cuts off, diode D105 drops to its low state and the sweep ends. Also when Q145 cuts off, Q134 and Q135 are permitted to conduct. Transistor Q134 extinguishes the READY lamp, and Q135 keeps Q145 cut off until the Single Sweep control is pushed to RESET.

Timing Switch

Timing in the Miller run-up circuit is determined by Timing Capacitor C160 charging through Timing Resistor R160. Timing Switch SW160 selects the proper combination of timing resistor and timing capacitor for each sweep rate. In the NORM. position of the MODE switch, uncalibrated variable sweep rates are available. If uncalibrated sweep rates are desired, the VARIABLE control (red knob) is turned away from the CALIBRATED position. This control, R160Y, varies the sweep rate over a 2½ to one range. Switch SW160Y is ganged with the VARIABLE control in such a way that the UNCALIBRATED light comes on when the control is turned away from the CALIBRATED position.

CRT Unblanking

The electron beam in the crt is unblanked by a negative waveform coupled from the plate of V194A through pin 13 of the interconnecting plug to the blanking plates in the crt. The unblanked period coincides with the time that tunnel diode D105 is in its high state (sweep period). When D105 switches to its high state, Q114 turns on and a negative pulse from its collector is applied to the base of Q182. This transistor is connected as an emitter follower and the negative pulse passes to the MODE switch. From the MODE switch it passes to the base of Q194, where it is amplified and coupled to the grid of V194A. A clamp circuit (D195 and R195) prevents the plate of V194A from dropping below +125 volts.

Delayed Sweep Trigger

This circuit is almost identical to the normal sweep trigger circuit and the detailed description is the same. The only difference is the supply voltage for the comparator (Q74 and Q84). The +125-volt supply is connected through the MODE switch and is only present in the TRIG. positions of this switch. In all other positions of the MODE switch the delayed sweep trigger circuit is inoperative.

Delayed Sweep Generator

The part of this circuit that forms the delayed sweep ramp is the same type as that in the normal sweep generator . The major difference between the two sweep generators is the method of starting the sweep.

Transistors Q235 and Q245 and associated circuit elements form a bistable flip-flop. With the MODE switch in the

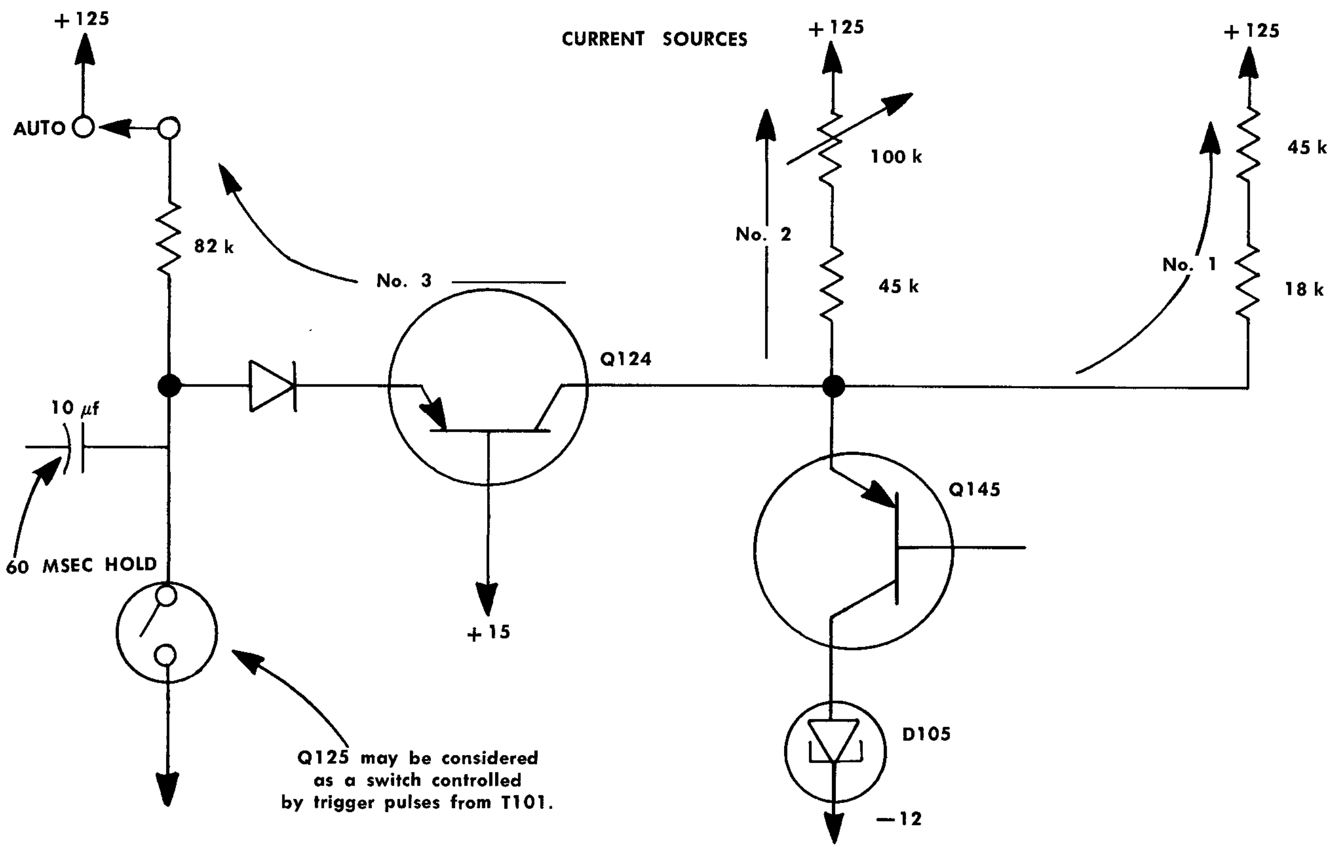


Fig. 4-4. Simplified drawing showing current sources for Q145 in AUTO mode.

NORM. position, the flip-flop is made inoperative by opening the emitter circuit. In all other positions of the MODE switch, the flip-flop gates the delayed sweep circuit.

With the MODE switch in INTEN. or DLY'D SWP. positions, current for the emitter circuit of the transistors and for tunnel diode D205 flows through three parallel resistance paths. For purposes of explanation, assume that Q235 is conducting and Q245 is cut off. The arrival of a delayed trigger pulse from C424 at the base of Q245 switches the flip-flop and Q245 conducts. Due to the three parallel resistance paths in the emitter circuit of Q245, the current through Q245 and D205 switches D205 to its high state, triggering the sweep circuit. As the sweep runs up, Diode D270 becomes forward biased and applies an increasing positive voltage to the base of Q245. The positive voltage applied to the base of Q245 eventually cuts off Q245, ends the sweep and resets the flip-flop.

When the MODE switch is in the TRIG. INTEN. or TRIG. DLY'D SWP. position, R229 is switched out of the parallel resistance network. The arrival of a delayed trigger pulse from C424 at the base of Q245 causes the flip-flop to switch, but due to the increased resistance in the emitter circuit, the current through Q245 is insufficient to cause D205 to switch to its high state. Instead, D205 is moved to the ready point, and switches to its high state only if it receives a trigger pulse from the delayed sweep trigger circuit. With the arrival of a trigger pulse, D205 switches to its high state and triggers the delayed sweep. The run-up of the sweep applies a positive voltage to the base of Q245, ends the sweep and resets the flip-flop as before.

Intensifying Circuit

Th negative pulse (during sweep) at the collector of Q214 passes directly to the base of Q283. This emitter follower sends the waveform in two directions: (1) to Q294 to intensify the display, and (2) to the MODE switch for unblanking the crt when operating in either of the DLY'D SWP. position of the MODE switch.

Delay Pickoff

This circuit sets the start point for the delayed sweep. V414 is a comparator with the normal sweep ramp voltage applied to one grid, and a positive dc voltage from the DELAY TIME control applied to the other grid. At the start of a normal sweep, V414B is conducting and V414A is cutoff. V194B is a constant-current source for the comparator. When the normal sweep voltage to the gird of V414A rises to equal the delay time voltage, the comparator switches and V414A turns on while V414B cuts off. At this point tunnel diode D415 switches to its low state and puts a more positive voltage on the base of Q424. This signal is inverted in polarity and coupled as a differentiated negative pulse through C424 to the Delayed Sweep Generator circuit at the base of Q245.

Horizontal Amplifier

The sweep voltage enters the circuit through the MODE switch. When this switch is in NORM. or either INTEN. position, the normal sweep ramp voltage drives the Horizontal Amplifier. In the two DLY'D SWP positions, the delayed sweep ramp voltage drives the amplifier.

The sweep voltage (0.04 Volt/cm at emitter of Q314) drives the emitter of Q314 through R310 and R312 (SWP. CAL.). The POSITION control is also current connected to the emitter of Q314. Since the Horizontal Amplifier is dc coupled, a small current change by the POSITION control biases the signal enough to position the sweep on the crt.

Q314 is a grounded-base amplifier and amplifies the sweep signal without changing the polarity. The sweep voltage then drives the base of emitter follower Q323 and passes from its emitter to the base of Q354. Transistor Q333 balances any changes in Q323 due to temperature drift.

The output stage of the horizontal amplifier is a hybrid paraphase circuit that matches the low-voltage, low impedance characteristics of the transistorized circuitry to the high-voltage, high impedance characteristics needed to drive the crt deflection plates. The ramp voltage from transistor Q323 drives transistor Q354. Transistor Q354 in turn drives grounded grid amplifier V383A, and by sharing emitter current with grounded base transistor Q364, drives that transistor and grounded grid amplifier V383B in push-pull.

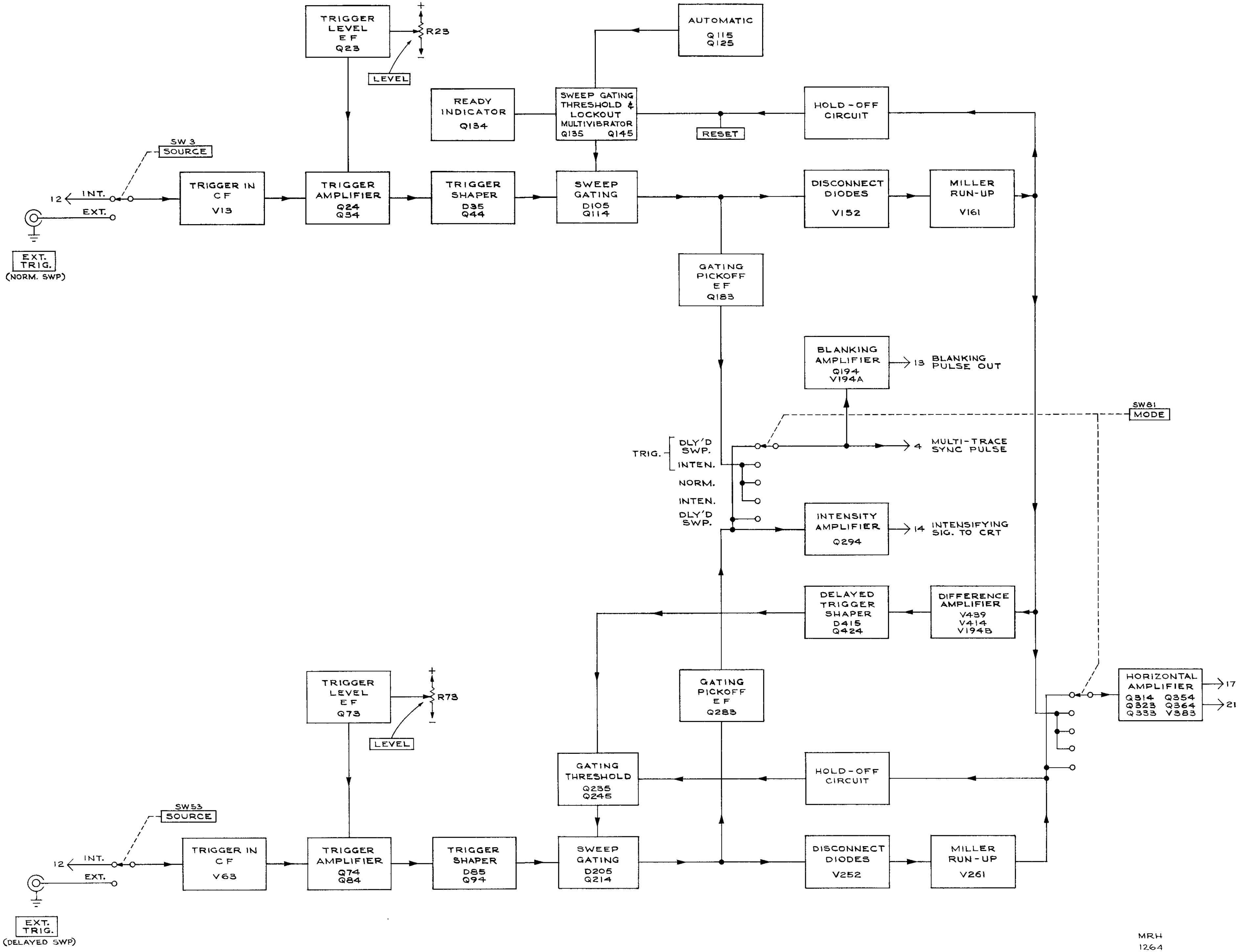
The gain of the paraphase amplifier is determined by the amount of degeneration in the emitter circuit. In normal operation, resistor R364 in the emitter circuit of Q354 and Q364 acts as a voltage divider which reduces coupling between the two transistors. At the same time, it is in the emitter circuit of the transistor which is conducting and reduces the amount of current drawn. When the 5X MAG. switch is closed, R364 is shunted by a low resistance, the coupling between the two transistors is increased, and the resistance of the current path from the emitters to the —100 volt supply is decreased. The result of shunting R364 with a low resistance is to increase the gain of the paraphase amplifier; in this case the gain is increased five times (Calibrated by the 5X gain adjustment).

Capaitors C364, C354. and C356 across emitter coupling resistors R354, R355, R356 and R364 compensate for distributed capacitance at the output tube plates that may affect linearity at fast sweep rates. The push-pull output from the plates of V383A and V383B is coupled directly to the crt horizontal deflection plates.

Timing Switches

The Normal and Delayed Sweep Timing Switches contain the resistors and capacitors that set the sweep rate and holdoff period. Both timing switches are the same except for the VARIABLE TIME/DIV. control, R160Y and the hold off circuit which is not required in the delayed sweep. In the NORM. position of the MODE switch, R160Y is connected to the normal sweep timing resistor R160. In all other positions of the MODE switch the control is connected to the delayed sweep timing resistor R260.

The VARIABLE TIME/DIV. control (R160Y) extends the sweep time by reducing the voltage supplied to the timing resistors. When this control is fully clockwise, SW160Y shorts out R160Y and applies —100 volts to the timing resistors. Any other position of the control reduces the —100 volts and reduces the sweep rate. SW160Y also removes the voltage from R160W and the UNCAL. lamp (B160W) so that the lamp is off in the calibrated position.



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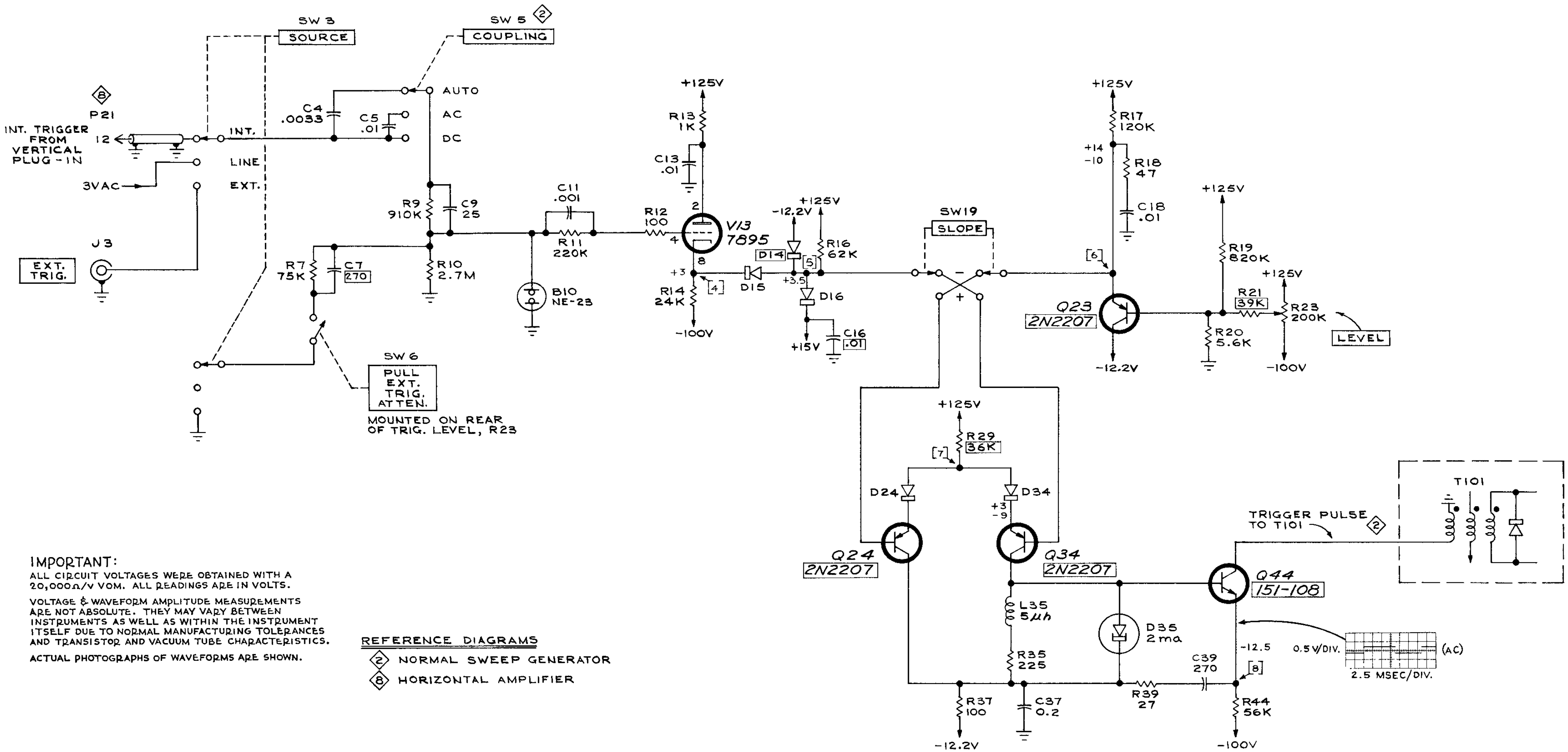
BLOCK DIAGRAM



IMPORTANT:

ALL CIRCUIT VOLTAGES WERE OBTAINED WITH A 20,000Ω/V VOM. ALL READINGS ARE IN VOLTS.

VOLTAGE & WAVEFORM AMPLITUDE MEASUREMENTS ARE NOT ABSOLUTE. THEY MAY VARY BETWEEN INSTRUMENTS AS WELL AS WITHIN THE INSTRUMENT ITSELF DUE TO NORMAL MANUFACTURING TOLERANCES AND TRANSISTOR AND VACUUM TUBE CHARACTERISTICS.

ACTUAL PHOTOGRAPHS OF WAVEFORMS ARE SHOWN.

REFERENCE DIAGRAMS

- ② NORMAL SWEEP GENERATOR
- ⑧ HORIZONTAL AMPLIFIER

WAVEFORMS & VOLTAGE READINGS WERE OBTAINED UNDER FOLLOWING CONDITIONS:

LEVEL:
UPPER VOLTAGE READINGS . . . . CW
LOWER VOLTAGE READINGS . . . . CCW
COUPLING . . . . AC
SOURCE . . . . LINE
SLOPE . . . . +

SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH BLUE OUTLINE

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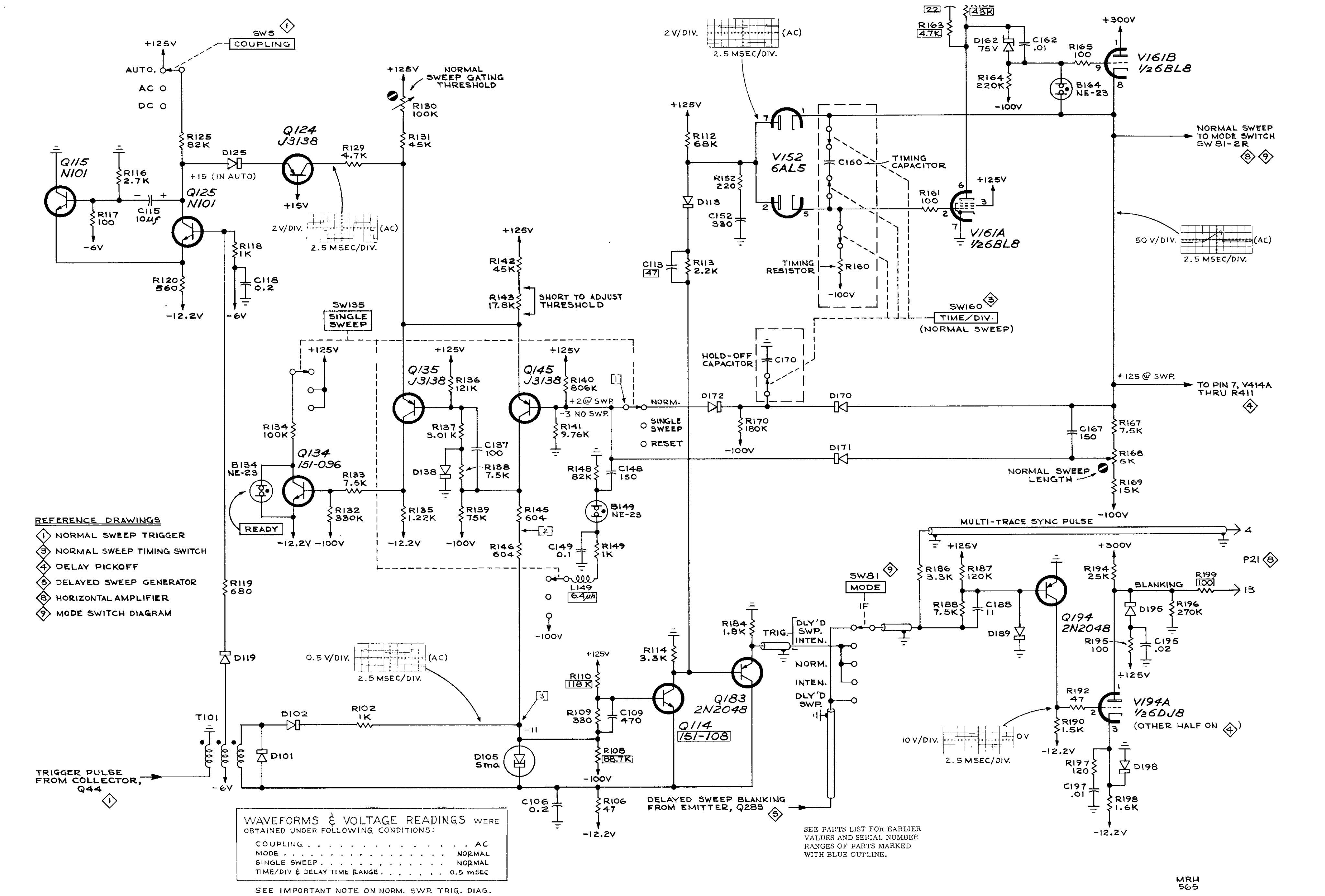
NORMAL SWEEP TRIGGER

CIRCUIT NUMBERS 1 THRU 49



TYPE 3B3 PLUG-IN

C2

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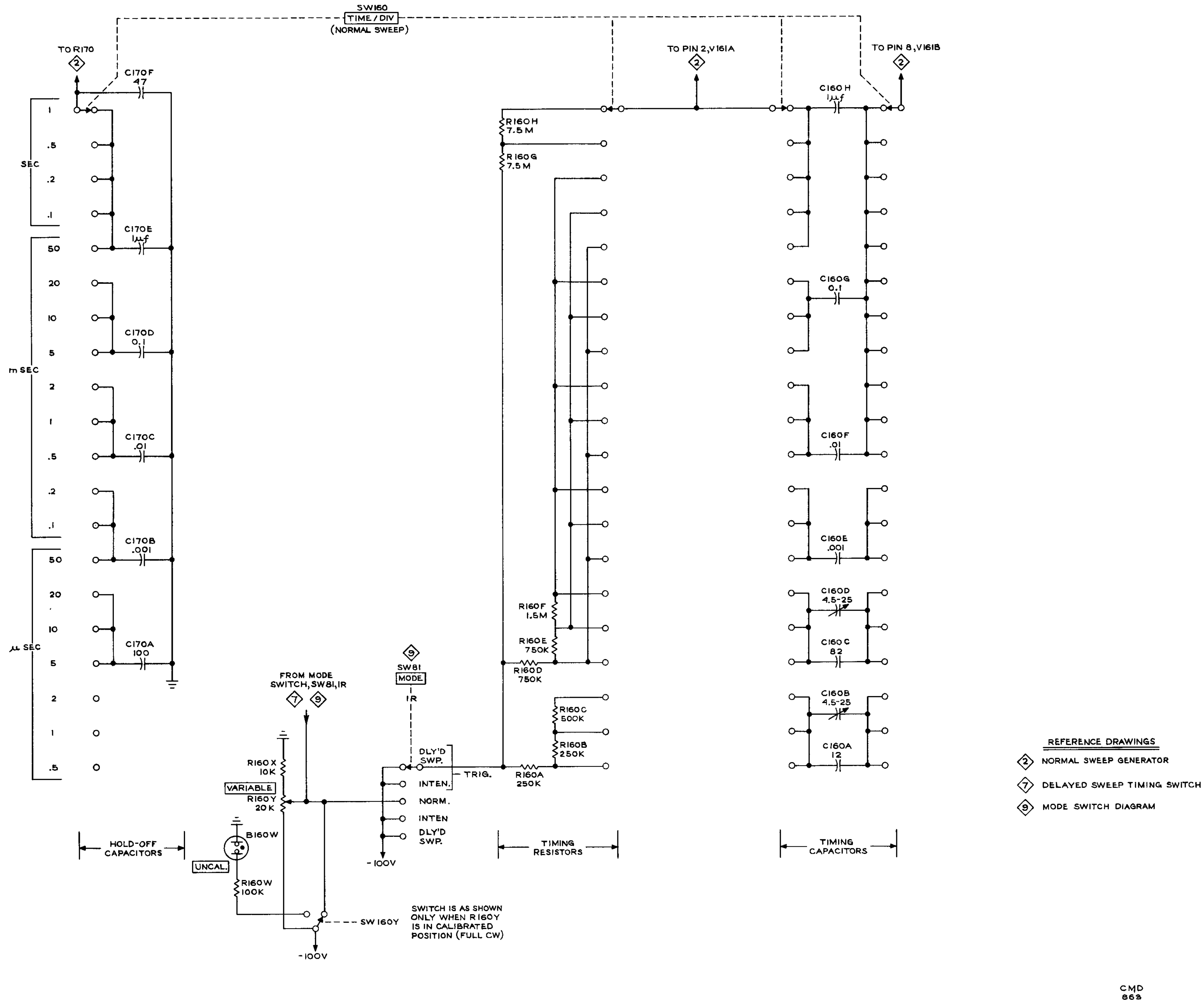
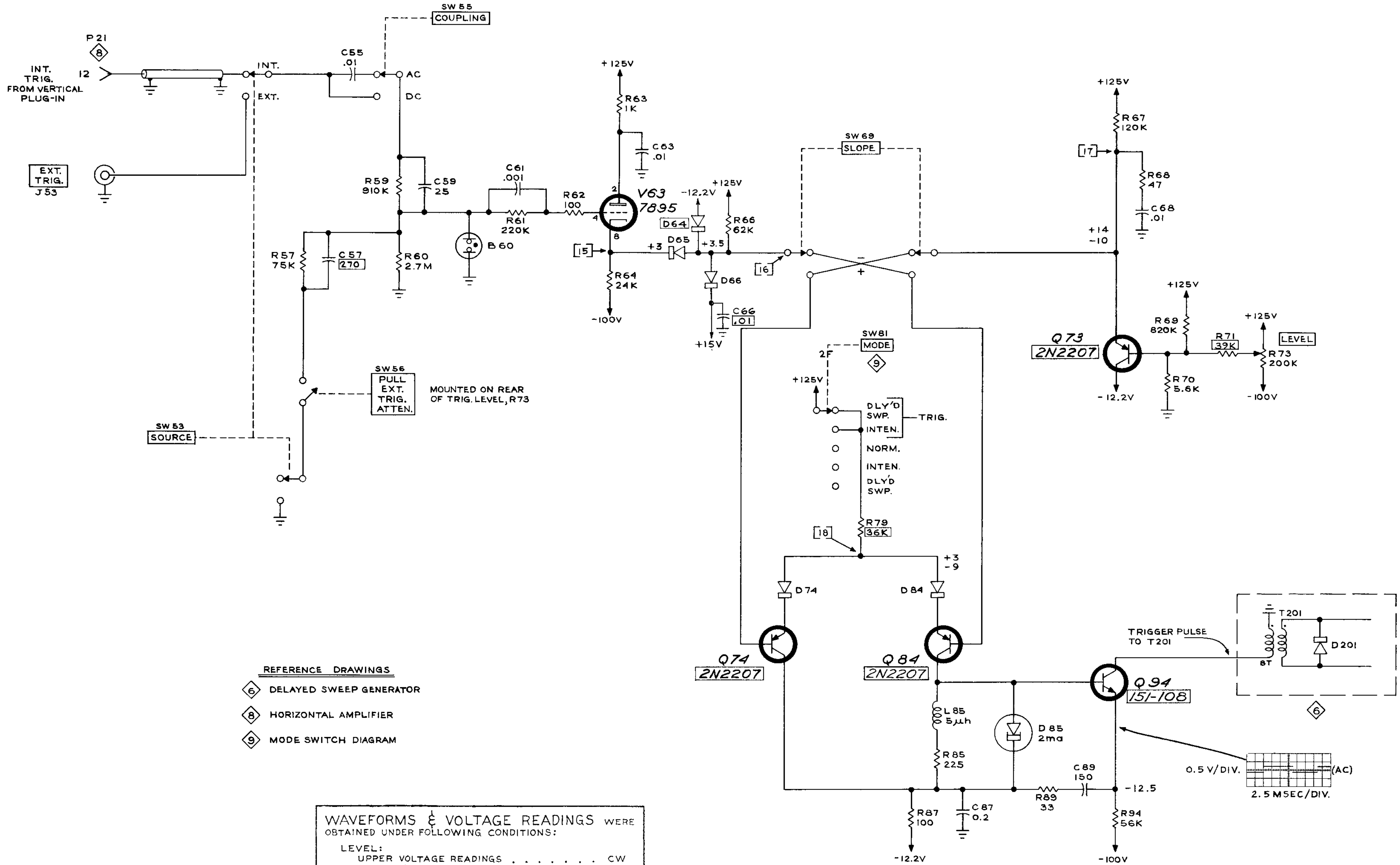
565

NORMAL SWEEP GENERATOR

CIRCUIT NUMBERS 100 THRU 199


SW160
TIME / DIV
(NORMAL SWEEP)
TO R170
TO PIN 2, V161A
TO PIN 8, V161B
C170F 47
C170E 1µf
C170D 0.1
C170C .01
C170B .001
C170A 100
SEC
mSEC
µ SEC
1
.5
.2
.1
50
20
10
5
2
1
.5
.2
.1
50
20
10
5
2
1
.5
R160H 7.5 M
R160G 7.5 M
R160F 1.5M
R160E 750K
R160D 750K
R160C 500K
R160B 250K
R160A 250K
C160H 1µf
C160G 0.1
C160F .01
C160E .001
C160D 4.5-25
C160C 82
C160B 4.5-25
C160A 12
FROM MODE SWITCH, SW81, IR
SW81
MODE
IR
DLY'D SWP.
INTEN.
TRIG.
NORM.
INTEN
DLY'D SWP.
-100V
R160X 10K
VARIABLE
R160Y 20K
B160W
UNCAL.
R160W 100K
SW 160Y
-100V
SWITCH IS AS SHOWN ONLY WHEN R160Y IS IN CALIBRATED POSITION (FULL CW)
HOLD-OFF CAPACITORS
TIMING RESISTORS
TIMING CAPACITORS
REFERENCE DRAWINGS
2 NORMAL SWEEP GENERATOR
7 DELAYED SWEEP TIMING SWITCH
9 MODE SWITCH DIAGRAM
CMD 863



REFERENCE DRAWINGS

- ⑥ DELAYED SWEEP GENERATOR
- ⑧ HORIZONTAL AMPLIFIER
- ⑨ MODE SWITCH DIAGRAM

WAVEFORMS & VOLTAGE READINGS WERE OBTAINED UNDER FOLLOWING CONDITIONS:

LEVEL:	
UPPER VOLTAGE READINGS	CW
LOWER VOLTAGE READINGS	CCW
MODE	DLY'D
SOURCE	LINE
SLOPE	+

SEE IMPORTANT NOTE ON NORM. SWP. TRIG. DIAG.

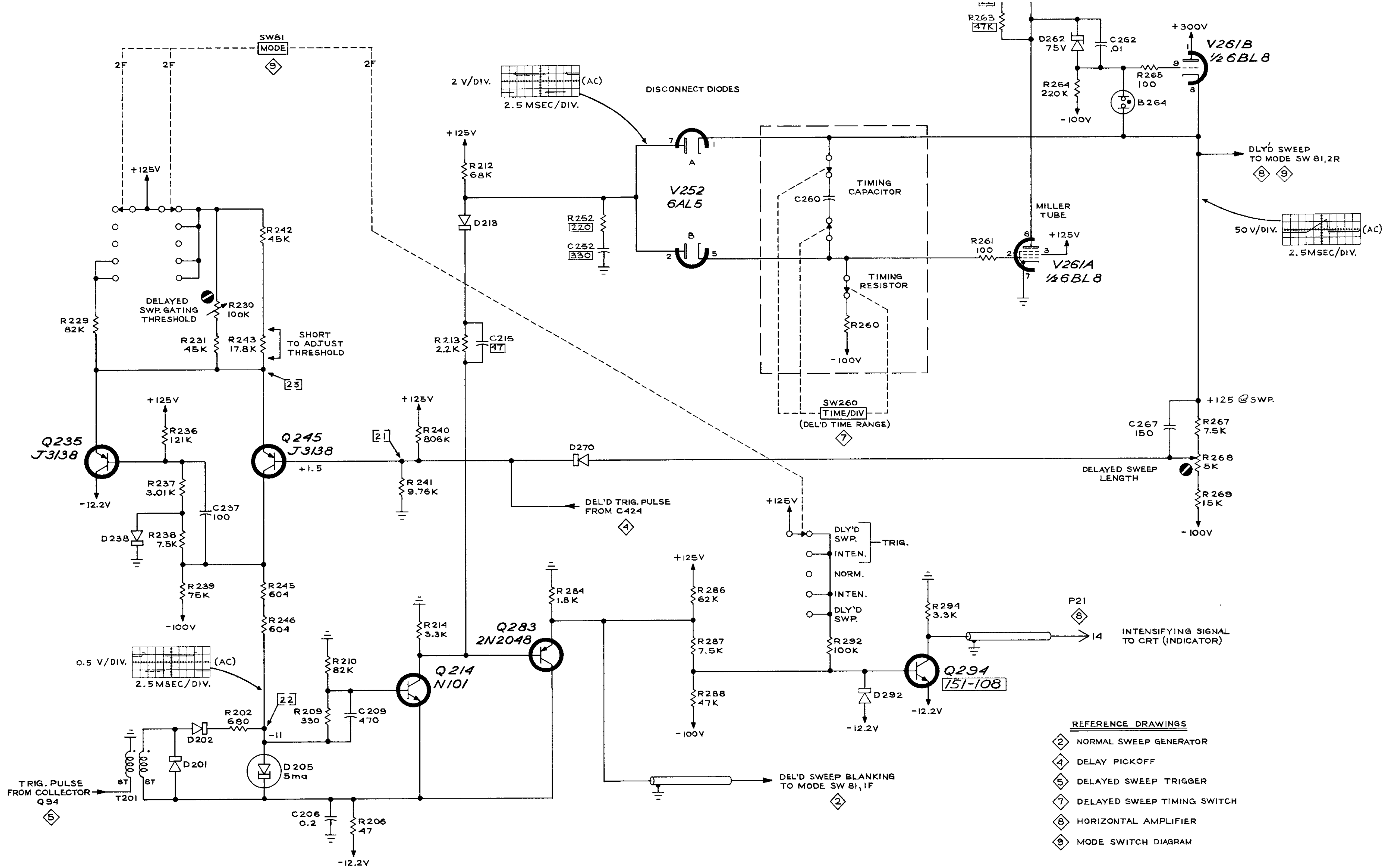
SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH BLUE OUTLINE

CIRCUIT NUMBERS 50 THRU 99

CMD 1063

TYPE 3B3 PLUG-IN

DELAYED SWEEP TRIGGER



SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH BLUE OUTLINE

WAVEFORMS & VOLTAGE READINGS WERE OBTAINED UNDER FOLLOWING CONDITIONS:

MODE . . . . DLY'D SWEEP

TIME/DIV . . . . 0.5 MSEC

CIRCUIT NUMBERS 200 THRU 299

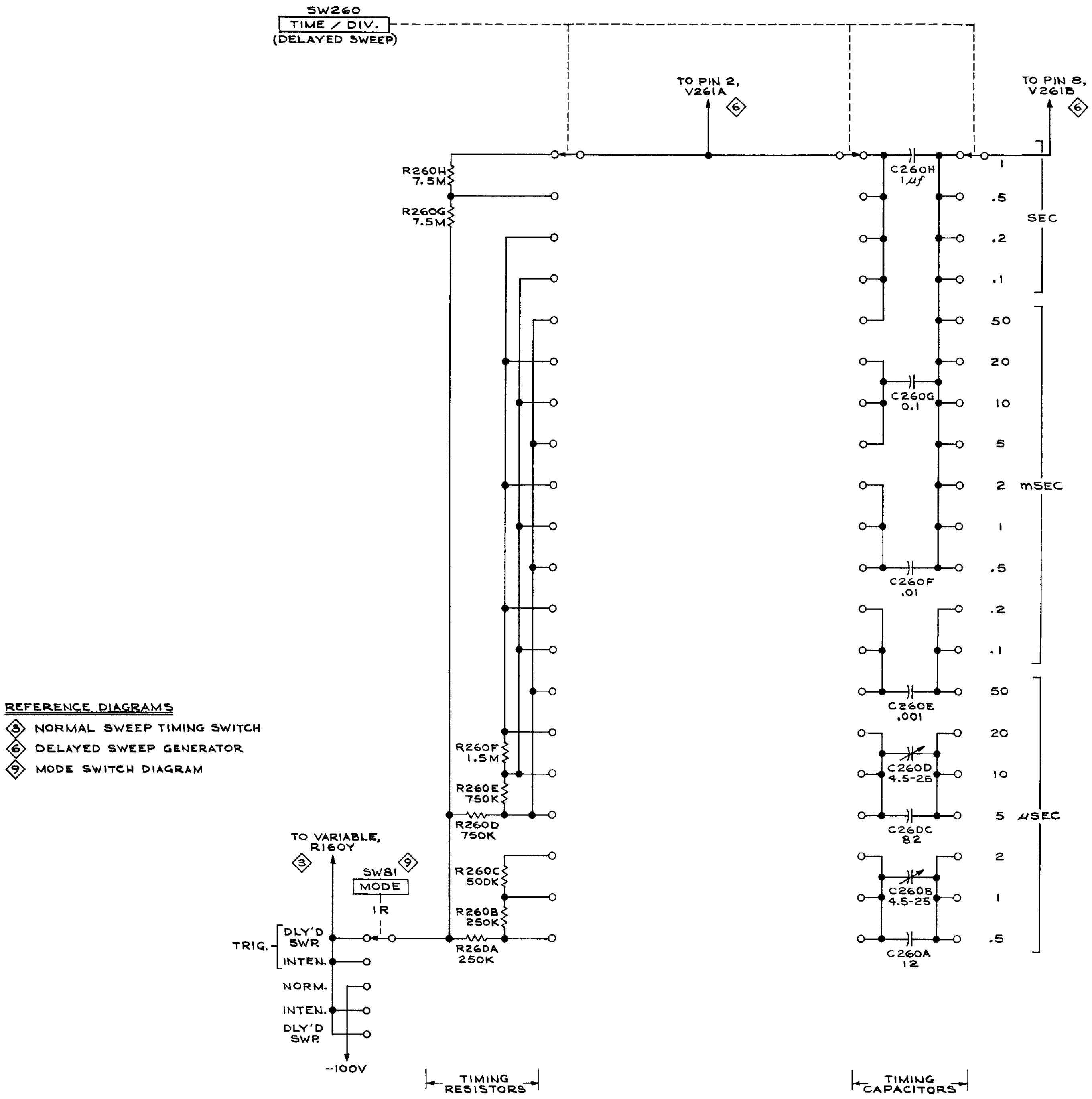
CMD 864

TYPE 3B3 PLUG-IN

SEE IMPORTANT NOTE ON NORM. SWP. TRIG. DIAG.

C

DELAYED SWEEP GENERATOR



TYPE 3B3 PLUG-IN

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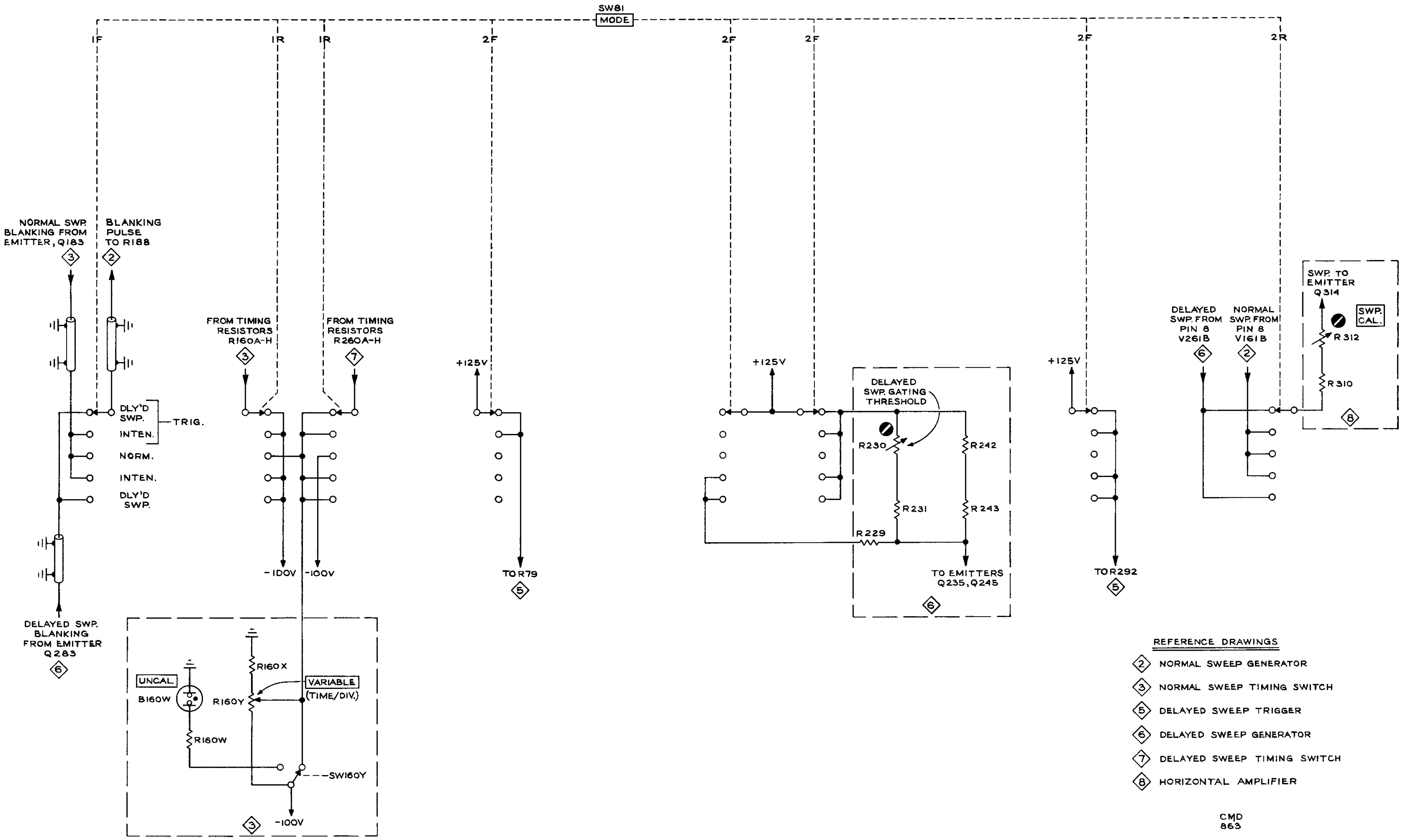
A DELAYED SWEEP TIMING SWITCH



REFERENCE DRAWINGS

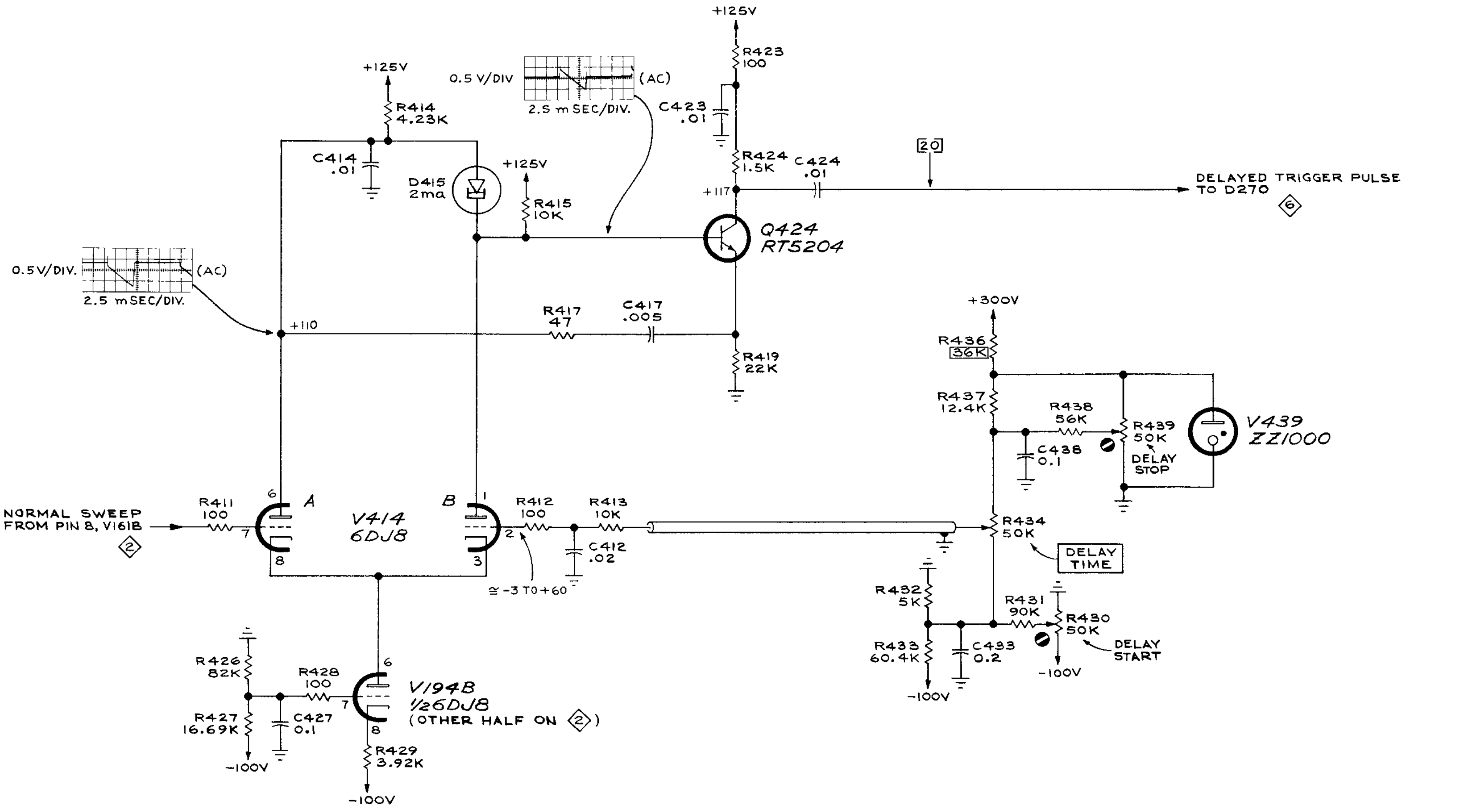
2 NORMAL SWEEP GENERATOR
3 NORMAL SWEEP TIMING SWITCH
5 DELAYED SWEEP TRIGGER
6 DELAYED SWEEP GENERATOR
7 DELAYED SWEEP TIMING SWITCH
8 HORIZONTAL AMPLIFIER

CMD
863

MODE SWITCH DIAGRAM

A

TYPE 3B3 PLUG-IN



WAVEFORMS & VOLTAGE READINGS WERE OBTAINED UNDER FOLLOWING CONDITIONS:	
TIME/DIV. & DELAY TIME	1 mSEC
DELAY TIME	5.00

SEE IMPORTANT NOTE ON NORM. SWP. TRIG. DIAG.

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS MARKED WITH BLUE OUTLINE.

REFERENCE DIAGRAMS

2 NORMAL SWEEP GENERATOR

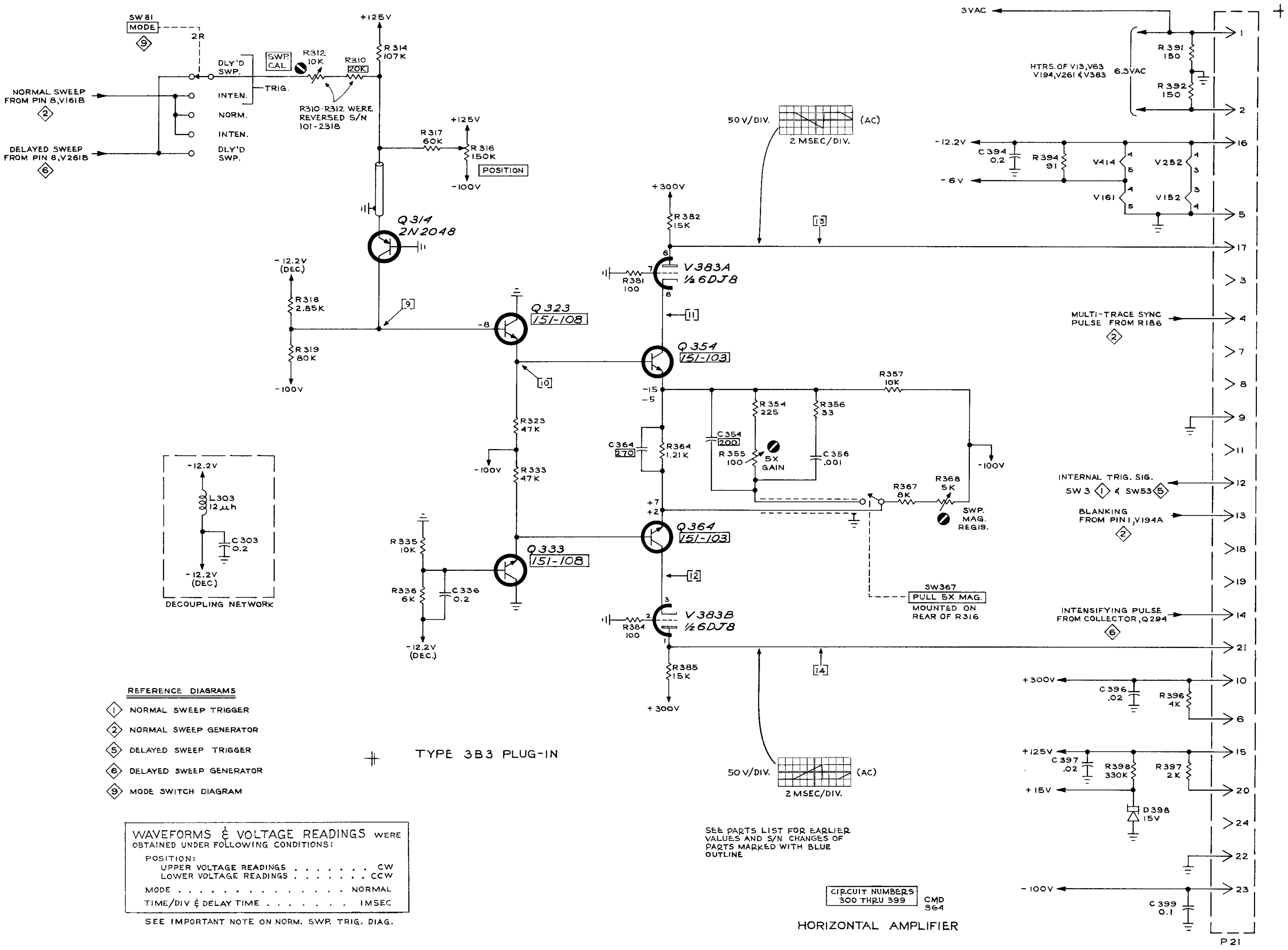
6 DELAYED SWEEP GENERATOR

TYPE 3B3 PLUG-IN

MRH
764

DELAY PICKOFF

CIRCUIT NUMBERS
400 THRU 439



REFERENCE DIAGRAMS

- ⟨1⟩ NORMAL SWEEP TRIGGER
- ⟨2⟩ NORMAL SWEEP GENERATOR
- ⟨5⟩ DELAYED SWEEP TRIGGER
- ⟨6⟩ DELAYED SWEEP GENERATOR
- ⟨9⟩ MODE SWITCH DIAGRAM

TYPE 3B3 PLUG-IN

WAVEFORMS & VOLTAGE READINGS WERE OBTAINED UNDER FOLLOWING CONDITIONS:

POSITION:
UPPER VOLTAGE READINGS . . . . CW
LOWER VOLTAGE READINGS . . . . CCW
MODE . . . . NORMAL
TIME/DIV & DELAY TIME 1MSEC

SEE IMPORTANT NOTE ON NORM. SWP. TRIG. DIAG.

SEE PARTS LIST FOR EARLIER VALUES AND S/N CHANGES OF PARTS MARKED WITH BLUE OUTLINE

CIRCUIT NUMBERS 300 THRU 399

CMD 864

HORIZONTAL AMPLIFIER

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages. If it does not, your manual is correct as printed.

TYPE 3B1 -- TENT. S/N 3880

TYPE 3B3 -- TENT. S/N 3690

PARTS LIST CORRECTIONS

CHANGE TO:

R21	301-0393-00	39 k	1/2 w	5%
R71	301-0393-00	39 k	1/2 w	5%

TYPE 3B1 -- TENT. S/N 3930
TYPE 3B3 -- TENT. S/N 3840

PARTS LIST CORRECTIONS

REMOVE:

R397	308-0003-00	2 k	5 w	WW	5%

CHANGE TO:

R396	308-0003-00	2 k	5 w	WW	5%

ADD:

R393 [1]	308-0245-00	.6 Ω	2 w	WW	

[1] Added in series with the filament of V261.

M9304/665