

TABLE 1-1

PERFORMANCE SPECIFICATIONS

CATHODE-RAY TUBE

Type.....5AFP Dual-beam
 Total Accelerating Potential.....3,000 Volts (with respect to cathode)
 Illuminated Scale.....Engraved illuminated scale with front panel dimmer control

VERTICAL AXIS

Deflection Factor

Amplifier (at full gain).....0.1 volt peak-to-peak full scale:
 or 0.025 peak-to-peak volt/inch
 (.009 rms volt/inch)
 Direct.....36-45 peak-to-peak volts/inch;13-16 rms volts/inch

Undistorted Deflection.....At least 4 inches

Sinusoidal Frequency Response (Through Ampl)

Direct Coupling.....Flat to dc. Down not more than 10% at 100 kilocycles or 50% at 350 kc
 Capacitive Coupling.....Down not more than 10% at 10 cycles and 100 kc or 50% at 350 kc

Transient Response

Rise Time (10% to 90%).....2 μ s max.

Overshoot.....2% max.

Decay

Direct coupling.....None

Capacitive Coupling.....10% or less in 45 Milliseconds

Input Voltage (To Ampl)-- Maximum

Single-ended

Capacitive Coupling.....1,000 (dc plus peak ac)

Direct Coupling.....1,000 (dc plus peak ac) on all ranges of VOLTS FULL SCALE except 0.1 where it is 100 volts (dc plus peak ac)

Balanced.....0.4 volt peak-to-peak between grids, with a mean dc level between 0 and +1 volt (VOLTS FULL SCALE switch) at 0.1 DC only and (MULTIPLIER fully clockwise)

Input Impedance

Method.....Capactive or direct

Attenuation.....By Factors of 1, 10, 100, 1,000 \pm 2% as selected by the VOLTS FULL SCALE switch (0.1, 1, 10 or 100 positions respectively)

Input Impedance

Amplifier

Single-ended.....2 megohms, 50 μ f

Balanced.....4 megohms, 40 μ f

Direct
 Single-ended.....1.5 megohms, 20 μ f
 Balanced.....3 megohms, 20 μ f
 Positioning.....Permits examination on screen of any
 portion of signal expanded to five-
 time full scale diameter.

HORIZONTAL AXIS

Deflection Factor

Amplifier (at full gain).....0.3 peak to peak volt/inch; 0.1 rms
 volt/inch
 Direct.....40-50 peak to peak volts/inch; 14-18
 rms volts/inch

Sinusoidal Frequency Response

Individual Channel

Direct Coupling.....Flat to dc. Down not more than 10%
 at 100kc or 50% at 300 kilocycles
 Capacitive Coupling.....Down not more than 10% at 10 cycles
 and 100 kc or 50% at 300 kilocycles

Common Channel

Direct Coupling.....Down not more than 10% at 10 cycles
 and 70 kc or 50% at 200 kilocycles

Transient Response

Individual

Rise Time (10% to 90%).....2 μ s max.
 Overshoot.....1% max.

Decay

Direct Coupling.....None
 Capacitive Coupling.....20% or less in 45 milliseconds

Common

Rise Time.....2.5 μ s
 Overshoot.....1% max.

Decay

Direct Coupling.....None
 Capacitive Coupling.....20% or less in 45 milliseconds

Input Voltage

Capacitive Coupling.....1,000 volts (dc plus peak ac)
 Direct Coupling.....Attenuator Setting Peak-to-Peak Volts
 1:1 18
 10:1 180

Input Coupling (To Ampl).....Capacitive or direct

Attenuation (Ampl Connection)..By factors of 1 or 10 \pm 10%

Input Impedance

Amplifier.....2 megohms, 40 μ f
 Direct
 Single-ended.....1.5 megohms, 20 μ f
 Balanced.....3 megohms, 20 μ f

Linear-Sweep Time Base

Circuit.....A gas triode is used for both driven and recurrent sweeps. Return trace is automatically blanked. With common sweep, build-in compensation equalizes horizontal deflection and position for both beams

Frequency (Recurrent Sweep)....2 to 30,000 sawtooth cps. Sweep frequencies lower than 2 cps may be obtained by connecting a external capacitor between the SAWTOOTH Terminal and ground (SWEEP at EXT CAP), giving 0.5 second per microfarad. SWEEP at EXT CAP with no capacitor connected gives approximately 50,000 sawtooth cps.

Time Duration (Driven Sweep)...0.5 second to 33 microseconds for 4-inch deflection

Positioning.....Permits examination on screen of any Portion of sweep expanded to six-times full screen diameter

Synchronization.....INTernal, EXternal, or LINE frequency as selected

Common Sweep.....Provision for Channel A sweep to deflect both beams simultaneously thus providing a common time base for vertical inputs to Channels A and B

Individual Sweep.....Provision for independent sweep operation of Channel A and B

INTENSITY MODULATION (Z AXIS)

Input Impedance.....0.2 meohms, 30 μ f

Sensitivity.....2 to 56 volts peak (negative), depending on the intensity setting, are required to blank the beam

DUAL CHANNEL CONTROLS

Beam Control.....Permits selection of either beam separately or simultaneously

Sweep Selector.....Permits selection of common or individual sweep operation

CALIBRATION VOLTAGE

Availability	To input of Vertical Ampl of each channel (following the attenuator) by means of individual front-panel switches
Amplitude	0.1 volt peak-to-peak. Independent of VOLTS FULL SCALE setting
Waveshape and frequency	Square wave at power-line frequency
Accuracy (Amplitude)Over-all	±5% or better

SAWTOOTH TEST SIGNAL

Availability	At front panel for each channel
Voltage	5 volts peak-to-peak, nominal
Impedance	50,000 ohms
Frequency	2 to 30,000 sawtooth cps

POWER SOURCE

Voltage	115/230 volts rms ±10%
Frequency	50 to 400 cycles per second
Power Consumption	225 watts
Fuses	3 amp (115 volts); 1.5 amp (230 volts). In addition, power supply for each channel is fused separately

PHYSICAL CHARACTERISTICS

Size	Height: 15-3/4"; width: 12-1/2"; depth: 22-7/8"
Weight	75 lbs.

MAINTENANCE

BACK OF PANEL ADJUSTMENTS

a. Adjustments for Y Amplifiers

(1) Position Centering Adjustment (Y-CTR)-R119-This adjustment is set to bring the cathode-ray tube trace to the vertical center of the screen with no signal input (VOLTS FULL SCALE (RANGE) at OFF) and (Y) POSITION control at the mechanical center of its range (pointing up).

(2) D-C Balance Adjustments (Y D-C BAL)-R110 and R610-The Y- amplifiers are supplied with D-C balance controls, which are adjusted at the front panel by means of a screwdriver. When these adjusted at the front panel by means of a screwdriver. When these adjustments are properly set, there will be no shifting in the zero position of the trace (up and down) with changes in the setting of the (MULTIPLIER) controls. Since this adjustment requires occasional resetting, owing to aging components or when balanced input is used, it is made readily accessible to the operator. To set the Y D-C BALANCE adjustment, set the VOLTS FULL SCALE (RANGE) switch to the OFF position and the (MULTIPLIER) control at 1. Position the trace to the vertical center of the cathode-ray tube. Increase the (MULTIPLIER) control to 10 and adjust Y D-C BALANCE to return the trace to its previous position. It should now be possible to move the (MULTIPLIER) control from 1 to 10 without any vertical displacement resulting. Repeat the adjustment procedure if any vertical displacement is observed.

(3) Sensitivity Adjustment (Y SENS)-R121 and R621-This control is set to give the amplifier a sensitivity of 100 millivolts peak-to-peak full scale or 25 millivolts peak-to-peak per inch at full gain. For standards, the calibrating voltages of the Type 322-A (100 mv peak-to-peak) or a Du Mont Type 2649B Voltage Calibrator may be used.

(4) Bias Adjustments (Y-BIAS)-R125 and R625-These adjustments are provided to set the bias on V103 and V603 to 5 volts, measured on a vacuum-tube voltmeter connected between the grid and cathode of each tube.

(5) Linearity Adjustment (Y LIN ADJ)--R132 and R634-To make these adjustments, depress the CALIBRATOR button and adjust for 1 inch vertical deflection at the center of the screen. Position pattern 1-1/2 inches up and 1-1/2" down and observe whether vertical size of pattern becomes greater or smaller, away from the center of the Y LIN control until a minimum change in size with positioning occurs. When this adjustment (R119 and R619); also check the over-all amplifier sensitivity and reset the Y SENS adjustment as outlined in paragraph (2).

(6) VOLTS FULL SCALE (RANGE) Compensation capacitors--The trimmer capacitors C104 and C604, C103 and C603 and C102 and C602 are used for compensating the VOLTS FULL SCALE (RANGE) switch in the 1, 10 and 100-volt position, respectively. Compensation should be adjusted by applying a 10-kc square wave to the Y INPUT terminals and adjusting the appropriate trimmer to pass the square wave with minimum distortion.

b. ADJUSTMENTS FOR X AMPLIFIERS

(1) Position Centering Adjustments (X POS CTR)-R313 and R413-With no signal input (X SELECTOR at OFF) and the (X) POSITION control at the mechanical center of its range (pointing up), this adjustment is set to bring the cathode-ray tube trace to the horizontal center of the screen.

ADJUSTMENTS FOR X AMPLIFIERS (cont'd.)

(2) D-C Balance Adjustments (X D-C BAL)-R316 and R416-As with the Y amplifiers, each of the X amplifiers has an X D-C BALANCE adjustment, variable from the front panel by means of screwdriver. The adjustment procedure of this control is the same as for the Y D-C BALANCE. Set X SELECTOR at OFF and the X AMPLITUDE control at 10. By means of the (X) POSITION control, move the pattern to the horizontal center of the cathode-ray tube screen. Advance the X (AMPLITUDE) control to 100. Reposition the pattern to the horizontal center of the screen by means of the X D-C BALANCE adjustment. Reset the X (AMPLITUDE) control to 10 and repeat the above procedure until there is no horizontal displacement of the trace when rotating the X (AMPLITUDE) control from one end of its range to the other.

(3) Linearity Adjustment (X LIN ADJ)-R328 and R428-To set this adjustment, obtain a 1-inch sweep at the horizontal center of the screen. Position the pattern 1-1/2 inches to the left and 1-1/2 inches to the right of center; observe whether horizontal size of the pattern is greater at the left side or the right side of center. Then adjust the pattern to have the same amplitude on both sides of center. Then adjust the pattern to have the same amplitude on both sides of center.

(4) Attenuator Compensation Capacitors-C301 and C401-These trimmer capacitors are used for compensating the X SELECTOR attenuator in the 10:1 position. Compensation is made in the same manner as for the Y attenuator described in paragraph 4B(6).

c. ADJUSTMENTS FOR THE SWEEPS

(1) Sweep D-C Level Adjustments (SW DC LEVEL)-R713 and R724-These adjustments are made so that the sweeps expand equally in both directions as the X (AMPLITUDE) controls are advanced. To obtain the proper sweep for this

adjustment, set the SWEEP (RANGE) switch in the 50-250 position, the SWEEP (VERNIER) in the center of its range, X SELECTOR at RECUR, SYNC (SELECTOR) at EXT and SYNC (AMPLITUDE) at zero.

(2) Sweep-output Attenuator Trimmers-The sweep-output attenuator trimmers, C304 and C404, are adjusted for optimum linearity and minimum "tail" of the wave at the horizontal deflection plates on a sweep of approximately 300 cps. These trimmers are located on the underside of the chassis, directly behind their respective SWEEP switches. It is suggested that a separate oscillograph be employed to check for proper trimmer adjustment. Observe the waveform, obtained at the X AXIS amplifier terminals on the sidepanels of the Type 322-A, while adjusting the appropriate trimmer for minimum "tail" on the sawtooth wave.

(3) Driven Sweep Bias (DRIVEN SW BIAS)--R219 and R519-To adjust properly for normal operation of the driven sweep, set the SWEEP (RANGE) switch at the 2-10 cps position; set the SYNC (AMPLITUDE) control at zero and the SWEEP (VERNIER) fully clockwise (100). Depress the CALIBRATOR button and adjust VOLTS FULL SCALE (MULTIPLIER) control for about 1 inch vertical deflection. Set the X SELECTOR switch to DRIVEN SWEEP and adjust the DRIVEN SWEEP BIAS potentiometer until the sweep just stops and a vertical bar appears. Check this setting with the SWEEP (VERNIER) turned completely counterclockwise (10) also making certain that this adjustment is no way affects normal operation of the sweep on RECURRENT. Set the SYNC SELECTOR switch at INT.

ADJUSTMENTS FOR THE SWEEPS (cont'd.)

It should now be possible to trigger the "driven sweep" by rotating the SYNC (AMPLITUDE) control either way from "0". Check for proper triggering of the "driven sweep" with the SWEEP (VERNIER) control turned completely counterclockwise. If the sweep fails to trigger in this case, increase the vertical amplitude of the signal to a maximum of 1.5 inches. If the SYNC (AMPLITUDE) control, when fully advanced, still does not trigger the "driven sweep", the sweep thyatron (V202 or V502) may be defective.

(4) Sync Limiter (SYNC LIM)-R226 and R526-To adjust the SYNC LIM potentiometer set the front panel controls as follows:

X SELECTOR	DRIVEN SWEEP
SYNC (SELECTOR)	INT
SYNC (AMPLITUDE)	±50
(MULTIPLIER)	1.0
CALIBRATOR	In (on)

Adjust the sweep controls for several cycles of the calibrator square wave. Turn the (MULTIPLIER) towards 10 and note the amplitude of the square wave when the sweep stops. The SYNC LIM control is adjusted so that the square-wave amplitude may be varied, by means of the (MULTIPLIER), from full-scale deflection down to 0.6 inches (6 scale divisions) without losing synchronization of the sweep.

(5) Position Correction Adjustments (POS CORR)-R325 and R326-Adjust to establish the relative horizontal position of the two sweep traces when the SWEEP SELECTOR switch is set at A-COMMON. These adjustments are best made by beginning with each control at the midpoint of rotation; then adjust each control to effect half of the required correction.

(6) Sensitivity Correction Adjustment (SENS CORR)-R802-This adjustment is set to correct for the difference between the two sets of horizontal deflecting plates

in the cathode-ray tube. To make this adjustment, set SWEEP SELECTOR at A-COMMON and obtain horizontal traces approximately 4" long. If the traces are of unequal length, adjust R802 for equal length. After the traces are of equal length, check the relative horizontal position. If the traces do not start and stop together, the POS CORR adjustments, R325 and R326 should be readjusted slightly.

e. OTHER SERVICE ADJUSTMENTS

(1) Astigmatism Controls (AST A and AST B)-R701 and R702 - Apply a 60 cycle sine-wave test signal to the Y INPUT terminal. Synchronize one or two cycles of this signal on the screen and expand the trace to full-screen diameter. Adjust the FOCUS control for sharpest trace. Then adjust the corresponding ASTigmatism control to uniform width of trace from start to finish. It will probably be necessary to readjust the FOCUS control simultaneously with the ASTigmatism control to maintain the best focus.

(2) Hum Balance Adjustment (HUM BAL)-R141 and R641 - To adjust for hum rejection in the heaters of V101 and V601, shield the Y INPUT terminals, set the VOLTS FULL SCALE (RANGE) at 0:1 and the (MULTIPLIER) at 1.0. Set the SYNC SELECTOR at LINE, and adjust SYNC (AMPLITUDE) for a steady trace. Place a sheet metal shield at the side of the instrument to shield the tube (V101 or V601) and the back of the Y INPUT terminal (to correspond to the shielding of the instrument by its cabinet). Adjust the HUM BAL potentiometer to give minimum residual ripple

Hum Balance Adjustment (cont'd.)

on the trace (0.05 inch max.)

5. REPLACEMENT OF CATHODE-RAY TUBE

WARNING

The cathode-ray tube should be removed or inserted with great care to prevent damage which might result in personal injury. Do not employ force at any time. As an added precaution, wear safety goggles and gloves.

To replace the Type 5AFP-Cathode-ray Tube, removal of the old tube may be accomplished as follows: Disconnect the power cord from the line; remove the two screws holding the chassis to the rear of the cabinet; and carefully slide the instrument forward until it is clear of the cabinet. Detach the circular ring (bezel), calibrated scale, and color filter from the front panel by removing the four screws which hold them in place. Next, loosen the screw holding the tube base clamp. Remove the cathode-ray tube socket and the two intensifier buttons. Then remove carefully the tube-base clamp and inner shield by removing the two screws which secure them to the frame. Slide the tube back until the two collar sockets are clear of the outer shield and can be easily disconnected. The tube may now be removed through the front-panel opening.

Insert the new cathode-ray tube through the front-panel opening and the tube shield. When inserting the tube, the intensifier pins should be on top of the tube. Push the tube in far enough so that the collar sockets can be installed; replace the filter, calibra-

ted screen and bezel, and push the tube forward so that it just touches the filter. Then replace the inner shield and base clamp.

Connect the lead from the lower left of the instrument (when facing the panel) to the front intensifier pin and the lead from the top right to the rear intensifier pin. Next, connect the tube-base socket. Connect the power cord to the line; turn on the instrument, and set SWEEP SELECTOR to A-COMMON. If the resulting traces are not horizontal, rotate the tube as required and tighten the tube-base clamp, taking care not to rotate the tube. Check alignment of the tube after the clamp is tightened.

Slide the instrument back into the cabinet and replace the two screws at the rear which hold the chassis in place.

6. ILLUMINATED CALIBRATED SCALE

As an aid in amplitude and time calibration, in visual observation, and in photographic recording, the Type 322-A is provided with an illuminated intensity may be varied by the dimmer control on the front panel. The four illumination lamps are located behind the front panel. To replace a defective lamp, remove the lamp assembly by pressing on the sides of the spring clip and release it from the panel. The defective bulb then may be removed and replaced.

TABLE 4-1

VOLTAGE AND RESISTANCE MEASUREMENTS*

Pre-set Front-Panel controls according to the following chart:

CONTROL	POSITION	CONTROL	POSITION
Y Position	(A & B) Center	Sweep Range	(A & B) 50-250
X Position	(A & B) Center	X Selector	(A & B) RECUR
Intensity	(A & B) Max CCW	X Amplitude	(A & B) Max CCW
Focus	(A & B) Max CCW	Volts Full Scale	(A & B) OFF
Sync Selector	(A & B) EXT	Multiplier	(A & B) 4
Sync Amplitude	(A & B) Max CCW	Calibrator	(A & B) OFF
Sweep Vernier	(A & B) Center	Beam Control	OFF
Sweep Selector	Individual		

TUBE	DATE REPLACED	PIN NUMBERS												
			Symbol	Type	Function	1	2	3	4+	5+	6	7	8	9+
V101	8/66	12AU7	Input Cathode Follower	12K	210K	4K	0-250	0-250	12K	210K	4K	0-250		
V601	8/66			97V	0V	5.4V	VAC	VAC	97V	0V	5.4V	VAC	6.0-0	
V102			Phase Inverter	12K	5K	1K	0-250	0-250	12K	4K	1K	0-250		
V602		12AU7		54V	5.4V	6.3V	VAC	6.0-0	54V	5.4V	6.3V	VAC	12.3-6	
V103	8/66		1st. Push-pull Amplifier	40K	14K	20K	0/	0/	40K	14K	20K	0/		
V603	8/66	12AU7		105V	54V	56V	VAC	VAC	105V	54V	56V	VAC		
V104		6CL6	2nd Push-pull Amplifier	22K	40K	36K	0/	0/	26K	22K	36K	40K		
V604				110V	105V	255V	VAC	VAC	235V	110V	255V	105V		
V105			2nd Push-pull Amplifier	22K	40K	36K	0/	0/	26K	22K	36K	40K		
V605		6CL6		110V	105V	240V	VAC	VAC	200V	110V	240V	105V		
V201			(a) Sync Amplifier	110V	2M	10K	0/	0/	320K	85K	2K	0/		
V501		12AX7	(b) Sync Phase Splitter	105V	**		3.2	3.2				3.2		
V202			Sweep Generator		0/	350K		95K		0/	1K			
V502		6Q5G			3.2					3.2				
V203			(a) Series Dropping Triode		VAC	41V		0.2V		VAC	4.8V			
V503		12AU7	(b) Driven Sweep Limiter	13K	150K	42K	0/	0/	350K	350K	29K	0/		
				360V	65V	80V	VAC	VAC	41V	41V	103V	VAC	3.2	

TABLE 4-1

VOLTAGE AND RESISTANCE MEASUREMENTS* (Continued)

TUBE			PIN NUMBERS								
Symbol	Type	Function	1	2	3	4/	5/	6	7	8	9/
V204		(a) Sweep	28K	350K	180K	0/	0/	115K	14K	0	0/
V504	8/66 12AU7	Output Cathode Follower.	250V	41V	60V	3.2	3.2	40V		0V	3.2
		(b) Return Trace Blanking Ampl.				VAC	VAC				VAC
V205	6AL5	(a) Sync Limiter	0	100K	0/	0/	0		100K		
		Channel A	0V	-0.2V	VAC	VAC	0V		-0.2V		
		(b) Sync Limiter									
		Channel B									
*Obtained when using a 20,000 ohms/volt test meter. Readings are typical and nominal and may vary by as much as 20% or more in some cases. All voltages are d-c unless otherwise indicated.											
**Obtained when using a vacuum-tube voltmeter.											
/Values on V101, V601, V102, V602, V804 and V806 depend upon the settings of grounded-arm HUM BALANCE potentiometers (R141 and R641).											
V301			26K	100K	6K	0/	0/	26K	0	5K	0/
V401	8/66 12AU7	Input Cathode Follower	300V	-0.2V	17.5V	3.2	3.2	300V	0V	18V	3.2
						VAC	VAC				VAC
V302			50K	50K	0/	0/	10K	5K	5K		
V402	6J6	Phase Inverter	66V	62V	3.2	3.2	17V	16.8V	18V		
					VAC	VAC					
V303		Push-Pull Amplifier	50K	50K	0/	0/	49K	49K	10K		
V403	6J6		228V	228V	3.2	3.2	61V	62V	66V		CAP
					VAC	VAC					
V801	1X2A	-1400V Rectifier	750	750							580K
			1250	1250							-1420
			VAC	VAC							V
V802		/390V		13K		150		150		13K	
V808	5V4	Rectifier		420V		370		370		420V	
						VAC		VAC			
V803	0A2	/150V Regulator	10K				10K		0		
			147V				147V		0V		
V804				0-250					0-250		
V806	3-14	Filament Regulator		18.6-24.2					0-5.8		
				VAC					VAC		

TABLE 4-1

VOLTAGE AND RESISTANCE MEASUREMENTS* (Continued)

TUBE		PIN NUMBERS									
Symbol	Type	Function	1	2	3	4	5	6	7	8	9 CAP
V805	6AL5	Voltage	32K	0	0 \cancel{f}	0 \cancel{f}	220K		220K		
		Calibrator	118V	0V	VAC	VAC	52V		52V		
V807	6AQ5	110V	VAR	0	0 \cancel{f}	0 \cancel{f}	22K	10K	0		
		Regulator	VAR	0	3.2	3.2	110V	147V	0V		
V810	6AQ5		VAR	0	VAC	VAC					
V809	1X2A	1600V	5M	5M							750
		Rectifier	1550V	1550V							

V701			5AFP-				Cathode-Ray Tube				
1	2	3	5	7	8	9	10	12	14		(BASE)
560	560		760	470				560	760	470	560
K	K		K	K				K	K	K	K
-1400	-1300		-800	-800				-1300	-1400	-830	-1400
V	V		V	V				V	V	V	V

1	2	3	6	7	8	9	10	11	13	14	L	K	(BULB)
32K	28K	28K	65K	40K	48K	26K	26K	120K	36K	60K	120K	5M	
100	145	175	240	240	200	225	200	145	260	300	145	1550	
V	V	V	V	V	V	V	V	V	V	V	V	V	

Replacement for tubes listed in this table are:

- 5V4-GA for 5V4
- 6AQ5-A for 6AQ5
- ECC82/12AU7 for 12AU7
- ECC83/12AX7 for 12AX7

TABLE 4-2
ADJUSTMENTS TO BE MADE WHEN REPLACING TUBES

Type Reference Symbol	Type	1st. Readjustment	2nd. Readjustment	3rd. Readjustment
V101 V601	12AU7	Y DC BAL (R110, R610)	HUM BAL (R141, R641)	
V102 V602	12AU7	Y CTR (R119, R619)	Y SENS (R121, R621)	*Y CTR (R119, R619) HUM BAL (R141, R641)

TABLE 4-2

ADJUSTMENTS TO BE MADE WHEN REPLACING TUBES (Continued)

<u>Type</u> <u>Reference</u> <u>Symbol</u>	<u>Type</u>	<u>1st.</u> <u>Readjustment</u>	<u>2nd.</u> <u>Readjustment</u>	<u>3rd.</u> <u>Readjustment</u>
V103 V603	12AU7	Y SENS (R121, R621)	Y CTR (R119, R619)	-----
V104 V105	6CL6	Y LIN (R125)	Y SENS (R121)	Y CTR (R119)
V604 V605	6CL6	Y LIN (R625)	Y SENS (R621)	Y CTR (R619)
V202 V502	6Q5G	DRIVEN SWP BIAS (R219, R519)	SW DC LEVEL (R713, R724)	-----
V203 V503	12AU7	DRIVEN SWP BIAS (R219, R519)	SW DC LEVEL (R713, R724)	-----
V205	6AL5	SYNC LIM (R226, R526)	-----	-----
V301 V401	12AU7	X POS CTR (R313, R413)	X DC BAL (R316, R416)	-----
V302 V402	6J6	X POS CTR (R313, R413)	-----	-----
V303 V403	6J6	X BIAS (R334, R434)	X LIN (R328, R428)	(R325, R326) POS CORR
V701	5AFP-	Y SENS (R121, R621) Y CTR (R119, R619)	POS CORR (R325, R326) SENS CORR (R802)	AST A (R701) AST B (R702)
V801	1X2A	SENS CORR (R802)	-----	-----
V805	6AL5	CAL A (R808) CAL B (R806)	-----	-----

*The Y CTR control needs readjustment at this point because the (Y) POSITION Control is dependent on Y SENS. The latter control cannot be listed as the second readjustment when replacing V102 or V602 because in doing so may result in displacing the pattern so far off the screen that the (Y) POSITION Control has no effect on the pattern.

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH

Symbol	Part Number	Description
CAPACITORS		
(All capacitors are fixed and 500 V unless otherwise specified)		
C101	0300 0460	paper, 0.1 uf, ± 20 -10%, 1000V
C102 to C104	0300 3040	variable, ceramic, 3-12 uuf
C105	0303 3640	mica, 6800 uuf ± 10 %, 300V
C106	0302 9440	mica, 1000 uuf ± 10 %
C107	0302 0420	mica, 82 uuf ± 10 %
C108 to C109	0301 5920	ceramic, 0.01 uf, ± 100 -0%, 450V
C110	0300 0460	paper, 0.1 uf, ± 20 -10%, 1000 V
C111 A, B, C, D	0300 2350	electrolytic, 10/10/10/10 uf, ± 75 -20%, 450 V
C112	0300 0460	paper, 0.1 uf, ± 20 -10%, 1000 V
C113 and C114	0301 4520	composition, 0.68 uuf, ± 20
C115	0313 8600	electrolytic, 5uf, ± 100 -10%, 150V
C201	0300 4170	paper, 0.05 uf, ± 20 -10%, 600 V
C203 to C205	0312 3090	paper, 0.47 uf, ± 20 %, 200 V
C206 A, B	0300 3910	paper, 0.5/0.5 uf, ± 20 -10%, 600 V
C207	0300 3160	paper, 0.04 uf, ± 10 %, 400 V
C208	0303 3640	mica, 6800 uuf, ± 10 %, 300 V
C209	0302 9440	mica, 1000 uuf, ± 10 %
C210	0302 0450	mica, 150 uuf, ± 10 %
C211	0300 0040	electrolytic, 25 uf, ± 150 -25%, 50V
C212	0302 0430	mica, 100 uuf, ± 10 %
C213	0301 5920	ceramic, 0.01 uf, ± 100 -0%, 450 V
C301	0300 3040	variable, ceramic, 3-12 uuf
C302	0302 0430	mica, 100 uuf, ± 10 %
C303	0300 0460	paper, 0.1 uf, ± 20 -10%, 1000 V
C304	0300 3040	variable, ceramic, 3-12 uuf
C305	0312 2240	electrolytic, 25 uf, ± 150 -25%, 50 V
C311 to C312	0300 0460	paper, 0.1 uf, ± 20 -10%, 1000 V
C314	0300 0040	electrolytic, 25 uf, ± 150 -25%, 50 V
C315 to C316	0301 4550	mica, 3.3 uuf, ± 20 %
C401	0300 0460	variable, ceramic, 3-12 uuf
C402	0302 0430	mica, 100 uuf, ± 10 %
C403	0300 0460	paper, 0.1 uf, ± 20 -10%, 1000 V
C404	0300 3040	variable, ceramic, 3-12 uuf
C405	0312 2240	electrolytic, 25 uf, ± 150 -25%, 50 V
C411 to C412	0300 0460	paper, 0.1 uf, ± 20 -10%, 1000 V

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
CAPACITORS		
C414	0300 0040	electrolytic, 25uf, \pm 150 -25%, 50 V
C415 to C416	0301 4550	mica, 3.3 uuf, \pm 20%
C501	0300 4170	paper, 0.05 uf, \pm 20 -10%, 600 V
C503 to C505	0312 3090	paper, 0.47 uf, \pm 20%, 200 V
C506A	0300 3910	paper, 0.5/0.5 uf, \pm 20 -10%, 600 V
C507	0300 3160	paper, 0.04 uf, \pm 10%, 400 V
C508	0303 3640	mica, 6800 uuf, \pm 10%, 300 V
C509	0302 9440	mica, 1000 uuf, \pm 10%
C510	0302 0450	mica, 150 uuf, \pm 10%
C511	0300 0040	electrolytic, 25 uf, \pm 150, -25%, 50 V
C512	0302 0430	mica, 100 uuf, \pm 10%
C513	0301 5920	ceramic, 0.01 uf, \pm 100, -0%, 450 V
C601	0300 0460	paper, 0.1 uf, \pm 20, -10%, 1000 V
C602 to C604	0300 3040	variable, ceramic, 3-12 uuf
C605	0303 3640	mica, 6800 uuf, \pm 10%, 300 V
C606	0302 9440	mica, 1000 uuf, \pm 10%
C607	0302 0420	mica, 82 uuf, \pm 10%
C608 & C609	0301 5920	ceramic, 0.01 uf, \pm 100, -0%, 450 V
C610	0300 0460	paper, 0.1 uf, \pm 20 -10%, 1000 V
C611 A, B, C, D	0300 2350	electrolytic, 10/10/10/10 uf, \pm 75 -20%, 450 V
C612	0300 0460	paper, 0.1 uf, \pm 20 -10%, 1000 V
C613 & C614	0301 4520	composition, 0.68 uuf, \pm 20%
C615	0313 8600	electrolytic, 5 uf, \pm 100 -10%, 150 V
C701 & C702	0301 5920	ceramic, 0.01 uf, \pm 100 -0%, 450 V
C703 & C704	0301 6360	paper, 0.05 uf, \pm 20 -10%, 2000 V
C705 & C706	0301 4660	paper, 0.25 uf, \pm 30 -20%, 400 V
C707 & C708	0301 6360	paper, 0.05 uf, \pm 20 -10%, 2000 V
C801 to C805	0301 7750	paper, 0.5 uf, \pm 20 -10%, 2000 V
C806	0301 2470	electrolytic, 80 uf, \pm 40 -10%, 475 V
C807	0300 2440	electrolytic, 10 uf, \pm 10%, 450 V
C808	0301 2470	electrolytic, 80 uf, \pm 40 -10%, 475 V
C809	0300 2440	electrolytic, 10 uf, \pm 10%, 450 V
C810	0313 8630	electrolytic, 25 uf, \pm 100 -10%, 150 V
C811	0301 7750	paper, 0.5 uf, \pm 20 -10%, 2000 V
C813	0301 5920	ceramic, 0.01 uf, \pm 100 -0%, 450 V
C815	0301 5920	ceramic, 0.01 uf, \pm 100 -0%, 450 V

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
NEON REGULATORS		
E701 & E702	1200 3960	lamp, glow, NE-2
FUSES		
F801	1100 0790	3 amperes (115-volt operation)
	1100 0770	1.5 amperes (230-volt operation)
F802 & F803	1100 0770	1.5 amperes (115-volt operation)
	1100 0750	0.75 amperes (230-volt operation)
LAMPS		
1801 to 1805	1200 1310	incandescent, miniature bayonet, 0.15 ampere
RECEPTACLES		
J101 & J102	5100 1290	post, binding
J103	5100 7080	post, binding
J201 & J202	5100 1290	post, binding
J204	5100 1290	post, binding
J301	5100 1290	post, binding
J401	5100 1290	post, binding
J501 to J503	5100 1290	post, binding
J601 & J602	5100 1290	post, binding
J603	5100 7080	post, binding
INDUCTORS		
L801 & L802	2100 4301	fixed, 10h
RESISTORS		
(all resistors are fixed, composition, \neq 5% and 1/2 W unless otherwise specified. Resistance values in ohms; K=thousand, M=million)		
R101	0221 8420	2K, \neq 1%
R102	0221 8430	20.4K, \neq 1%
R103	0221 8440	250K, \neq 1%
R104 & R105	0221 8450	2M, \neq 1%
R106	0204 1270	2M
R107	0203 0500	1200
R108	0203 2050	220K, \neq 10%
R109	0203 1850	4700, \neq 10%

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
RESISTORS		
R110	0105 3500	variable, 2K, $\pm 20\%$, 1/4W
R111	0203 1850	4700, $\pm 10\%$
R112	0103 7100	variable, 2K, $\pm 20\%$
	8700 0252	assembly, consist of R112 & S101
R113	0203 0540	1800
R114	0203 2050	220K, $\pm 10\%$
R115 & R116	0203 0740	1200
R117	0103 8372	variable, 1200/10K, $\pm 20\%$
R118	0203 0870	43K
R119	0101 4020	variable, 25K, $\pm 20\%$
R120	0203 0870	43K
R121	0101 4020	variable, 25K, $\pm 20\%$
R123	0204 2550	2K
R124	0204 3790	20K, 1 W
R125	0101 4050	variable, 200K, $\pm 20\%$
R126 & R127	0203 3840	33K, 1 W
R128	0203 3630	4300, 1 W
R129	0203 1610	47, $\pm 10\%$
R130	0204 1310	3M
R131	0203 1610	47, $\pm 10\%$
R132 & R133	0210 8090	wire wound, 15K, 10 W
R134	0203 6860	39K, 2 W
R135	0203 1030	200K
R137 & R138	0203 2210	4.7M, $\pm 10\%$
R139 & R140	0203 2170	2.2M, $\pm 10\%$
R141	0105 3600	variable, wire wound, 1K, $\pm 20\%$, 1.5W
R142	0204 1310	3 M
R201	0203 2170	2.2M, $\pm 10\%$
R202	0203 2050	220K, $\pm 10\%$
R203	0203 2170	2.2M, $\pm 10\%$
R204	0203 1890	10K, $\pm 10\%$
R205	0203 0540	1800
R206	0203 0700	8200
R207	0203 2050	220K, $\pm 10\%$
R208	0103 7200	variable, 200K, $\pm 20\%$
	8700 0232	assembly, consist of R208 & S201
R209	0203 0440	680
R210	0203 5010	100K, $\pm 10\%$, 1 W
R211	0203 2010	100K, $\pm 10\%$
R212	0203 1910	15K, $\pm 10\%$

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
RESISTORS		
R213	0103 7000	variable, 5M, $\pm 20\%$, 2 W
	8700 0242	assembly, consist of R213 & S202
R214	0203 5090	470K, $\pm 10\%$, 1 W
R215	0203 6950	91K, 2 W
R216	0203 0500	1200
R217	0203 0480	1K
R218	0203 7990	68K, $\pm 10\%$, 2 W
R219	0101 4030	variable, 50K, $\pm 20\%$
R220	0203 1090	360K
R221	0203 1070	300K
R222	0203 1910	15K, $\pm 10\%$
R223	0203 8010	100K, $\pm 10\%$, 2 W
R224	0203 1910	15K, $\pm 10\%$
R225	0203 2050	220K, $\pm 10\%$
R226	0102 3920	variable, 3K, $\pm 10\%$, 1-1/2 W
R227	0203 3870	43K, $\pm 5\%$, 1 W
R301	0204 1270	2M
R302	0204 1040	220K
R303	0204 1200	1M
R304	0203 1610	47, $\pm 10\%$
R305	0204 1020	180K
R306	0203 1900	12K, $\pm 10\%$
R307	0203 1970	47K, $\pm 10\%$
R308	0103 7100	25K, $\pm 20\%$
	8700 0291	assembly, consist of R308 & S301
R309	0203 0540	1800
R310	0203 2170	2.2M, $\pm 10\%$
R311	0203 1850	4700, $\pm 10\%$
R312	0203 0430	620
R313	0101 4080	variable, 1K, $\pm 20\%$
R314	0103 8372	variable, 1200/10K, $\pm 20\%$
R315	0203 4170	750K, 1 W
R316	0105 3510	variable, 10K, $\pm 20\%$, 1/4 W
R317	0203 0650	5100
R318	0203 1610	47, 3M, $\pm 10\%$
R319 & R320	0203 0720	10K
R321	0203 0660	5600
R322 & R323	0203 1610	47, $\pm 10\%$

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
RESISTORS		
R324	0203 3630	4300, 1 W
R325 A, B & R326 A, B	0105 2400	variable, 10K/10K, \pm 20%
R327	0203 7920	18K, \pm 10%, 2 W
R328	0105 3960	variable, 25K, \pm 20 %, 2 W
R329	0203 7920	18K, \pm 10%, 2 W
R330 & R331	0203 2210	4.7M, \pm 10%
R332 & R333	0203 2170	2.2M, \pm 10%
R334	0105 3950	variable, 1K, \pm 20%, 2 W
R401	0204 1270	2M
R402	0204 1040	220K
R403	0204 1200	1M
R404	0203 1610	47, \pm 10%
R405	0204 1020	180K
R406	0203 1900	12K, \pm 10%
R407	0203 1970	47K, \pm 10%
R408	0103 7100	25K, \pm 20%
	8700 0291	assembly, consist of R408 & S401
R409	0203 0540	1800
R410	0203 2170	2.2M, \pm 10%
R411	0203 1850	4700, \pm 10%
R412	0203 0430	620
R413	0101 4080	variable, 1K, \pm 20%
R414	0103 8372	variable, 1200/10K, \pm 20%
R415	0203 4170	750K, 1 W
R416	0105 3510	variable, 10K, \pm 20%, 1/4 W
R417	0203 0650	5100
R418	0203 1610	47, \pm 10%
R419 & R420	0203 0720	10K
R421	0203 0660	5600
R422 & R423	0203 1610	47, \pm 10%
R424	0203 3630	4300, 1 W
R425 & R426	0203 7940	27K, \pm 10%, 2 W
R428	0105 3960	variable, 25K, \pm 20%, 2 W
R430 & R431	0203 2210	4.7M, \pm 10%
R432 & R433	0203 2170	2.2M, \pm 10%
R434	0105 3950	variable 1K, \pm 20 % 2 W
R501	0203 2170	2.2M, \pm 10%
R503	0203 2170	2.2M, \pm 10%
R504	0203 1890	10K, \pm 10%

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
RESISTORS		
R505	0203 0540	1800
R506	0203 0700	8200
R507	0203 2050	220K, $\pm 10\%$
R508	0103 7200	variable, 200K, $\pm 20\%$
	8700 0232	assembly, consist of R508 & S501
R509	0203 0440	680
R510	0203 5010	100K, $\pm 10\%$, 1 W
R511	0203 2010	100K, $\pm 10\%$
R512	0203 1910	15K, $\pm 10\%$
R513	0103 7000	variable, 5M, $\pm 20\%$, 2 W
	8700 0242	assembly, consist of R513 & S502
R514	0203 5090	470K, $\pm 10\%$, 1 W
R515	0203 6950	91K, 2 W
R516	0203 0500	1200
R517	0203 0480	1K
R518	0203 7990	68K, $\pm 10\%$, 2 W
R519	0101 4030	variable, 50K, $\pm 20\%$
R520	0203 1090	360K
R521	0203 1070	300K
R522	0203 1910	15K, $\pm 10\%$
R523	0203 8010	100K, $\pm 10\%$, 2 W
R524	0203 1910	15K, $\pm 10\%$
R525	0203 2050	220K, $\pm 10\%$
R526	0102 3920	variable, 3K, $\pm 20\%$, 1-1/2 W
R527	0203 3870	43K, 1 W
R601	0221 8420	2K, $\pm 1\%$
R602	0221 8430	20.4K, $\pm 1\%$
R603	0221 8440	250K, $\pm 1\%$
R604 & R605	0221 8450	2M, $\pm 1\%$
R606	0204 1270	2M
R607	0203 0500	1200
R608	0203 2050	220K, $\pm 10\%$
R609	0203 1850	4700, $\pm 10\%$
R610	0105 3500	variable, K, $\pm 20\%$, 1/4 W
R611	0203 1850	4700, $\pm 10\%$
R612	0103 7100	variable, 25K, $\pm 20\%$
	8700 0252	assembly, consist of R612 & S601
R613	0203 0540	1800
R614	0203 2050	220K, $\pm 10\%$
R615 & R616	0203 0740	1200
R617	0103 8372	variable, 1200/10K, $\pm 20\%$

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
RESISTORS		
R618	0203 0870	43K
R619	0101 4020	variable, 25K, $\pm 20\%$
R620	0203 0870	43K
R621	0101 4020	variable, 25K, $\pm 20\%$
R623	0204 2550	2K
R624	0204 3790	20K
R625	0101 4050	variable, 200K, $\pm 20\%$
R626 & R627	0203 3840	33K, 1 W
R628	0203 3630	4300, 1 W
R629	0203 1610	47, $\pm 10\%$
R630	0204 1310	3M
R631	0203 1610	47, $\pm 10\%$
R632 & R633	0210 8090	wire wound, 15K, 10 W
R634	0203 6860	39K, 2 W
R635	0203 1030	200K
R637 & R638	0203 2210	4.7M, $\pm 10\%$
R639 & R640	0203 2170	2.2M, $\pm 10\%$
R641	0105 3600	variable, wire wound, 1 K, $\pm 20\%$ 1/5 W
R642	0204 1310	3M
R701 & R702	0101 4050	variable, 200K, $\pm 20\%$
R703 & R704	0203 1890	10K, $\pm 10\%$
R705 & R706	0203 1030	200K
R707/R709	0103 8382	variable, 50K/200K, $\pm 20\%$
R708	0203 5050	220K, $\pm 10\%$, 1 W
R710	0206 3790	560K, 1 W
R712	0203 0930	75K
R713	0101 4030	variable, 50K, $\pm 20\%$
R715	0203 2050	220K, $\pm 10\%$
R716	0203 2170	2.2M, $\pm 10\%$
R717	0203 1910	15K, $\pm 10\%$
R718	0203 5050	220K, $\pm 10\%$, 1 W
R719/R720	0103 8382	variable, 50K/200K, $\pm 20\%$
R721	0206 3790	560K, 1 W
R723	0203 0930	75K
R724	0101 4030	variable, 50K, $\pm 20\%$
R726	0203 2050	220K, $\pm 10\%$
R727	0203 2170	2.2M, $\pm 10\%$
R728	0203 1910	15K, $\pm 10\%$
R801	0203 4970	47K, $\pm 10\%$, 1 W
R802 A, B	0105 2510	variable, 200K/200K, $\pm 20\%$

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
RESISTORS		
R803	0203 4970	47K, $\pm 10\%$, 1 W
R804	0210 8050	wire wound, 12K, 10 W
R805	0203 4280	2.2M, 1 W
R806	0101 4020	variable, 25K, $\pm 20\%$
R807	0203 1770	1K, $\pm 10\%$
R808	0101 4020	variable, 25K, $\pm 20\%$
R809	0203 1770	1K, $\pm 10\%$
R810	0203 5070	330K, $\pm 10\%$ 1 W
R811	0203 4890	10K, $\pm 10\%$, 1 W
R812	0203 5010	100K, $\pm 10\%$, 1 W
R813	0203 7300	2.7M, 2 W
R814	0210 6800	wire wound, 10K, 20 W
R815	0104 4421	variable, wire wound, 6, $\pm 10\%$ 2 W
R816	0203 7300	2.7M, 2 W
R818	0210 8050	wire wound, 12K, 10 W
R819	0203 4280	2.2M, 1 W
R820 & R821	0203 0570	2400
R822	0203 4320	3.3M, 1 W
R823	0203 1040	220K
R824	0203 0930	75K
R825	0203 1170	750K
R826	0203 1770	1K, $\pm 10\%$
R827	0203 4320	3.3M, 1 W
R828	0203 1040	220K
R829	0203 0930	75K
R830	0203 1170	750K
R831	0203 1770	1K, $\pm 10\%$
R832 & R833	0210 6060	250, 10W

SWITCHES

S101	0500 5352	rotary, 30°, 2 decks, 9 positions
	8700 0252	assembly consist of S101 & R112
S102	0500 6793	push-push
	8700 0232	assembly, consist of S201 & R208
S201	0500 5332	rotary, 60°, 1 deck, 3 positions
	8700 0232	assembly, consist of S201 & R208
S202	0500 5342	rotary, 30°, 2 decks, 7 positions
	8700 0242	assembly, consist of S202 & R213
S301	0500 5701	rotary, 30°, 2 decks, 7 positions
	8700 0291	assembly, consist of S301 & R308

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
SWITCHES		
S401	0500 5701 8700 0291	rotary, 30°, 2 decks, 7 positions assembly, consist of S401 & R408
S402	0500 5463	rotary, 60°, 2 decks, 2 positions
S501	0500 5332 8700 0232	rotary, 60°, 1 deck, 3 positions assembly, consist of S501 & R508
S502	0500 5342 8700 0242	rotary, 30°, 2 decks, 7 positions assembly, consist of S502 & R513
S601	0500 5352 8700 0252	rotary, 30°, 2 decks, 9 positions assembly, consist of S601 & R612
S602	0500 6793	push-push
S701	0500 5452	rotary, 30°, 1 deck, 5 positions
S801	0500 1130	toggle, SPST

TRANSFORMERS

T801 & T802	2000 7793	power, 115/230 volts, 50-400 cps
-------------	-----------	----------------------------------

TUBES

V101 to V103	2501 1610	ECC82/12AU7
....	2500 0130	12AU7 (alternate)
V104 & V105	2500 7820	6CL6
V201	2501 1680	ECC83/12AX7
....	2500 1500	12AX7 (alternate)
V202	2500 0640	6Q5G
V203 & V204	2501 1610	ECC82/12AU7
....	2500 0130	12AU7 (alternate)
V205	2500 0020	6AL5
V301	2501 1610	ECC82/12AU7
....	2500 0130	12AU7 (alternate)
V302 & V303	2500 0190	616
V401	2501 1610	ECC82/12AU7
....	2500 0130	12AU7 (alternate)
V402 & V403	2500 0190	6J6
V501	2501 1680	ECC83/12AX7
....	2500 1500	12AX7 (alternate)
V502	2500 0640	6Q5G
V503 & V504	2501 1610	ECC82/12AU7
....	2500 0130	12AU7 (alternate)
V601 & V603	2501 1610	ECC82/12AU7
....	2500 0130	12AU7 (alternate)

ELECTRICAL PARTS LIST AND SCHEMATIC

TYPE 322-A DUAL-BEAM CATHODE-RAY OSCILLOGRAPH (continued)

Symbol	Part Number	Description
TUBES		
V604 & V605	2500 7820	6CL6
V701*	2500 8100	5AFP1
	2500 8110	5AFP2
	2500 8120	5AFP7
TRANSFORMERS		
	2500 8130	5AFP11
	*depends on Sales Order	
V801	2500 6490	1X2-A
V802	2501 1180	5V4-GA
....	2500 0160	5V4-G (alternate)
V803	2500 0300	OA2
V804	0214 2600	resistor, thermal, 3-14
V805	2500 0020	6AL5
V806	0214 2600	resistor, thermal, 3-14
V807	2501 1750	6AQ5-A
....	2500 0340	6AQ5 (alternate)
V808	2501 1180	5V4-GA
	2500 0160	5V4-G (alternate)
V809	2500 6490	1X2-A
V810	2501 1750	6AQ5-A
	2500 0340	6AQ5 (alternate)