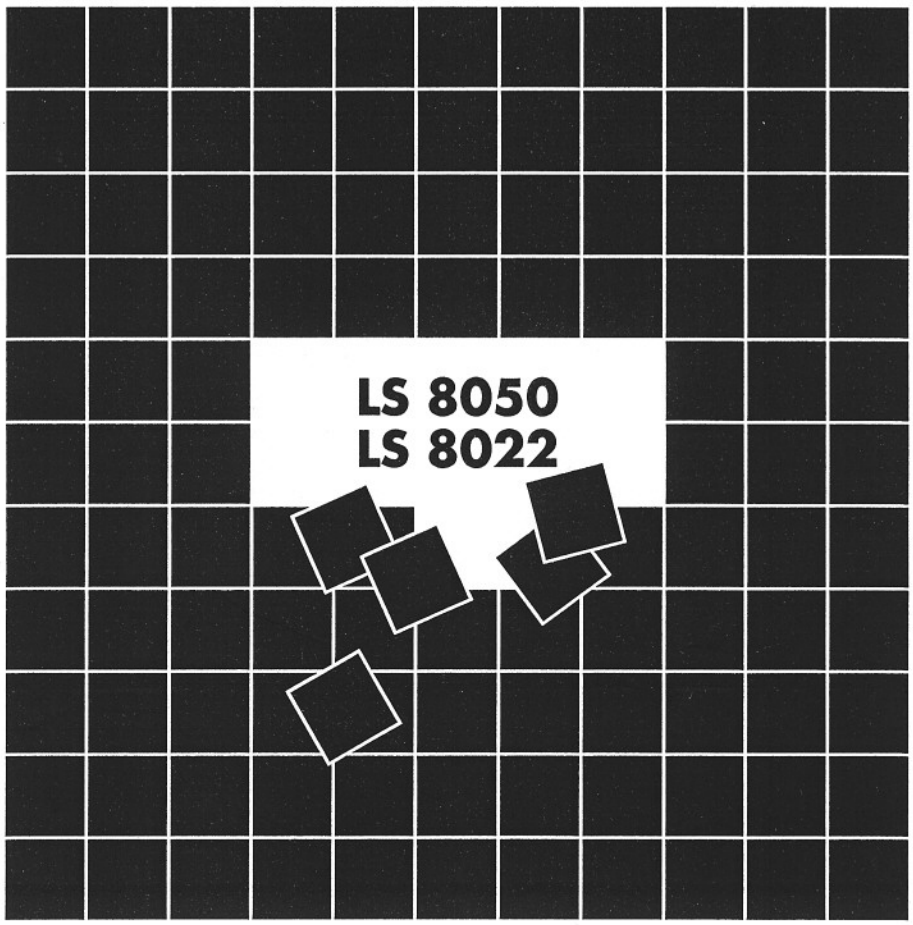
LEADER

50MHz OSCILLOSCOPES
20MHz OSCILLOSCOPES

SERVICE MANUAL



LEADER ELECTRONICS CORP.

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Part 1 Operation

1. GENERAL

1.1 Description

The LS 8050 and LS 8022 oscilloscopes are dual-channel oscilloscopes with maximum sensitivity of 1 mV/DIV, and maximum sweep time of 10 nSec/DIV. Each of these oscilloscopes employs a 6-inch rectangular type cathode-ray tube with red internal graticule. LS 8050 has a sweep magnification feature with B sweep.

These oscilloscopes are sturdy, easy to operate and exhibits high operational reliability.

1.2 Features

1) High intensity CRT with high acceleration voltage:

The CRT is a high beam transmission, high intensity type with a high acceleration voltage of 2kV for model LS 8022 ,and 12KV for model LS 8050. It displays clear readable traces even at high sweep speeds.

2) High stability with less drift:

The oscilloscope employs a temperature compensation circuit which is newly developed to reduce the drift of base lines and DC balance disturbance caused by temperature change.

3) A trigger level lock function which makes the triggering adjustment unnecessary:

A new trigger level lock circuit is incorporated. This circuit eliminates the procedures of the troublesome triggering adjustment not only for displaying signals but also for that of video signals and large duty-cycle signals.

4) TV sync triggering:

The oscilloscope has a sync separator circuit incorporated within the TIME/DIV switch for of automatic triggering TV-V and TV-H signals.

5) Linear focus:

Once the beam focus is adjusted to the optimum position, it is automatically maintained regardless to the intensity change.

2. TECHNICAL SPECIFICATIONS

Specifications \ Model		20MHz OSCILLOSCOPE LS 8022	50MHz OSCILLOSCOPE LS 8050
VERTICAL AXIS	Sensitivity	1mV to 5V/DIV, 12 steps in 1-2-5 sequence	
	Sensitivity accuracy	5mV to 5V/DIV:≤3%, 1mV to 2mV/DIV: ≤5% (10 ℃ to 35 ℃) << 5 DIV at the center of display>>	
	Vernier vertical sensitivity	To 1/2.5 or less of panel-indicated value.	
	Frequency bandwidth (−3dB)	5mV to 5V/DIV:DC to 20MHz, 1mV to 2mV/DIV:DC to 10MHz	5mV to 5V/DIV : DC to 50MHz, 1mV to 2mV/DIV:DC to 15MHz
		AC coupling: Low limit frequency 10Hz. (with reference to 100kHz,8DIV. Frequency response with -3dB.)	
	Rise time	5mV to 5V/DIV:≈ 17.5ns 1mV to 2mV/DIV: ≈ 35ns	5mV to 5V/DIV:≈ 7ns, 1mV to 2mV/DIV: ≈ 23ns
	Input impedance	1M ohm ±2% // Approx. 25pF	
	Square wave characteristics	Overshoot : ≤ 5% (At 10mV/DIV range) << 5 DIV at the center of display>> Other distortions and other ranges: 5% added to the above value. (10 ℃ to 35 ℃)	
	DC balance shift	5mV to 5V/DIV: ±0.5DIV, 1mV to 2mV/DIV: ±2.0DIV	
	Linearity	< ±0.1 DIV of amplitude change when waveform of 2 DIV at graticule center is moved vertically.	
	Vertical modes	CH1 : CH1 single channel. CH2 : CH2 single channel. DUAL : CHOP/ALT are auto-set by TIME/DIV switch.(CHOP:0.5s to 5ms/DIV, ALT:2ms to 0.1 μs/DIV) When CHOP switch is pushed in, the two traces are displayed in the CHOP mode at all range. ADD : CH1 + CH2 algebraic addition.	
	Chopping repetition frequency	Approx. 250kHz	
	Input coupling	AC, DC, GND	
	Maximum input voltage	400V (DC+AC peak), AC: frequency 1kHz or lower. When set probe switch at 1:1, the maximum effective readout is 40Vpp (14Vrms at sine wave), or set probe switch at 1:10, the maximum effective readout is 400Vpp (140Vrms at sine wave).	
	Common mode rejection ratio	50:1 or better at 50kHz sinusoidal wave. (When sensitivities of CH1 and CH2 are set equally)	
	Isolation between channels	> 1000:1 at 50kHz , >30:1 at 20MHz (At 5mV/DIV range)	> 1000:1 at 50kHz > 30:1 at 50MHz (At 5mV/DIV range)
	CH1 signal output	Approx. 100mV/DIV without termination, 50mV/DIV with 50 ohm termination. Bandwidth(-3dB) : LS 8022 : 20MHz LS 8050 : 40MHz	
	CH2 INV BAL.	Balanced point variation : ≤ 1 DIV (Reference at center graticule.)	
	Dynamic range	>8DIV at 20MHz	>8DIV at 50MHz

Specifications \ Model		20MHz OSCILLOSCOPE LS 8022	50MHz OSCILLOSCOPE LS 8050
TRIGGER -ING	Triggering source	CH1, CH2, LINE, EXT (CH1 and CH2 can be selected only when the vertical mode is DUAL or ADD. In ALT mode, if the TRIG. ALT switch is pushed in , it can be use for alternate triggering of two different source.)	
	Coupling	AC, HF-REJ, TV, DC (TV-V/TV-H can be auto-set by TIME/DIV range. TV-V: 0.5s-0.1ms/DIV; TV-H: 50μs-0.1μs/DIV)	
	Polarity	+/−	
	Sensitivity	DC to 5MHz : 0.5 DIV (EXT: 0.1V) 5 to 20MHz : 1.5 DIV (EXT: 0.2V)	DC to 10MHz : 0.5 DIV (EXT: 0.1V) 10 to 50MHz : 1.5 DIV (EXT: 0.2V)
		TV(video signal): 2.0 DIV (EXT: 0.2V) AC coupling : Attenuate signal components of lower than 10Hz. HF-REJ: Attenuate signal components of higher than 50kHz.	
	Triggering modes	AUTO : Sweeps run in the free mode when no triggering input signal is applied. (Applicable for repetitive signals of frequency 50Hz or over.) NORM : When no triggering signal is applied, the trace is in the READY state and not displayed.	
		SINGLE : One-shot sweep with triggering signal. Can be reset to the READY state by means of the RESET switch. The READY lamp(LED) turns on when in the READY state or in the sweep operation. (LS 8050 only)	
	LEVEL LOCK and ALT triggering	Satisfies the value of the above trigger sensitivity plus 0.5 DIV (EXT: 0.05V) for signal of duty cycle 20 : 80.	
		Repetition frequency : 50Hz to 20MHz	Repetition frequency : 50Hz to 40MHz
	EXT triggering signal input	EXT HOR input terminal is used in common.	
	Input impedance	1M ohm ±2% // approx. 35p	
	Max. input voltage	100V (DC+AC peak), AC: Frequency not higher than 1kHz	
	B triggering signal.	—	The A triggering signal of main sweep is used as the B triggering signal.
HORIZON TAL AXIS	Horizontal axis display	A	A, A INT, B, B TRIG'D
	A sweep(main sweep) time	0.1μs to 0.5s/DIV, 21 steps in 1-2-5 sequence	
	Sweep time accuracy	±3%, (10 ℃ to 35 ℃)	
	Vernier sweep time control	≤ 1/2.5 of panel-indicated value	
	Hold off time	Continuous variable >= twice sweep length (time) at 0.1μSec~1mSec/DIV ranges.	
	B sweep delay system	—	Continuous delay and triggered
	B sweep(delay sweep) time	—	Delay 0.1μs to 0.5ms/DIV, 12 steps
	Sweep time accuracy	—	±3%, (10 ℃to 35 ℃)
	Delay time	—	1μs to 5mSec

Specifications \ Model		20MHz OSCILLOSCOPE	50MHz OSCILLOSCOPE
		LS 8022	LS 8050
HORIZONTAL AXIS	Sweep magnification	10 times (maximum sweep time 10ns/DIV)	
	×10MAG sweep time accuracy	0.1μs to 50ms/DIV ±5%, 10ns to 50ns/DIV ±8% (10 ℃ to 35 ℃)	
	Linearity	NORM:±3%, ×10MAG:±5% (±8% for 10ns to 50ns/DIV)	
	Position shift caused by × 10MAG	Within 2 div. at CRT screen center	
X-Y MODE	Sensitivity	Same as vertical axis.(X-axis:CH1 input signal; Y-axis:CH2 input signal.)	
	Sensitivity accuracy	NORM:±4%, ×10MAG:±6% (10 ℃ to 35 ℃)	
	Frequency bandwidth	DC to 1MHz (-3dB)	DC to 2MHz (-3dB)
	X-Y phase difference	≤3° at DC to 50kHz	≤3° at DC to 100kHz
EXT HOR MODE	Sensitivity	Approx. 0.1V/DIV (Trace swept by an external horizontal signal applied to the EXT TRIG IN terminal. Vertical axis modes are CH1, CH2, DUAL and ADD modes in the CHOP mode.)	
	Frequency bandwidth	DC to 1MHz (-3dB)	DC to 2MHz (-3dB)
	Phase difference between vertical axis	≤ 3° at DC to 50kHz	≤ 3° at DC to 100kHz
Z AXIS	Sensitivity	3 Vp-p (Trace becomes brighter with negative input.)	
	Frequency bandwidth	DC to 5MHz	
	Input resistance	Approx. 5k ohm	
	Maximum input voltage	50 V (DC+AC peak, AC frequency≤ 1kHz)	
CALIBRATION VOLTAGE	Waveform	Positive-going square wave	
	Frequency	1 kHz ±5%	
	Duty ratio	Within 48:52	
	Output voltage	2 Vp-p ±2%	
	Output impedance	Approx. 2 k ohm.	
CRT	Type	6-inch rectangular type, internal graticule.	
	Phosphor	P 31	
	Acceleration voltage	Approx. 2 kV	Approx. 12 kV
	Effective screen size	8 × 10 DIV (1 DIV = 10mm(0.39in))	
	Graticule	Internal; continuous adjustable illumination (LS 8050 only)	

Line Power Requirements

Voltage**:** AC 100V, 120V, 220V, 230V ±10% selectable

Frequency**:** 50Hz or 60Hz

Power consumption**:** Approx. 70VA, 60W(max.)

Operating Environment

Ambient temperature :

To satisfy specifications : 5° to 35 ℃

Maximum operating ranges: 0° to 40 ℃

Relative humidity:85% RH(max.) non condensing

Indoor use

Altitude up to 2000 m

Installation Category II

Pollution degree 2

Accessories

Power cord ×1; Instruction manual. ×1; Probes LP-051C×2; FUSE×1

Mechanical Specifications

Dimensions: 310 W x 150 H x 455 D (mm)

Weight: Approx.8.2Kg

Storage Temperature & Humidity

-10° to 70 ℃,70%RH (maximum)

3. PRECAUTIONS BEFORE OPERATING THE OSCILLOSCOPE

3.1 Unpacking the Oscilloscope

The oscilloscope is shipped from the factory after being fully inspected and tested. Upon receiving the instrument, immediately unpack and inspect it for any damages that might have been sustained during transportation. If any sign of damage is found, immediately notify the bearer and/or the dealer.

3.2 Checking the Line Voltage

These oscilloscopes will operate on any one of the line voltage shown in the table below, by inserting the line voltage selector plug in the corresponding position on the rear panel. Before connecting the power plug to an AC line outlet, make sure the voltage selector is set to the correct position corresponding to the line voltage. Note the oscilloscope may be damaged if it is connected to the wrong AC line voltage.

WARNING. To avoid electrical shock the power cord protective grounding conductor must be connected to ground.

When line voltages are changed, replace the required fuses shown below.

Line voltage	Range	Fuse	Line voltage	Range	Fuse
100V	90-110V	T 0.63A 250V	220V	198-242V	T 0.315A 250V
120V	108-132V		230V	207-250V	

WARNING. To avoid personal injury, disconnect the power cord before removing the fuse holder.

3.3 Environment

The normal ambient temperature range of this instrument is 0° to 40°C (32° to 104°F). Operation of the instrument above this temperature range may cause damage to the circuits.

Do not use the instrument in a place where strong magnetic or electric field exists. Such fields may disturb the measurement.

3.4 Equipment Installation, and Operation

Ensure there is proper ventilation for the hole vents in the oscilloscope case.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

3.5 CRT Intensity

To prevent permanent damage to the CRT phosphor, do not make the CRT trace excessively bright or leave the spot stationary for an unreasonably long time.

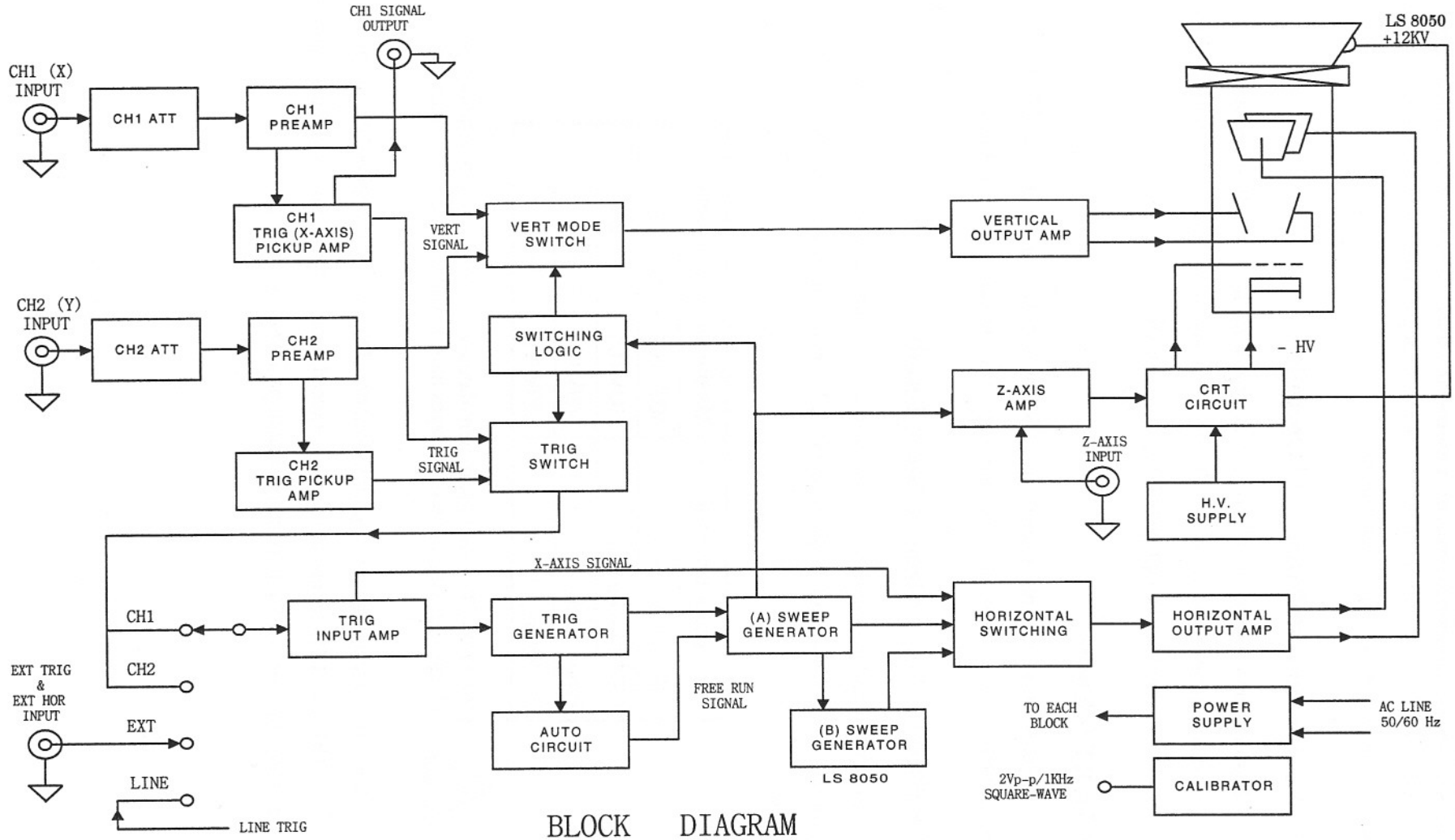
3.6 Withstanding Voltages of Input Terminals

The withstanding voltages of the instrument input terminals and probe Input terminals are as shown in the following table. Do not apply voltages higher than these limits.

Input terminal	Maximum input voltage
CH1, CH2, inputs	400V (DC + AC peak)
EXT TRIG input	100V (DC + AC peak)
Probe inputs	600V (DC + AC peak)
Z AXIS input	50V (DC + AC peak)

CAUTION. To avoid instrument damage, do not exceed maximum input voltages. Maximum input voltages must have frequencies less than 1 kHz.

If an AC voltage which is superimposed on a DC voltage is applied, the maximum peak of CH1 and CH2 input voltage must exceed + or – 400V. So for voltages with a mean value of zero volt the maximum peak to peak value is 800Vpp.



BLOCK DIAGRAM

LS 8022 ADJUSTMENT PROCEDURES

WARNING

The following instructions are for qualified service personnel only. To avoid electrical shock, do not perform servicing unless you are qualified to do so.

High voltage appears when covers are removed and the unit is in operation. Remember that high voltage may be retained indefinitely on high voltage capacitors. In addition, the AC line voltage is present on line voltage input circuit (including the fuse holder, line cord receptacle, and POWER switch) whenever the instrument is plugged into an AC outlet, even when it is turned off.

Unplug the oscilloscope and discharge high voltage capacitors before performing service procedures unless it is necessary to have its power turned on.

GENERAL

This unit was carefully checked and calibrated at the factory before shipment. After the oscilloscope has been used for a period of time, it should be calibrated to maintain instrument accuracy. Calibration is also required if repairs have been made in a circuit which may affect the former calibration. Keep in mind that some calibration adjustments require high precision test instruments. Those adjustments should be attempted only if the proper test equipment is available and you are experienced in using it. The unit should be calibrated at an ambient temperature of 23 degrees C (± 5 degrees C). Connect the unit to AC line voltage, 50/60 Hz line source and allow it to warm up for at least 30 minutes before any adjustment. The following test equipment required complete calibration::

LEADER 856 Multi-meter or equivalent.

TEKTRONIX CG-5001 & SG-503 Oscilloscope Calibrator or equivalent.

FLUKE High Voltage Probe or equivalent with capability of measuring at least 12kV.

NOTE

All voltage measurements are to be taken with respect to earth (chassis) ground unless otherwise noted. The adjusting procedures ***MUST*** *be done in sequence. Unit Under Test position must direct to South-North direction.*

LS 8022 ADJUSTMENT PROCEDURES

1 *SUPPLY VOLTAGE ADJUSTMENT & CHECK*

USE 856 DIGITAL MULTIMETER & 149-10A H.V.DIGITAL METER INSTRUMENT

a). Connect the METER between test point on 03 PCB and chassis. Check the voltage accordingly as shown in the following table.

Test Point	Voltage	Adjust & Check	Tolerance
Pin 1 of J603	+ 12 V	VR601	+11.95V ~ +12.05V
Pin 2 of J603	- 12 V	CHECK	-11.80V ~ -12.20V
Pin 3 of J603	+ 5 V	CHECK	+4.75V ~ +5.25V
Pin 5 of J603	+ 185 V	CHECK	+180V ~ +190V

b). Connect the DC HIGH VOLTAGE METER to -H.V point.

Spec : - 1950V ~ - 2150V

WARNING ! **Extreme caution must be taken while working in the high voltage section so as to prevent personal injury.**

2 *INTENSITY ADJUSTMENT*

a). Set TIME/DIV to 1ms/Div, rotate HOLD OFF VR fully anti clockwise, rotate INTENSITY VR until write indicator drop at center of "L", AC-GND-DC switch to GND.

b). Adjust VR603 (SUB INTEN) until a dim trace appears on CRT display.

c). Check INTEN VR when rotate clockwise sweep will become brighten & rotate anti clockwise sweep will disappear.

3 *FOCUS ADJUSTMENT*

a). Rotate FOCUS VR to center position, set X-Y, rotate HOR POS VR until a spot at center.

b). Adjust VR602 (SUB FOCUS) until optimum spot is obtained.

4 *ASTIG ADJUSTMENT*

a). Adjust VR604 (ASTIG) until when rotating FOCUS VR the best round spot obtained.

5 *ILLUM CHECK(EXCEPT LS 8022)*

a). Rotate ILLUM VR clockwise will illuminate on CRT screen, when rotate anti clock light will disappear.

6 *TRACE ROTATION CHECK.*

a). Set TIME/DIV to 1ms/Div, AC-GND-DC to GND, rotate HOR POS VR to left until sweep start from first graticule & rotate VERT POS VR until sweep at center.

b). When rotate TRACE ROTATION VR fully clockwise & anti clockwise, sweep will move UP & DOWN.

Spec : +/- 0.2 Div above.

7 *STEP DC BAL ADJUSTMENT*

a). Set AC-GND-DC (both) to GND, VOLTS/DIV VAR. (both) to CAL.VERT MODE select CH1 (CH2), rotate VOLT/DIV switch to 10mv. (both)

b). Let's sweep at center of graticule line, rotate VOLT/DIV to 5mV & adjust CH1: VR101 (CH2: VR201) until the sweep at center. Repeat above step until in spec.

Spec : +/- 0.05 Div

c). Check VOLT/DIV from 5mV~5V range.

Spec : +/- 0.05 Div

8 *MAG DC BAL ADJUSTMENT*

a). Rotate VOLT/DIV switch to 5mV(both). VERT MODE select CH1 (CH2).

b). Let's sweep at center of graticule line. Rotate VOLT/DIV switch to 2mV & adjust CH1: VR104 (CH2: VR220) until the sweep at center. Repeat above step until in spec.

Spec : +/- 0.2 Div

c). Check VOLT/DIV from 2mV~1mV range.

9 *VAR DC BAL ADJUSTMENT*

a). Rotate VOLT/DIV switch to 10mV (both). VERT MODE select CH1 (CH2).

b). Rotate the VAR VR fully anti clockwise, rotate VERT POS VR until the sweep at center graticule line & rotate VAR VR fully clockwise, then adjust CH1: VR106 (CH2: VR206) until the sweep at center. Repeat above step until in spec.

Spec : +/- 0.1 Div

c). Rotate VOLT/DIV switch to 2mV & check when rotate CH1: VAR VR(CH2) fully anti clockwise, the deflection must be in spec.

Spec : +/- 0.2 Div

10 CH1 & CH2 VERT POS CENTRE & CH2 INV ADJUSTMENT

***(UUT must put horizontally)**

a). Set AC-GND-DC to GND.VOLT/ DIV (both) switch to 10mV & VERTPOS knob (both) to mid position. Set VERT MODE to CH2.

b). Press INV switch & adjust VR213 until the trace stays stationary irrespective to pressing or releasing.

Spec : +/- 0.2 Div

c). Adjust VR303 until CH2 sweep at center of graticule line, check again INV.

d). VERT MODE selects to CH1 & adjusts VR113 until sweep at center.

Spec : +/- 0.2 Div

11 ADD BAL ADJUSTMENT

***(UUT must put horizontally)**

a). Set AC-GND-DC to GND (BOTH), VOLT/DIV to 10mV (both), VERT MODE to CH1 (CH2).

b). Rotate VERT POS VR until sweep at center of graticule line (both)

c). VERT MODE select to ADD.

d). Adjust VR301 until sweep at center of graticule line.

e). Check VERT MODE CH1, CH2.DUAL, ADD. Sweep must at center of graticule line.

Spec : +/- 0.1 Div

12 *X10 MAG CENTRE ADJUSTMENT*

***(UUT must put horizontally)**

a). Set T/D to 1ms/Div, press X10 MAG sw. & rotate HOR POS VR until sweep start point at left 0.6 Div.

b). Release X10MAG sw. & adjust VR502 until sweep start point at center.

Spec : +/- 0.3 Div

13 *A-START ADJUSTMEN*

***(UUT must put horizontally)**

a). Set T/D to 1ms/Div, rotate HOR POS VR knob point to center.

b). Adjust VR408 to obtain a start sweep at first vertical graticule line.

Spec : +/- 0.3 Div

14 *X-Y POSITION ADJUSTMENT*

***(UUT must put horizontally)**

a). Set T/D to 1ms/Div & rotate HOR POS VR until sweep start from first vertical graticule line.

b). Press X-Y sw. & adjust VR401 until the spot at center on graticule line.

Spec : +/- 0.2 Div

15 *TIME/DIV ACCURACY ADJUSTMENT*

USE SC-340 SCOPE CALIBRATION INSTRUMENT

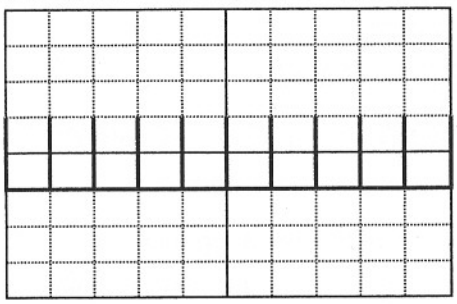
a). Set VERT MODE to CH1, Release SWP UNCAL & TIME/DIV to 1ms/Div.

b). Input Time Marker with TIME/DIV according to scope setting below.

c). Use 2nd marker & 9th marker for reference.

Spec : +/- 0.2 Div

SC-340 SETTING	T/D SETTING	ADJUST VR
1ms/Div	1ms/Div	VR405
1us/Div	1us/Div	VR404
.1us/Div	.1us/Div	VR802



16 *SENSITIVITY ADJUSTMENT*

USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VOLT/DIV (both) to 10mv,VOLT/DIV (both) to CAL, AC-GND-DC to DC, TIME/DIV to 0.2ms/Div, VERT MODE to CH1.

b). Input 1KHz, 60m V_{p-p} square wave to CH1 & CH2 terminal.

c). Adjust VR108 until amplitude at 6. Div. (see fig 1)

d). Set VERT MODE to DUAL, AC-GND-DC to GND (both), rotate CH1 & CH2 VERTICAL POSITION VR until two sweep at vertical center graticule line.

e). Set VERT MODE to ADD, AC-GND-DC to DC (both), Push in CH2 INV switch.

f). Adjust VR208 until get one sweep. (See fig 2)

Spec : +/- 0.05Div

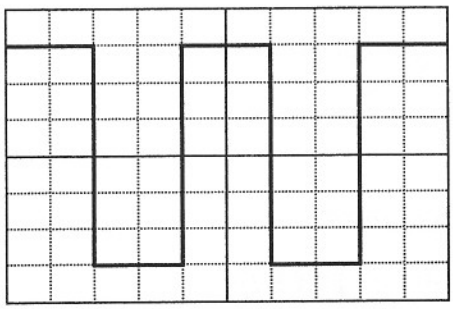


Figure 1

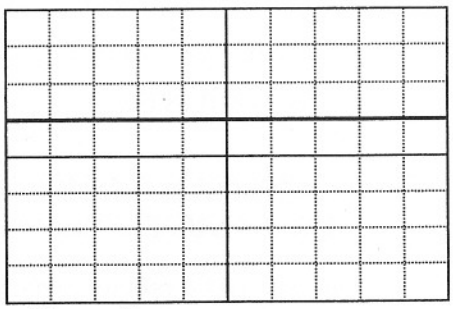


Figure 2

17 *MAG SENSITIVITY ADJUSTMENT*

USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VOLT/DIV (both) at 2mV,VOLT/DIV VAR at CAL, AC-GND-DC at DC & VERT MODE set CH1 (CH2).

b). Input square wave 1KHz, 12mV_{p-p} to CH1 (CH2) input terminal.

c). Adjust VR102 (VR202) until 6 Div

Spec : +/- 0.1 Div

18 PHASE COMPENSATION ADJUSTMENT
USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VOLT/DIV (both) set at 0.1V,VOLT/DIV at CAL, AC-GND-DC to DC & VERT MODE CH1 (CH2).

b). Input square wave 1KHz, 0.6V_{p-p} to CH1 (CH2) input terminal.

c). Adjust CH1, 1/10 VC102 (CH2, 1/10 VC202) until obtain an ideal waveform.

d). VOLT/DIV (both) set at 1V. Input 6V_{p-p} to CH1 (CH2) input terminal.

e). Adjust CH1, 1/100 VC104 (CH2, 1/100 VC204) until obtain an ideal waveform.

Spec : +/- 0.1 Div

19 X-GAIN ADJUSTMENT
USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VOLT/DIV (both) to 10mV, set X-Y mode, TRIG-COUPLING to AC, AC-GND-DC to AC, TRIG-SOURCE to CH1, VERT MODE to CH2, VOLT/DIV VAR (both) to CAL

b). Input 1KHz, 60mV_{p-p} square wave to CH1.

c). Adjust VR109 until 6 Div.

d). Input 1KHz 12mV_{p-p} square wave

e). VOLT/DIV set to 2mV & check sweep length becomes 6 Div.

Spec : +/- 0.18 Div

20 CAPACITANCE ADJUSTMENT
USE CAPACITANCE METER INSTRUMENT

a). Set V/D (both) to 10mv,VERT MODE to CH1 (CH2)

b). Input CAPACITANCE METER BNC to CH1 (CH2)& read capacitance value for reference.

c). Set V/D to 0.1V (both), adjust CH1=VC101 (CH2=VC201) until get same reading with reference value.

Spec : 25pf +/- 3pf

d). Set V/D to 1V (both), adjust CH1=VC103 (CH2=VC203) until get same reading with reference value.

Spec : 25pf +/- 3pf

21 *1MHz OVERSHOOT ADJUSTMENT(USE 50Ω LOAD)*

USE PG506 CALIBRATION GENERATOR INSTRUMENT

a). Set VOLT/DIV to 10mV(both), TIME/DIV 0.2 μs/Div, AC-GND-DC to DC (both), VERT MODE to CH1 (CH2), TRIG-SOURE to CH1 (CH2).

b). Input 1MHz square wave to CH1 (CH2) input terminal. Set the frequency amplitude until 5 div on screen.

c). Adjust 1ST COMP.VC105 (CH2=VC205) & 2ND COMP. VC106 (CH2=VC206) to maximum overshoot.

d). Adjust 1ST COMP.VR103 (CH2=VC203) to specification.

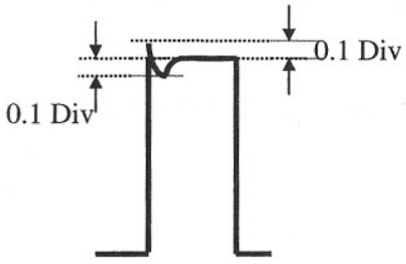
~ Adjust 3RD COMP.VR302 & VC301 for a flat-off & roll-off on the leading edge.

~ Adjust 2ND COMP.SVR for a flat-top & roll-off on the leading edge.

~ Adjust 2ND COMP.SVC for flat-top & roll-off.

Spec : +0.1 ~ -0.1 Div (+/-2.0% for 10mv),

other range: +6.7% / -6.7% (+/-0.33 div) .



22 *FREQUENCY RESPONSE CHECK (USE 50Ω LOAD)*

USE SG-503 LEVELED SINEWAVE GENERATOR INSTRUMENT

a). Common mode rejection ration checks (at 10Mhz):

b). Connect the sine wave generator to CH1& CH2 input terminal, set the frequency 10MHz & the output for display of 8 Div. Press in CH2 INV, VERT MODE= ADD. Check AC $V_{p\text{-}p}$. If out of spec, repeat step 21.

Spec : 0.4Div

c). Set freq 50khz, o/p amplitude 5 div, connect to CH1 (CH2) input terminal. Increase the frequency to 23MHz.

Spec : 3.6~5Div

d). Repeat frequency response check for 0.1V/Div & 1V/Div range. (Repeat step 21 if necessary)

e). Set VOLT/DIV to 2mV (both), set frequency to 50KHz & the output amplitude for display of 5 Div, check frequency between 5MHz~10MHz.

f). Set input frequency to 15MHz.

23 *TRIG DC OFFSET ADJUSTMENT*

USE 33120A 15MHZ FUNCTION GENERATOR INSTRUMENT

***(UUT must put horizontally)**

a). Set VOLT/DIV to 10mV(both), AC-GND-DC to DC (both), VERT MODE set CH1 (CH2), TRIG SOURE CH1 (CH2), TRIG COUPLING to AC.

b). Move sweep to center of vertical graticule line & input 1KHz sine wave to CH1 (CH2) and amplitude show 8 Div on screen.

c). Rotate TRIG-LEVEL until trigger point start at the center.

d). TRIG-COUPLING from AC to DC position & Adjust VR110 (CH2=VR210) until trigger point start from same position.

e). Check TRIG-COUPLING from AC to DC the start point must be center.

Spec : +/- 0.1 Div

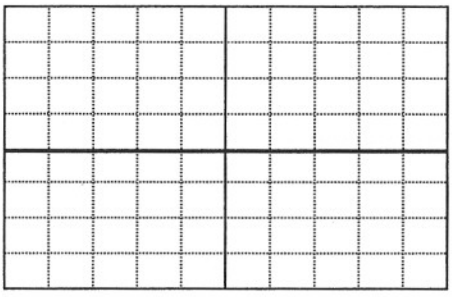
24 *CH1 OUTPUT DC OFFSET ADJUSTMENT*

a). Set CH1 & CH2 VOLT/DIV to 10mV, AC-GND-DC to GND, VERT MODE to BOTH, TRIG-SOURCE to CH1.

b). Rotate CH1 & CH2 VERT POSITION to center of CRT & connect CH1 OUTPUT to CH2 input by a cable "BNC TO BNC".

c). Release CH2 GND switch & adjust VR112 until sweep at center of graticule line. (see fig below)

Spec : +/- 0.22 Div



25 *TRIG-SLOPE BAL ADJUSTMENT*

USE 33120A 15MHZ FUNCTION GENERATOR INSTRUMENT

a). Set TIME/DIV to 1ms/Div, VERT MODE to CH1, Press-in LOCK switch, Press-in SLOPE switch & AC-GND-DC to GND.

b). Adjust VR403 Use 856 DIGITAL MULTIMETER to measure voltage at Q414(C)

Spec : 1.40+/- 0.02V

(Release GND sw, input 1KHz 0.4 Div sinewave, check +/- slope both can sync.)

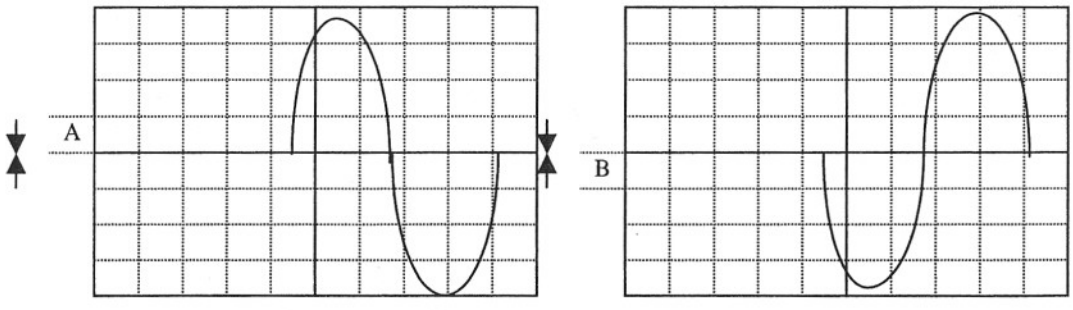
26 *TRIGGERING CENTRE ADJUSTMENT*

USE 3310A 15MHZ FUNCTION GENERATOR INSTRUMENT

a). Set TIME/DIV to 1ms/Div, TRIG-LEVEL unlock, AC-GND-DC to AC, input 1KHz 8 Div sinewave to CH1 input terminal. (make sure AC-GND-DC at GND, sweep at center of graticule line.)

b) Set LEVEL VR knob at center & adjust VR407 until when slope +/- trigger point deviation must be same. (see fig below)

Spec: LOCK: A, B≤1.5Div from origin, UNLOCK: A, B≤0.2Div & A-B≤0.2Div



27 *CAL. FREQUENCY ADJUSTMENT*

USE 826 INTELLIGENT COUNTER

a). Measure the CAL. FREQUENCY by the counter.

b). Adjust VR701 until frequency 1KHz.

Spec : 0.980KHz~1020KHz.

LS 8022 PRE-ADJUST CHECKING PROCEDURES

1 ***HIGH-POT TEST***

a). At 120V : AC 1.2KV,<3.5mV.Time 1minute.

b). At 220V : AC 2KV,<3.5mV.Time 1minute.

2 ***INTENSITY CHECK***

a). Rotate Intensity clockwise & anti clockwise, sweep will become brightness & disappear.

3 ***FOCUS CHECK***

a). Press X-Y Mode, Rotate FOCUS VR until optimum spot is obtained.

4 ***TRACE ROTATION CHECK***

a). When rotate TRACE ROTATION VR clockwise & anti clockwise, the START point & END point of sweep will move UP & DOWN.

5 ***CH1 & CH2 PPSITION CHECK***

a). Rotate CH1 & CH2 POSITION VR clockwise & anti clockwise, sweep will move up & down.

6 ***HORIZONTAL POSITION CHECK***

a). Rotate HORIZONTAL POSITION VR clockwise & anti clockwise, sweep will move left & right.

7 ***HOLD OFF CHECK***

a). Rotate HOLD OFF VR clockwise, sweep intensity will change.

8 ***CH1 & CH2 VOLT/DIV CHECK***

a). Input CAL frequency to CH1 & CH2 input terminal.

b). Rotate CH1 & CH2 VOLT/DIV switch, amplitude will change.

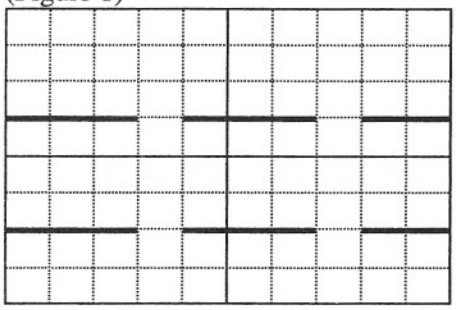
9 *TIME/DIV CHECK*

a). Rotate TIME/DIV switch from 0.5s/Div to 0.1us/Div, sweep start from slow to fast.

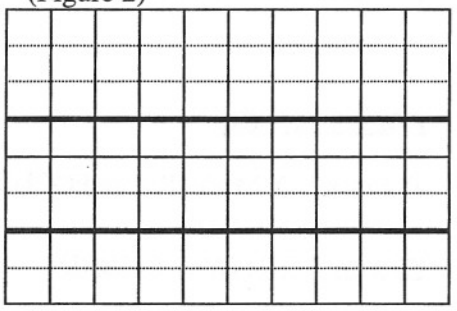
10 *CHOP & ALT CHECK*

a). VERT MODE set DUAL, T/D=0.5s/Div~5ms/Div will appear CHOP sweep (see figure 1), T/D=2ms/Div~0.1us/Div will appear ALT sweep (see figure 2) & Press-in CHOP sw. ALT will change to CHOP sweep.

(Figure 1)



(Figure 2)



11 *ADD CHECK*

a). When select from DUAL to ADD mode, CH1 & CH2 sweep will ADD to become one sweep. VERTICA POS VR of CH1 & CH2 can control the sweep.

12 *CH2 INVERT CHECK*

a). Input CAL. frequency to CH1 input terminal.

b). When press-in INVERT sw. phase will invert 180 degree.

13 *X10 MAG CHECK*

a). When press-in X10MAG sw. sweep will become longer.

14 *X-Y MODE CHECK*

a). Press-in X-Y sw. & the spot will appear.

15 AUTO/ NORM/SGL. MODE CHECK

a). Press-in AUTO sw. sweep will appear.

b). Set to NORM mode, sweep will disappear but when rotate LEVEL VR sweep will appear.

16 CH1/CH2 VAR.& SWP UNCAL CHECK

a). Input CAL frequency to CH1 & CH2 input terminal.

b). Rotate CH1 & CH2 VAR VR will reduce the amplitude of waveform.

c). Press-in SWP UNCA sw. & rotate the VAR VR will change the waveform length.

17 LINE TRIGGERING CHECK

a). Set VERT MODE to CH1, V/D set 1mV, TRIG-SOURCE set LINE.

b). Place the screwdriver to CH 1 INPUT BNC (make sure the screwdriver does not touch the outer most shell [GND] of the BNC) and make sure the signals are synchronized.

LS 8050 ADJUSTMENT PROCEDURES

WARNING

The following instructions are for qualified service personnel only. To avoid electrical shock, do not perform servicing unless you are qualified to do so.

High voltage appears when covers are removed and the unit is in operation. Remember that high voltage may be retained indefinitely on high voltage capacitors. In addition, the AC line voltage is present on line voltage input circuit (including the fuse holder, line cord receptacle, and POWER switch) whenever the instrument is plugged into an AC outlet, even when it is turned off.

Unplug the oscilloscope and discharge high voltage capacitors before performing service procedures unless it is necessary to have its power turned on.

GENERAL

This unit was carefully checked and calibrated at the factory before shipment. After the oscilloscope has been used for a period of time, it should be calibrated to maintain instrument accuracy. Calibration is also required if repairs have been made in a circuit which may affect the former calibration. Keep in mind that some calibration adjustments require high precision test instruments. Those adjustments should be attempted only if the proper test equipment is available and you are experienced in using it. The unit should be calibrated at an ambient temperature of 23 degrees C (± 5 degrees C). Connect the unit to AC line voltage, 50/60 Hz line source and allow it to warm up for at least 30 minutes before any adjustment. The following test equipment required complete calibration::

LEADER 856 Multi-meter or equivalent.

TEKTRONIX CG-5001 & SG-503 Oscilloscope Calibrator or equivalent.

FLUKE High Voltage Probe or equivalent with capability of measuring at least 12kV.

NOTE

All voltage measurements are to be taken with respect to earth (chassis) ground unless otherwise noted. The adjusting procedures ***MUST*** *be done in sequence. Unit Under Test position must direct to South-North direction.*

LS 8050 ADJUSTMENT PROCEDURES

1 *SUPPLY VOLTAGE ADJUSTMENT & CHECK*

USE 856 DIGITAL MULTIMETER & 149-10A H.V.DIGITAL METER INSTRUMENT

a). Connect the METER between test point on 03 PCB and chassis. Check the voltage accordingly as shown in the following table.

Test Point	Voltage	Adjust & Check	Tolerance
Pin 1 of J603	+ 12 V	VR601	+11.95V ~ +12.05V
Pin 2 of J603	- 12 V	CHECK	-11.80V ~ -12.20V
Pin 3 of J603	+ 5 V	CHECK	+4.75V ~ +5.25V
Pin 5 of J603	+ 145 V	CHECK	+140V ~ +150V

b). Connect the DC HIGH VOLTAGE METER to -H.V point.

Spec : - 1725V ~ - 1875V

WARNING ! **Extreme caution must be taken while working in the high voltage section so as to prevent personal injury.**

2 *INTENSITY ADJUSTMENT*

a). Set HORIZ DISPLAY MODE to A, A TIME/DIV to 1ms/Div, Rotate HOLD OFF VR fully anti clockwise, rotate A INTENSITY VR until write indicator drop at center of "L", AC-GND-DC switch to GND. (B INTEN VR fully anti clockwise.)

b). Adjust VR603 (SUB INTEN) until a dim trace appears on CRT display.

c). Check INTEN VR when rotate clockwise sweep will become brighten & rotate anti clockwise sweep will disappear.

3 *B INTEN CHECK*

a). Set: A TIME/DIV to 1ms/Div, HORIZ DISPLAY MODE to A INT, B TIME/DI to 0.5ms/DIV & DELAY TIME POSITION VR rotate fully anti clockwise.

b). Check when B INTEN VR rotate clockwise, sweep INTEN A will become dim but sweep B INTEN look like no change. (B sweep length is half of A sweep).

4 *FOCUS ADJUSTMENT*

a). Rotate FOCUS VR to center position, set X-Y, rotate HOR POS VR until a spot at center.

b). Adjust VR602 (SUB FOCUS) until optimum spot is obtained.

5 *ASTIG ADJUSTMENT*

a). Adjust VR604 (ASTIG) until when rotating FOCUS VR the best round spot obtained.

6 *ILLUM CHECK*

a). Rotate ILLUM VR clockwise will illuminate on CRT screen, when rotate anti clock light will disappear.

7 *TRACE ROTATION CHECK.*

a). Set TIME/DIV to 1ms/Div, AC-GND-DC to GND, rotate HOR POS VR to left until sweep start from first graticule & rotate VERT POS VR until sweep at center.

b). When rotate TRACE ROTATION VR fully clockwise & anti clockwise, sweep will move UP & DOWN.

Spec : +/- 0.2 Div above.

8 *STEP DC BAL ADJUSTMENT*

a). Set AC-GND-DC (both) to GND, VOLTS/DIV VAR. (both) to CAL.VERT MODE select CH1 (CH2), rotate VOLT/DIV switch to 10mv. (both)

b). Let's sweep at center of graticule line, rotate VOLT/DIV to 5mV & adjust CH1: VR101 (CH2: VR201) until the sweep at center. Repeat above step until in spec.

Spec : +/- 0.05 Div

c). Check VOLT/DIV from 5mV~5V range.

Spec : +/- 0.05 Div

12 ADD BAL ADJUSTMENT

***(UUT must put horizontally)**

a). Set AC-GND-DC to GND (BOTH), VOLT/DIV to 10mV (both), VERT MODE to CH1 (CH2).

b). Rotate VERT POS VR until sweep at center of graticule line (both)

c). VERT MODE select to ADD.

d). Adjust VR301 until sweep at center of graticule line.

e). Check VERT MODE CH1, CH2.DUAL, ADD. Sweep must at center of graticule line.

Spec : +/- 0.1 Div

13 X10 MAG CENTRE ADJUSTMENT

***(UUT must put horizontally)**

a). Set T/D to 1ms/Div, press X10 MAG sw. & rotate HOR POS VR until sweep start point at center.

b). Release X10MAG sw. & adjust VR502 until sweep start point at center.

Spec : +/- 0.3 Div

14 A-START ADJUSTMENT

***(UUT must put horizontally)**

a). Set A TIME/DIV to 1ms/Div, rotate HOR POS VR knob point to center.

b). Adjust VR408 to obtain a start sweep at first vertical graticule line.

Spec : +/- 0.3 Div

15 B-START SWEEP ADJUSTMENT

***(UUT must put horizontally)**

a). Set HOR POS to A & A T/D to 0.5ms/div .

b) Rotate HOR POS VR until a start sweep at first vertical graticule line.

c). Set HOR DISPLAY to B (release B TRIG'D), B T/D to 0.2ms/div, DELAY TIME POSITION VR fully anti clockwise.

d). Adjust VRC01 to obtain a start sweep at first vertical graticule line.

e). HOR DISPLAY set to A INT, DELAY TIME VR fully clockwise.

f). Adjust VRA06 until B SWEEP inten dim trace appear on CRT SCREEN.

16 X-Y POSITION ADJUSTMENT

***(UUT must put horizontally)**

a). Set T/D to 1ms/Div & rotate HOR POS VR until sweep start from first vertical graticule line.

b). Press X-Y sw. & adjust VR401 until the spot at center on graticule line.

Spec : +/- 0.2 Div

17 A TIME/DIV ACCURACY ADJUSTMENT

USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VERT MODE to CH1, Release SWP UNCAL & TIME/DIV to 1ms/Div.

b). Input Time Marker with TIME/DIV according to scope setting below.

c). Use 2nd marker & 9th marker for reference.

Spec : +/- 0.2 Div

SC-340 SETTING	T/D SETTING	ADJUST VR
1ms/Div	1ms/Div	VR405
1us/Div	1us/Div	VR404
.1us/Div	.1us/Div	VR802

18 B TIME/DIV ACCURACY ADJUSTMENT

USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). HOR DISPLAY A, A T/D 2us/Div & HOR DISPLAY set to B, T/D set 1us/div, DELAY TIME POS. fully anti clockwise, input 1us/div pulse train to CH1.

b). Adjust VRC02 until pulse train align with CRT vertical line.

c). Set HOR DISPLAY A, A T/D set 0.2us/div & HOR DISPLAY set to B.B T/D set 0.1us/div, input 0.1us/div pulse train.

d). Adjust VRC03 until pulse train align with CRT vertical line.

Spec : +/- 0.2 Div

19 SENSITIVITY ADJUSTMENT

USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VOLT/DIV (both) to 10mv,VOLT/DIV (both) to CAL, AC-GND-DC to DC, TIME/DIV to 0.2ms/Div, VERT MODE to CH1.

b). Input 1KHz, 60m V_{p-p} square wave to CH1 & CH2 terminal.

c). Adjust VR108 until amplitude at 6.06 Div. (or adjust 6.00 div by setting calibrator 60mV±1%). (Adjust to exactly 6.00 div if adjust with cover) (See fig 1)

d). Set VERT MODE to DUAL, AC-GND-DC to GND (both), rotate CH1 & CH2 VERTICAL POSITION VR until two sweep at vertical center graticule line.

e). Set VERT MODE to ADD, AC-GND-DC to DC (both), Push in CH2 INV switch.

f). Adjust VR208 until get one sweep. (See fig 2)

Spec : +/- 0.05Div

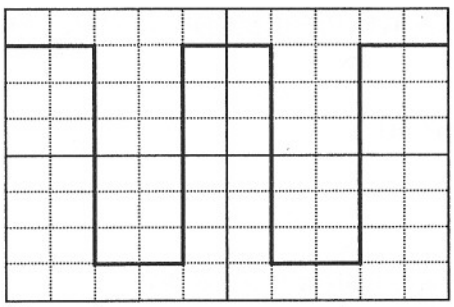


Figure 1

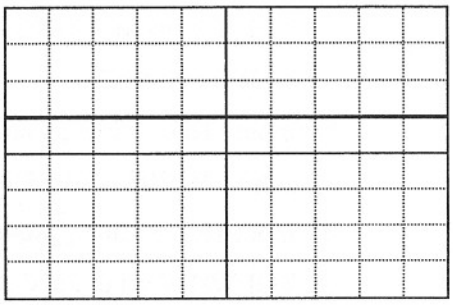


Figure 2

20 MAG SENSITIVITY ADJUSTMENT

USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VOLT/DIV (both) at 2mV,VOLT/DIV VAR at CAL, AC-GND-DC at DC & VERT MODE set CH1 (CH2).

b). Input square wave 1KHz, 12mV_{p-p} to CH1 (CH2) input terminal.

c). Adjust VR102 (VR202) until 6.06 Div (or adjust 6.00 div by setting calibrator 12mV±1%). (Adjust to exactly 6.00 div if adjust with cover)

Spec : +/- 0.1 Div

21 *PHASE COMPENSATION ADJUSTMENT*
USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VOLT/DIV (both) set at 0.1V,VOLT/DIV at CAL, AC-GND-DC to DC & VERT MODE CH1 (CH2).

b). Input square wave 1KHz, 0.6V_{p-p} to CH1 (CH2) input terminal.

c). Adjust CH1, 1/10 VC102 (CH2, 1/10 VC202) until obtain an ideal waveform.

d). VOLT/DIV (both) set at 1V. Input 6V_{p-p} to CH1 (CH2) input terminal.

e). Adjust CH1, 1/100 VC104 (CH2, 1/100 VC204) until obtain an ideal waveform.

Spec : +/- 0.1 Div

22 *X-GAIN ADJUSTMENT*
USE SC-340 SCOPE CALIBRATION INSTRUMENT

a). Set VOLT/DIV (both) to 10mV, set X-Y mode, TRIG-COUPLING to AC, AC-GND-DC to AC, TRIG-SOURCE to CH1, VERT MODE to CH2, VOLT/DIV VAR (both) to CAL

b). Input 1KHz, 60mV_{p-p} square wave to CH1.

c). Adjust VR109 until 6 Div.

d). Input 1KHz 12mV_{p-p} square wave

e). VOLT/DIV set to 2mV & check sweep length becomes 6 Div.

Spec : +/- 0.18 Div

23 *CAPACITANCE ADJUSTMENT*
USE CAPACITANCE METER INSTRUMENT

a). Set V/D (both) to 10mv,VERT MODE to CH1 (CH2)

b). Input CAPACITANCE METER BNC to CH1 (CH2)& read capacitance value for reference.

c). Set V/D to 0.1V (both), adjust CH1=VC101 (CH2=VC201) until get same reading with reference value.

Spec : 25pf +/- 3pf

d). Set V/D to 1V (both), adjust CH1=VC103 (CH2=VC203) until get same reading with reference value.

Spec : 25pf +/- 3pf

24 *1MHz OVERSHOOT ADJUSTMENT(USE 50Ω LOAD)*

USE PG506 CALIBRATION GENERATOR INSTRUMENT

a). Set VOLT/DIV to 10mV(both), TIME/DIV 0.2 μs/Div, AC-GND-DC to DC (both), VERT MODE to CH1 (CH2), TRIG-SOURE to CH1(CH2).

b). Input 1MHz square wave to CH1 (CH2) input terminal. Set the frequency amplitude until 5 div on screen.

c). Adjust 1ST COMP.VC105 (CH2=VC205) & 2ND COMP. VC106 (CH2=VC206) to maximum overshoot.

d). Adjust 1ST COMP.VR103 (CH2=VC203) to specification.

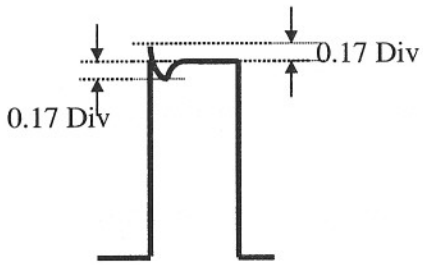
~ Adjust 3RD COMP.VR302 & VC301 for a flat-off & roll-off on the leading edge.

~ Adjust 2ND COMP.SVR for a flat-top & roll-off on the leading edge.

~ Adjust 2ND COMP.SVC for flat-top & roll-off.

Spec : +0.17 ~ -0.17 div (+/-3.3% for 10mv),

other range: +6.7% / -6.7% (+/-0.3 div) .



25 *FREQUENCY RESPONSE CHECK (USE 50Ω LOAD)*

USE SG-503 LEVELED SINEWAVE GENERATOR INSTRUMENT

a). Common mode rejection ration checks (at 10MHz):

b). Connect the sine wave generator to CH1& CH2 input terminal, set the frequency 10MHz & the output for display of 8 Div. Press in CH2 INV, VERT MODE= ADD. Check AC $V_{p\text{-}p}$. If out of spec, repeat step 24.

Spec : 0.4Div

c). Set freq 50khz, o/p amplitude 5 div, connect to CH1 (CH2) input terminal. Increase the frequency to 53MHz. Check the amplitude

Spec : 3.6~5Div

d). Repeat frequency response check for 0.1V/Div & 1V/Div range. (Repeat step 24 if necessary)

e). Set VOLT/DIV to 2mV (both), set frequency to 50KHz & the output amplitude for display of 5 Div, check frequency between 5MHz~10MHz.

Spec : 3.6~5.3 Div

f). Set input frequency to 18MHz.

Spec : 3.6~5.3 Div

26 TRIG DC OFFSET ADJUSTMENT

USE 33120A 15MHZ FUNCTION GENERATOR INSTRUMENT

***(UUT must put horizontally)**

a). Set VOLT/DIV to 10mV(both), AC-GND-DC to DC (both), VERT MODE set CH1 (CH2), TRIG SOURE CH1(CH2), TRIG COUPLING to AC.

b). Move sweep to center of vertical graticule line & input 1KHz sine wave to CH1 (CH2) and amplitude show 8 Div on screen.

c). Rotate TRIG-LEVEL until trigger point start at the center.

d). TRIG-COUPLING from AC to DC position & Adjust VR110 (CH2=VR210) until trigger point start from same position.

e). Check TRIG-COUPLING from AC to DC the start point must be center.

Spec : +/- 0.1 Div

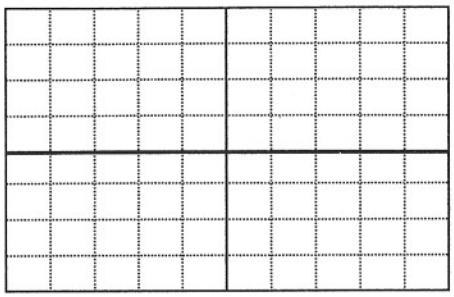
27 CH1 OUTPUT DC OFFSET ADJUSTMENT

a). Set CH1 & CH2 VOLT/DIV to 10mV, AC-GND-DC to GND, VERT MODE to BOTH, TRIG-SOURCE to CH1.

b). Rotate CH1 & CH2 VERT POSITION to center of CRT & connect CH1 OUTPUT to CH2 input by a cable "BNC TO BNC".

c). Release CH2 GND switch & adjust VR112 until sweep at center of graticule line. (see fig below)

Spec : +/- 0.22 Div



28 *TRIG-SLOPE BAL ADJUSTMENT*

USE 33120A 15MHZ FUNCTION GENERATOR INSTRUMENT

a). Set TIME/DIV to 1ms/Div, VERT MODE to CH1, Press-in LOCK switch, Press-in SLOPE switch & AC-GND-DC to GND.

b). Adjust VR403 Use 856 DIGITAL MULTIMETER to measure voltage at Q414(C)

Spec : 1.40+/- 0.02V

(Release GND sw, input 1KHz 0.4 Div sinewave, check +/- slope both can sync.)

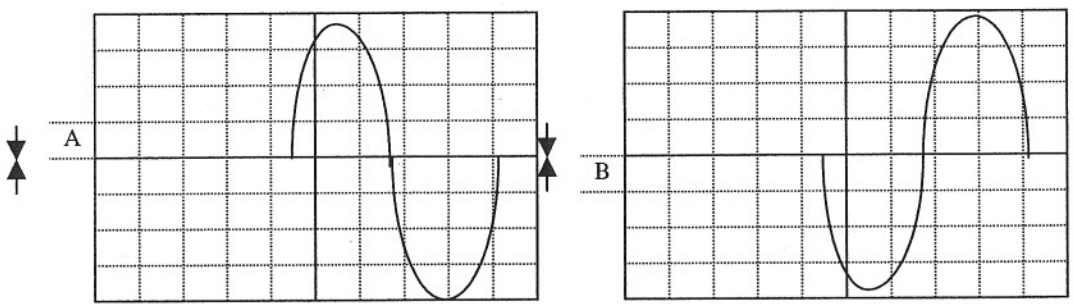
29 *TRIGGERING CENTRE ADJUSTMENT*

USE 3310A 15MHZ FUNCTION GENERATOR INSTRUMENT

a). Set TIME/DIV to 1ms/Div, TRIG-LEVEL unlock, AC-GND-DC to AC, input 1KHz 8 Div sinewave to CH1 input terminal. (make sure AC-GND-DC at GND, sweep at center of graticule line.)

b) Set LEVEL VR knob at center & adjust VR407 until when slope +/- trigger point deviation must be same. (see fig below)

Spec: LOCK: A, B≤1.5Div, UNLOCK: A, B≤0.2Div & A-B≤0.2Div



30 CAL. FREQUENCY ADJUSTMENT

USE 826 INTELLIGENT COUNTER

a). Measure the CAL. FREQUENCY by the counter.

b). Adjust VR701 until frequency 1KHz.

Spec : 0.980KHz~1020KHz.

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Part 3 Circuit diagram

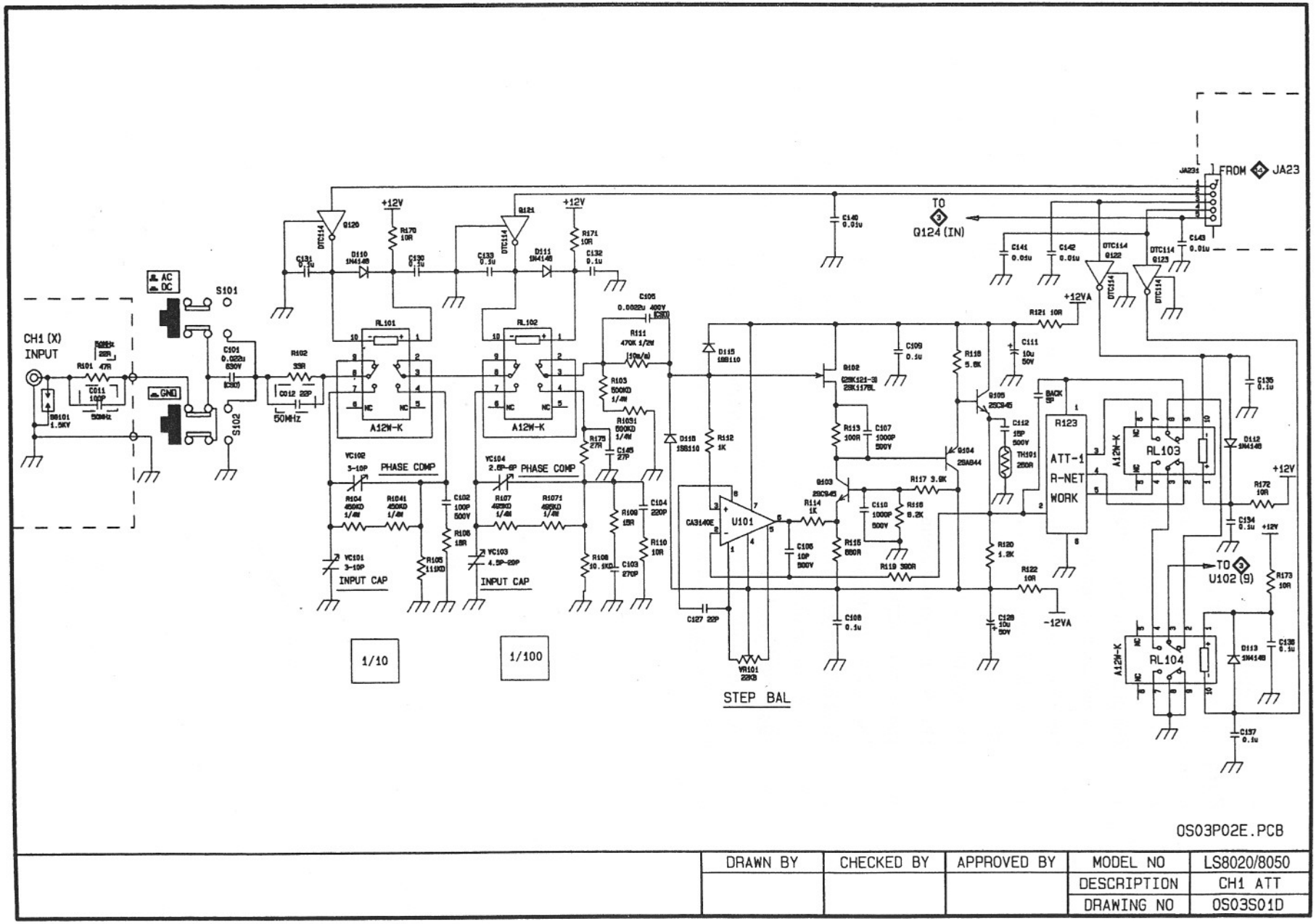


Figure 1: The attenuant circuit of Channel 1

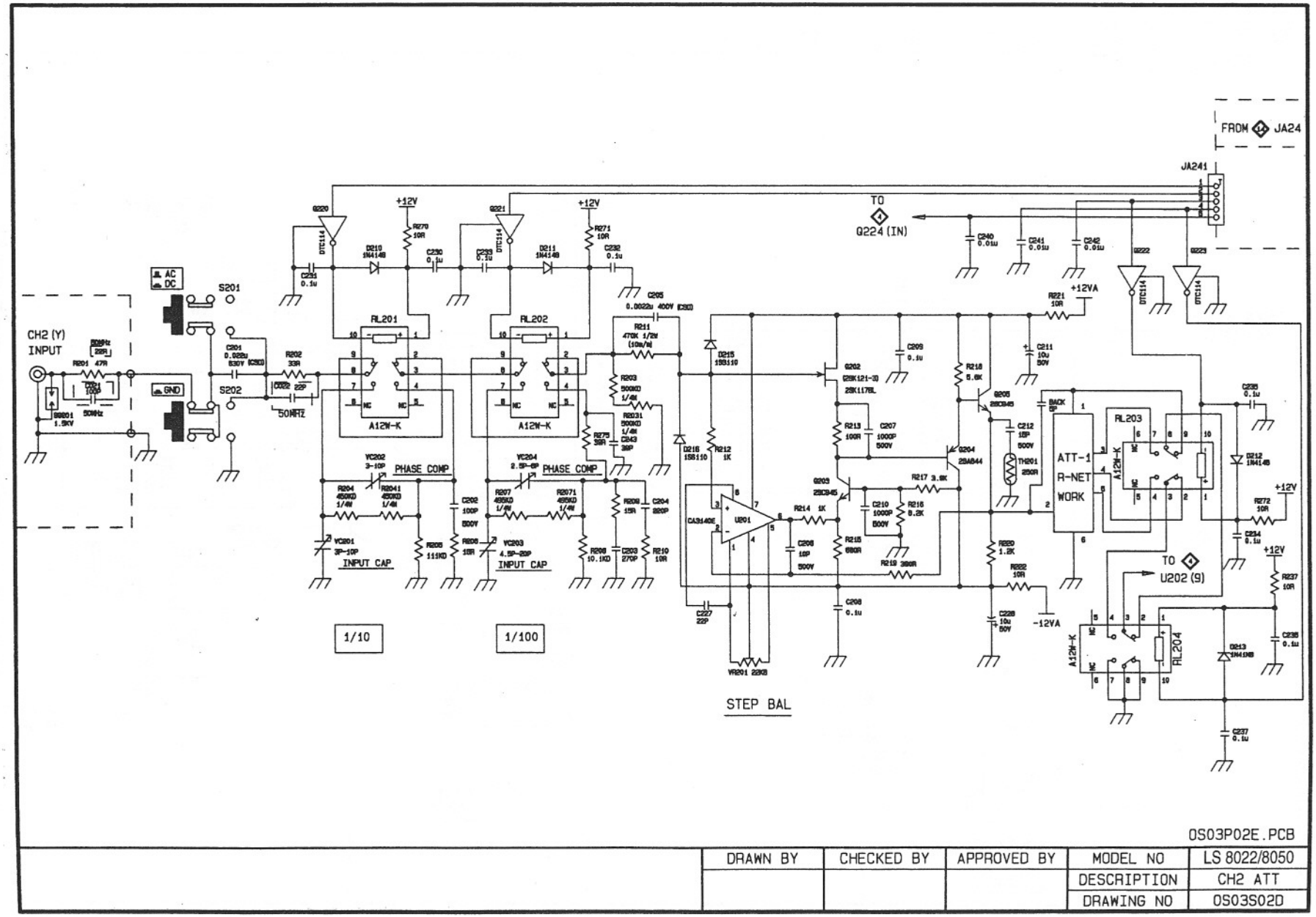


Figure 2: The attenuant circuit of Channel 2

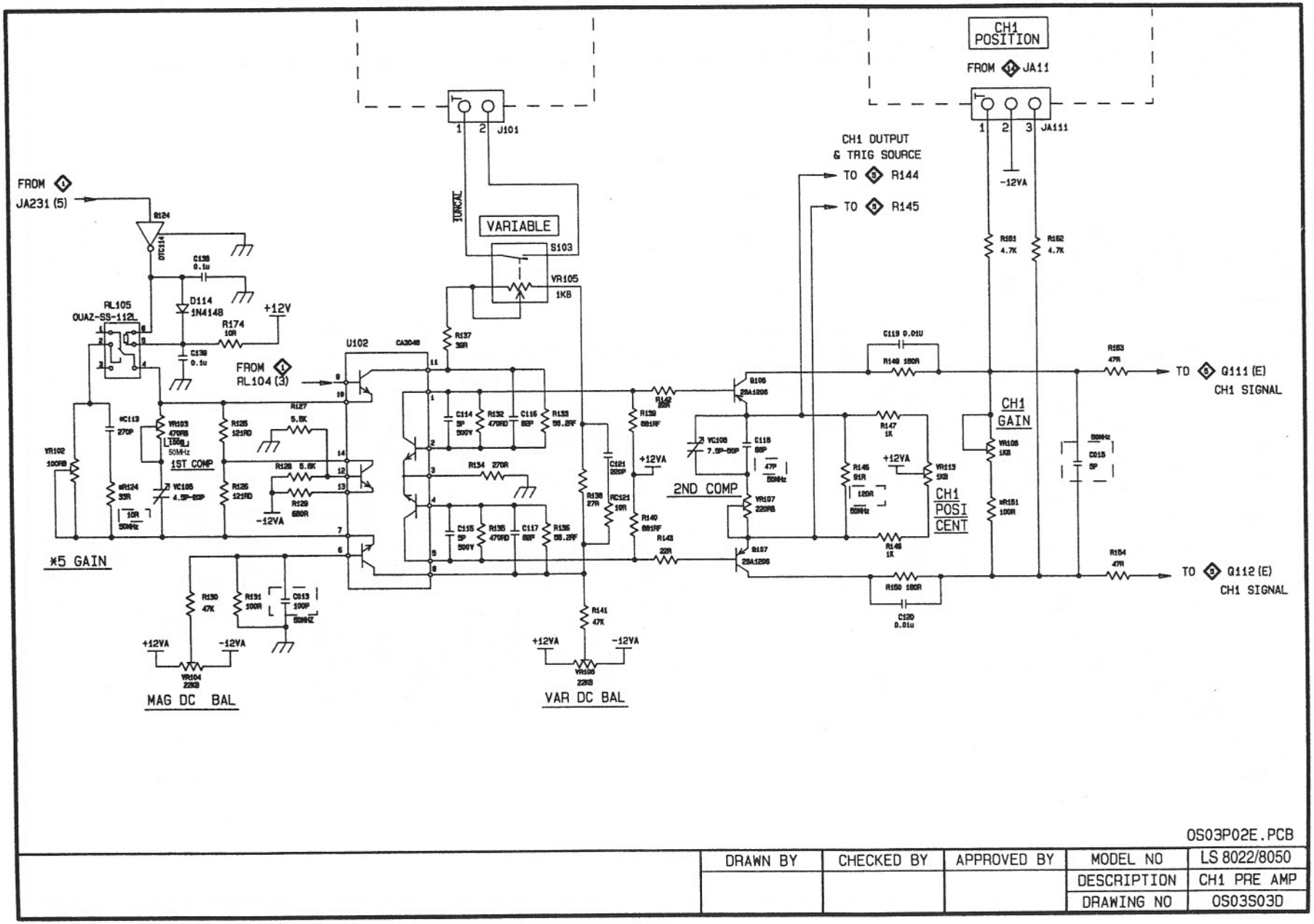


Figure 3: The pre-amp circuit of Channel 1

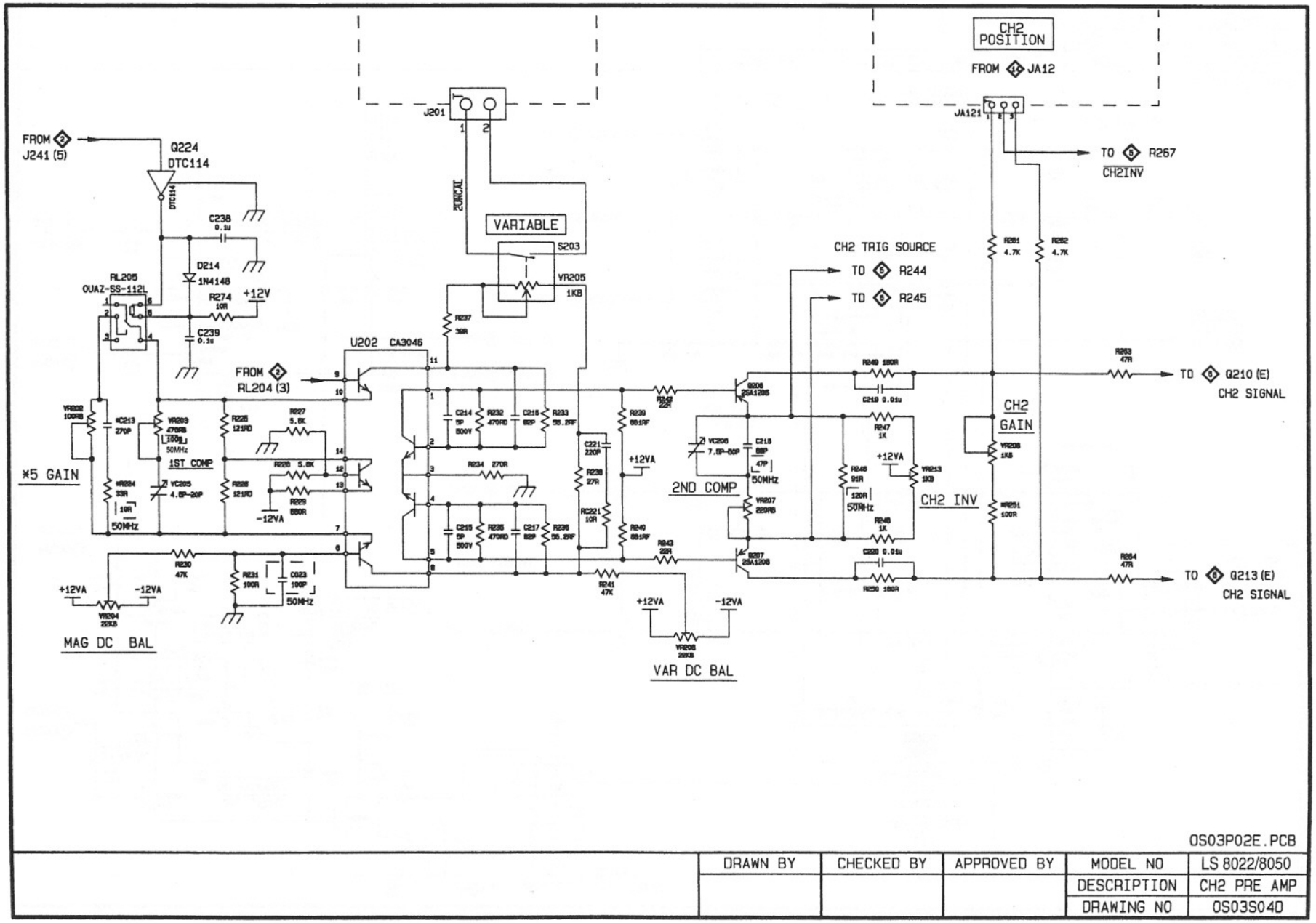


Figure 4: The pre-amp circuit of Channel 2

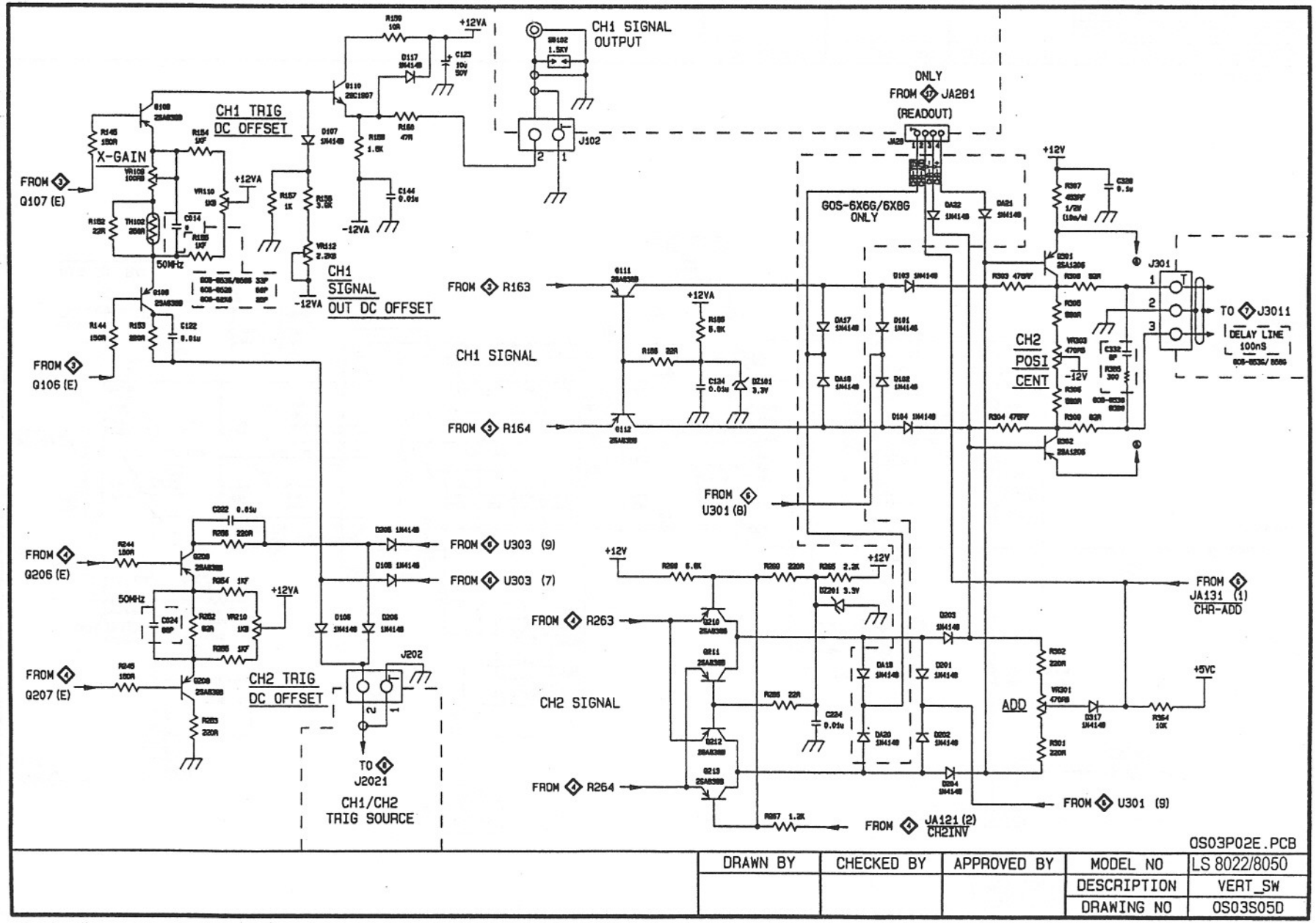


Figure 5: The vertical switch circuit

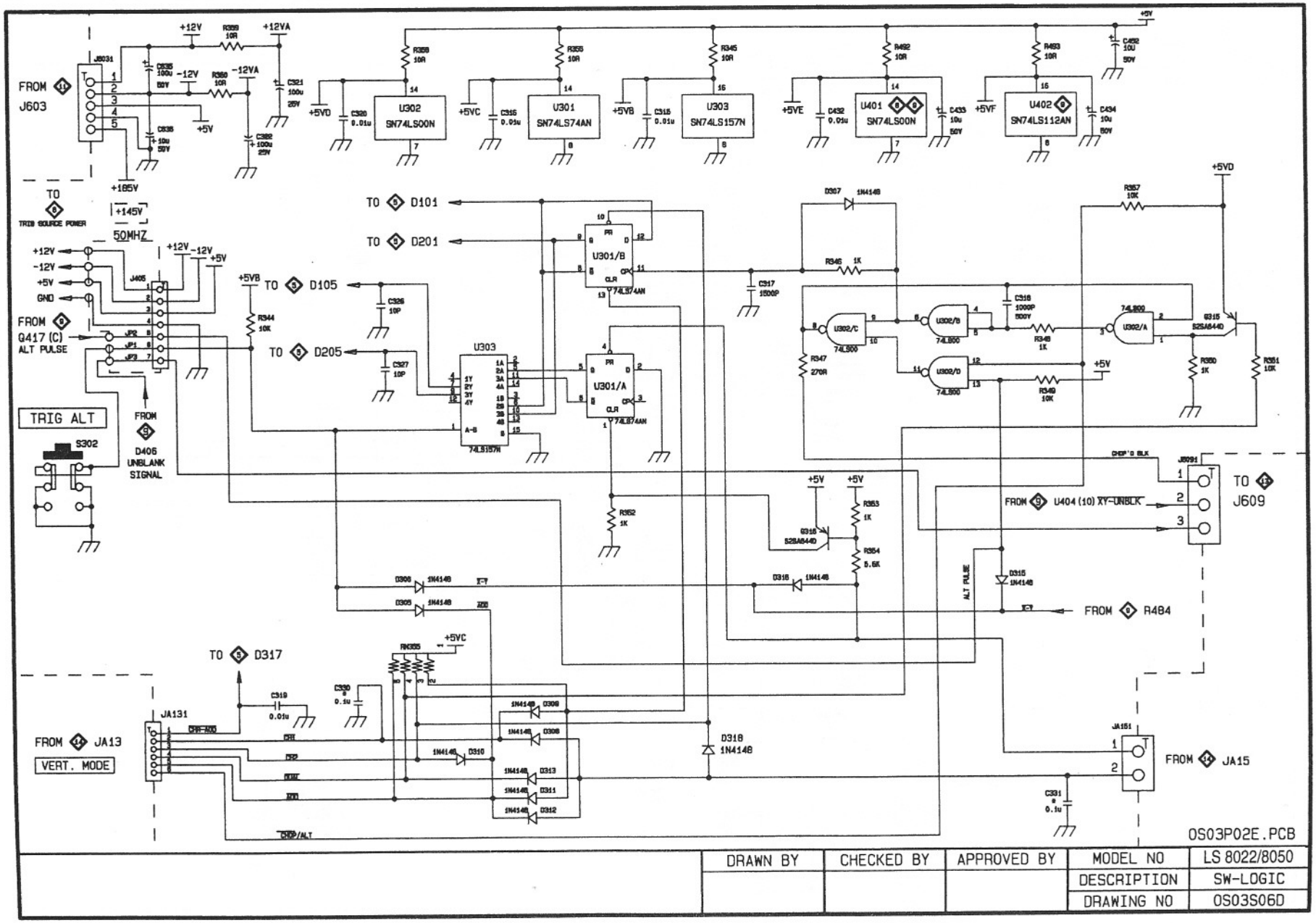


Figure 6: The switch logic circuit

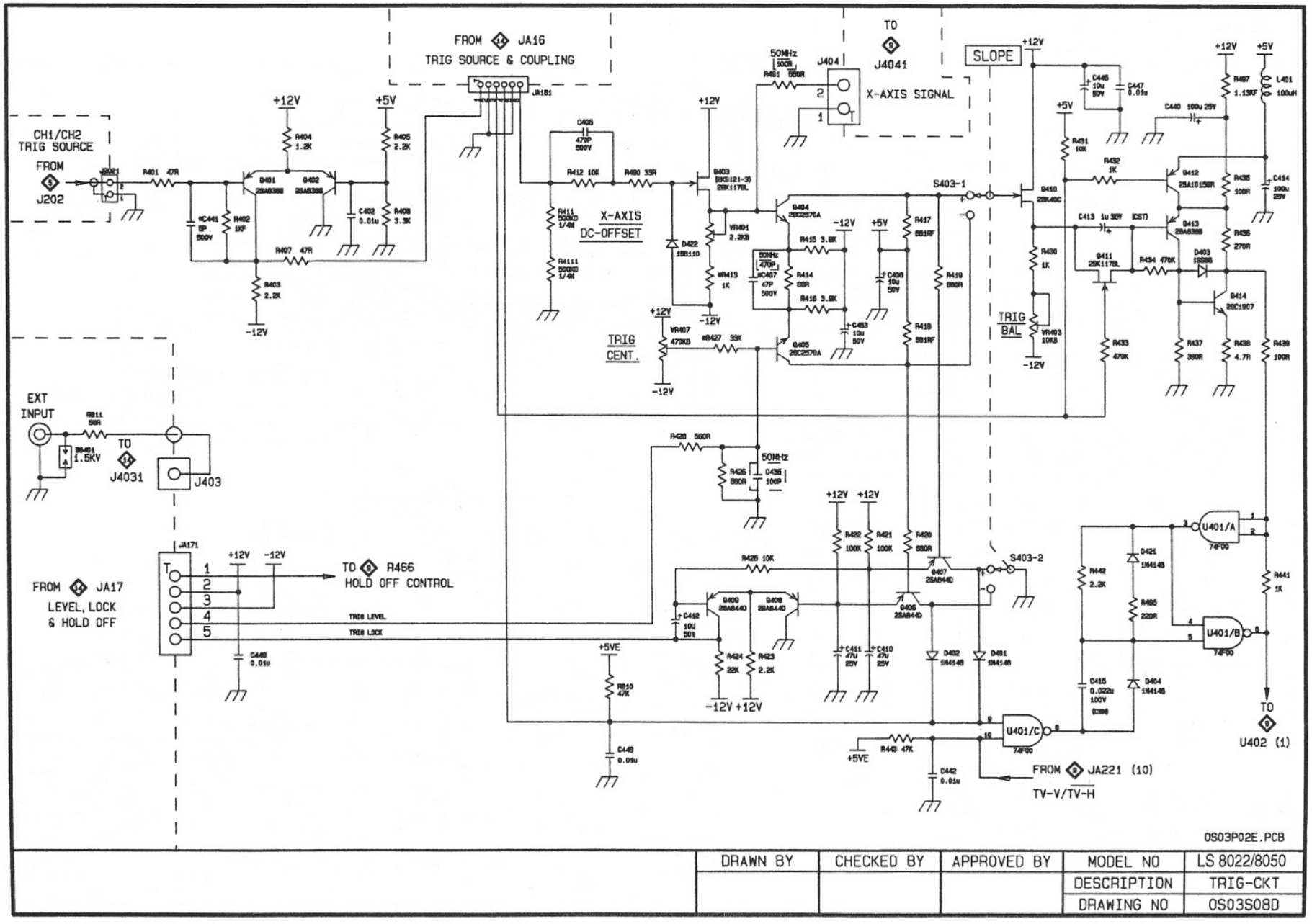


Figure 8: The trigger circuit

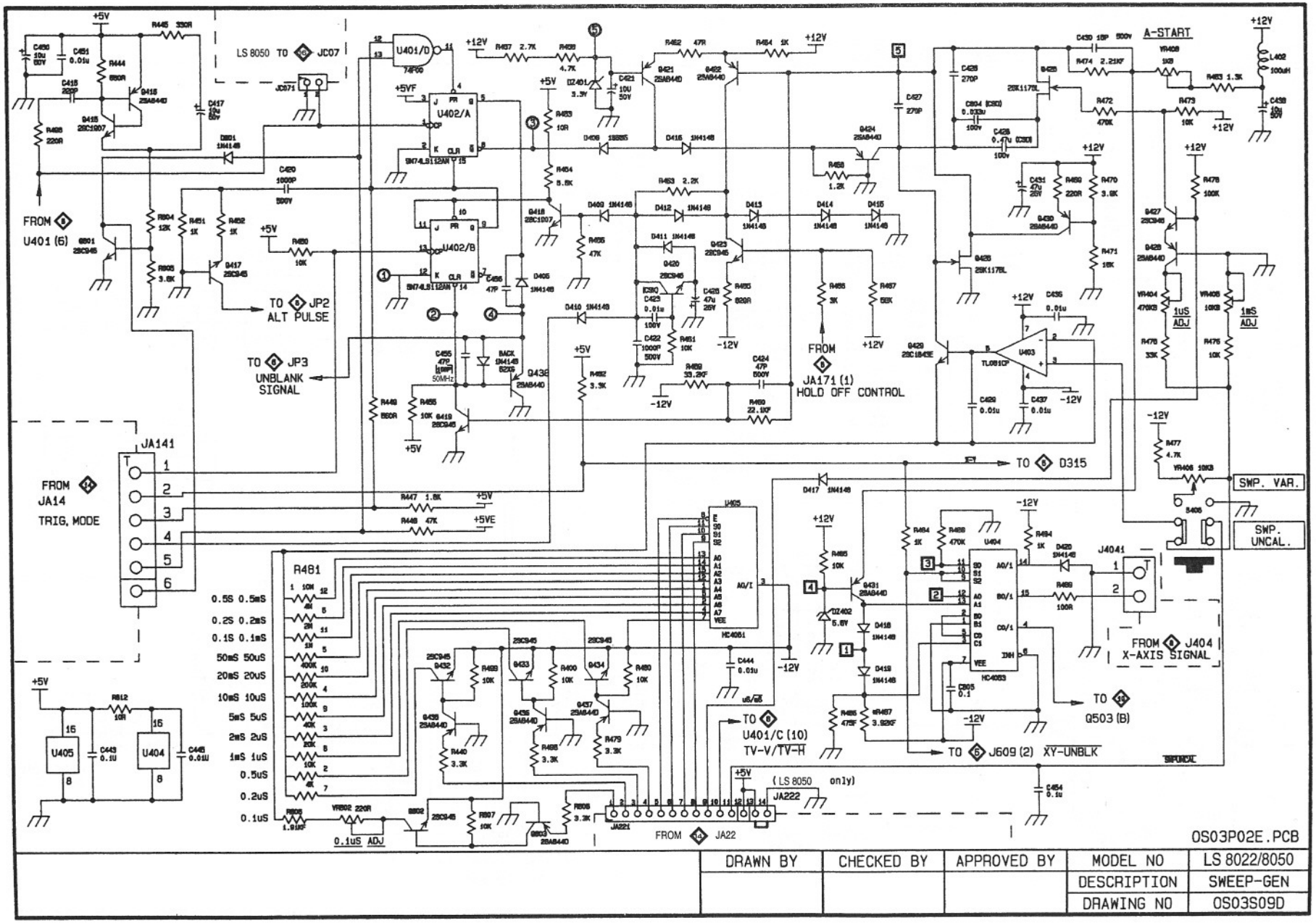
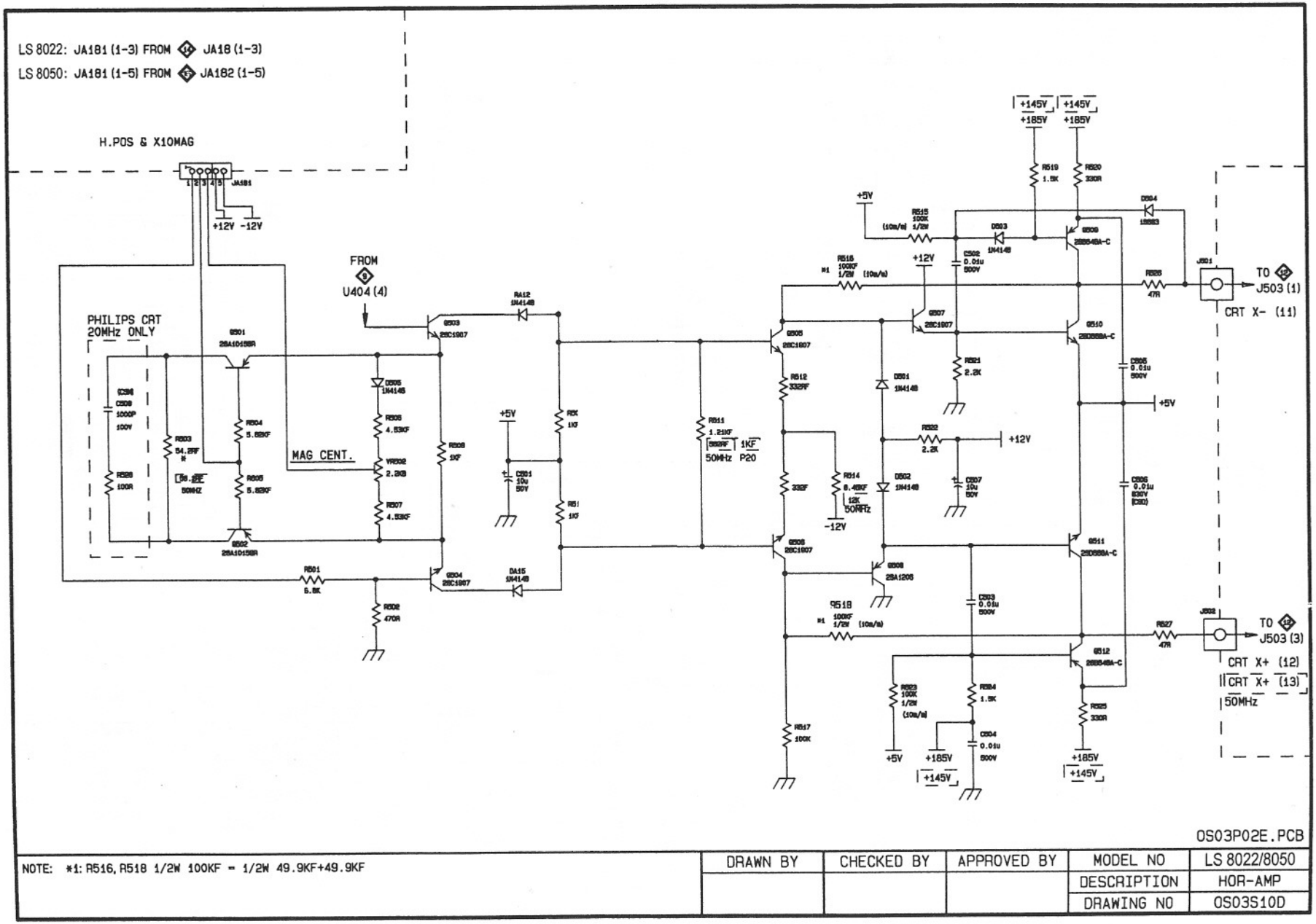


Figure 9: The sweep generator circuit



NOTE: *1: R516, R518 1/2W 100KF = 1/2W 49.9KF+49.9KF

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			DESCRIPTION	HOR-AMP
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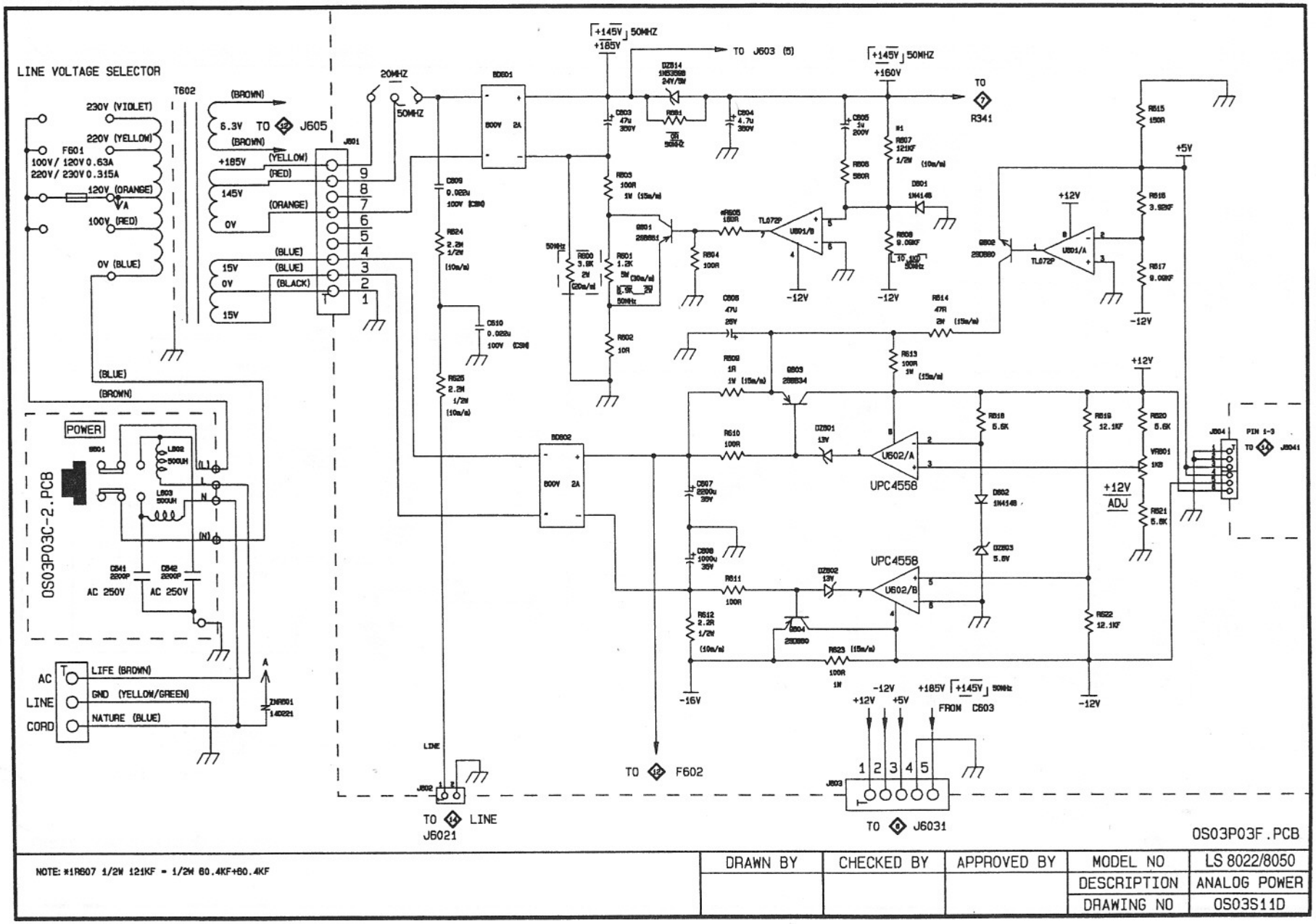

Figure 11: The analog power circuit

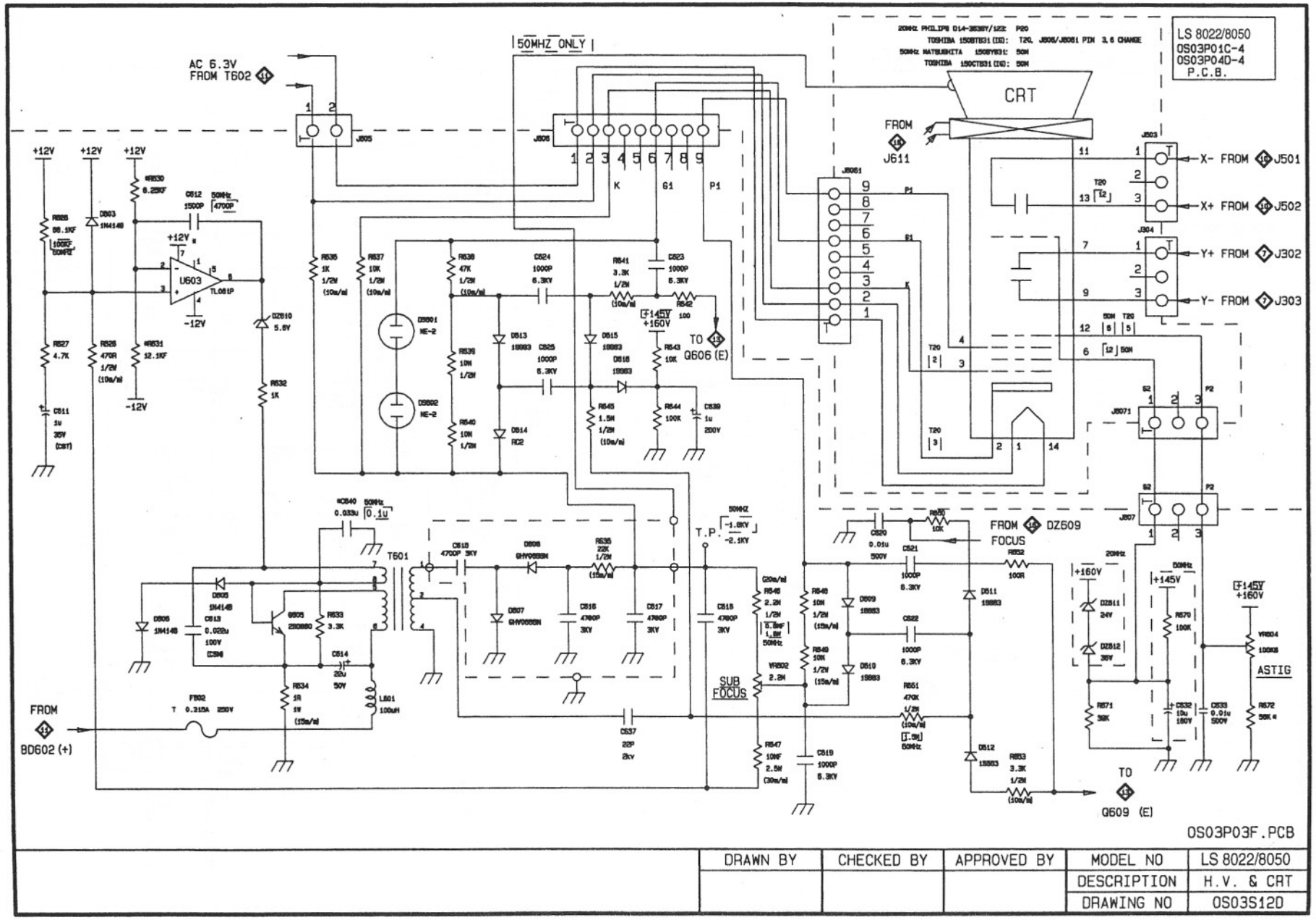

Figure 12: The high voltage and CRT circuit

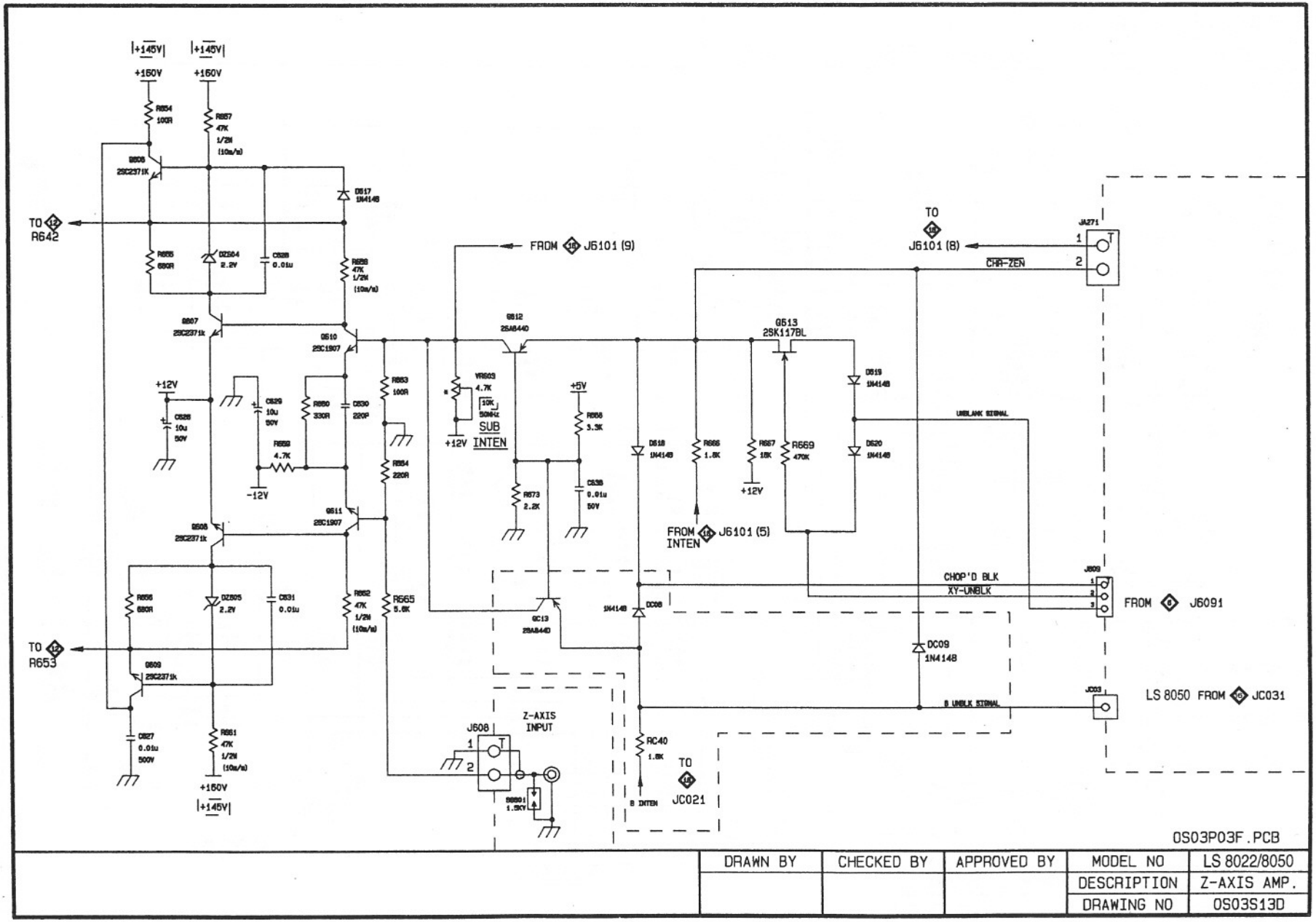

Figure 13: The Z-AXIS amplifier circuit

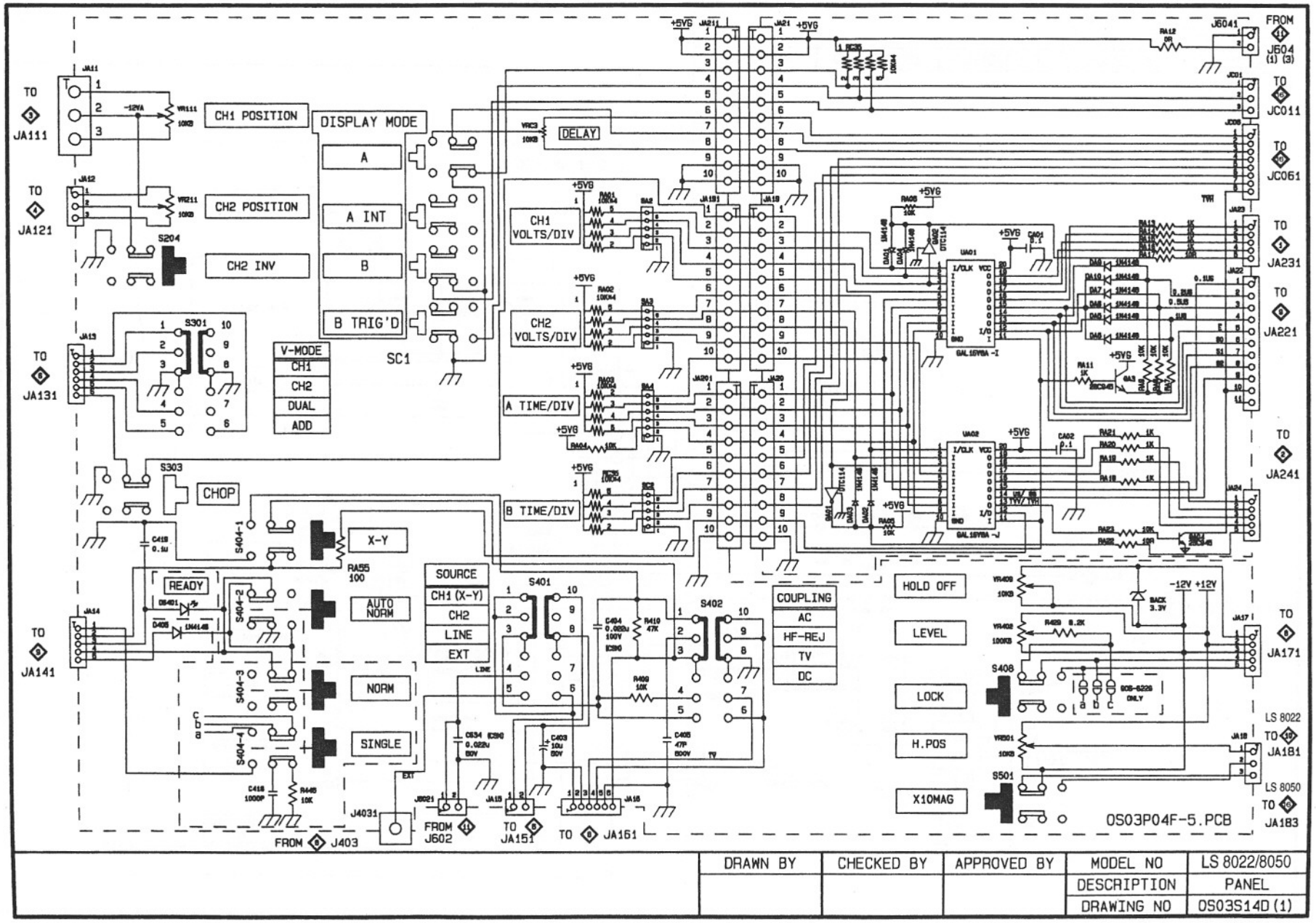

Figure 14: The panel circuit

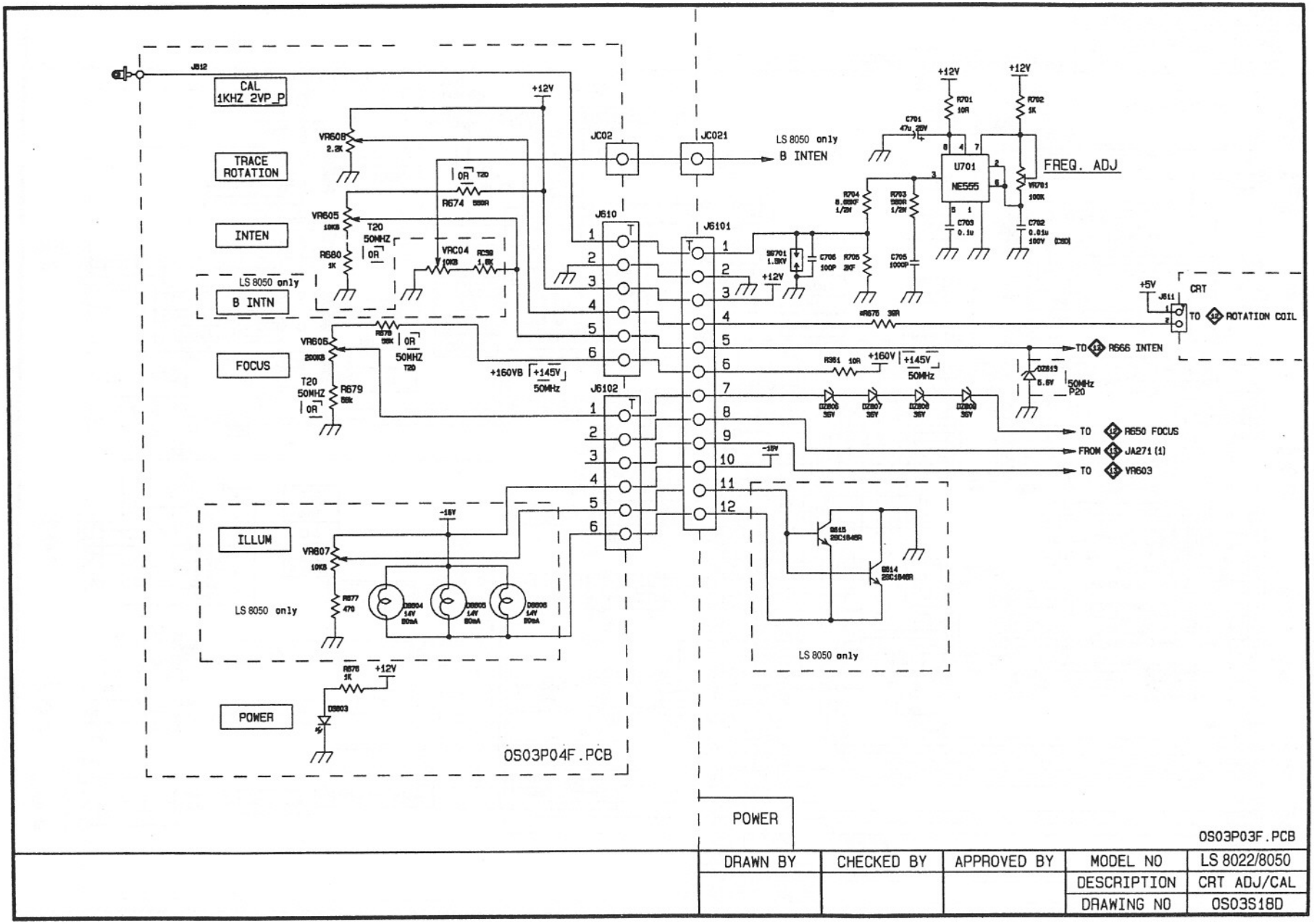

Figure 15: The CRT adjustment and calibration circuit

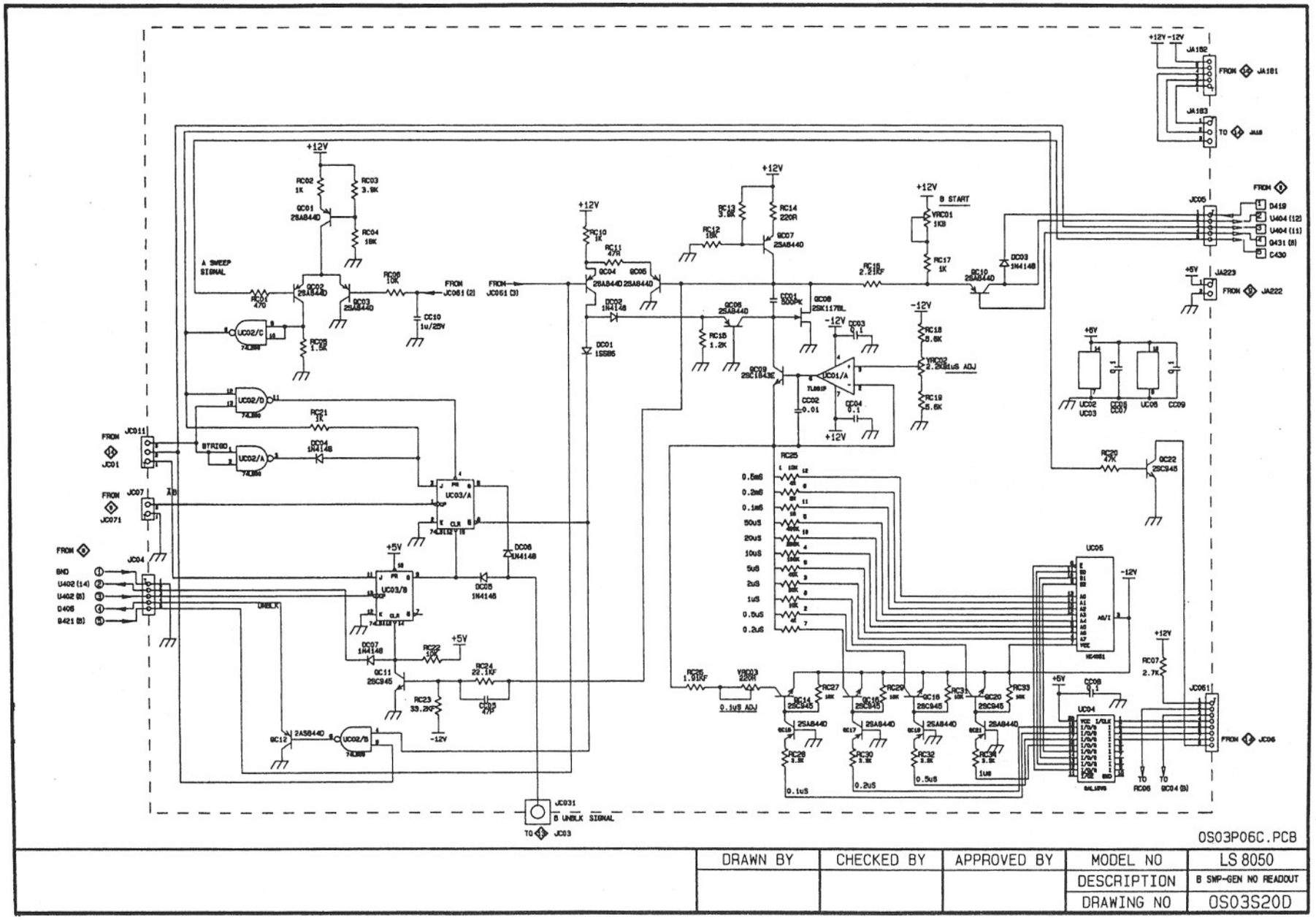

Figure 16: The B sweep generator without readout circuit

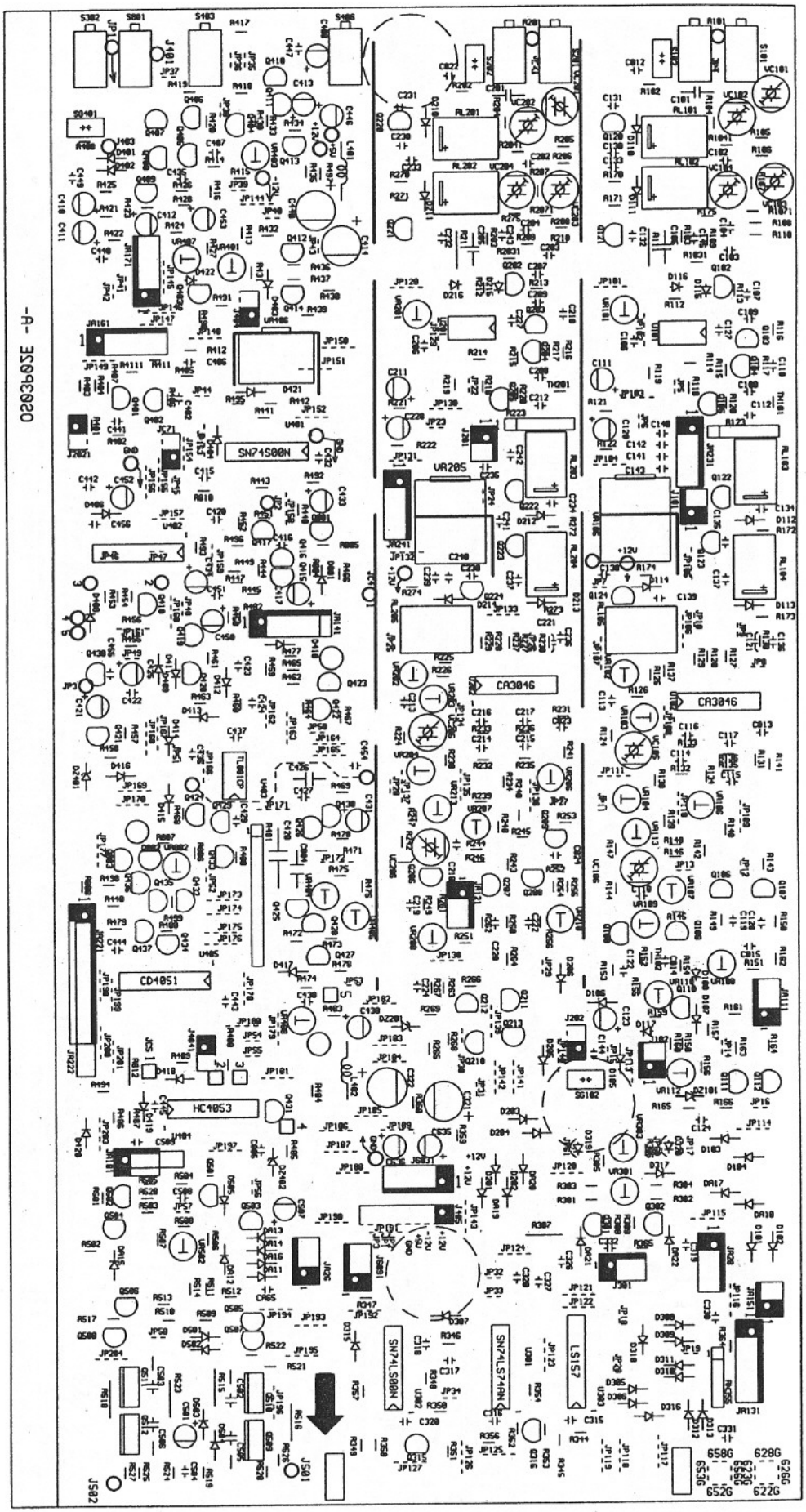

Figure 1: The silkscreen side layer of the OS03P02E PCB

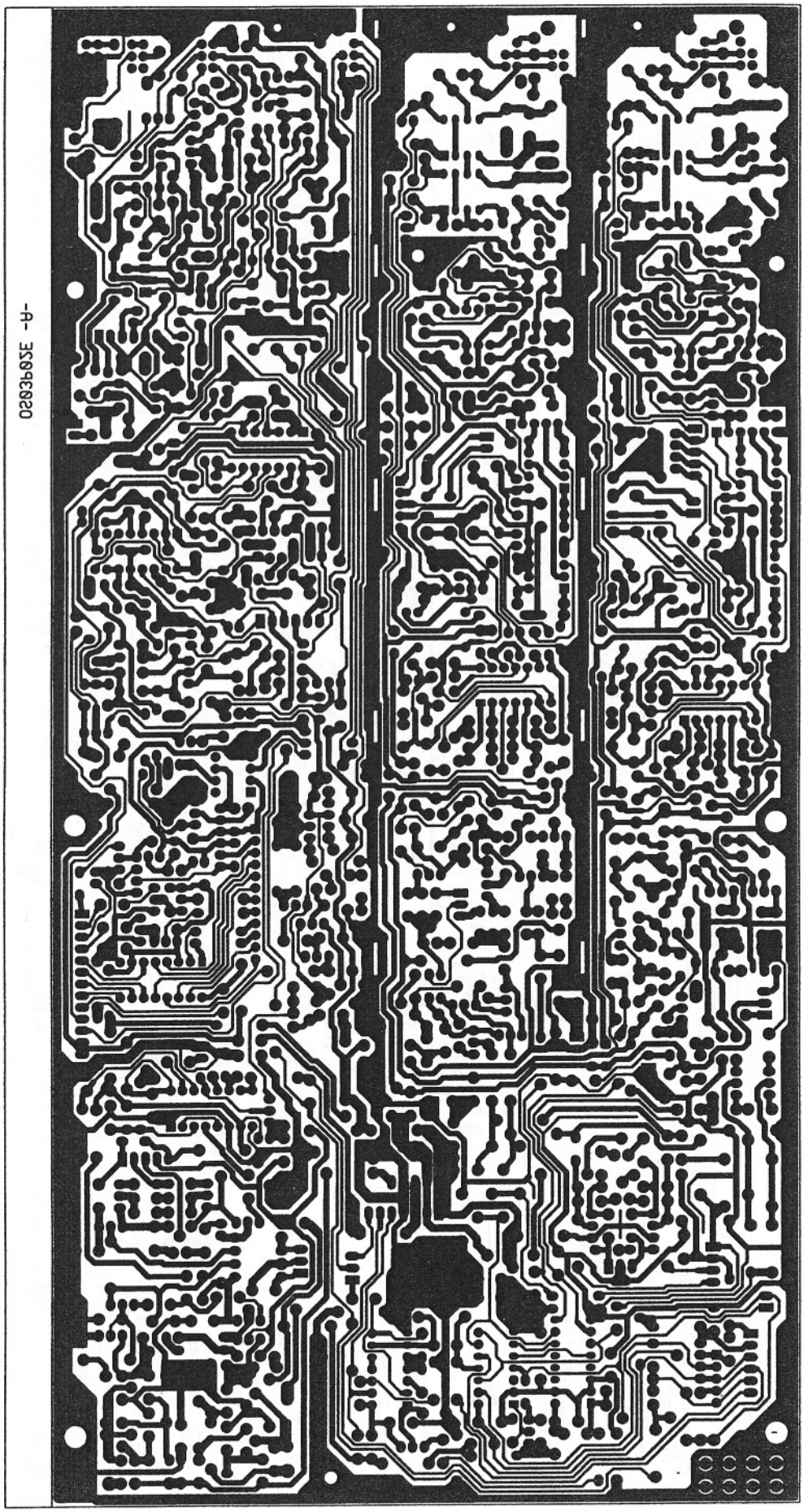

Figure 2: The solder side layer of the OS03P02E PCB

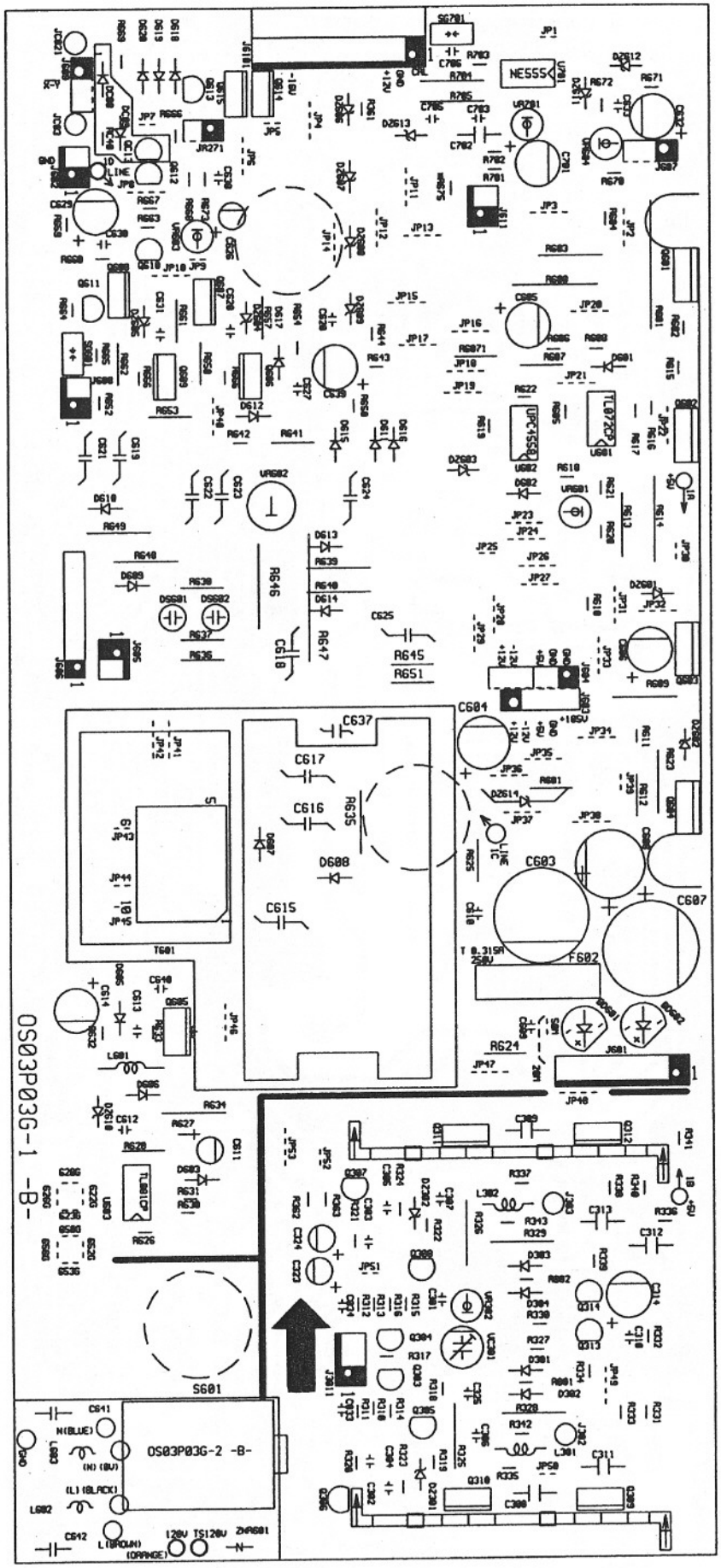

Figure 3: The silkscreen side layer of the OS03P03G-1 PCB

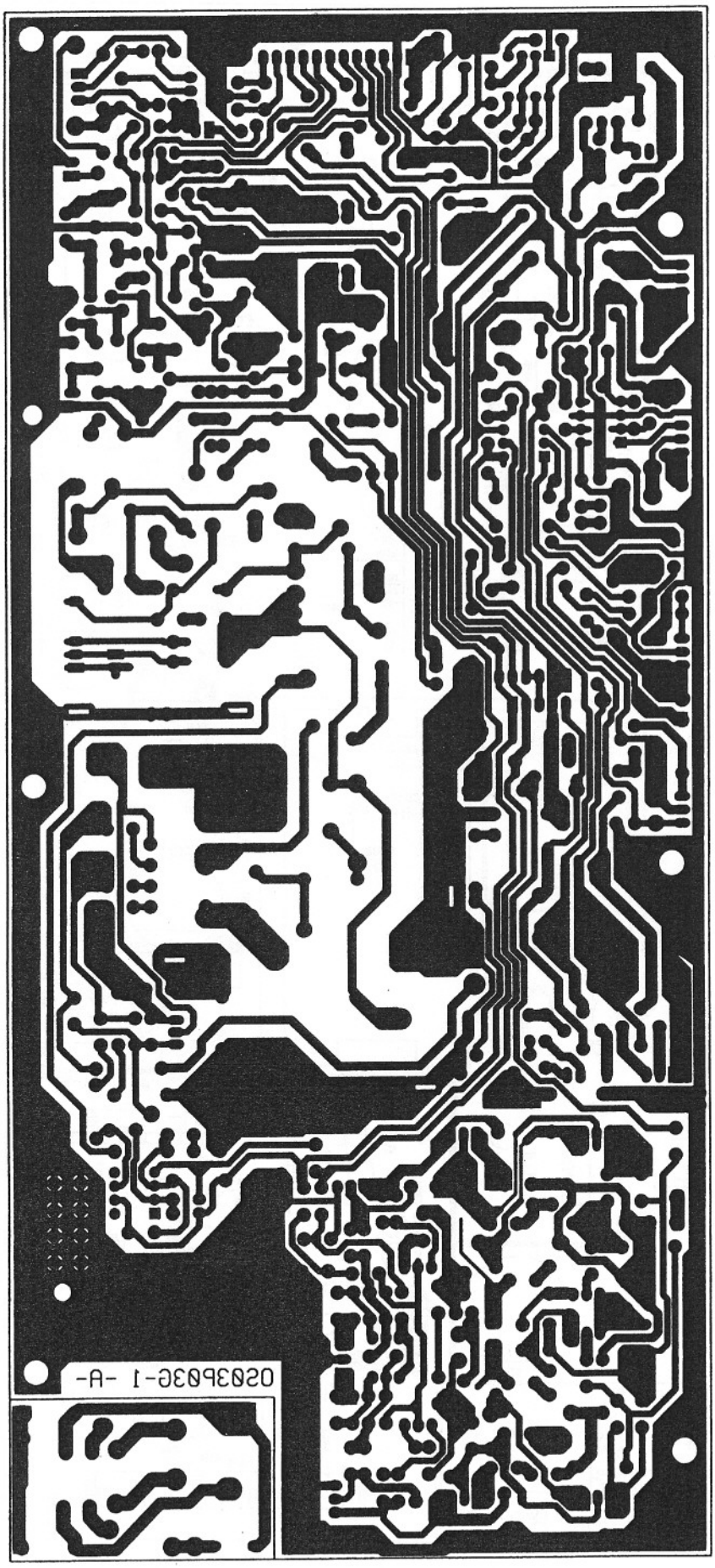

Figure 4: The solder side layer of the OS03P03G-1 PCB

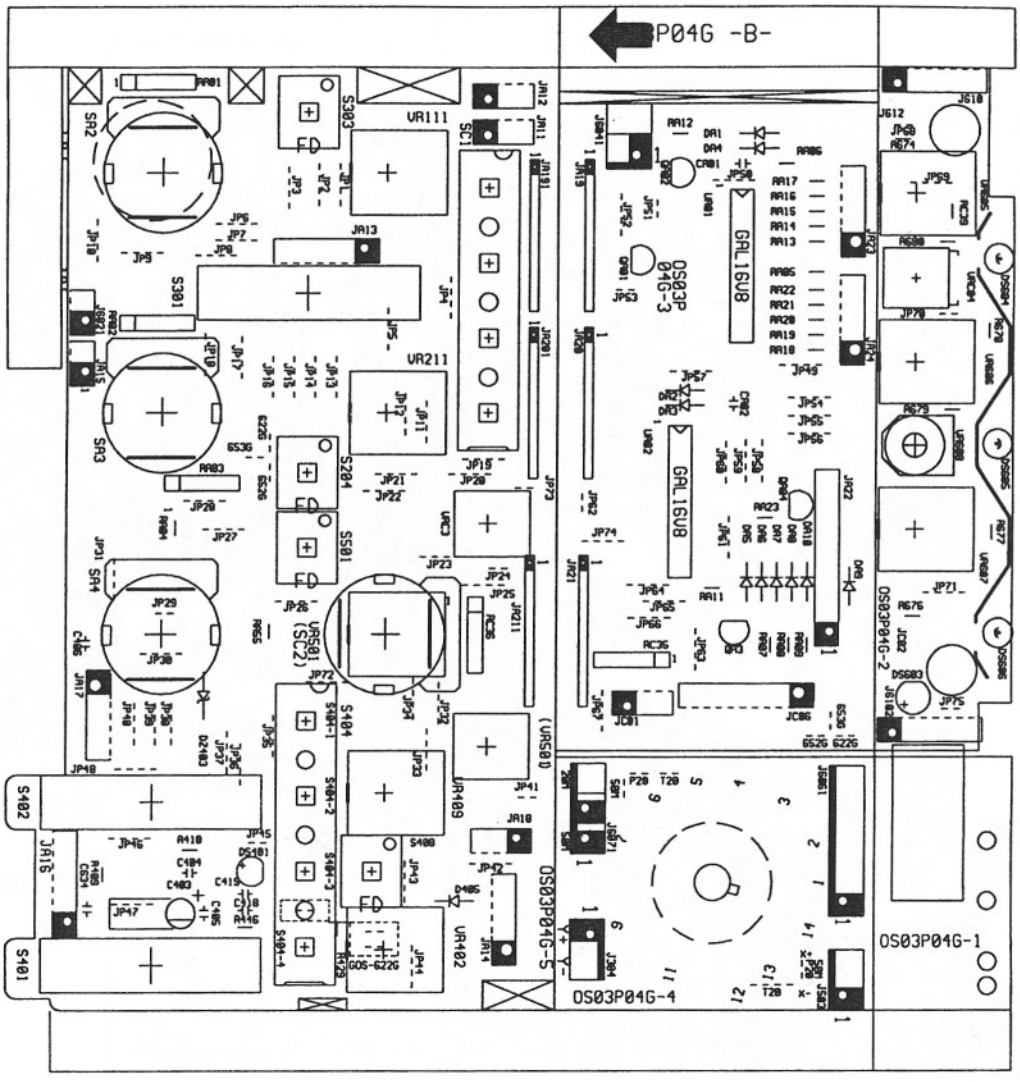

Figure 5: The silkscreen side layer of the OS03P04G-4 PCB

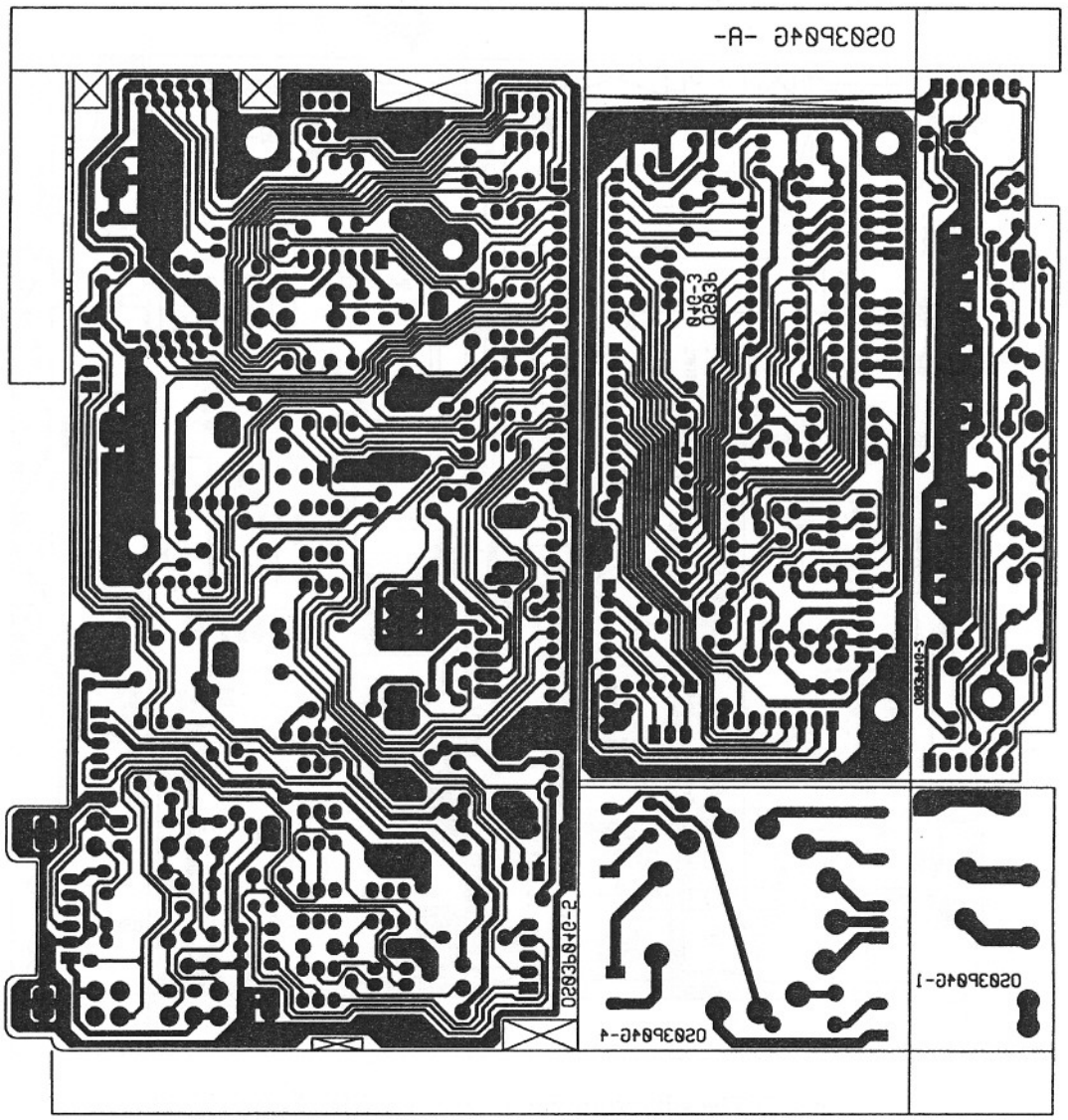

Figure 6: The solder side layer of the OS03P04G-4 PCB

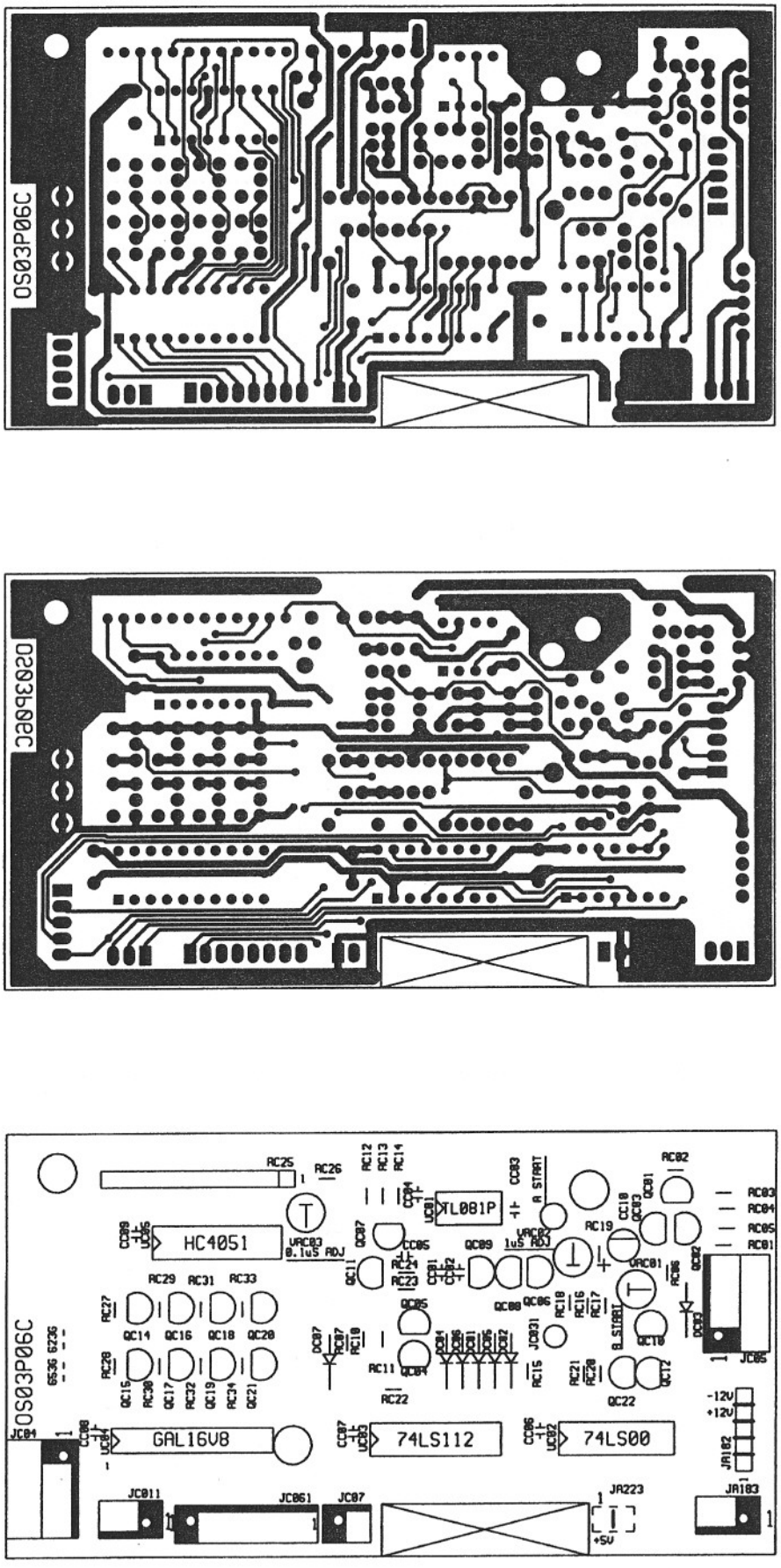

Figure 7: The silkscreen side layer, component side layer and solder side layer of the OS03P06C PCB

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40WCJ1025330	J608	1	TO Z-AXIS INP
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Part Number	Location	Q'ty	Comment
2204-50103Z0	C432	1	
2204-50103Z0	C429	1	
2204-50103Z0	C319-320	2	
2204-50103Z0	C315-316	2	
2204-50103Z0	C242	1	
2204-50103Z0	C232	1	
2204-50103Z0	C224	1	
2204-50103Z0	C222	1	
2204-50103Z0	C219-220	2	
2204-50103Z0	C142-144	3	
2204-50103Z0	C141	1	
2204-50103Z0	C240	1	
2204-50103Z0	C124	1	
2204-50103Z0	C122	1	
2204-50103Z0	C119-120	2	
2204-50103Z0	C402	1	
2204-50103Z0	C451	1	
2204-50104Z0	C443	1	
2204-50104Z0	C330-331	2	
2204-50104Z0	C328	1	
2204-50104Z0	C233-239	7	
2204-50104Z0	C230-231	2	
2204-50104Z0	C208-209	2	
2204-50104Z0	C130-139	10	
2204-50104Z0	C108-109	2	
2204-50104Z0	C805	1	
2204-50152K0	C317	1	
2204-50471J0	C406	1	
2204-5A102K0	C210	1	
2204-5A102K0	C207	1	
2204-5A102K0	C110	1	
2204-5A102K0	C107	1	
2204-5A102K0	C422	1	
2204-5A102K0	C318	1	
2204-5A102K0	C420	1	
2204-5A103Z0	C505	1	
2204-5A103Z0	C502-503	2	
2204-5A103Z0	C504	1	
2214-50100J0	C326-327	2	
2214-50101J0	C435	1	
2214-50101J0	C202	1	
2214-50101J0	C102	1	
2214-50101J0	C113	1	
2214-50101J0	C213	1	
2214-50220J0	C227	1	
2214-50220J0	C127	1	
2214-50221J0	C104	1	
2214-50221J0	C416	1	
2214-50221J0	C204	1	
2214-50221J0	C221	1	
2214-50221J0	C121	1	
2214-50250J0	C14	1	
2214-50271J0	C103	1	
2214-50271J0	C203	1	
2214-50271J0	C426-427	2	
2214-50390J0	C243	1	
2214-50680J0	C218	1	
2214-50680J0	C118	1	
2214-50820J0	C216-217	2	
2214-50820J0	C116-117	2	
2214-5A050D0	C441	1	
2214-5A050D0	C214-215	2	
2214-5A050D0	C114-115	2	
2214-5A100J0	C106	1	
2214-5A100J0	C206	1	
2214-5A150J0	C212	1	
2214-5A150J0	C430	1	
2214-5A150J0	C112	1	
2214-5A270J0	C145	1	
2214-5A470J0	C407	1	
2214-5A470J0	C455	1	
2214-5A470J0	C456	1	
2214-5A470J0	C424	1	
2224-1A103J0	C423	1	
2224-1A223J0	C415	1	
2244-25107Z0	C414	1	
2244-25107Z0	C440	1	
2244-25107Z0	C321-322	2	
2244-25476Z0	C431	1	
2244-25476Z0	C425	1	
2244-50106Z0	C412	1	
2244-50106Z0	C408	1	
2244-50106Z0	C228	1	
2244-50106Z0	C211	1	
2244-50106Z0	C128	1	
2244-50106Z0	C123	1	
2244-50106Z0	C111	1	
2244-50106Z0	C410	1	
2244-50106Z0	C635	1	
2244-50106Z0	C507	1	
2244-50106Z0	C501	1	
2244-50106Z0	C453	1	
2244-50106Z0	C452	1	
2244-50106Z0	C450	1	
2244-50106Z0	C446	1	
2244-50106Z0	C438	1	

Part Number	Location	Q'ty	Comment
2244-50106Z0	C433-434	2	
2244-50106Z0	C636	1	
2244-50106Z0	C421	1	
2244-50226Z0	C411	1	
2244C50106Z0	C417	1	
2261-35105M0	C413	1	
2271-1A333F0	C804	1	
2271-50474F0	C428	1	
2271-6A103J0	C506	1	
2271-6A223J0	C201	1	
2271-6A223J0	C101	1	
2291-4A222J0	C205	1	
2291-4A222J0	C105	1	
22G1-1M00100	SG401	1	
22G1-1M00100	SG102	1	
2311-0600020	VC204	1	
2311-0600020	VC104	1	
2311-1000020	VC202	1	
2311-1000020	VC201	1	
2311-1000020	VC102	1	
2311-1000020	VC101	1	
2311-2000020	VC205	1	
2311-2000020	VC203	1	
2311-2000020	VC105	1	
2311-2000020	VC103	1	
2311-5000020	VC206	1	
2311-5000020	VC106	1	
2502-1SS83H0	D504	1	
2502-1SS86H0	D408	1	
2502-1SS86H0	D403	1	
2502-N4148H0	D318	1	
2502-N4148H0	D315-317	3	
2502-N4148H0	D305-313	9	
2502-N4148H0	DA15	1	
2502-N4148H0	DA12	1	
2502-N4148H0	D210-214	5	
2502-N4148H0	D801	1	
2502-N4148H0	D505	1	
2502-N4148H0	D201-206	6	
2502-N4148H0	D502-503	2	
2502-N4148H0	D501	1	
2502-N4148H0	D110-114	5	
2502-N4148H0	D409-421	13	
2502-N4148H0	D406	1	
2502-N4148H0	D107	1	
2502-N4148H0	D404	1	
2502-N4148H0	D101-106	6	
2502-N4148H0	D401-402	2	

Part Number	Location	Q'ty	Comment
2503T0320050	DZ401	1	
2503T0320050	DZ201	1	
2503T0320050	DZ101	1	
2503T0550050	DZ402	1	
2503T0750050	R497	1	
2505T2251000	R246	1	
2505T2251000	R146	1	
2505T2251000	TH201	1	
2505T2251000	TH101-102	2	
2600-1015GRV	Q501-502	2	
2600-1015GRV	Q412	1	
2600-1206K-V	Q508	1	
2600-1206K-V	Q301-302	2	
2600-1206K-V	Q206-207	2	
2600-1206K-V	Q106-107	2	
2600-838B-0V	Q413	1	
2600-838B-0V	Q401	1	
2600-838B-0V	Q208-213	6	
2600-838B-0V	Q111-112	2	
2600-838B-0V	Q108-109	2	
2600-838B-0V	Q402	1	
2600-844D-0V	Q431	1	
2600-844D-0V	Q428	1	
2600-844D-0V	Q424	1	
2600-844D-0V	Q421-422	2	
2600-844D-0V	Q406-409	4	
2600-844D-0V	Q315-316	2	
2600-844D-0V	Q204	1	
2600-844D-0V	Q104	1	
2600-844D-0V	Q803	1	
2600-844D-0V	Q438	1	
2600-844D-0V	Q435-437	3	
2600-844D-0V	Q430	1	
2600-844D-0V	Q416	1	
2601-648AC-0	Q512	1	
2601-648AC-0	Q509	1	
2602-1843E-V	Q429	1	
2602-1907-0V	Q505-507	3	
2602-1907-0V	Q503-504	2	
2602-1907-0V	Q418	1	
2602-1907-0V	Q414	1	
2602-1907-0V	Q110	1	
2602-1907-0V	Q415	1	
2602-2570A-V	Q404-405	2	
2602-945Q-0V	Q801	1	
2602-945Q-0V	Q433	1	
2602-945Q-0V	Q432	1	
2602-945Q-0V	Q427	1	

Part Number	Location	Q'ty	Comment
2602-945Q-0V	Q423	1	
2602-945Q-0V	Q420	1	
2602-945Q-0V	Q205	1	
2602-945Q-0V	Q203	1	
2602-945Q-0V	Q105	1	
2602-945Q-0V	Q103	1	
2602-945Q-0V	Q434	1	
2602-945Q-0V	Q419	1	
2602-945Q-0V	Q417	1	
2602-945Q-0V	Q802	1	
2603-668AC-0	Q510-511	2	
2615-114ES-V	Q220-224	5	
2615-114ES-V	Q120-124	5	
2661-117BL-V	Q403	1	
2661-117BL-V	Q202	1	
2661-117BL-V	Q102	1	
2661-117BL-V	Q425-426	2	
2661-117BL-V	Q411	1	
2661-30Y0000	Q410	1	
2702-3046-00	U202	1	
2702-3046-00	U102	1	
2702-3140E-0	U201	1	
2702-3140E-0	U101	1	
270314051BCP	U405	1	
270314053BCP	U404	1	
2711-081CP-0	U403	1	
2711-74LS00N	U302	1	
2711-FFFF001	U402	1	
271174LS157N	U303	1	
271174LS74AN	U301	1	
2755-74F00-0	U401	1	
2900-10110CA	L401-402	2	
3202-1110740	S406	1	
3202-1110740	S403	1	
3202-1110740	S302	1	
3202-1110740	S201-202	2	
3202-1110740	S101-102	2	
3311-1201370	RL205	1	
3311-1201370	RL105	1	
3322-1202380	RL201-204	4	
3322-1202380	RL101-104	4	
35OS-03P02E0		1	
40WA-01T1R3B	J403	1	TO J4031 (EXT
40WA-B11BXHA	JA221	1	
40WA-B2BXHA0	JA151	1	
40WA-B2BXHA0	J102	1	
40WA-B3BXHA0	JA181	1	
40WA-B3BXHA0	JA121	1	
40WA-B3BXHA0	J6091	1	
40WA-B3BXHA0	JA111	1	
40WA-B5BXHA0	JA171	1	
40WA-B5BXHA0	JA141	1	
40WA-B5BXHA0	J6031	1	
40WA-B5BXHA0	J241	1	
40WA-B5BXHA0	JA231	1	
40WA-B6BXHA0	JA161	1	
40WA-B6BXHA0	JA131	1	
40WCJ1010182	12V	2	
40WCJ1010183	GND	1	
40WCJ1020192	J202	1	TO J2021
40WCJ1020193	J404	1	
40WCJ1030207	J501-502	1	TO J503
40WCJ1070048	J405	1	+/-12,+5,G,JP
4214-1112003	GND	1	TO GND
4270-06D0000	JP101-111	11	
4270-06D0000		1	
4270-06D0000	JP203-204	2	
4270-06D0000	JP113-201	89	
4270-06D0000	JP4-61	58	
4270-06D0000		1	
5209-AW0002A		2	
62AS-220SP3A		2	
62AS-220SP4A		2	
62AS-220SP9A		1	FOR VR406
62OS-658SP60		2	FOR VR105,VR2
HDS0437HB	C455	1	
HDS0437HB	D108	1	
HDS0477HB	D422	1	
HDS0477HB	D215-216	2	
HDS0477HB	D115-117	3	
03-PCB ASS'Y		1	
2002-10B0JT1	R361	1	
2002-10B0JT1	R602	1	
2002-10B0JT1	R336	1	
2002-10B0JT1	R341	1	
2002-10B0JT1	R362-363	2	
2002-10B0JT1	R701	1	
2002-10B1JT1	R604	1	
2002-10B1JT1	R652	1	
2002-10B1JT1	R654	1	
2002-10B1JT1	R610-611	2	
2002-10B1JT1	R642	1	
2002-10B1JT1	R663	1	
2002-10B2JT1	R632	1	
2002-10B2JT1	R340	1	
2002-10B2JT1	R331	1	

Part Number	Location	Q'ty	Comment
2002-10B2JT1	R702	1	
2002-10B3JT1	R650	1	
2002-10B3JT1	R643	1	
2002-10B4JT1	R644	1	
2002-15B1JT1	R615	1	
2002-15B3JT1	R318	1	
2002-18B1JT1	R605	1	
2002-18B2JT1	R666	1	
2002-18B3JT1	R667	1	
2002-22B0JT1	R801	1	
2002-22B0JT1	R323-324	2	
2002-22B0JT1	R802	1	
2002-22B1JT1	R319	1	
2002-22B1JT1	R322	1	
2002-22B1JT1	R664	1	
2002-22B2JT1	R673	1	
2002-22B3JT1	R672	1	
2002-33B1JT1	R660	1	
2002-33B2JT1	R668	1	
2002-33B2JT1	R330	1	
2002-33B2JT1	R327	1	
2002-33B2JT1	R633	1	
2002-39B0JT1	R675	1	
2002-39B3JT1	R671	1	
2002-47B1JT1	R320-321	2	
2002-47B1JT1	R342-343	2	
2002-47B2JT1	R659	1	
2002-47B2JT1	R627	1	
2002-47B4JT1	R669	1	
2002-47BDJT1	R337-339	3	
2002-47BDJT1	R333-335	3	
2002-56B1JT1	R703	1	
2002-56B1JT1	R606	1	
2002-56B2JT1	R665	1	
2002-56B2JT1	R620-621	2	
2002-56B2JT1	R618	1	
2002-68B1JT1	R316	1	
2002-68B1JT1	R314	1	
2002-68B1JT1	R655-656	2	
2002-75B1JT1	R317	1	
2002-75B1JT1	R315	1	
2002-82B0JT1	R332	1	
2003-10B2JT0	R636	1	
2003-10B3JT0	R637	1	
2003-15B5JT0	R645	1	
2003-22B5JT0	R624-625	2	
2003-22BDJT0	R612	1	
2003-33B2JT0	R653	1	
2003-33B2JT0	R641	1	
2003-47B1JT0	R628	1	
2003-47B3JT0	R661-662	2	
2003-47B3JT0	R657-658	2	
2003-47B3JT0	R638	1	
2003-47B4JT0	R651	1	
2004-10B1JH2	R613	1	
2004-10B1JH2	R603	1	
2004-10B1JH2	R623	1	
2004-10BDJH2	R634	1	
2004-10BDJH2	R609	1	
2004-47B3JH2	R328-329	2	
2005-33B3JH2	R325-326	2	
2005-47B0JH2	R614	1	
2007-12B2J05	R601	1	
2012-1212FT1	R631	1	
2012-1212FT1	R622	1	
2012-1212FT1	R619	1	
2012-3921FT1	R616	1	
2012-4750FT1	R313	1	
2012-4750FT1	R310	1	
2012-6812FT1	R626	1	
2012-8251FT1	R630	1	
2012-9091FT1	R617	1	
2012-9091FT1	R608	1	
2012-909DFT1	R311-312	2	
2013-2001FH2	R705	1	
2013-6042FT0	R6071	1	
2013-6042FT0	R607	1	
2013-8661FH2	R704	1	
2043-10B6JH2	R648-649	2	
2043-10B6JH2	R639-640	2	
2043-2204JH7	R646	1	
2043-22B3K00	R635	1	
204F-1005F00	R647	1	
2100-102BM12	VR601	1	
2100-104BM00	VR701	1	
2100-104BM00	VR604	1	
2100-225BM00	VR602	1	
2100-471BM01	VR302	1	
2100-472BM00	VR603	1	
2201-3K472Z1	C615-617	3	
2201-3K472Z1	C618	1	
2201-6K102Z0	C619	1	
2201-6K102Z0	C621-625	5	
2204-50103Z0	C638	1	
2204-50103Z0	C631	1	
2204-50103Z0	C628	1	

Part Number	Location	Q'ty	Comment
2204-50104Z0	C703	1	
2204-50104Z0	C310	1	
2204-50152K0	C612	1	
2204-50333Z0	C640	1	
2204-5A102K0	C705	1	
2204-5A103Z0	C633	1	
2204-5A103Z0	C627	1	
2204-5A103Z0	C620	1	
2211-3K220J7	C637	1	
2214-50101J0	C706	1	
2214-50101J0	C304-305	2	
2214-50221J0	C630	1	
2214-5A050D0	C301	1	
2214-5A470J0	C302	1	
2214-5A470J0	C303	1	
2214-5A50CC0	C306-307	2	
2224-1A223J0	C613	1	
2224-1A223J0	C609-610	2	
2241-35108Z0	C608	1	
2241-35228Z0	C607	1	
2241-3B475Z0	C604	1	
2241-3B476Z0	C603	1	
2244-25476Z0	C701	1	
2244-25476Z0	C606	1	
2244-2A105Z0	C639	1	
2244-2A105Z0	C605	1	
2244-2A105Z0	C314	1	
2244-50106Z0	C629	1	
2244-50106Z0	C626	1	
2244-50106Z0	C323-324	2	
2254-50226Z0	C614	1	
2261-35105M0	C611	1	
2271-1A103F0	C702	1	
2271-2B223J0	C312	1	
2271-2B473J0	C308-309	2	
2271-6A223J0	C311	1	
2271-6A223J0	C313	1	
2291-2X222M1	C641-642	2	
22G1-1M00100	SG701	1	
22G1-1M00100	SG601	1	
2311-5000020	VC301	1	
2501-RC200T0	D614	1	
2501-Y10GA00	D607-608	2	
2502-1SS83H0	D615-616	2	
2502-1SS83H0	D609-613	5	
2502-N4148H0	D617-620	4	
2502-N4148H0	D605-606	2	
2502-N4148H0	D601-603	3	
2502-N4148H0	D301-304	4	
2503H2400500	DZ614	1	
2503T0210050	DZ604-605	2	
2503T0210050	DZ301-302	2	
2503T0550050	DZ610	1	
2503T0550051	DZ603	1	
2503T1300050	DZ601-602	2	
2503T2300050	DZ611	1	
2503T3500050	DZ612	1	
2503T3500050	DZ606-609	4	
2504-2W06M00	BD601-602	2	
2506-2211700	ZNR601	1	
2600-1206K-V	Q306-307	2	
2600-844D-0V	Q612	1	
2601-648AC-0	Q312	1	
2601-648AC-0	Q309	1	
2601-834Y-00	Q603	1	
2601-861C-00	Q601	1	
2602-1907-0V	Q610-611	2	
2602-1907-0V	Q308	1	
2602-1907-0V	Q303-305	3	
2602-2371K-0	Q606-609	4	
2602-2570A-V	Q313-314	2	
2603-668AC-0	Q310-311	2	
2603-880Y-00	Q605	1	
2603-880Y-00	Q604	1	
2603-880Y-00	Q602	1	
2661-117BL-V	Q613	1	
2708-4558C-0	U602	1	
2711-072CP-0	U601	1	
2711-081CP-0	U603	1	
2711-555P-00	U701	1	
2900-10110CA	L601	1	
2900-22D90MQ	L301-302	2	
2900150110DA	L602-603	2	
3080-OS0010D	T601	1	
3153-0062000	DS601-602	2	
3202-1120010	S601	1	
35OS-03P03G0		1	
37FT-1124311	F602	1	
37H4-5200010	F602	1	
40WA-B2BXHA0	J611	1	
40WA-B2BXHA0	J608	1	
40WA-B2BXHA0	J605	1	
40WA-B2BXHA0	J602	1	
40WA-B9BXHA0	J601	1	
40WA-S12BXHA	J6101	1	
40WCJ0018427	GND	1	CASE TO P/S G

Part Number	Location	Q'ty	Comment
40WCJ1010182	1A	1	TO 1B (+5V)
40WCJ1010227	S601	1	(L) TO SELECTOR
40WCJ1010228		1	N TO NATURE
40WCJ1010245	120V	1	
40WCJ1030201	J607	1	TO J6071
40WCJ1030202	J302-303	1	TO J304
40WCJ1030219	J609	1	TO 02PCB-J609
40WCJ1030220	J604	1	TO J6041
40WCJ1050053	J603	1	TO 02PCB-J603
40WCJ1090220	J606	1	
40WCJ3010002	L	1	L TO LIFE
4213-9881753	J301	1	TO J3011
4214-1112003	1C	1	TO 1D(LIVE)
4270-06D0000		1	
4270-06D0000		1	
5208-AP00000		2	Q309-310,311-
5209-AW00030		1	
57IL-21G0040		5	
57IL-21W0010	Q601-604	4	
57IL-21W0070	Q605	1	
62OS-658SP1A		1	
62OS-658SP5B		1	
04-PCB ASS'Y		1	
2002-10B0JT1	RA17	1	
2002-10B0JT1	RA22	1	
2002-10B1JT1	RA55	1	
2002-10B2JT1	RA18-21	4	
2002-10B2JT1	RA13-16	4	
2002-10B2JT1	R676	1	
2002-10B2JT1	RA11	1	
2002-10B3JT1	RA4-9	6	
2002-10B3JT1	R409	1	
2002-10B3JT1	RA23	1	
2002-47B3JT1	R410	1	
2002-56B1JT1	R674	1	
2002-82B2JT1	R429	1	
2061-10B3J50	R1-3	3	
2100-202BM03	VR608	1	
2110-103BC30	VR409	1	
2110-103BC30	VR501	1	
2110-103BC30	VR111	1	
2110-103BC30	VR605	1	
2110-103BC30	VR211	1	
2110-104BC09	VR402	1	
2110-204BC05	VR606	1	
2204-50104Z0	C406	1	
2204-50104Z0	C419	1	

Part Number	Location	Q'ty	Comment
2204-50104Z0	CA1-2	2	
2214-5A470J0	C405	1	
2224-1A223J0	C404	1	
2224-50223J0	C634	1	
2244-50106Z0	C403	1	
2502-N4148H0	D405	1	
2502-N4148H0	DA1-10	10	
2503T0320050	DZ403	1	JA17 PIN1(-) PIN
2602-945Q-0V	QA3-4	2	
2615-114ES-V	QA1-2	2	
2743-16V8A0I	UA1	1	
2743-16V8A0J	UA2	1	
3111-05D0190	DS603	1	
3200-1410320	SA2-3	2	
3200-1510330	SA4	1	
3202-1121270	S404-4	1	
3202-1121270	S404-2	1	
3202-1121270	S404-1	1	
3202-1121270	S501	1	
3202-1121270	S303	1	
3202-1121270	S204	1	
3204-0420280	S401-402	2	
3204-0420280	S301	1	
35OS-03P04G0		1	
3612-20D000N	UA1-2	2	
3613-14D003N		1	CRT
40WA-B2BXHA0	J6041	1	
40WA-B3BXHA0	J6071	1	
40WA-B3BXHA0	J503	1	
40WA-B3BXHA0	J304	1	
40WA-B9BXHA0	J6061	1	
40WCJ1010165	J612	1	BACK TO CAL
40WCJ1010165	J4031	1	BACK TO J403
40WCJ1010183	JA21	1	BACK
40WCJ1020208	J6021	1	
40WCJ1020209	JA15	1	
40WCJ1030218	JA12	1	
40WCJ1030219	JA18	1	
40WCJ1030221	JA11	1	
40WCJ1050051	JA17	1	TO JA171
40WCJ1050052	JA24	1	TO JA241
40WCJ1050053	JA14	1	
40WCJ1055335	JA23	1	TO JA231
40WCJ1060126	JA16	1	TO JA161
40WCJ1060128	JA13	1	
40WCJ1110007	JA22	1	TO 02PCB-JA22
40WCJ1120016	J610-6102	1	BACK TO J6101

Part Number	Location	Q'ty	Comment
4231-1015000	JA20	1	BACK
4231-1015000	JA19	1	BACK
4270-06D0000	JP63-67	5	
4270-06D0000	JP54-61	8	
4270-06D0000	JP52	1	
4270-06D0000	JP46-50	5	
4270-06D0000	R680	1	
4270-06D0000	R678-679	2	
4270-06D0000	RA12	1	
4270-06D0000	JP42-44	3	
4270-06D0000	JP73	1	
4270-06D0000	JP70	1	
4270-06D0000	JP68	1	
4270-06D0000	JP62	1	
4270-06D0000	JP30-40	1	
4270-06D0000	JP53	1	
4270-06D0000	JP51	1	
4270-06D0000	JP45	1	
4270-06D0000	JP41	1	
4270-06D0000	JP74-75	2	
4270-06D0000	JP25-28	4	
4270-06D0000	JP29	1	
4270-06D0000	JP24	1	
4270-06D0000	JP71-72	2	
4270-06D0000	GOS622G	3	
4270-06D0000		1	
4270-06D0000	JP69	1	
4270-06D0000	JP1-23	23	
63EF-ZF10090	DS603	1	

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Part Number	Location	Q'ty	Comment
MECHANICAL	R101	1	
2002-22B0JT0	R201	1	
2002-22B0JT0			
GOS-653G		1	
MECHANICAL	R201	1	
2002-22B0JT0	R101	1	
2002-22B0JT0	R811	1	
2002-56B0JT0	C21	1	
2214-50101J0	C11	1	
2214-50101J0	SG201	1	
22G1-1M00100	SG101	1	
22G1-1M00100		1	
2411-0602600		1	
2901-8030001	T602	1	
3004-OS0210D		1	
3610-0100051		1	GND TO CASE
40WCJ1010217	JC3	1	TO JC31
40WCJ1010220	J102	1	TO CH1-OUTPUT
40WCJ1025329	J608	1	TO Z-AXIS INPUT
40WCJ1025330	BNC	3	
4215-2000303	J301	1	
4281-2100040		5	
44BB-9010030		1	
44GT-K110010		2	
5000-180G040		9	
5005-110G010		3	
5005-110G020		1	
5005-110G030		1	
5005-240G020		3	
5031-090G02A		12	
5034-060G030		7	
5034-060G040		1	
5054-110G010		1	
51OS-653G01D		1	
51OS-653G020		1	
51OS-653G03B		1	
51OS-658G04D		3	
51OS-658G050		30	
5306-1000000		1	
5306-2500500		1	
5307-1003150		2	
5312-0110970		1	
5312-0120400		3	N TO NATURE
5312-0291000		3	
5316-2101400		1	
5317-2560340		4	
5320-0060350		2	
5321-0101000		3	
5322-0160400		4	
57FC-10B0060		4	
57FC-30B0080		1	
57IL-28F001B		1	
57IL-28F0120		1	
57RB-30B0390	1	1	
57RB-30B0410		1	
57RB-30B0460		1	
57RB-30B0470		1	
57RB-30B0510		1	
57RG-21B007B		1	
5804-021454A		1	
5806-0201010		17	
593B-03006N		44	
594B-03006N		1	
594B-W4008NS		4	
594B-W4016NS		14	
62AS-220PP10		1	
62OS-600PP1A		2	
62OS-600PP60	CR	1	CRT-CASE
62OS-600SP30		1	
62OS-642HP20		1	
62OS-645SP10		1	
62OS-658FP1C		1	
62OS-658HP2E		1	
62OS-658HP3D		1	
62OS-658HP4D		1	
62OS-658HP5A		1	
62OS-658HP7A		1	
62OS-658RP1B		1	
62OS-658SP30		1	
62OS-658SP40		1	
62OS-658TS10		1	
63CC-BE10030		1	
63FP-AG1037A		3	
63LK-AG1001A		2	
63LK-AG1002B		1	
63LK-OB10010		2	
66AN-1050000		1	
66FN-2200000		1	
PACKING		2	
1100-LF19000		1	
37FT-1124311		1	
4321-8068110		1	

Part Number	Location	Q'ty	Comment
5801-0206970		2	
593B-05014NP		1	
62OS-658LO1A		1	
62OS-658UP10		1	
63HD-AG10070		1	
80OS-658CN1D		1	
81OS-658PE10		1	
81PF-658PF1A		1	
81PF-658PF2A		1	
82OS-658G0MC		1	
8322-8570200		1	
84EB-2501250		1	
84PB-3001950		1	
84PB-6604800		1	
394A ASS'Y	R901	1	
2043-22B3K00	R902	1	Y5U ,EPOXY CO
204G-1005F00	C907-909	6	Y5U ,EPOXY CO
2201-3K472Z1	C901-906	6	
2201-6K102Z0	D901-907	7	
2501-Y10GA00		1	
35OS-543094A		1	
4215-7223006		1	
63OU-AB1001A	J901-903	3	
66SD-3400000		1	
02-PCB ASS'Y	R812	1	
2002-10B0JT0	R345	1	
2002-10B0JT1	R221-222	2	
2002-10B0JT1	R110	1	
2002-10B0JT1	R492-493	2	
2002-10B0JT1	R358-360	3	
2002-10B0JT1	R159	1	
2002-10B0JT1	R121-122	2	
2002-10B0JT1	R172-174	3	
2002-10B0JT1	R210	1	
2002-10B0JT1	R453	1	
2002-10B0JT1	R272-274	3	
2002-10B0JT1	R356	1	
2002-10B0JT1	R124	1	
2002-10B0JT1	R224	1	
2002-10B0JT1	RC221	1	SERIES C221
2002-10B0JT1	RC121	1	SERIES C121
2002-10B0JT1	R151	1	
2002-10B1JT1	R439	1	
2002-10B1JT1	R489	1	
2002-10B1JT1	R213	1	
2002-10B1JT1	R251	1	
2002-10B1JT1	R113	1	
2002-10B1JT1	R131	1	
2002-10B1JT1	R435	1	
2002-10B1JT1	R231	1	
2002-10B1JT1	R491	1	
2002-10B1JT1	R112	1	
2002-10B2JT1	R451-452	2	
2002-10B2JT1	R494	1	
2002-10B2JT1	R432	1	
2002-10B2JT1	R484	1	
2002-10B2JT1	R350	1	
2002-10B2JT1	R430	1	
2002-10B2JT1	R352-353	2	
2002-10B2JT1	R441	1	
2002-10B2JT1	R247-248	2	
2002-10B2JT1	R214	1	
2002-10B2JT1	R348	1	
2002-10B2JT1	R346	1	
2002-10B2JT1	R157	1	
2002-10B2JT1	R212	1	
2002-10B2JT1	R114	1	
2002-10B2JT1	R147-148	2	
2002-10B2JT1	R464	1	
2002-10B2JT1	R413	1	
2002-10B2JT1	R400	1	
2002-10B3JT1	R364	1	
2002-10B3JT1	R499	1	
2002-10B3JT1	R351	1	
2002-10B3JT1	R344	1	
2002-10B3JT1	R349	1	
2002-10B3JT1	R357	1	
2002-10B3JT1	R485	1	
2002-10B3JT1	R473	1	
2002-10B3JT1	R807	1	
2002-10B3JT1	R476	1	
2002-10B3JT1	R431	1	
2002-10B3JT1	R480	1	
2002-10B3JT1	R412	1	
2002-10B3JT1	R461	1	
2002-10B3JT1	R450	1	
2002-10B3JT1	R425	1	
2002-10B3JT1	R455	1	
2002-10B3JT1	R517	1	
2002-10B4JT1	R478	1	
2002-10B4JT1	R421-422	2	
2002-10B4JT1	R146	1	
2002-12B1JT1	R246	1	
2002-12B1JT1	R468	1	
2002-12B2JT1	R404	1	
2002-12B2JT1	R267	1	

Part Number	Location	Q'ty	Comment
2002-12B2JT1	R220	1	
2002-12B2JT1	R120	1	
2002-12B2JT1	R804	1	
2002-12B3JT1	R514	1	
2002-12B3JT1	R483	1	
2002-13B2JT1	R209	1	
2002-15B0JT1	R109	1	
2002-15B0JT1	R244-245	2	
2002-15B1JT1	R144-145	2	
2002-15B1JT1	R524	1	
2002-15B2JT1	R519	1	
2002-15B2JT1	R158	1	
2002-15B2JT1	R249-250	2	
2002-18B1JT1	R149-150	2	
2002-18B1JT1	R447	1	
2002-18B2JT1	R471	1	
2002-18B3JT1	R266	1	
2002-22B0JT1	R242-243	2	
2002-22B0JT1	R206	1	
2002-22B0JT1	R166	1	
2002-22B0JT1	R152	1	
2002-22B0JT1	R142-143	2	
2002-22B0JT1	R106	1	
2002-22B0JT1	R495-496	2	
2002-22B1JT1	R469	1	
2002-22B1JT1	R301-302	2	
2002-22B1JT1	R270-271	2	
2002-22B1JT1	R269	1	
2002-22B1JT1	R256	1	
2002-22B1JT1	R253	1	
2002-22B1JT1	R170-171	2	
2002-22B1JT1	R153	1	
2002-22B1JT1	R463	1	
2002-22B2JT1	R521-522	2	
2002-22B2JT1	R442	1	
2002-22B2JT1	R423	1	
2002-22B2JT1	R405	1	
2002-22B2JT1	R403	1	
2002-22B2JT1	R265	1	
2002-22B2JT1	R424	1	
2002-22B3JT1	R238	1	
2002-27B0JT1	R175	1	
2002-27B0JT1	R138	1	
2002-27B0JT1	R436	1	
2002-27B1JT1	R234	1	
2002-27B1JT1	R134	1	
2002-27B1JT1	R347	1	
2002-27B1JT1	R457	1	
2002-27B2JT1	R156	1	
2002-27B2JT1	R365	1	
2002-30B1JT1	R466	1	
2002-30B2JT1	R202	1	
2002-33B0JT1	R102	1	
2002-33B0JT1	R490	1	
2002-33B0JT1	R525	1	
2002-33B1JT1	R520	1	
2002-33B1JT1	R445	1	
2002-33B1JT1	R482	1	
2002-33B2JT1	R808	1	
2002-33B2JT1	R498	1	
2002-33B2JT1	R479	1	
2002-33B2JT1	R440	1	
2002-33B2JT1	R406	1	
2002-33B2JT1	R475	1	
2002-33B3JT1	R427	1	
2002-33B3JT1	R805	1	
2002-36B2JT1	R137	1	
2002-39B0JT1	R275	1	
2002-39B0JT1	R237	1	
2002-39B0JT1	R219	1	
2002-39B1JT1	R119	1	
2002-39B1JT1	R437	1	
2002-39B1JT1	R470	1	
2002-39B2JT1	R217	1	
2002-39B2JT1	R415-416	2	
2002-39B2JT1	R117	1	
2002-39B2JT1	R407	1	
2002-47B0JT1	R263-264	2	
2002-47B0JT1	R462	1	
2002-47B0JT1	R526-527	2	
2002-47B0JT1	R401	1	
2002-47B0JT1	R163-164	2	
2002-47B0JT1	R160	1	
2002-47B0JT1	R502	1	
2002-47B1JT1	R458	1	
2002-47B2JT1	R261-262	2	
2002-47B2JT1	R477	1	
2002-47B2JT1	R161-162	2	
2002-47B2JT1	R456	1	
2002-47B3JT1	R810	1	
2002-47B3JT1	R448	1	
2002-47B3JT1	R443	1	
2002-47B3JT1	R141	1	
2002-47B3JT1	R241	1	
2002-47B3JT1	R230	1	
2002-47B3JT1	R130	1	

Part Number	Location	Q'ty	Comment
2002-47B3JT1	R433-434	2	
2002-47B4JT1	R472	1	
2002-47B4JT1	R488	1	
2002-47B4JT1	R438	1	
2002-47BDJT1	R426	1	
2002-56B1JT1	R305-306	2	
2002-56B1JT1	R449	1	
2002-56B1JT1	R428	1	
2002-56B1JT1	R454	1	
2002-56B2JT1	R354	1	
2002-56B2JT1	R227-228	2	
2002-56B2JT1	R218	1	
2002-56B2JT1	R165	1	
2002-56B2JT1	R127-128	2	
2002-56B2JT1	R118	1	
2002-56B2JT1	R467	1	
2002-56B3JT1	R414	1	
2002-68B0JT1	R444	1	
2002-68B1JT1	R419-420	2	
2002-68B1JT1	R229	1	
2002-68B1JT1	R215	1	
2002-68B1JT1	R129	1	
2002-68B1JT1	R115	1	
2002-68B1JT1	R501	1	
2002-68B2JT1	R268	1	
2002-68B2JT1	R308-309	2	
2002-82B0JT1	R252	1	
2002-82B0JT1	R465	1	
2002-82B1JT1	R216	1	
2002-82B2JT1	R116	1	
2002-82B2JT1	R515	1	
2003-10B4JT0	R523	1	
2003-10B4JT0	R211	1	
2003-47B4JT0	R111	1	
2003-47B4JT0	R154-155	2	
2012-1001FT1	R402	1	
2012-1001FT1	R254-255	2	
2012-1001FT1	R508-510	3	
2012-1001FT1	R208	1	
2012-1012DT1	R108	1	
2012-1012DT1	R205	1	
2012-1113DT1	R105	1	
2012-1113DT1	R125-126	2	
2012-1210DT1	R225-226	2	
2012-1210DT1	R806	1	
2012-1911FT1	R474	1	
2012-2211FT1	R460	1	
2012-2212FT1	R512-513	2	
2012-3320FT1	R459	1	
2012-3322FT1	R487	1	
2012-3921FT1	R204-2041	2	
2012-4503DT1	R104-1041	2	
2012-4503DT1	R506-507	2	
2012-4531FT1	R235	1	
2012-4700DT1	R232	1	
2012-4700DT1	R135	1	
2012-4700DT1	R132	1	
2012-4700DT1	R486	1	
2012-4750FT1	R303-304	2	
2012-4750FT1	R207-2071	2	
2012-4953DT1	R107-1071	2	
2012-4953DT1	R411-4111	2	
2012-5003DT1	R203-2031	2	
2012-5003DT1	R103-1031	2	
2012-5003DT1	R503	1	
2012-542DDT3	R511	1	
2012-5620FT1	R504-505	2	
2012-5621FT1	R236	1	
2012-562DFT1	R233	1	
2012-562DFT1	R136	1	
2012-562DFT1	R133	1	
2012-562DFT1	R417-418	2	
2012-6810FT1	R239-240	2	
2012-6810FT1	R139-140	2	
2012-6810FT1	R307	1	
2013-4530FT0	R518	2	
2013-4992FT0	R516	2	
2013-4992FT0	R123	1	
2061-10B1F00	R223	1	
2061-10B1F00	RN355	1	
2061-10B3J50	R481	1	
2061-10B6FC0	VR202	1	
2100-101BM02	VR103	1	
2100-101BM02	VR203	1	
2100-101BM02	VR109	1	
2100-101BM08	VR102	1	
2100-101BM08	VR113	1	
2100-102BM12	VR108	1	
2100-102BM12	VR208	1	
2100-102BM12	VR110	1	
2100-102BM12	VR408	1	
2100-102BM12	VR210	1	
2100-102BM12	VR213	1	
2100-102BM12	VR403	1	
2100-103BM01	VR405	1	
2100-103BM07	VR107	1	

Part Number	Location	Q'ty	Comment
2100-221BM00	VR207	1	
2100-221BM00	VR802	1	
2100-221BM00	VR502	1	
2100-222BM00	VR401	1	
2100-222BM00	VR112	1	
2100-222BM00	VR204	1	
2100-223BM00	VR106	1	
2100-223BM00	VR104	1	
2100-223BM00	VR206	1	
2100-223BM00	VR101	1	
2100-223BM00	VR201	1	
2100-223BM00	VR303	1	
2100-471BM01	VR301	1	
2100-471BM01	VR407	1	
2100-474BM00	VR404	1	
2100-474BM00	VR205	1	
2110-102AC00	VR105	1	
2110-102AC00	VR406	1	
2110-103BC04	C240	1	
2204-50103Z0	C232	1	
2204-50103Z0	C224	1	
2204-50103Z0	C219-220	2	
2204-50103Z0	C142-144	3	
2204-50103Z0	C141	1	
2204-50103Z0	C124	1	
2204-50103Z0	C122	1	
2204-50103Z0	C119-120	2	
2204-50103Z0	C509	1	
2204-50103Z0	C447-449	3	
2204-50103Z0	C444-445	2	
2204-50103Z0	C222	1	
2204-50103Z0	C442	1	
2204-50103Z0	C436-437	2	
2204-50103Z0	C432	1	
2204-50103Z0	C242	1	
2204-50103Z0	C429	1	
2204-50103Z0	C402	1	
2204-50103Z0	C319-320	2	
2204-50103Z0	C315-316	2	
2204-50103Z0	C451	1	
2204-50103Z0	C230-231	2	
2204-50104Z0	C208-209	2	
2204-50104Z0	C130-139	10	
2204-50104Z0	C108-109	2	
2204-50104Z0	C330-331	2	
2204-50104Z0	C805	1	
2204-50104Z0	C233-239	7	
2204-50104Z0	C443	1	

Part Number	Location	Q'ty	Comment
2204-50104Z0	C328	1	
2204-50104Z0	C317	1	
2204-50152K0	C407	1	
2204-50471J0	C420	1	
2204-5A102K0	C110	1	
2204-5A102K0	C107	1	
2204-5A102K0	C422	1	
2204-5A102K0	C210	1	
2204-5A102K0	C207	1	
2204-5A102K0	C318	1	
2204-5A102K0	C502-503	2	
2204-5A103Z0	C505	1	
2204-5A103Z0	C504	1	
2204-5A103Z0	BACK	2	
2214-50050D0	C332	1	
2214-50080D0	C326-327	2	
2214-50100J0	C202	1	
2214-50101J0	C13	1	
2214-50101J0	C23	1	
2214-50101J0	C435	1	
2214-50101J0	C102	1	
2214-50101J0	C113	1	
2214-50151J0	C213	1	
2214-50151J0	C455	1	
2214-50151J0	C12	1	
2214-50220J0	C227	1	
2214-50220J0	C127	1	
2214-50220J0	C22	1	
2214-50220J0	C416	1	
2214-50221J0	C204	1	
2214-50221J0	C104	1	
2214-50221J0	C221	1	
2214-50221J0	C121	1	
2214-50221J0	C426-427	2	
2214-50271J0	C203	1	
2214-50271J0	C103	1	
2214-50271J0	C14	1	
2214-50330J0	C243	1	
2214-50330J0	C24	1	
2214-50680J0	C216-217	2	
2214-50820J0	C116-117	2	
2214-50820J0	C214-215	2	
2214-5A050D0	C441	1	
2214-5A050D0	C15	1	
2214-5A050D0	C114-115	2	
2214-5A050D0	C145	1	
2214-5A100J0	C206	1	
2214-5A100J0	C106	1	

Part Number	Location	Q'ty	Comment
2214-5A100J0	C212	1	
2214-5A150J0	C430	1	
2214-5A150J0	C112	1	
2214-5A150J0	C218	1	
2214-5A470J0	C456	1	
2214-5A470J0	C424	1	
2214-5A470J0	C406	1	
2214-5A470J0	C118	1	
2214-5A470J0	C423	1	
2224-1A103J0	C415	1	
2224-1A223J0	C440	1	
2244-25107Z0	C414	1	
2244-25107Z0	C321-322	2	
2244-25107Z0	C431	1	
2244-25476Z0	C425	1	
2244-25476Z0	C635	1	
2244-50106Z0	C507	1	
2244-50106Z0	C501	1	
2244-50106Z0	C453	1	
2244-50106Z0	C452	1	
2244-50106Z0	C450	1	
2244-50106Z0	C446	1	
2244-50106Z0	C438	1	
2244-50106Z0	C433-434	2	
2244-50106Z0	C412	1	
2244-50106Z0	C410	1	
2244-50106Z0	C408	1	
2244-50106Z0	C228	1	
2244-50106Z0	C211	1	
2244-50106Z0	C128	1	
2244-50106Z0	C123	1	
2244-50106Z0	C111	1	
2244-50106Z0	C636	1	
2244-50106Z0	C421	1	
2244-50106Z0	C411	1	
2244-50226Z0	C417	1	
2244C50106Z0	C413	1	
2261-35105M0	C804	1	
2271-1A333F0	C428	1	
2271-50474F0	C506	1	
2271-6A103J0	C201	1	
2271-6A223J0	C101	1	
2271-6A223J0	C205	1	
2291-4A222J0	C105	1	
2291-4A222J0	SG401	1	
22G1-1M00100	SG102	1	
22G1-1M00100	VC204	1	
2311-0600020	VC104	1	
2311-0600020	VC202	1	
2311-1000020	VC201	1	
2311-1000020	VC102	1	
2311-1000020	VC101	1	
2311-1000020	VC203	1	
2311-2000020	VC103	1	
2311-2000020	VC105	1	
2311-2000020	VC205	1	
2311-2000020	VC206	1	
2311-5000020	VC106	1	
2311-5000020	D504	1	
2502-1SS83H0	D408	1	
2502-1SS86H0	D403	1	
2502-1SS86H0	D315-317	3	
2502-N4148H0	D305-313	9	
2502-N4148H0	D210-214	5	
2502-N4148H0	D201-206	6	
2502-N4148H0	D501	1	
2502-N4148H0	D110-114	5	
2502-N4148H0	D318	1	
2502-N4148H0	D406	1	
2502-N4148H0	D107	1	
2502-N4148H0	D404	1	
2502-N4148H0	D409-421	13	
2502-N4148H0	D401-402	2	
2502-N4148H0	D502-503	2	
2502-N4148H0	D505	1	
2502-N4148H0	D101-106	6	
2502-N4148H0	DA15	1	
2502-N4148H0	DA12	1	
2502-N4148H0	D801	1	
2502-N4148H0	DZ401	1	
2503T0320050	DZ201	1	
2503T0320050	DZ101	1	
2503T0320050	DZ402	1	
2503T0550050	R497	1	
2503T0750050	TH201	1	
2505T2251000	TH101-102	2	
2505T2251000	Q501-502	2	
2600-1015GRV	Q412	1	
2600-1015GRV	Q508	1	
2600-1206K-V	Q301-302	2	
2600-1206K-V	Q206-207	2	
2600-1206K-V	Q106-107	2	
2600-1206K-V	Q413	1	
2600-838B-0V	Q401	1	
2600-838B-0V	Q208-213	6	
2600-838B-0V	Q111-112	2	

Part Number	Location	Q'ty	Comment
2600-838B-0V	Q108-109	2	
2600-838B-0V	Q402	1	
2600-838B-0V	Q803	1	
2600-844D-0V	Q438	1	
2600-844D-0V	Q435-437	3	
2600-844D-0V	Q431	1	
2600-844D-0V	Q428	1	
2600-844D-0V	Q424	1	
2600-844D-0V	Q421-422	2	
2600-844D-0V	Q406-409	4	
2600-844D-0V	Q315-316	2	
2600-844D-0V	Q204	1	
2600-844D-0V	Q104	1	
2600-844D-0V	Q430	1	
2600-844D-0V	Q416	1	
2600-844D-0V	Q512	1	
2601-648AC-0	Q509	1	
2601-648AC-0	Q429	1	
2602-1843E-V	Q505-507	3	
2602-1907-0V	Q503-504	2	
2602-1907-0V	Q418	1	
2602-1907-0V	Q414	1	
2602-1907-0V	Q110	1	
2602-1907-0V	Q415	1	
2602-1907-0V	Q404-405	2	
2602-2570A-V	Q801	1	
2602-945Q-0V	Q433	1	
2602-945Q-0V	Q432	1	
2602-945Q-0V	Q427	1	
2602-945Q-0V	Q423	1	
2602-945Q-0V	Q420	1	
2602-945Q-0V	Q205	1	
2602-945Q-0V	Q203	1	
2602-945Q-0V	Q105	1	
2602-945Q-0V	Q103	1	
2602-945Q-0V	Q802	1	
2602-945Q-0V	Q434	1	
2602-945Q-0V	Q419	1	
2602-945Q-0V	Q417	1	
2602-945Q-0V	Q510-511	2	
2603-668AC-0	Q220-224	5	
2615-114ES-V	Q120-124	5	
2615-114ES-V	Q425-426	2	
2661-117BL-V	Q411	1	
2661-117BL-V	Q403	1	
2661-117BL-V	Q202	1	
2661-117BL-V	Q102	1	
2661-117BL-V	Q410	1	

Part Number	Location	Q'ty	Comment
2661-30Y0000	U202	1	
2702-3046-00	U102	1	
2702-3046-00	U201	1	
2702-3140E-0	U101	1	
2702-3140E-0	U405	1	
270314051BCP	U404	1	
270314053BCP	U403	1	
2711-081CP-0	U302	1	
2711-74LS00N	U402	1	
2711-FFFF001	U303	1	
271174LS157N	U301	1	
271174LS74AN	U401	1	
2755-74F00-0	L401-402	2	
2900-10110CA	S406	1	
3202-1110740	S403	1	
3202-1110740	S302	1	
3202-1110740	S201-202	2	
3202-1110740	S101-102	2	
3202-1110740	RL205	1	
3311-1201370	RL105	1	
3311-1201370	RL201-204	4	
3322-1202380	RL101-104	4	
3322-1202380		1	
35OS-03P02E0	JA222	1	
40PC-002SH01	JA181	1	
40PC-005SH01	J403	1	TO J4031 (EXT
40WA-01T1R3B	JA221	1	
40WA-B11BXHA	JA151	1	
40WA-B2BXHA0	J102	1	
40WA-B2BXHA0	JA121	1	
40WA-B3BXHA0	J6091	1	
40WA-B3BXHA0	J301	1	
40WA-B3BXHA0	JA111	1	
40WA-B3BXHA0	JA171	1	
40WA-B5BXHA0	JA141	1	
40WA-B5BXHA0	J6031	1	
40WA-B5BXHA0	J241	1	
40WA-B5BXHA0	JA231	1	
40WA-B5BXHA0	JA161	1	
40WA-B6BXHA0	JA131	1	
40WA-B6BXHA0	12V	2	
40WCJ1010182	GND	1	
40WCJ1010183	J202	1	TO J2021
40WCJ1020192	J404	1	
40WCJ1020193	JC71	1	
40WCJ1025327	J501-502	1	TO J503
40WCJ1030207	JC51	1	P1-5
40WCJ1050054	JC41	1	P1-5

Part Number	Location	Q'ty	Comment
40WCJ1050054	J405	1	+/-12,+5,G,JP
40WCJ1070048	GND	1	TO GND
4214-1112003	JP203-204	2	
4270-06D0000	JP113-201	89	
4270-06D0000	JP101-111	11	
4270-06D0000		1	
4270-06D0000	JP4-61	58	
4270-06D0000		1	
4270-06D0000		2	
62AS-220SP3A		2	
62AS-220SP4A		1	FOR VR406
62AS-220SP9A		2	FOR VR105,VR2
62OS-658SP60	D108	1	
HDS0437HB	D422	1	
HDS0477HB	D215-216	2	
HDS0477HB	D115-117	3	
HDS0477HB		1	
03-PCB ASS'Y	R681	1	
2002-0BB0JT0	R341	1	
2002-10B0JT1	R602	1	
2002-10B0JT1	R362-363	2	
2002-10B0JT1	R336	1	
2002-10B0JT1	R361	1	
2002-10B0JT1	R701	1	
2002-10B0JT1	R604	1	
2002-10B1JT1	R652	1	
2002-10B1JT1	R610-611	2	
2002-10B1JT1	R663	1	
2002-10B1JT1	R642	1	
2002-10B1JT1	R654	1	
2002-10B1JT1	R632	1	
2002-10B2JT1	R702	1	
2002-10B2JT1	R340	1	
2002-10B2JT1	R331	1	
2002-10B2JT1	R320-321	2	
2002-10B2JT1	R643	1	
2002-10B3JT1	R650	1	
2002-10B3JT1	R644	1	
2002-10B4JT1	R670	1	
2002-10B4JT1	R615	1	
2002-15B1JT1	R318	1	
2002-15B3JT1	R605	1	
2002-18B1JT1	R666	1	
2002-18B2JT1	RC40	1	
2002-18B2JT1	R667	1	
2002-18B3JT1	R801	1	
2002-22B0JT1	R323-324	2	
2002-22B0JT1	R802	1	
2002-22B0JT1	R319	1	
2002-22B1JT1	R322	1	
2002-22B1JT1	R664	1	
2002-22B1JT1	R673	1	
2002-22B2JT1	R672	1	
2002-22B3JT1	R660	1	
2002-33B1JT1	R633	1	
2002-33B2JT1	R668	1	
2002-33B2JT1	R330	1	
2002-33B2JT1	R327	1	
2002-33B2JT1	R675	1	
2002-39B0JT1	R671	1	
2002-39B3JT1	R342-343	2	
2002-47B1JT1	R659	1	
2002-47B2JT1	R627	1	
2002-47B2JT1	R669	1	
2002-47B4JT1	R337-339	3	
2002-47BDJT1	R333-335	3	
2002-47BDJT1	R316	1	
2002-56B1JT1	R314	1	
2002-56B1JT1	R703	1	
2002-56B1JT1	R606	1	
2002-56B1JT1	R665	1	
2002-56B2JT1	R620-621	2	
2002-56B2JT1	R618	1	
2002-56B2JT1	R315	1	
2002-62B1JT1	R655-656	2	
2002-68B1JT1	R332	1	
2002-82B0JT1	R636	1	
2003-10B2JT0	R637	1	
2003-10B3JT0	R645	1	
2003-15B5JT0	R651	1	
2003-15B5JT0	R624-625	2	
2003-22B5JT0	R612	1	
2003-22BDJT0	R641	1	
2003-33B2JT0	R653	1	
2003-33B2JT0	R628	1	
2003-47B1JT0	R638	1	
2003-47B3JT0	R661-662	2	
2003-47B3JT0	R657-658	2	
2003-47B3JT0	R613	1	
2004-10B1JH2	R603	1	
2004-10B1JH2	R623	1	
2004-10B1JH2	R609	1	
2004-10BDJH2	R634	1	
2004-10BDJH2	R328-329	2	
2004-47B3JH2	R325-326	2	
2005-33B3JH2	R600-601	2	

Part Number	Location	Q'ty	Comment
2005-39B2JH3	R614	1	
2005-47B0JH2	R626	1	
2012-1003FT1	R608	1	
2012-1012DT1	R631	1	
2012-1212FT1	R622	1	
2012-1212FT1	R619	1	
2012-1212FT1	R616	1	
2012-3921FT1	R313	1	
2012-4750FT1	R310	1	
2012-4750FT1	R630	1	
2012-8251FT1	R617	1	
2012-9091FT1	R311-312	2	
2012-909DFT1	R705	1	
2013-2001FH2	R6071	1	
2013-6042FT0	R607	1	
2013-6042FT0	R704	1	
2013-8661FH2	R648-649	2	
2043-10B6JH2	R639-640	2	
2043-10B6JH2	R647	1	
204F-1005F00	R646	1	
204G-6804F00	VR601	1	
2100-102BM12	VR603	1	
2100-103BM01	VR604	1	
2100-104BM00	VR701	1	
2100-104BM00	VR602	1	
2100-225BM00	VR302	1	
2100-471BM01	C618	1	
2201-3K472Z1	C619	1	
2201-6K102Z0	C621-625	5	
2201-6K102Z0	C638	1	
2204-50103Z0	C631	1	
2204-50103Z0	C628	1	
2204-50103Z0	C703	1	
2204-50104Z0	C310	1	
2204-50104Z0	C640	1	
2204-50104Z0	C612	1	
2204-50472K0	C705	1	
2204-5A102K0	C633	1	
2204-5A103Z0	C627	1	
2204-5A103Z0	C620	1	
2204-5A103Z0	C637	1	
2211-3K220J7	C706	1	
2214-50101J0	C304-305	2	
2214-50101J0	C33-34	2	
2214-50220J0	C630	1	
2214-50221J0	C301	1	
2214-5A050D0	C303	1	
2214-5A150J0	C302	1	
2214-5A150J0	C306-307	2	
2214-5A50CC0	C613	1	
2224-1A223J0	C609-610	2	
2224-1A223J0	C608	1	
2241-35108Z0	C607	1	
2241-35228Z0	C604	1	
2241-3B475Z0	C603	1	
2241-3B476Z0	C632	1	
2244-1B106Z0	C701	1	
2244-25476Z0	C606	1	
2244-25476Z0	C605	1	
2244-2A105Z0	C314	1	
2244-2A105Z0	C639	1	
2244-2A105Z0	C629	1	
2244-50106Z0	C626	1	
2244-50106Z0	C323-324	2	
2244-50106Z0	C614	1	
2254-50226Z0	C611	1	
2261-35105M0	C702	1	
2271-1A103F0	C312	1	
2271-2B223J0	C308-309	2	
2271-2B473J0	C313	1	
2271-6A223J0	C311	1	
2271-6A223J0	C641-642	2	
2291-2X222M1	SG601	1	
22G1-1M00100	SG701	1	
22G1-1M00100	VC301	1	
2311-5000020	D614	1	
2501-RC200T0	D615-616	2	
2502-1SS83H0	D609-613	5	
2502-1SS83H0	D617-620	4	
2502-N4148H0	DC8-9	2	
2502-N4148H0	D605-606	2	
2502-N4148H0	D601-603	3	
2502-N4148H0	D301-304	4	
2502-N4148H0	DZ604-605	2	
2503T0210050	DZ301-302	2	
2503T0210050	DZ610	1	
2503T0550050	DZ613	1	
2503T0550051	DZ603	1	
2503T0550051	DZ601-602	2	
2503T1300050	DZ606-609	4	
2503T3500050	BD601-602	2	
2504-2W06M00	ZNR601	1	
2506-2211700	Q306-307	2	
2600-1206K-V	Q312	1	
2600-1360O-0	Q309	1	
2600-1360O-0	Q612	1	

Part Number	Location	Q'ty	Comment
2600-844D-0V	QC13	1	
2600-844D-0V	Q603	1	
2601-834Y-00	Q601	1	
2601-861C-00	Q614-615	2	
2602-1846R-0	Q610-611	2	
2602-1907-0V	Q308	1	
2602-1907-0V	Q303-305	3	
2602-1907-0V	Q606-609	4	
2602-2371K-0	Q313-314	2	
2602-2570A-V	Q310-311	2	
2602-3423O-0	Q605	1	
2603-880Y-00	Q604	1	
2603-880Y-00	Q602	1	
2603-880Y-00	Q613	1	
2661-117BL-V	U602	1	
2708-4558C-0	U601	1	
2711-072CP-0	U603	1	
2711-081CP-0	U701	1	
2711-555P-00	L601	1	
2900-10110CA	L301-302	2	
2900-14C350Q	L602-603	2	
2900150110DA	T601	1	
3080-OS0010D	DS601-602	2	
3153-0062000	S601	1	
3202-1120010		1	
35OS-03P03G0	F602	1	
37FT-1124311	F602	1	
37H4-5200010	JC21	1	
40WA-01T1R3B	JC3	1	
40WA-01T1R3B	J611	1	
40WA-B2BXHA0	J608	1	
40WA-B2BXHA0	J605	1	
40WA-B2BXHA0	J602	1	
40WA-B2BXHA0	J3011	1	
40WA-B3BXHA0	J601	1	
40WA-B9BXHA0	J6101	1	
40WA-S12BXHA	GND	1	CASE TO P/S G
40WCJ0018427	1A	1	TO 1B (+5V)
40WCJ1010182	S601	1	(L) TO SELECTOR
40WCJ1010227		1	N TO NATURE
40WCJ1010228	120V	1	
40WCJ1010245	J607	1	TO J6071
40WCJ1030201	J302-303	1	TO J304
40WCJ1030202	J609	1	TO 02PCB-J609
40WCJ1030219	J604	1	TO J6041
40WCJ1030220	J603	1	TO 02PCB-J603
40WCJ1050053	J606	1	

Part Number	Location	Q'ty	Comment
40WCJ1090015	L	1	L TO LIFE
40WCJ3010002	1C	1	TO 1D(LIVE)
4214-1112003		1	
4270-06D0000		1	
4270-06D0000		2	Q309-310,311-
5208-AP00000		1	
5209-AW00030		5	
57IL-21G0040	Q601-604	4	
57IL-21W0010	Q605	1	
57IL-21W0070		1	
57RB-20B0020		1	
62OS-658SP1A		1	
62OS-658SP5B		1	
04-PCB ASS'Y	R678-680	3	
2002-0BB0JT1	RA17	1	
2002-10B0JT1	RA22	1	
2002-10B0JT1	RA55	1	
2002-10B1JT1	RA11	1	
2002-10B2JT1	R676	1	
2002-10B2JT1	RA18-21	4	
2002-10B2JT1	RA13-16	4	
2002-10B2JT1	RA4-9	6	
2002-10B3JT1	R409	1	
2002-10B3JT1	RA23	1	
2002-10B3JT1	R446	1	
2002-10B3JT1	RC39	1	
2002-18B2JT1	R677	1	
2002-47B1JT1	R410	1	
2002-47B3JT1	R674	1	
2002-56B1JT1	R429	1	
2002-82B2JT1	R1-3	3	
2061-10B3J50	RC35-36	2	
2061-10B3J50	VR608	1	
2100-202BM03	VRC4	1	
2110-103BC25	VR607	1	
2110-103BC30	VR409	1	
2110-103BC30	VR211	1	
2110-103BC30	VR111	1	
2110-103BC30	VR605	1	
2110-103BC30	VR501	1	
2110-103BC31	VRC3	1	
2110-103BC31	VR402	1	
2110-104BC09	VR606	1	
2110-204BC05	C418	1	
2204-50102K0	C406	1	
2204-50104Z0	CA1-2	2	
2204-50104Z0	C419	1	
2204-50104Z0	C405	1	

Part Number	Location	Q'ty	Comment
2214-5A470J0	C404	1	
2224-1A223J0	C634	1	
2224-50223J0	C403	1	
2244-50106Z0	DA1-10	10	
2502-N4148H0	D405	1	
2502-N4148H0	DZ403	1	JA17 PIN1(-) PIN
2503T0320050	QA3-4	2	
2602-945Q-0V	QA1-2	2	
2615-114ES-V	UA1	1	
2743-16V8A0I	UA2	1	
2743-16V8A0J	DS603	1	
3111-05D0190	DS401	1	
3111-05D0190	DS604-606	3	
3160-1400080	SC2	1	
3200-1410320	SA2-3	2	
3200-1410320	SA4	1	
3200-1510330	S501	1	
3202-1121270	S303	1	
3202-1121270	S408	1	
3202-1121270	S204	1	
3202-1121270	S404	1	
3202-3421340	SC1	1	
3202-3421390	S401-402	2	
3204-0420280	S301	1	
3204-0420280		1	
35OS-03P04G0	UA1-2	2	
3612-20D000N		1	CRT
3613-14D003N	J6041	1	
40WA-B2BXHA0	J6071	1	
40WA-B3BXHA0	J503	1	
40WA-B3BXHA0	J304	1	
40WA-B3BXHA0	J6061	1	
40WA-B9BXHA0	JC2	1	BACK
40WCJ1010164	J4031	1	BACK TO J403
40WCJ1010165	J612	1	BACK TO CAL
40WCJ1010165	J6021	1	
40WCJ1020208	JA15	1	
40WCJ1020209	JC1	1	TO 06PCB-JC11
40WCJ1030216	JA12	1	
40WCJ1030218	JA18	1	
40WCJ1030219	JA11	1	
40WCJ1030221	JA17	1	TO JA171
40WCJ1050051	JA24	1	TO JA241
40WCJ1050052	JA14	1	
40WCJ1050053	JA23	1	TO JA231
40WCJ1055335	JA16	1	TO JA161
40WCJ1060126	JA13	1	

Part Number	Location	Q'ty	Comment
40WCJ1060128	JC6	1	TO 06PCB-JC61
40WCJ1080043	JA22	1	TO 02PCB-JA22
40WCJ1110007	J610-6102	1	BACK TO J6101
40WCJ1120016	JA20	1	BACK
4231-1015000	JA19	1	BACK
4231-1015000	JA21	1	BACK
4231-1015000	JP24	1	
4270-06D0000	JP74-75	2	
4270-06D0000	JP42-44	3	
4270-06D0000	JP71-72	2	
4270-06D0000	JP69	1	
4270-06D0000	JP30-40	11	
4270-06D0000	JP63-67	5	
4270-06D0000	JP54-61	8	
4270-06D0000	JP25-28	4	
4270-06D0000	JP70	1	
4270-06D0000		1	
4270-06D0000	GOS622G	3	
4270-06D0000	JP62	1	
4270-06D0000	JP29	1	
4270-06D0000	JP52	1	
4270-06D0000	JP53	1	
4270-06D0000	JP51	1	
4270-06D0000	JP45	1	
4270-06D0000	JP41	1	
4270-06D0000	JP68	1	
4270-06D0000	JP46-50	5	
4270-06D0000	JP73	1	
4270-06D0000	JP1-23	23	
4270-06D0000	RA12	1	
4270-06D0000		1	
62OS-658HP80	DS603	1	
63EF-ZF10090	DS401	1	
63EF-ZF10090		1	
06-PCB ASS'Y	RC2	1	
2002-10B2JT1	RC21	1	
2002-10B2JT1	RC17	1	
2002-10B2JT1	RC10	1	
2002-10B2JT1	RC29	1	
2002-10B3JT1	RC27	1	
2002-10B3JT1	RC33	1	
2002-10B3JT1	RC22	1	
2002-10B3JT1	RC31	1	
2002-10B3JT1	RC6	1	
2002-10B3JT1	RC15	1	
2002-12B2JT1	RC5	1	
2002-15B2JT1	RC4	1	
2002-18B3JT1	RC12	1	

Part Number	Location	Q'ty	Comment
2002-18B3JT1	RC14	1	
2002-22B1JT1	RC7	1	
2002-27B2JT1	RC28	1	
2002-33B2JT1	RC34	1	
2002-33B2JT1	RC32	1	
2002-33B2JT1	RC30	1	
2002-33B2JT1	RC13	1	
2002-39B2JT1	RC3	1	
2002-39B2JT1	RC11	1	
2002-47B0JT1	RC1	1	
2002-47B1JT1	RC20	1	
2002-47B3JT1	RC18-19	2	
2002-56B2JT1	RC26	1	
2012-1911FT1	RC16	1	
2012-2211FT1	RC24	1	
2012-2212FT1	RC23	1	
2012-3322FT1	RC25	1	
2061-10B6FC0	VRC1	1	
2100-102BM02	VRC3	1	
2100-221BM00	VRC2	1	
2100-222BM00	CC2	1	
2204-50103Z0	CC6-9	4	
2204-50104Z0	CC3-4	2	
2204-50104Z0	CC1	1	
2204-50501K0	CC5	1	
2214-5A470J0	CC10	1	
2244-50105Z0	DC1	1	
2502-1SS86H0	DC2-7	6	
2502-N4148H0	QC21	1	
2600-844D-0V	QC19	1	
2600-844D-0V	QC17	1	
2600-844D-0V	QC15	1	
2600-844D-0V	QC12	1	
2600-844D-0V	QC10	1	
2600-844D-0V	QC1-7	7	
2600-844D-0V	QC9	1	
2602-1843E-V	QC22	1	
2602-945Q-0V	QC20	1	
2602-945Q-0V	QC18	1	
2602-945Q-0V	QC16	1	
2602-945Q-0V	QC14	1	
2602-945Q-0V	QC11	1	
2602-945Q-0V	QC8	1	
2661-117BL-V	UC5	1	
270314051BCP	UC1	1	
2711-081CP-0	UC2	1	
2711-74LS00N	UC3	1	
2711-FFFF001	UC4	1	

Part Number	Location	Q'ty	Comment
2743-16V8A0K		1	
35OS-03P06C0	UC4	1	FOR UC4
3612-20D000N	JA223	1	BACK TO JA222
40PC-002PH02	JA182	1	BACK TO JA181
40PC-005PH01	JC31	1	
40WA-01T1R3B	JC7	1	
40WA-B2BXHA0	JC11	1	
40WA-B3BXHA0	JA183	1	
40WA-B3BXHA0	JC61	1	
40WA-B8BXHA0	JC4-5	2	
40WA-S5BXHA0			