

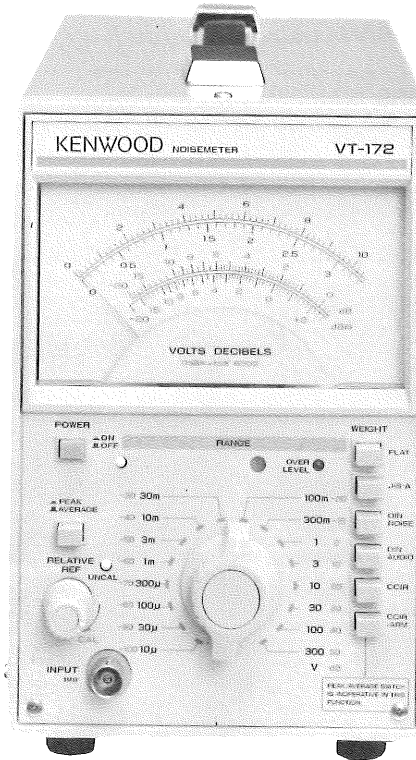
KENWOOD

NOISEMETER

VT-172

SERVICE MANUAL

KENWOOD CORPORATION



WARNING

The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do so.

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SPECIFICATIONS

[Voltmeter Section]

Voltage ranges: 10 μ V-300 V
(10 μ V/30 μ V/100 μ V/300 μ V/
1 mV/3 mV/10 mV/30 mV/
100 mV/300 mV/1 V/3 V/10 V/
30 V/100 V/300 V) fullscale

dB: -120 to +50 dB (0 dB = 1 V)
dBm: -120 to +52 dBm
(0 dBm = 1 mW/600 Ω)

Display accuracy: With average detection in FLAT mode:
10 μ V and 30 μ V ranges: within $\pm 5\%$ of fullscale
100 μ V-300 V ranges: within $\pm 3\%$ of fullscale
With quasi-peak detection and DIN NOISE, DIN AUDIO or CCIR weighting filter:
10 μ V range: within $\pm 7\%$ of fullscale
30 μ V-300 V ranges: within $\pm 5\%$ of fullscale

Frequency response: With average detection and RMS display
10 μ V range: 20 Hz-10 kHz $\pm 5\%$
10 Hz-30 kHz $\pm 10\%$
30 μ V-300 μ V ranges:
20 Hz-20 kHz $\pm 5\%$
10 Hz-100 kHz $\pm 10\%$
1 mV-300 V ranges:
20 Hz-100 kHz $\pm 3\%$
15 Hz-300 kHz $\pm 5\%$
10 Hz-500 kHz $\pm 10\%$
With quasi-peak detection and RMS display
10 μ V range: 30 Hz-15 kHz $\pm 5\%$
20 Hz-20 kHz $\pm 10\%$
10 Hz-30 kHz $\pm 20\%$
30 μ V-300 V ranges:
30 Hz-20 kHz $\pm 5\%$
20 Hz-50 kHz $\pm 10\%$
10 Hz-100 kHz $\pm 20\%$

Input impedance: 1 M Ω $\pm 5\%$
Parallel capacitance: 50 pF or less

Overload voltage level: 10 μ V-300 μ V ranges:
AC 10 Vrms, DC 500 V
1 mV-300 mV ranges:
AC 80 Vrms
500 V (DC+AC peak)
1 V-300 V ranges:
500 V (DC+AC peak)

Relative reference adjustment:
0 to approx. -12dB

Over level: Lights up or flickers when a signal of more than +15 dB for maximum value is applied.
This indicates that there is a possibility of erroneous indication due to over input when a level weighting filter is used.

Residual noise: Average detection:
10 μ V range input shorted, Input equality value
Below 1.5 μ Vrms (1.0 μ Vrms TYP.)
30 μ V range, input shorted, Input equality value
Below 5 μ Vrms (3.0 μ Vrms TYP.)
Peak detection:
10 μ V range input shorted, Input equality value
Below 2.0 μ Vrms (1.0 μ Vrms TYP.)
30 μ V range input shorted, Input equality value
Below 5 μ Vrms (3.0 μ Vrms TYP.)

Stability: Within $\pm 0.5\%$ of fullscale for $\pm 10\%$ line voltage fluctuation.

[Amplifier Section]

AC AMPLIFIER:
Gain: Approx. 100 dB
Output voltage: 1 Vrms $\pm 10\%$
Output resistance: 600 Ω $\pm 10\%$
Distortion: Below 1% of fullscale at 1 kHz
This distortion is determined by the S/N for the ranges 10 μ V-300 μ V

S/N: With respect to fullscale:
1 mV-300 V ranges:
40 dB minimum
300 μ V range: 30 dB minimum
100 μ V range: 25 dB minimum
30 μ V range: 20 dB minimum
10 μ V range: 16.5 dB minimum

Frequency response: 1 mV-300 V ranges:
10 Hz-500 kHz within ± 3 dB
30 μ V-300 μ V ranges:
10 Hz-150 kHz within ± 3 dB
10 μ V range:
10 Hz-30 kHz within ± 3 dB

SPECIFICATIONS

DC OUTPUT AMPLIFIER:

Output voltage: $1\text{ V} \pm 10\%$ for fullscale
Output resistance: $600\ \Omega \pm 10\%$
Frequency response: Approx. the same as the meter indication.

[Environment]

Coefficient: $0.08\% / ^\circ\text{C}$ or less
(at 1 mV range or more)
Operating temperature and humidity for within specification: 15 to 35°C , 80% RH maximum.
Full operating range: 0 to 50°C , 80% RH maximum.

[Power Supply Section]

Supply voltage: $100/117/220/240\text{ VAC} \pm 10\%$
(Max. 250 VAC) 50/60 Hz
Power consumption: Approx. 15 W

[Dimensions]

Width 128 mm
Height 190 (214) mm
Depth 285 (315) mm
() dimensions include protrusions from the basic case.

[Weight]

4.6 kg

[Accessories]

Power cord..... 1
Input cable (CA-41)..... 1
Instruction manual..... 1

SAFETY

SAFETY

Before connecting the instrument to a power source, carefully read the following information, then verify that the proper power cord is used and the proper line fuse is installed for power source. The specified voltage is shown at the fuse holder of the AC inlet. If the power cord is not applied for specified voltage, there is always a certain amount of danger from electric shock.

Line voltage

This instrument operates using ac-power input voltages that 100/120/220/240 V at frequencies from 50 Hz to 60 Hz.

Power cord

The ground wire of the 3-wire ac power plug places the chassis and housing of the oscilloscope at earth ground. Do not attempt to defeat the ground wire connection or float the oscilloscope; to do so may pose a great safety hazard. The appropriate power cord is supplied by an option that is specified when the instrument is ordered.

The optional power cords are shown as follows in Fig. 1.

Line fuse

The fuse holder is located on the rear panel and contains the line fuse. Verify that the proper fuse is installed by replacing the line fuse.

Voltage conversion

This oscilloscope may be operated from either a 100 V to 240 V, 50/60 Hz power source. Use the following procedure to change from 100 to 240 volt operation or vice versa.

1. Remove the fuse holder.
2. Replace fuse F 1 with a fuse of appropriate value, 0.5 amp for 100 VAC to 117 VAC operation, 0.3 amp for 220 VAC to 240 VAC operation.
3. Reinsert it for appropriate voltage range.
4. When performing the reinsertion of fuse holder for the voltage conversion, the appropriate power cord should be used. (See Fig. 1.)





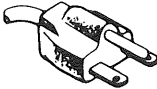
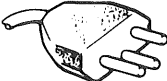
Plug configuration	Power cord and plug type	Factory installed instrument fuse	Line cord plug fuse	Parts No. for power cord set
	North American 120 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.5 A, 250 V Fast blow 6 × 30 mm	None	Cord: E30-1820-05
	Universal Europe 220 volt/50 Hz Rated 16 amp	North Europe 315 mA, 250 V Slow blow 5 × 20 mm	None	Cord: E30-1819-05
		Other Europe 0.3 A, 250 V Fast blow 6 × 30 mm		
	U.K. 240 volt/50 Hz Rated 13 amp	0.3 A, 250 V Fast blow 6 × 30 mm	0.8 A Type C	—
	Australian 240 volt/50 Hz Rated 10 amp	0.3 A, 250 V Fast blow 6 × 30 mm	None	Cord: E30-1821-05
	North American 240 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.3 A, 250 V Fast blow 6 × 30 mm	None	—
	Switzerland 240 volt/50 Hz Rated 10 amp	0.3 A, 250 V Fast blow 6 × 30 mm	None	—

Fig. 1 Power Input Voltage Configuration

CIRCUIT DESCRIPTION

First-Stage Attenuator

It is the attenuator based on the resistance-dividing method, and its two-staged attenuation volume — one is 0 dB (the range between 10 μ V and 300 mV), and the other is -60 dB — is converted by a relay.

Impedance Conversion Circuit

It is the circuit to convert the signals from the first-stage attenuator into a fully low impedance in order to send it to the second-stage attenuator (1 mV-300 V).

Second-Stage Attenuator

It is the attenuator based on the resistance-dividing method. Conversion is made in two ways; One is by relay for two stages (0 dB and -30 dB), the other is by the CMOS analog switch for four stages (0 dB, -10 dB, -20 dB and -30 dB). It outputs the signals of 1 mVrms when the meter is on the full scale.

Pre-Amplifier And Filter Circuit

When the range is between 10 μ V and 300 μ V, input is amplified by +40 dB by the front-end amplifier in order to pass the input through a filter circuit. In addition, the power source of the front-end amplifier contains a ripple filter (Q9.10).

Main Amplifier

It is the broad-ranged as well as non-inversion amplifier based on the variant input. Its gain is +32 dB.

Filter And Filter Conversion Circuit

It is comprised of each filter of FLAT, DIN NOISE, DIN, AUDIO, CCIR and CCIR/ARM and their conversion circuit.

Over-Level Circuit

It is the circuit that tells the over-input situation by lighting up a red LED. It conducts full-wave rectification of signals and detects a peak value in order to conduct a level detection.

Impedance Conversion Circuit

It is the circuit to convert signals from the filter circuit into a fully low impedance.

Average Value Detection Circuit

It is the circuit that makes the signals detect average value and indicate root-mean-square value.

Sub-Peak Value Detection Circuit

It is the circuit to make signals indicate sub-peak level detection and root-mean-square value under the DIN and CCIR standard.

AC Output Amplifier Circuit

It amplifies the signal on the side of an impedance conversion circuit in order to output about 1 Vrms when a meter is on the full scale.

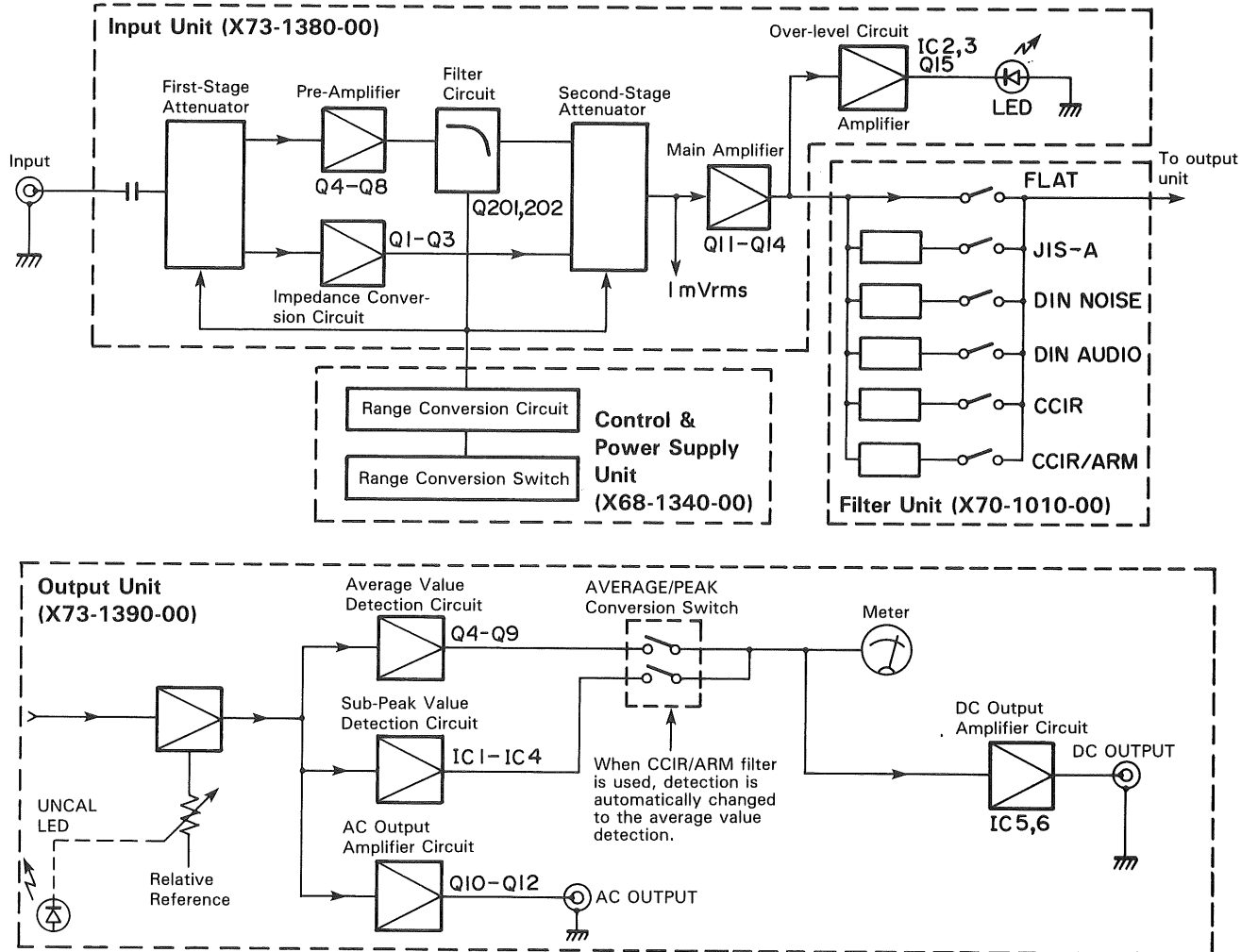
DC Output Amplifier Circuit

It is the instrumentation amplifier to amplify the voltage between the terminals of the meter in order to output about 1 V when the meter is on the full scale.

Switching-Over Of Range

This unit controls logically the conversion of range. The relay and FET switch of the input unit (X73-1380-00) are activated for transistor drive at Q1 to 7 and Q201,202. Q10 is the conversion transistor for a remote-control switch and panel (rotary switch).

BLOCK DIAGRAM



ADJUSTMENT

To obtain the best performance, periodically calibrate the unit. Sometimes, only one mode need be calibrated, while at other times, all modes should be calibrated. When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.

The following calibration required an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer. For optimum adjustment, turn the power on and warm up the scope sufficiently (more than 30 minutes) before starting.

Before calibrating the unit, check the power supply voltage.

TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustment.

Test Equipment	Model	Maker
Digital Multimeter	DL-712	KENWOOD
Frequency Counter	FC-756	KENWOOD
Oscilloscope	CS-6010	KENWOOD
Calibrator	5100B	FLUKE
CR Oscillator	AG-203	KENWOOD
Attenuator	RA-920	KENWOOD
Q-Meter	4343B	YHP
Distortion Meter	885	Shibasoku
Watt-meter	DPB-1W	YEW
Insulation Meter	SM-5	TOA
50 Ω Termination	TA-57	KENWOOD

PREPARATION FOR ADJUSTMENT

Control Settings

The control settings listed below must be used for each adjustment procedure.

Exceptions to these settings will be noted as they occur. After completing an adjustment, return the controls to the following settings.

NAME OF KNOBS	POSITION
POWER	ON
AVERAGE/PEAK	AVERAGE (■)
RELATIVE REF	CAL
WEIGHT	FLAT

ADJUSTMENT

Item	Adjustment VR (TC)	P.C.B.	Procedure																															
Meter: 0	—	—	When power is turned off, make adjustment to set the indicating pointer of the meter at mechanical 0. Make adjustment with a minus screwdriver from the front side of the meter.																															
Offset	VR3 VR10	X73-1390-00	1. At PEAK () When input is short-circuited, make adjustment to set the voltage of TP9 at 0 V by VR3. 2. At AVERAGE () When input is short-circuited, make adjustment to set the voltage of DC OUT at 0 V by VR10.																															
Full Scale	VR2	X73-1390-00	Adjust the Full Scale in each range to be set as follows:																															
	VR2 VR201 VR4 VR1 TC1	X73-1380-00																																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Range</th> <th style="text-align: center;">Input Voltage</th> <th style="text-align: center;">Input Frequency</th> <th style="text-align: center;">Adjustment VR (TC)</th> <th style="text-align: center;">P.C.B.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1 mV</td> <td style="text-align: center;">1 mVrms</td> <td style="text-align: center;">1 kHz</td> <td style="text-align: center;">VR2</td> <td style="text-align: center;">X73-1390-00</td> </tr> <tr> <td style="text-align: center;">100 μV</td> <td style="text-align: center;">10 μVrms</td> <td style="text-align: center;">1 kHz</td> <td style="text-align: center;">VR2</td> <td rowspan="5" style="text-align: center;">X73-1380-00</td> </tr> <tr> <td style="text-align: center;">10 μV</td> <td style="text-align: center;">10 μVrms</td> <td style="text-align: center;">1 kHz</td> <td style="text-align: center;">VR201</td> </tr> <tr> <td style="text-align: center;">100 mV</td> <td style="text-align: center;">100 mVrms</td> <td style="text-align: center;">1 kHz</td> <td style="text-align: center;">VR4</td> </tr> <tr> <td style="text-align: center;">1 V</td> <td style="text-align: center;">1 Vrms</td> <td style="text-align: center;">1 kHz</td> <td style="text-align: center;">VR1</td> </tr> <tr> <td style="text-align: center;">1 V</td> <td style="text-align: center;">1 Vrms</td> <td style="text-align: center;">100 kHz</td> <td style="text-align: center;">TC1</td> </tr> </tbody> </table>				Range	Input Voltage	Input Frequency	Adjustment VR (TC)	P.C.B.	1 mV	1 mVrms	1 kHz	VR2	X73-1390-00	100 μ V	10 μ Vrms	1 kHz	VR2	X73-1380-00	10 μ V	10 μ Vrms	1 kHz	VR201	100 mV	100 mVrms	1 kHz	VR4	1 V	1 Vrms	1 kHz	VR1	1 V	1 Vrms	100 kHz	TC1
Range	Input Voltage	Input Frequency	Adjustment VR (TC)	P.C.B.																														
1 mV	1 mVrms	1 kHz	VR2	X73-1390-00																														
100 μ V	10 μ Vrms	1 kHz	VR2	X73-1380-00																														
10 μ V	10 μ Vrms	1 kHz	VR201																															
100 mV	100 mVrms	1 kHz	VR4																															
1 V	1 Vrms	1 kHz	VR1																															
1 V	1 Vrms	100 kHz	TC1																															
Over Level	VR6	X73-1380-00	Set the range at 300 mV, and add 1 kHz to input in order to decrease the deflection by - 5 dB. Adjust the VR6 to light up the Over-level LED when the range is set at 30 mV by keeping the output of oscillator unchanged.																															
WEIGHT	VR1 VR2 VR3 VR4 VR5	X70-1010-00	In accordance with the following chart, adjust the deflection to be at specified deflection when a specified input is added at each WEIGHT. <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: center;">WEIGHT</th> <th style="text-align: center;">Range</th> <th style="text-align: center;">Input frequency</th> <th style="text-align: center;">Deflection</th> <th style="text-align: center;">Adjustment VR</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">JIS-A</td> <td style="text-align: center;">100 mV</td> <td style="text-align: center;">1 kHz</td> <td style="text-align: center;">0 dB</td> <td style="text-align: center;">VR1</td> </tr> <tr> <td style="text-align: center;">DIN NOISE</td> <td style="text-align: center;">100 mV</td> <td style="text-align: center;">1 kHz</td> <td style="text-align: center;">0 dB</td> <td style="text-align: center;">VR2</td> </tr> <tr> <td style="text-align: center;">DIN AUDIO</td> <td style="text-align: center;">100 mV</td> <td style="text-align: center;">1 kHz</td> <td style="text-align: center;">0 dB</td> <td style="text-align: center;">VR3</td> </tr> <tr> <td style="text-align: center;">CCIR</td> <td style="text-align: center;">1 V</td> <td style="text-align: center;">6.3 kHz</td> <td style="text-align: center;">- 7.8 dB</td> <td style="text-align: center;">VR4</td> </tr> <tr> <td style="text-align: center;">CCIR/ARM</td> <td style="text-align: center;">300 mV</td> <td style="text-align: center;">6.3 kHz</td> <td style="text-align: center;">- 3.4 dB</td> <td style="text-align: center;">VR5</td> </tr> </tbody> </table>	WEIGHT	Range	Input frequency	Deflection	Adjustment VR	JIS-A	100 mV	1 kHz	0 dB	VR1	DIN NOISE	100 mV	1 kHz	0 dB	VR2	DIN AUDIO	100 mV	1 kHz	0 dB	VR3	CCIR	1 V	6.3 kHz	- 7.8 dB	VR4	CCIR/ARM	300 mV	6.3 kHz	- 3.4 dB	VR5	
WEIGHT	Range	Input frequency	Deflection	Adjustment VR																														
JIS-A	100 mV	1 kHz	0 dB	VR1																														
DIN NOISE	100 mV	1 kHz	0 dB	VR2																														
DIN AUDIO	100 mV	1 kHz	0 dB	VR3																														
CCIR	1 V	6.3 kHz	- 7.8 dB	VR4																														
CCIR/ARM	300 mV	6.3 kHz	- 3.4 dB	VR5																														

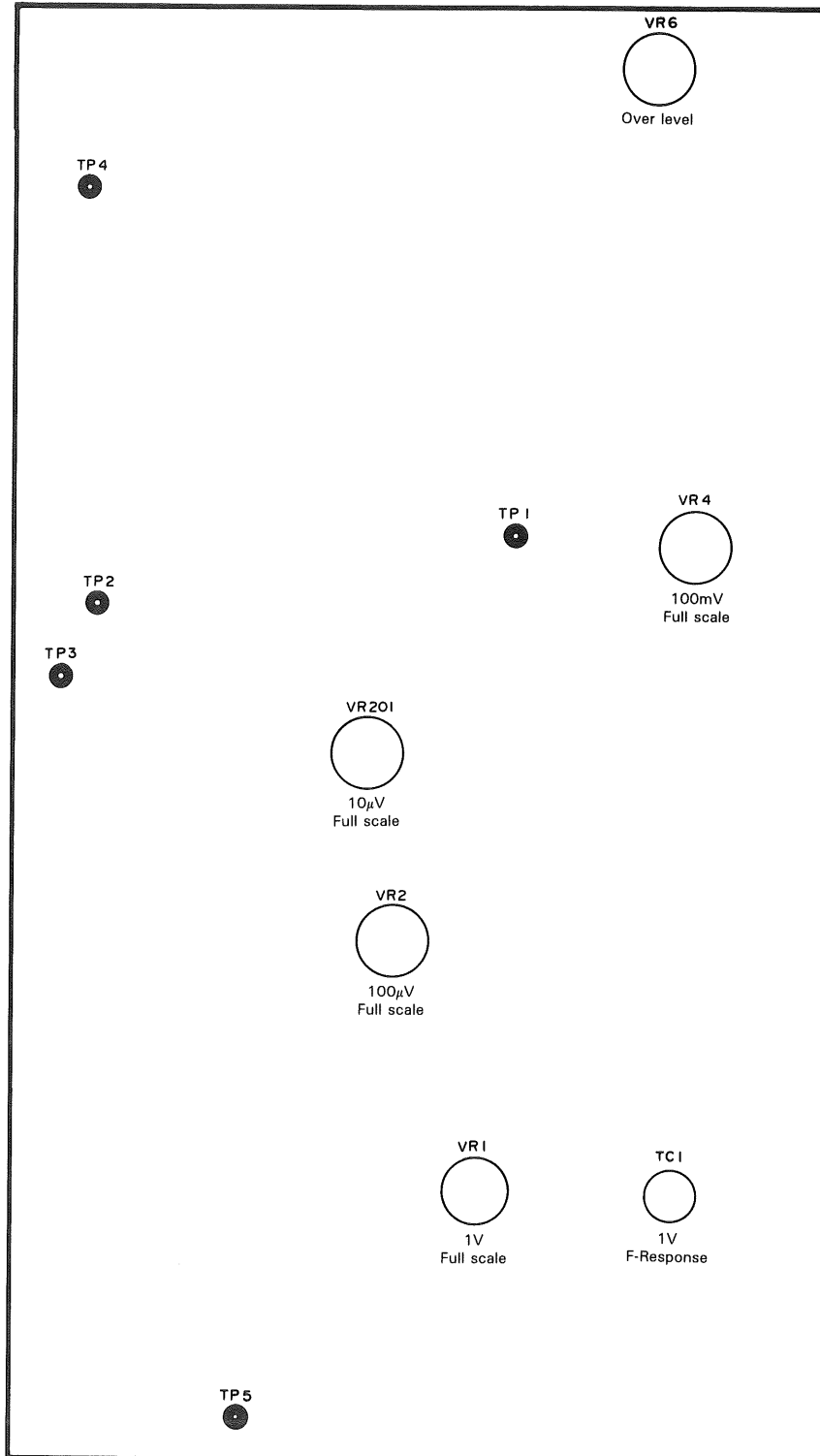
ADJUSTMENT

Item	Adjustment VR (TC)	P.C.B.	Procedure												
Dynamic Characteristic	VR4 VR5 VR6 VR7	X73-1390-00	<p>Make an adjustment when power is off and the connector P309 is being removed.</p> <ol style="list-style-type: none"> 1. Make an adjustment by VR4 in order to set the resistance between TP6 and TP8 at 27 Ω. 2. Make an adjustment by VR5 in order to set the resistance between TP5 and TP7 at 27 Ω. 3. Make an adjustment by VR6 in order to set the resistance between TR4 and TP8 at 18 kΩ. <p>Then, meke an adjustment in order to deflect the meter in full scale when power is off and connector P309 is installed at the time when a specified input is added.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tbody> <tr> <td style="text-align: center;">Range</td> <td style="text-align: center;">100 mV</td> </tr> <tr> <td style="text-align: center;">WEIGHT</td> <td style="text-align: center;">DIN NOISE</td> </tr> <tr> <td style="text-align: center;">AVERAGE/PEAK</td> <td style="text-align: center;">PEAK ()</td> </tr> <tr> <td style="text-align: center;">Input Voltage</td> <td style="text-align: center;">100 mVrms</td> </tr> <tr> <td style="text-align: center;">Input Frequency</td> <td style="text-align: center;">1 kHz</td> </tr> <tr> <td style="text-align: center;">Adjustment VR</td> <td style="text-align: center;">VR7</td> </tr> </tbody> </table>	Range	100 mV	WEIGHT	DIN NOISE	AVERAGE/PEAK	PEAK ()	Input Voltage	100 mVrms	Input Frequency	1 kHz	Adjustment VR	VR7
Range	100 mV														
WEIGHT	DIN NOISE														
AVERAGE/PEAK	PEAK ()														
Input Voltage	100 mVrms														
Input Frequency	1 kHz														
Adjustment VR	VR7														
AC OUT	VR8	X73-1390-00	When the range is set at 100 mV and FLAT, and 100 mVrms at 1 kHz is added, adjust VR8 in order to allow an output of AC OUT to be at 1 Vrms.												
DC OUT	VR9	X73-1390-00	After the AC OUT is adjusted, adjust the VR9 in order to allow an output of DC OUT to be at 1 V.												

ADJUSTMENT

INPUT UNIT (X73-1380-00)

Pattern side view

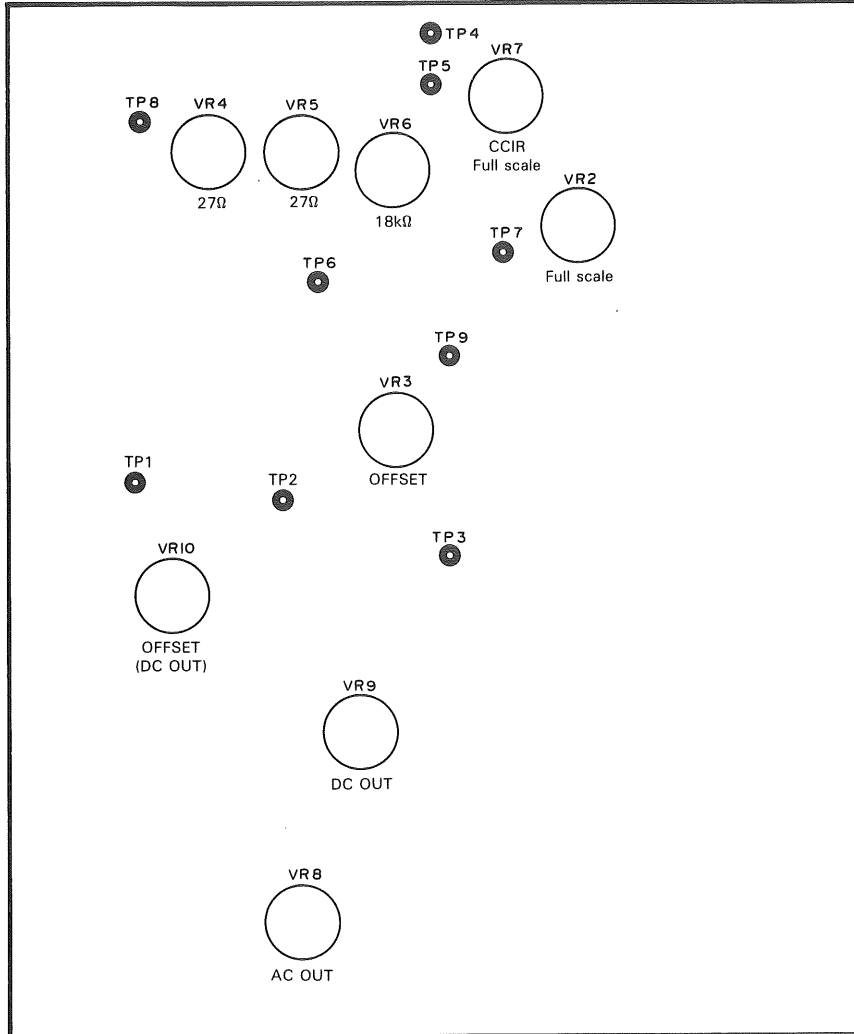


FRONT

ADJUSTMENT

OUTPUT UNIT (X73-1390-00)

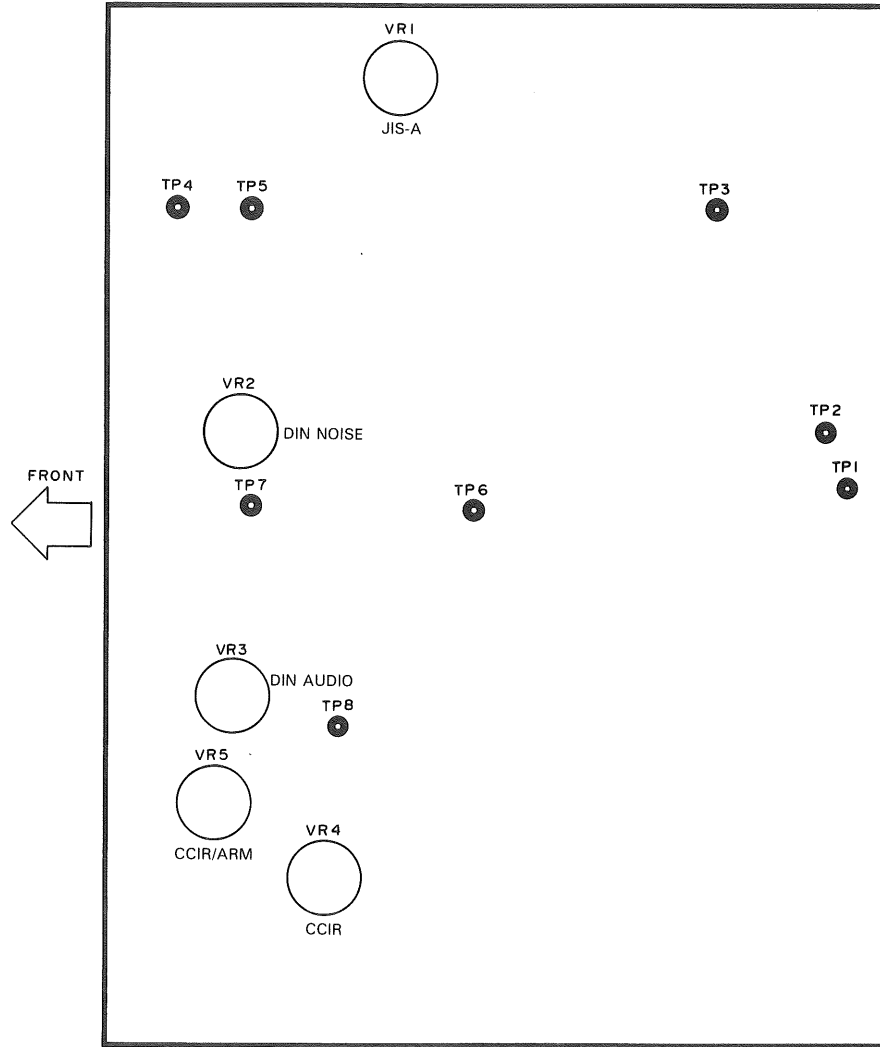
Parts side view



ADJUSTMENT

FILTER UNIT (X70-1010-00)

Pattern side view



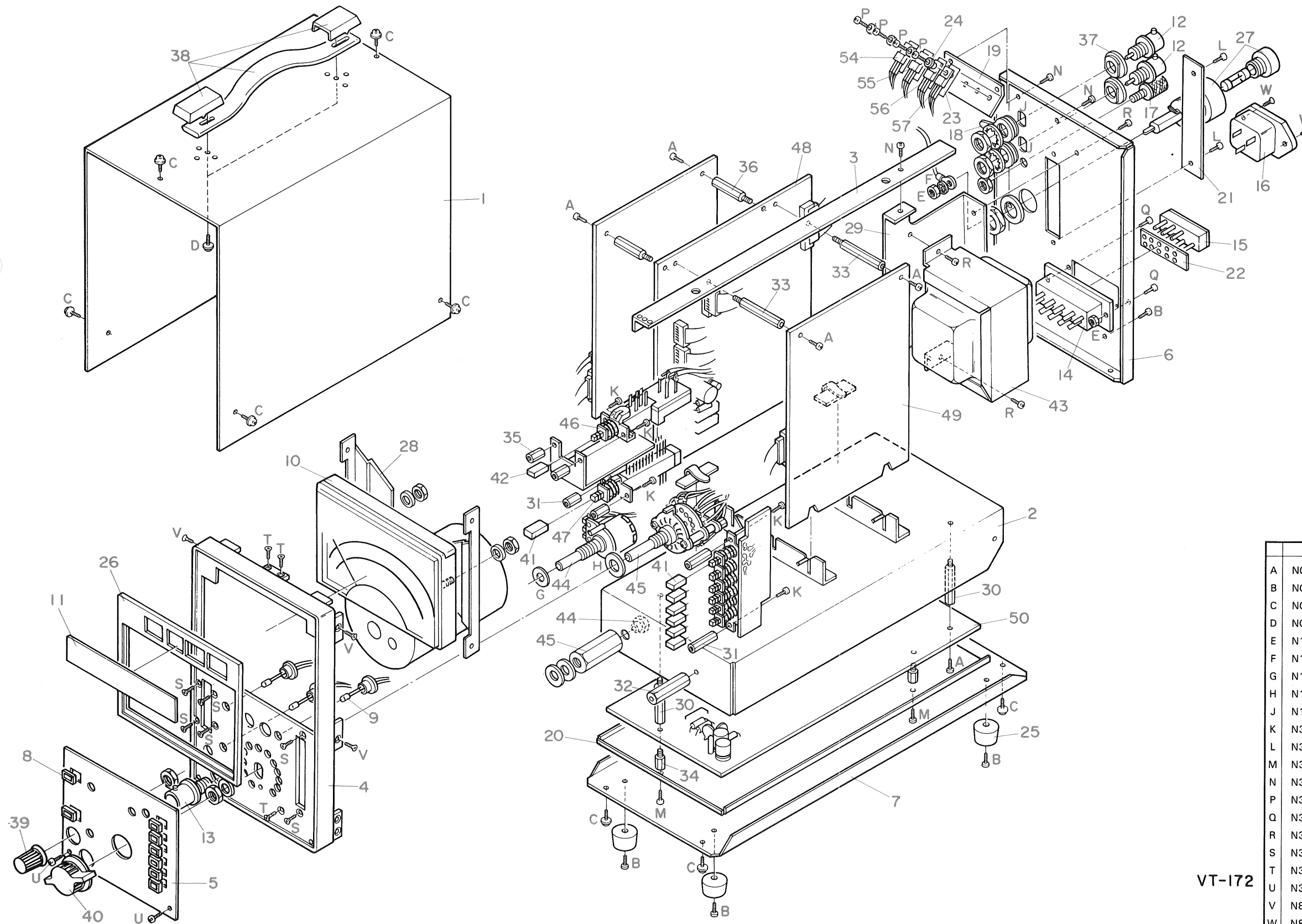
PARTS LIST

VT-172 UNIT (Y80-1370-00)

REF. NO	PARTS NO	NAME & DESCRIPTION
	B42-1837-04	LABEL, FOR ADJUSTMENT
	B50-7711-00	INSTRUCTION MANUAL ENG./JAP.
	C91-0571-05	CAP. CERAMIC 0.01 2KV
	E30-1644-15	BS POWER CORD
	E30-1818-05	JIS POWER CORD
	E30-1819-05	CEE POWER CORD
	E30-1820-05	UL/CSA POWER CORD
	E30-1821-05	SAA POWER CORD
	E31-0537-05	WIRE ASS'Y; WITH RING LUG, BLACK
	E31-0763-05	WIRE ASS'Y; P401 TO P101, 102
	E31-0764-05	WIRE ASS'Y; P201 TO P103
	E31-0765-05	WIRE ASS'Y; P105 TO P307
	E31-0766-05	WIRE ASS'Y; P202 TO P204
	E31-0767-05	WIRE ASS'Y; P302
	E31-0768-05	WIRE ASS'Y; P304
	E31-0769-05	WIRE ASS'Y; P405 TO P205, 305
	E31-0770-05	WIRE ASS'Y; P309
	E31-0772-05	WIRE ASS'Y; P308 TO P402
	E31-0773-05	WIRE ASS'Y; P203 TO P306
	E31-0774-05	WIRE ASS'Y; P404
	E31-0776-05	WIRE ASS'Y; P407
	E31-0777-05	WIRE ASS'Y; P408
	E31-0795-05	WIRE ASS'Y, WITH RING LUG, GRAY
	E31-0796-05	WIRE ASS'Y; TRANS. TO 3P CONNC.
	F05-3011-05	FUSE (6X30MM) 0.3A
	F05-3112-05	FUSE (5X20MM) 0.3AT
	F05-5013-05	FUSE (6X30MM) 0.5A
	H01-5918-04	CARTON BOX
	H10-2802-02	FOAMED STYRENE PAD
	H20-1716-04	VINYL COVER
	J19-1620-05	CORD KEEP
	J42-0515-05	BUSHING
	J61-0049-05	WIRE BAND
	W03-2309-05	ACCESSORY CORD CA-41
1	A01-0874-12	CASE, TOP
2	A10-1430-12	CHASSIS
3	A13-0735-13	FRAME
4	A20-2757-23	DIECAST PANEL
5	A21-1161-04	DECORATIVE PANEL
6	A23-1628-53	REAR PANEL
7	A40-0707-13	CASE, BOTTOM
8	B07-0706-04	ESCUTCHEON
9	B30-0903-15	LED
10	B31-0720-15	METER
11	B40-2927-04	NAME PLATE; MODEL NO.
12	E04-0251-05	BNC RECEPTACLE
13	E04-0253-15	BNC RECEPTACLE
14	E08-1081-05	VOLTAGE SELECTOR RECEPTACLE
15	E09-0681-05	VOLTAGE SELECTOR PLUG
16	E18-0351-05	AC INLET 3 P
17	E21-0657-04	TERMINAL (GND)
18	E23-0513-05	EARTH LUG, BNC
19	F01-0824-04	HEAT SINK
20	F10-1547-13	SHIELD PLATE
21	F15-0703-04	BLIND PLATE
22	F19-0703-04	PLATE, FOR VOLTAGE SELECTOR
23	F20-0078-05	INSULATOR
24	F29-0014-05	INSULATOR
25	J02-0363-04	RUBBER FOOT
26	J10-0422-03	BEZEL
27A	J13-0033-15	FUSE HOLDER
27B	J13-0031-05	FUSE HOLDER (NORTH EUROPE)
28	J21-2843-04	BLACKET FOR METER
29	J21-2931-14	BLACKET FOR TRANSFORMER
30	J32-0190-04	BOSS
31	J32-0813-04	BOSS
32	J32-0819-04	BOSS
33	J32-0820-04	BOSS
34	J32-0821-04	BOSS
35	J32-0822-04	BOSS
36	J32-0857-04	BOSS
37	J42-0507-04	BUSHING (FOR BNC)
38	K01-0532-05	HANDLE
39	K21-0908-04	KNOB
40	K21-0909-04	KNOB
41	K27-0504-04	BUTTON; GRAY
42	K27-0506-04	BUTTON; ORANGE
43	L01-9246-05	POWER TRANSFORMER
44	N08-0610-04	DRESSED SCREW

REF. NO	PARTS NO	NAME & DESCRIPTION
45	N14-0610-04	NUT
46	R01-1508-05	V.R.
47	S01-1512-05	ROTARY SWITCH
48	S40-2531-05	PUSH SWITCH
49	S40-6501-05	PUSH SWITCH
50	X68-1340-00	POWER & CONTROL UNIT
51	X70-1010-00	FILTER UNIT
52	X73-1380-00	INPUT UNIT
53	X73-1390-00	OUTPUT UNIT
54	LM7915CT	IC, NEGATIVE VOLTAGE REGULATOR
55	LM7815CT	IC, POSITIVE VOLTAGE REGULATOR
56	LM79M05CT	IC, NEGATIVE VOLTAGE REGULATOR
57	LM78M05CT	IC, POSITIVE VOLTAGE REGULATOR

DISASSEMBLY



VT-172

SCREWS

Parts No.	Parts Name	Figure
A	N09-0709-05 Sems screw (M3×6)	
B	N09-0739-05 Sems taptite screw (3×8)	
C	N09-0757-05 Sems taptite screw (3×6)	
D	N09-0777-05 Sems screw (M4×6)	
E	N10-2030-41 Hexagon nut (M3)	
F	N17-1030-41 Toothed lock washer (φ3)	
G	N19-0702-04 Plain washer (φ7)	
H	N19-0704-04 Plain washer, t=1 mm (φ9)	
J	N19-0711-04 Plain washer, t=0.5 mm (φ9)	
K	N30-2604-41 Pan head screw (M2.6×4)	
L	N30-2606-41 Pan head screw (M2.6×6)	
M	N30-3004-41 Pan head screw (M3×4)	
N	N30-3006-41 Pan head screw (M3×6)	
P	N30-3008-41 Pan head screw (M3×8)	
Q	N30-3010-41 Pan head screw (M3×10)	
R	N30-4006-41 Pan head screw (M4×6)	
S	N32-2606-41 Flat head screw (M2.6×6)	
T	N32-3006-41 Flat head screw (M3×6)	
U	N35-2604-41 Binding head screw (M2.6×4)	
V	N88-3006-41 Flat head taptite screw (3×6)	
W	N88-3008-41 Flat head taptite screw (3×8)	

PARTS LIST

POWER & CONTROL UNIT (X68-1340-00)

REF.NO	PARTS NO	NAME & DESCRIPTION
	E23-0046-04	TERMINAL
	E40-1211-05	PIN CONNECTOR 12P
	J25-2929-13	PCB (UNMOUNTED)
	R92-0150-05	JUMPING RES. ZERO OHM(10MM)
C001	CE04EW1V222M	CAP. ELECTRO 2200 20% 35V
C002	CE04EW1V222M	CAP. ELECTRO 2200 20% 35V
C003	C093M1H104K	CAP. MYLAR 0.1 10% 50V
C004	C093M1H104K	CAP. MYLAR 0.1 10% 50V
C005	C093M1H104K	CAP. MYLAR 0.1 10% 50V
C006	C093M1H104K	CAP. MYLAR 0.1 10% 50V
C007	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C008	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C009	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C010	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C011	CE04EW1E221M	CAP. ELECTRO 220 20% 25V
C012	CE04AW1E220M	CAP. ELECTRO 22 20% 25V
D001	S1RBA40	DIODE
D002	DS442X	DIODE
D003	DS442X	DIODE
D004	DS442X	DIODE
D005	DS442X	DIODE
D006	DS442X	DIODE
D007	DS442X	DIODE
D008	DS442X	DIODE
D009	DS442X	DIODE
D010	DS442X	DIODE
D011	DS442X	DIODE
D012	DS442X	DIODE
D013	DS442X	DIODE
D014	DS442X	DIODE
D015	DS442X	DIODE
D016	DS442X	DIODE
D017	DS442X	DIODE
D018	DS442X	DIODE
D019	DS442X	DIODE
D020	DS442X	DIODE
D021	DS442X	DIODE
D022	DS442X	DIODE
D023	DS442X	DIODE
D024	DS442X	DIODE
D025	DS442X	DIODE
D026	DS442X	DIODE
D027	DS442X	DIODE
D028	DS442X	DIODE
D029	DS442X	DIODE
D030	DS442X	DIODE
D031	DS442X	DIODE
D032	DS442X	DIODE
D033	DS442X	DIODE
D034	DS442X	DIODE
D035	DS442X	DIODE
D036	DS442X	DIODE
D037	DS442X	DIODE
D038	DS442X	DIODE
D039	DS442X	DIODE
D040	DS442X	DIODE
D041	DS442X	DIODE
D042	DS442X	DIODE
D043	DS442X	DIODE
D044	DS442X	DIODE
D045	DS442X	DIODE
D046	DS442X	DIODE
D047	DS442X	DIODE
D048	DS442X	DIODE
D049	DS442X	DIODE
D050	DS442X	DIODE
D051	DS442X	DIODE
D201	DS442X	DIODE
P401	E40-1273-05	PIN CONNECTOR 12P
P402	E40-0473-05	PIN CONNECTOR 4P
P403	E40-0473-05	PIN CONNECTOR 4P
P404	E40-1274-05	PIN CONNECTOR 12P
P405	E40-0473-05	PIN CONNECTOR 4P
P406	E40-0332-05	PIN CONNECTOR 3P
P407	E40-1273-05	PIN CONNECTOR 12P
P408	E40-0573-05	PIN CONNECTOR 5P

REF.NO	PARTS NO	NAME & DESCRIPTION
P409	E40-1273-05	PIN CONNECTOR 12P
P410	E40-0573-05	PIN CONNECTOR 5P
P411	NO USE	
P412	E40-1111-05	PIN CONNECTOR 11P
Q001	2SA970(BL)	TR. SI, PNP
Q002	2SA970(BL)	TR. SI, PNP
Q003	2SA970(BL)	TR. SI, PNP
Q004	2SA970(BL)	TR. SI, PNP
Q005	2SA970(BL)	TR. SI, PNP
Q006	2SA970(BL)	TR. SI, PNP
Q007	2SA970(BL)	TR. SI, PNP
Q008	2SC1815(Y)	TR. SI, NPN
Q009	2SC1815(Y)	TR. SI, NPN
Q010	2SC1815(Y)	TR. SI, NPN
Q201	2SA970(BL)	TR. SI, PNP
R001	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R002	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R003	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R004	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R005	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R006	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R007	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R008	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R009	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R010	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R011	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R012	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R013	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R014	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R015	RD14BB2E820J	RES. CARBON 82 5% 1/4W
R016	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R017	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R018	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R019	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R020	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R021	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R022	RD14BB2E104J	RES. CARBON 100K 5% 1/4W
R023	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R024	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R025	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R026	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R027	RD14BB2E123J	RES. CARBON 12K 5% 1/4W
R028	RD14BB2E562J	RES. CARBON 5.6K 5% 1/4W
R201	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R202	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R203	RD14BB2E101J	RES. CARBON 100 5% 1/4W
RL001	SS1-1404-05	RELAY

FILTER UNIT (X70-1010-00)

REF.NO	PARTS NO	NAME & DESCRIPTION
	E23-0046-04	TERMINAL
	J25-2926-03	PCB (UNMOUNTED)
	R92-0150-05	JUMPING RES. ZERO OHM(10MM)
C001	C093BP2A333F	CAP. MYLAR 0.033 1% 100V
C002	C093BP2A333F	CAP. MYLAR 0.033 1% 100V
C003	CM93BD2A511F	CAP. MICA 510P 1% 100V
C004	C093BP2A243F	CAP. MYLAR 0.024 1% 100V
C005	C093BP2A272F	CAP. MYLAR 2700P 1% 100V
C006	CM93BD2A131F	CAP. MICA 130P 1% 100V
C007	C093BP2A302F	CAP. MYLAR 3000P 1% 100V
C008	CM93BD2A271F	CAP. MICA 270P 1% 100V
C009	C093BP2A102F	CAP. MYLAR 1000P 1% 100V
C010	CM93BD2A390G	CAP. MICA 39P 2% 100V
C011	C093BP2A332F	CAP. MYLAR 3300P 1% 100V
C012	CM93BD2A820F	CAP. MICA 82P 1% 100V
C013	C093BP2A102F	CAP. MYLAR 1000P 1% 100V
C014	NO USE	
C015	C093BP2A682F	CAP. MYLAR 6800P 1% 100V
C016	C093BP2A272F	CAP. MYLAR 2700P 1% 100V
C017	CM93BD2A471F	CAP. MICA 470P 1% 100V
C018	C093BP2A103F	CAP. MYLAR 0.01 1% 100V
C019	C093BP2A333F	CAP. MYLAR 0.033 1% 100V
C020	C093BP2A102F	CAP. MYLAR 1000P 1% 100V
C021	C093BP2A114F	CAP. MYLAR 0.11 1% 100V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
C022	C093BP2A114F	CAP. MYLAR 0.11 1% 100V
C023	C093BP2A112F	CAP. MYLAR 1100P 1% 100V
C024	C093BP2A122F	CAP. MYLAR 1200P 1% 100V
C025	C093BP2A132F	CAP. MYLAR 1300P 1% 100V
C026	CM93BD2A391F	CAP. MICA 390P 1% 100V
C027	C093BP2A362F	CAP. MYLAR 3600P 1% 100V
C028	CM93BD2A181F	CAP. MICA 180P 1% 100V
C029	C093BP2A182F	CAP. MYLAR 1800P 1% 100V
C030	C093BP2A123F	CAP. MYLAR 0.012 1% 100V
C031	C093BP2A682F	CAP. MYLAR 6800P 1% 100V
C032	C093BP2A203F	CAP. MYLAR 0.02 1% 100V
C033	C093BP2A303F	CAP. MYLAR 0.03 1% 100V
C034	C093BP2A102F	CAP. MYLAR 1000P 1% 100V
C035	C093BP2A822F	CAP. MYLAR 8200P 1% 100V
C036	C093BP2A152F	CAP. MYLAR 1500P 1% 100V
C037	C093BP2A303F	CAP. MYLAR 0.03 1% 100V
C038	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C039	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C040	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C041	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C042	CM93BD2A391F	CAP. MICA 390P 1% 100V

REF.NO	PARTS NO	NAME & DESCRIPTION
IC001	TL082CP	IC, OP AMP
IC002	NJM4558D	IC, DUAL OP AMP
IC003	NJM4558D	IC, DUAL OP AMP
IC004	TL082CP	IC, OP AMP
IC005	TL082CP	IC, OP AMP
IC006	NJM4558D	IC, DUAL OP AMP

REF.NO	PARTS NO	NAME & DESCRIPTION
L001	L33-0802-05	CHOKO COIL
L002	L33-0803-05	CHOKO COIL

REF.NO	PARTS NO	NAME & DESCRIPTION
P201	E40-0274-05	PIN CONNECTOR 2P
P202	E40-0974-05	PIN CONNECTOR 9P
P203	E40-0373-05	PIN CONNECTOR 3P
P204	E40-0974-05	PIN CONNECTOR 9P

REF.NO	PARTS NO	NAME & DESCRIPTION
P295	E40-0374-05	PIN CONNECTOR 3P

REF.NO	PARTS NO	NAME & DESCRIPTION
Q001	2SC1815(Y)	TR. SI, NPN
Q002	2SC1815(Y)	TR. SI, NPN

REF.NO	PARTS NO	NAME & DESCRIPTION
R001	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R002	RN14BK2E1872F	RES. METAL FILM 18.7K 1% 1/4W
R003	RN14BK2E1872F	RES. METAL FILM 18.7K 1% 1/4W
R004	RN14BK2E7502F	RES. METAL FILM 75K 1% 1/4W
R005	RN14BK2E1003F	RES. METAL FILM 100K 1% 1/4W
R006	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R007	RN14BK2E1001F	RES. METAL FILM 1K 1% 1/4W
R008	NO USE	
R009	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R010	RN14BK2E1001F	RES. METAL FILM 1K 1% 1/4W
R011	RN14BK2E1001F	RES. METAL FILM 1K 1% 1/4W
R012	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
R013	RN14BK2E1102F	RES. METAL FILM 11K 1% 1/4W
R014	RN14BK2E1102F	RES. METAL FILM 11K 1% 1/4W
R015	RN14BK2E1302F	RES. METAL FILM 13K 1% 1/4W
R016	RN14BK2E1302F	RES. METAL FILM 13K 1% 1/4W
R017	RN14BK2E9101F	RES. METAL FILM 9.1K 1% 1/4W
R018	RN14BK2E9101F	RES. METAL FILM 9.1K 1% 1/4W
R019	RN14BK2E1102F	RES. METAL FILM 11K 1% 1/4W
R020	RN14BK2E5602F	RES. METAL FILM 56K 1% 1/4W
R021	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
R022	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R023	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R024	RN14BK2E1001F	RES. METAL FILM 1K 1% 1/4W
R025	RN14BK2E7872F	RES. METAL FILM 78.7K 1% 1/4W
R026	NO USE	
R027	RN14BK2E1583F	RES. METAL FILM 158K 1% 1/4W
R028	RN14BK2E8201F	RES. METAL FILM 8.2K 1% 1/4W
R029	RN14BK2E8201F	RES. METAL FILM 8.2K 1% 1/4W
R030	RN14BK2E8201F	RES. METAL FILM 8.2K 1% 1/4W
R031	RN14BK2E8201F	RES. METAL FILM 8.2K 1% 1/4W
R032	RN14BK2E8201F	RES. METAL FILM 8.2K 1% 1/4W
R033	RN14BK2E8201F	RES. METAL FILM 8.2K 1% 1/4W
R034	RN14BK2E8201F	RES. METAL FILM 8.2K 1% 1/4W
R035	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R036	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R037	RN14BK2E1001F	RES. METAL FILM 1K 1% 1/4W
R038	RN14BK2E2001F	RES. METAL FILM 2K 1% 1/4W
R039	RN14BK2E6040F	RES. METAL FILM 604 1% 1/4W
R040	RN14BK2E6040F	RES. METAL FILM 604 1% 1/4W
R041	RN14BK2E2001F	RES. METAL FILM 2K 1% 1/4W
R042	RN14BK2E3001F	RES. METAL FILM 3K 1% 1/4W

REF.NO	PARTS NO	NAME & DESCRIPTION
S201	S42-6503-05	PUSH SWITCH
VR001	R12-1033-05	RES. SEMI FIXED 2.2K B
VR002	R12-1037-05	RES. SEMI FIXED 3.3K B
VR003	R12-0060-05	RES. SEMI FIXED 330 B
VR004	R12-1501-05	RES. SEMI FIXED 1.5KB
VR005	R12-1501-05	RES. SEMI FIXED 1.5KB

INPUT UNIT (X73-1380-00)

REF.NO	PARTS NO	NAME & DESCRIPTION
	E23-0046-	

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION	REF.NO	PARTS NO	NAME & DESCRIPTION
D012	1S1587	DIODE	R040	RN14BK2E2001F	RES. METAL FILM 2K 1% 1/4W
D013	DS442X	DIODE	R041	RN14BK2E2001F	RES. METAL FILM 2K 1% 1/4W
D014	DS442X	DIODE	R042	RN14BK2E2700F	RES. METAL FILM 270 1% 1/4W
D015	DS442X	DIODE	R043	RN14BK2E4701F	RES. METAL FILM 4.7K 1% 1/4W
D016	DS442X	DIODE	R044	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
D017	NO USE		R045	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
D018	MT28.2JB	DIODE, ZENER 8.1V	R046	RN14BK2E1501F	RES. METAL FILM 1.5K 1% 1/4W
D019	MT28.2JB	DIODE, ZENER 8.1V	R047	R92-0786-05	RES. METAL FILM 60 0.5% 1/4W
D020	MT210JC	DIODE, ZENER 9.95V	R048	RN14BK2E4110D	RES. METAL FILM 411 0.5% 1/4W
D021	MT210JC	DIODE, ZENER 9.95V	R049	RN14BK2E2780D	RES. METAL FILM 278 0.5% 1/4W
D201	DS442X	DIODE	R050	RN14BK2E4110D	RES. METAL FILM 411 0.5% 1/4W
IC001	TC4066BP	IC, QUAD. ANALOG SW/QUAD. MPX	R051	RN14BK2E2780D	RES. METAL FILM 278 0.5% 1/4W
IC002	CA3100E	IC, WIDEBAND OP AMP	R052	RN14BK2E4110D	RES. METAL FILM 411 0.5% 1/4W
IC003	NJM4558D	IC, DUAL OP AMP	R053	RN14BK2E1900D	RES. METAL FILM 190 0.5% 1/4W
P101	E40-0673-05	PIN CONNECTOR 6P	R054	RN14BK2E1400F	RES. METAL FILM 140 1% 1/4W
P102	E40-0673-05	PIN CONNECTOR 6P	R055	RN14BK2E14ROF	RES. METAL FILM 14.0 1% 1/4W
P103	E40-0273-05	PIN CONNECTOR 2P	R056	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
P104	E40-0273-05	PIN CONNECTOR 2P	R057	RD14BB2E101J	RES. CARBON 100 5% 1/4W
P105	E40-0373-05	PIN CONNECTOR 3P	R058	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
Q001	2SK68A(L)	FET, N-CHANNEL	R059	RD14BB2E681J	RES. CARBON 680 5% 1/4W
Q002	2SC1815(Y)	TR. SI, NPN	R060	RN14BK2E3300F	RES. METAL FILM 330 1% 1/4W
Q003	2SC1815(Y)	TR. SI, NPN	R061	RN14BK2E1502F	RES. METAL FILM 15K 1% 1/4W
Q004	2SK68A(L)	FET, N-CHANNEL	R062	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
Q005	2SA970(BL)	TR. SI, PNP	R063	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
Q006	2SC3419(Y)	TR. SI, NPN	R064	RD14BB2E471J	RES. CARBON 470 5% 1/4W
Q007	2SA970(BL)	TR. SI, PNP	R065	RD14BB2E471J	RES. CARBON 470 5% 1/4W
Q008	2SC1815(Y)	TR. SI, NPN	R066	RD14BB2E104J	RES. CARBON 100K 5% 1/4W
Q009	2SC1815(Y)	TR. SI, NPN	R067	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
Q010	2SA733(O)	TR. SI, PNP	R068	RN14BK2E3302F	RES. METAL FILM 33K 1% 1/4W
Q011	2SA970(BL)	TR. SI, PNP	R069	RN14BK2E3301F	RES. METAL FILM 3.3K 1% 1/4W
Q012	2SA970(BL)	TR. SI, PNP	R070	RD14BB2E473J	RES. CARBON 47K 5% 1/4W
Q013	2SC1923(O)	TR. SI, NPN	R071	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
Q014	2SC1923(O)	TR. SI, NPN	R072	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
Q015	2SA733(O)	TR. SI, PNP	R073	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
Q016	2SA970(BL)	TR. SI, PNP	R074	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
Q017	2SK163(K)	FET, N-CHANNEL	R075	RN14BK2E1003F	RES. METAL FILM 100K 1% 1/4W
Q201	2SA970(BL)	TR. SI, PNP	R076	RD14BB2E333J	RES. CARBON 33K 5% 1/4W
Q202	2SC1815(Y)	TR. SI, NPN	R077	RD14BB2E681J	RES. CARBON 680 5% 1/4W
R001	RN14BK2H9993F	RES. METAL FILM 999K 1% 1/2W	R078	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R002	RN14BK2E9530F	RES. METAL FILM 953 1% 1/4W	R079	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R003	RD14BY2H100J	RES. CARBON 10 5% 1/2W	R080	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R004	RD14BB2E101J	RES. CARBON 100 5% 1/4W	R081	RD14BB2E681J	RES. CARBON 680 5% 1/4W
R005	RS14AB3A682J	RES. METAL FILM 6.8K 5% 1W	R082	RD14BB2E564J	RES. CARBON 560K 5% 1/4W
R006	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W	R083	RD14BB2E154J	RES. CARBON 150K 5% 1/4W
R007	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W	R084	RD14BB2E561J	RES. CARBON 560 5% 1/4W
R008	RD14BB2E103J	RES. CARBON 10K 5% 1/4W	R085	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R009	RD14BB2E103J	RES. CARBON 10K 5% 1/4W	R086	RN14BK2E39ROF	RES. METAL FILM 39.0 1% 1/4W
R010	RD14BB2E103J	RES. CARBON 10K 5% 1/4W	R087	RD14BB2E124J	RES. CARBON 120K 5% 1/4W
R011	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W	R088	RN14BK2E2000F	RES. METAL FILM 200 1% 1/4W
R012	RD14BB2E103J	RES. CARBON 10K 5% 1/4W	R201	RN14BK2E2001F	RES. METAL FILM 2K 1% 1/4W
R013	RN14BK2E7502F	RES. METAL FILM 75K 1% 1/4W	R202	RN14BK2E2001F	RES. METAL FILM 2K 1% 1/4W
R014	RD14BB2E103J	RES. CARBON 10K 5% 1/4W	R203	RN14BK2E4701F	RES. METAL FILM 4.7K 1% 1/4W
R015	RD14BB2E331J	RES. CARBON 330 5% 1/4W	R204	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R016	RD14BB2E102J	RES. CARBON 1K 5% 1/4W	R205	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R017	RD14BB2E102J	RES. CARBON 1K 5% 1/4W	RL001	S51-2408-05	RELAY
R018	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W	RL002	S51-1404-05	RELAY
R019	RS14AB3A101J	RES. METAL FILM 100 5% 1W	RL003	S51-1404-05	RELAY
R020	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W	RL004	S51-1404-05	RELAY
R021	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W	RL201	S51-1404-05	RELAY
R022	RD14BB2E103J	RES. CARBON 10K 5% 1/4W	TC001	C05-0416-05	CAP. TRIMMER 10P
R023	RD14BB2E103J	RES. CARBON 10K 5% 1/4W	VR001	R12-0502-05	RES. SEMI FIXED 100 B
R024	RN14BK2E3302F	RES. METAL FILM 33K 1% 1/4W	VR002	R12-0502-05	RES. SEMI FIXED 100 B
R025	RN14BK2E6202F	RES. METAL FILM 62K 1% 1/4W	VR003	NO USE	
R026	R92-0798-05	RES. FIXED 47M 5% 1/4%	VR004	R12-0058-05	RES. SEMI FIXED 470 B
R027	RN14BK2E3301F	RES. METAL FILM 3.3K 1% 1/4W	VR005	NO USE	
R028	RN14BK2E18ROF	RES. METAL FILM 18.0 1% 1/4W	VR006	R12-3502-05	RES. SEMI FIXED 33K B
R029	NO USE		VR201	R12-0058-05	RES. SEMI FIXED 470 B
R030	RN14BK2E13ROF	RES. METAL FILM 13.0 1% 1/4W			
R031	RN14BK2E3301F	RES. METAL FILM 3.3K 1% 1/4W			
R032	RN14BK2E8200F	RES. METAL FILM 820 1% 1/4W			
R033	RN14BK2E1000F	RES. METAL FILM 100 1% 1/4W			
R034	RN14BK2E4701F	RES. METAL FILM 4.7K 1% 1/4W			
R035	RN14BK2E1001F	RES. METAL FILM 1K 1% 1/4W			
R036	RD14BB2E682J	RES. CARBON 6.8K 5% 1/4W			
R037	RD14BB2E331J	RES. CARBON 330 5% 1/4W			
R038	RD14BB2E682J	RES. CARBON 6.8K 5% 1/4W			
R039	RD14BB2E331J	RES. CARBON 330 5% 1/4W			

PARTS LIST

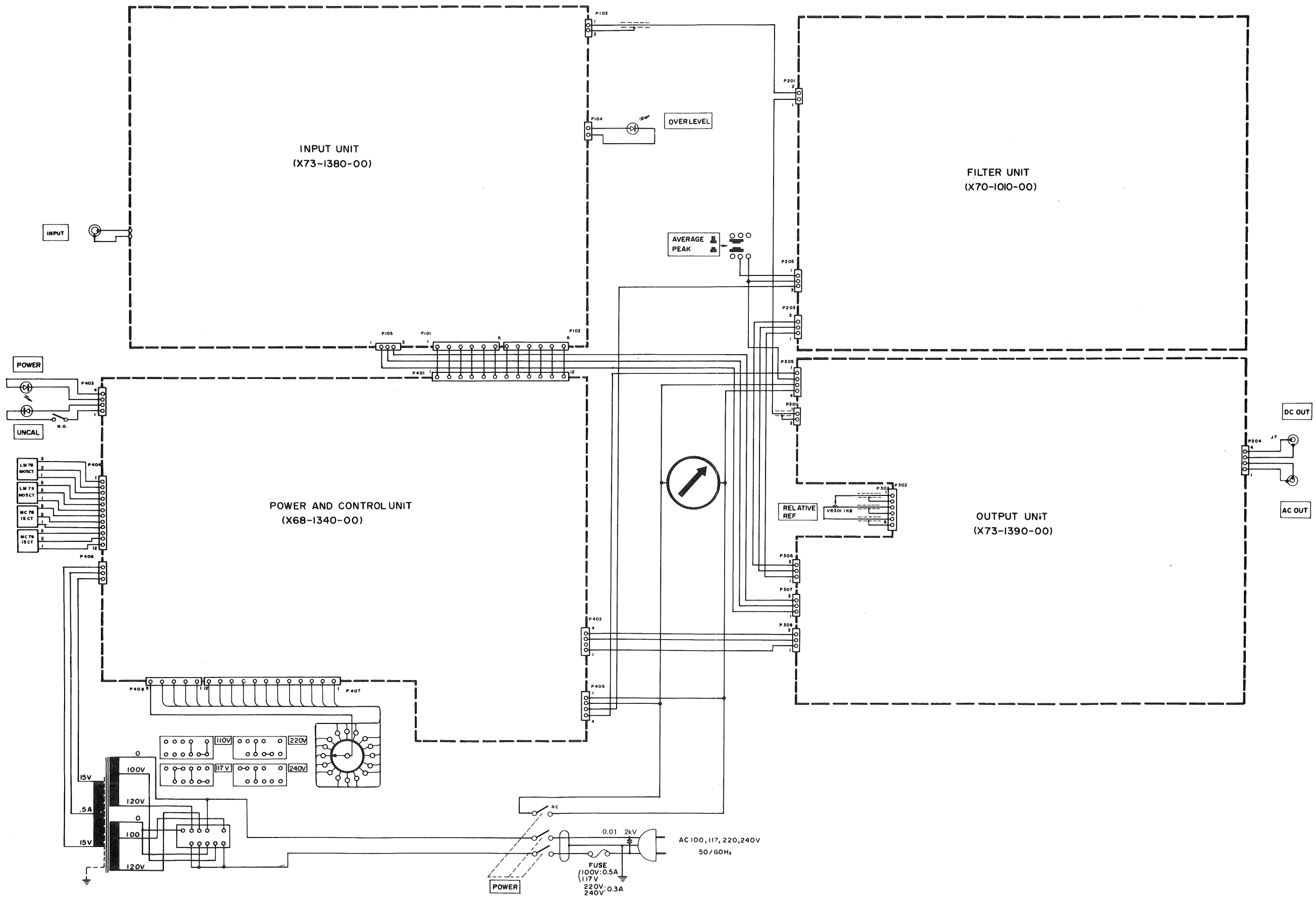
OUTPUT UNIT (X73-1390-00)

REF.NO PARTS NO NAME & DESCRIPTION

REF.NO	PARTS NO	NAME & DESCRIPTION
	E23-0046-04	TERMINAL
	J25-2928-13	PCB (UNMOUNTED)
	R92-0150-05	JUMPING RES. ZERO OHM(10MM)
	SDT1000	THERMISTOR
C001	CF93AN2A105J	CAP. POLYESTHEL 1 5% 100V
C002	CE04EW1A471M	CAP. ELECTRO 470 20% 10V
C003	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C004	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C005	CE04EW1A471M	CAP. ELECTRO 470 20% 10V
C006	CE04EW1A221M	CAP. ELECTRO 220 20% 10V
C007	CC45CH1H1000	CAP. CERAMIC 10P 0.5P 50V
C008	CE04EW1E470M	CAP. ELECTRO 47 20% 25V
C009	CE04EW1E470M	CAP. ELECTRO 47 20% 25V
C010	CE04EW1C101M	CAP. ELECTRO 100 20% 16V
C011	CM93BD2A300G	CAP. MICA 30P 2% 100V
C014	CE04EW1C101M	CAP. ELECTRO 100 20% 16V
C015	CC45CH1H1000	CAP. CERAMIC 10P 0.5P 50V
C016	CE04BW1A101M	CAP. ELECTRO 100 20% 10V
C017	CC45CH1H1000	CAP. CERAMIC 10P 0.5P 50V
C018	CC45CH1H1000	CAP. CERAMIC 10P 0.5P 50V
C019	C90-0903-05	CAP. ELECTRO 33 20% 25V
C020	C90-0903-05	CAP. ELECTRO 33 20% 25V
C021	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C022	CC45CH1H1000	CAP. CERAMIC 10P 0.5P 50V
C023	CC45CH1H150J	CAP. CERAMIC 15P 5% 50V
C024	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C025	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C026	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C027	NO USE	
C028	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C029	CE04EW1E101M	CAP. ELECTRO 100 20% 25V
C030	CE04EW1E470M	CAP. ELECTRO 47 20% 25V
C031	CE04EW1A221M	CAP. ELECTRO 220 20% 10V
D001	1S1588	DIODE
D002	1S1588	DIODE
D003	1S1588	DIODE
D004	1S1588	DIODE
D005	1S1588	DIODE
D006	DS442X	DIODE
D007	DS442X	DIODE
D008	DS442X	DIODE
D009	MT210JC	DIODE, ZENER 9.95V
D010	MT210JC	DIODE, ZENER 9.95V
IC001	CA3100E	IC, WIDEBAND OP AMP
IC002	CA3100E	IC, WIDEBAND OP AMP
IC003	CA3100E	IC, WIDEBAND OP AMP
IC004	NJM4558D	IC, DUAL OP AMP
IC005	NJM4558D	IC, DUAL OP AMP
IC006	NJM4558D	IC, DUAL OP AMP
P301	E40-0274-05	PIN CONNECTOR 2P
P302	E40-0674-05	PIN CONNECTOR 6P
P303	NO USE	
P304	E40-0474-05	PIN CONNECTOR 4P
P305	E40-0474-05	PIN CONNECTOR 4P
P306	E40-0373-05	PIN CONNECTOR 3P
P307	E40-0373-05	PIN CONNECTOR 3P
P308	E40-0373-05	PIN CONNECTOR 3P
P309	E40-0273-05	PIN CONNECTOR 2P
Q001	2SK30A(GR)	FET, N-CHANNEL
Q002	2SA970(BL)	TR. SI, PNP
Q003	2SC1815(Y)	TR. SI, NPN
Q004	2SC1815(Y)	TR. SI, NPN
Q005	2SA970(BL)	TR. SI, PNP
Q006	2SA970(BL)	TR. SI, PNP
Q007	2SC1923(O)	TR. SI, NPN
Q008	2SC1815(Y)	TR. SI, NPN
Q009	2SK30A(GR)	FET, N-CHANNEL
Q010	2SA970(BL)	TR. SI, PNP
Q011	2SA970(BL)	TR. SI, PNP
Q012	2SC1923(O)	TR. SI, NPN
R001	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R002	RN14BK2E3301F	RES. METAL FILM 3.3K 1% 1/4W
R003	NO USE	

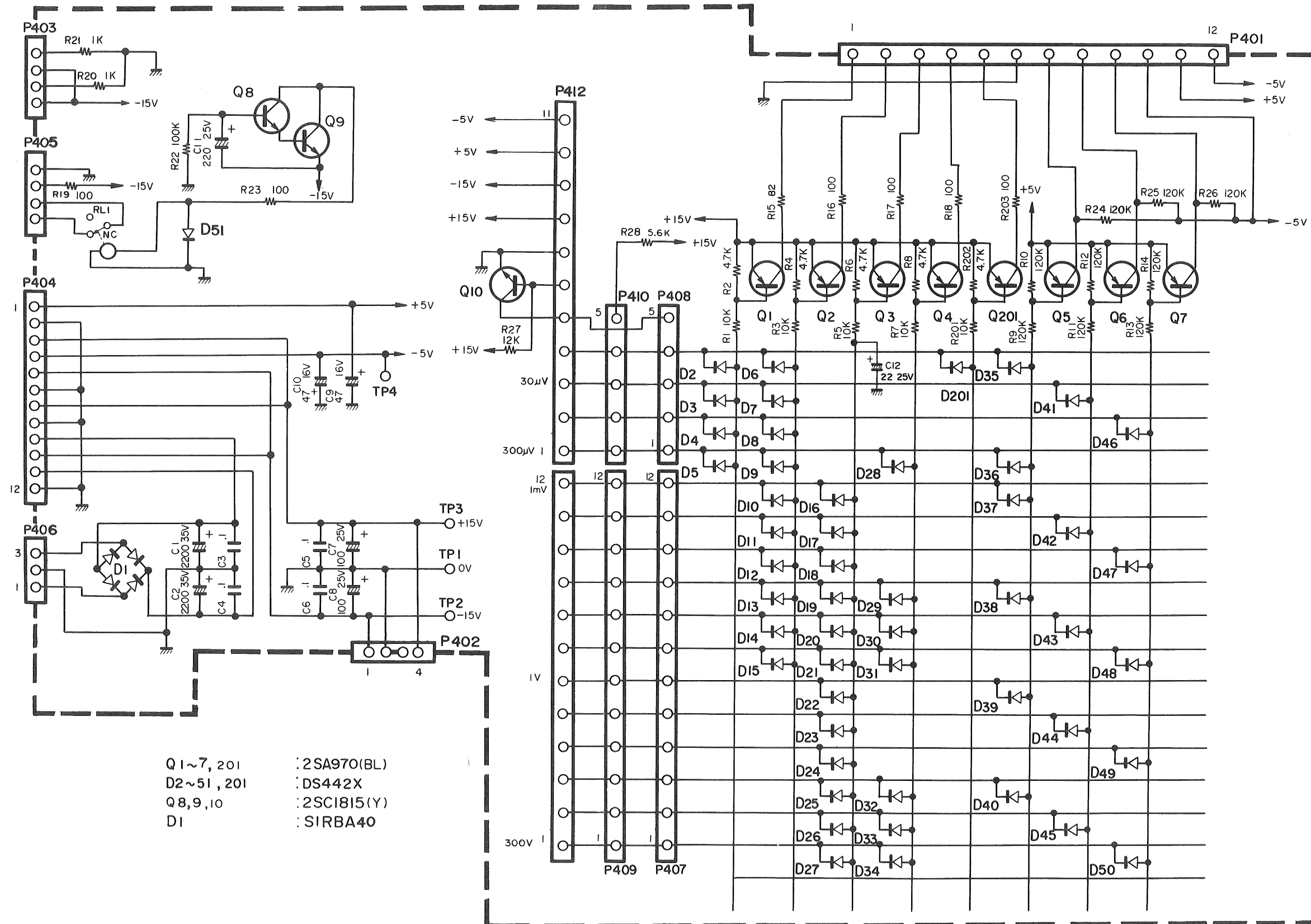
R004	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
R005	RN14BK2E3300F	RES. METAL FILM 330 1% 1/4W
R006	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R007	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R008	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R009	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R010	RN14BK2E3000F	RES. METAL FILM 300 1% 1/4W
R011	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R012	RD14BB2E270J	RES. CARBON 27 5% 1/4W
R013	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R014	RD14BB2E681J	RES. CARBON 680 5% 1/4W
R015	RD14BB2E683J	RES. CARBON 68K 5% 1/4W
R016	RD14BB2E104J	RES. CARBON 100K 5% 1/4W
R017	RD14BB2E561J	RES. CARBON 560 5% 1/4W
R018	RD14BB2E561J	RES. CARBON 560 5% 1/4W
R019	RN14BK2E3300F	RES. METAL FILM 330 1% 1/4W
R020	RN14BK2E20R0F	RES. METAL FILM 20.0 1% 1/4W
R021	RN14BK2E1000F	RES. METAL FILM 100 1% 1/4W
R022	RD14BB2E151J	RES. CARBON 150 5% 1/4W
R023	RD14BB2E151J	RES. CARBON 150 5% 1/4W
R024	RN14BK2E4701F	RES. METAL FILM 4.7K 1% 1/4W
R025	RN14BK2E1003F	RES. METAL FILM 100K 1% 1/4W
R026	RN14BK2E3301F	RES. METAL FILM 3.3K 1% 1/4W
R027	RN14BK2E4702F	RES. METAL FILM 47K 1% 1/4W
R028	RN14BK2E3900F	RES. METAL FILM 390 1% 1/4W
R029	RN14BK2E3900F	RES. METAL FILM 390 1% 1/4W
R030	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R031	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R032	RN14BK2E1802F	RES. METAL FILM 18K 1% 1/4W
R033	RN14BK2E1003F	RES. METAL FILM 100K 1% 1/4W
R034	RD14BB2E102J	RES. CARBON 1K 5% 1/4W
R035	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R036	RD14BB2E103J	RES. CARBON 10K 5% 1/4W
R037	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R038	RD14BB2E681J	RES. CARBON 680 5% 1/4W
R039	RN14BK2E3900F	RES. METAL FILM 390 1% 1/4W
R040	RN14BK2E1502F	RES. METAL FILM 15K 1% 1/4W
R041	RD14BB2E152J	RES. CARBON 1.5K 5% 1/4W
R042	RD14BB2E472J	RES. CARBON 4.7K 5% 1/4W
R043	RN14BK2E5230F	RES. METAL FILM 523 1% 1/4W
R044	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R045	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R046	RN14BK2E3002F	RES. METAL FILM 30K 1% 1/4W
R047	RN14BK2E5601F	RES. METAL FILM 5.6K 1% 1/4W
R048	RN14BK2E3002F	RES. METAL FILM 30K 1% 1/4W
R049	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
R050	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
R051	RN14BK2E1002F	RES. METAL FILM 10K 1% 1/4W
R052	RN14BK2E9761F	RES. METAL FILM 9.76K 1% 1/4W
R053	RN14BK2E6040F	RES. METAL FILM 604 1% 1/4W
R054	RD14BB2E105J	RES. CARBON 1M 5% 1/4W
R055	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R056	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R057	RD14BB2E101J	RES. CARBON 100 5% 1/4W
R058	RD14BB2E682J	RES. CARBON 6.8K 5% 1/4W
R059	RD14BB2E123J	RES. CARBON 12K 5% 1/4W
R060	RD14BB2E560J	RES. CARBON 56 5% 1/4W
R061	RN14BK2E1302F	RES. METAL FILM 13K 1% 1/4W
R062	RN14BK2E1302F	RES. METAL FILM 13K 1% 1/4W
RL001	SS1-2408-05	RELAY
VR002	R12-0502-05	RES. SEMI FIXED 100 B
VR003	R12-3041-05	RES. SEMI FIXED 10KB
VR004	R12-0502-05	RES. SEMI FIXED 100 B
VR005	R12-0502-05	RES. SEMI FIXED 100 B
VR006	R12-2020-05	RES. SEMI FIXED 6.8KB
VR007	R12-1037-05	RES. SEMI FIXED 3.3K B
VR008	R12-0511-05	RES. SEMI FIXED 220 B
VR009	R12-3040-05	RES. SEMI FIXED 22K B
VR010	R12-0058-05	RES. SEMI FIXED 470 B

CIRCUIT DIAGRAM



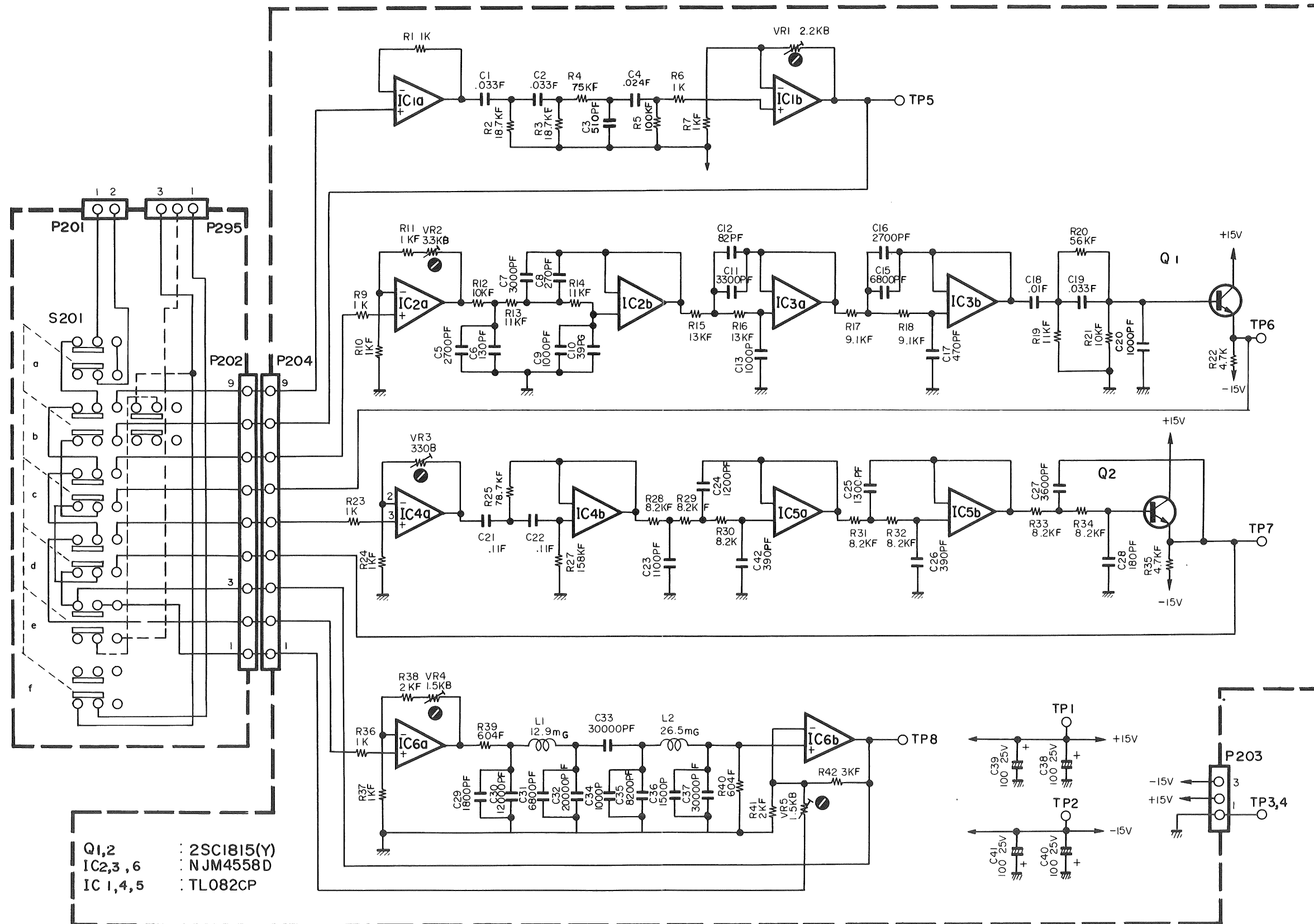
CIRCUIT DIAGRAM

POWER & CONTROL UNIT (X68-1340-00)



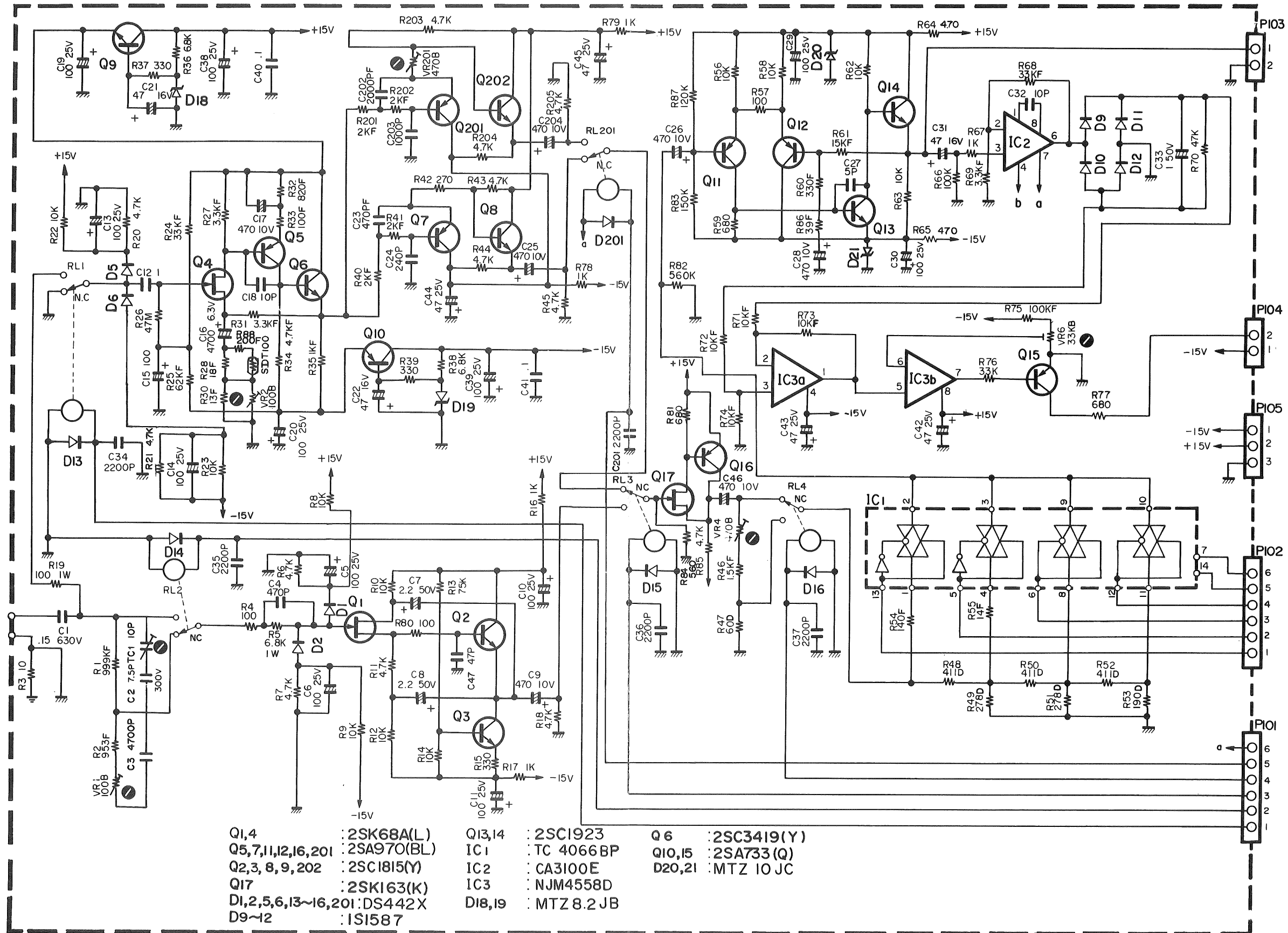
CIRCUIT DIAGRAM

FILTER UNIT (X70-1010-00)



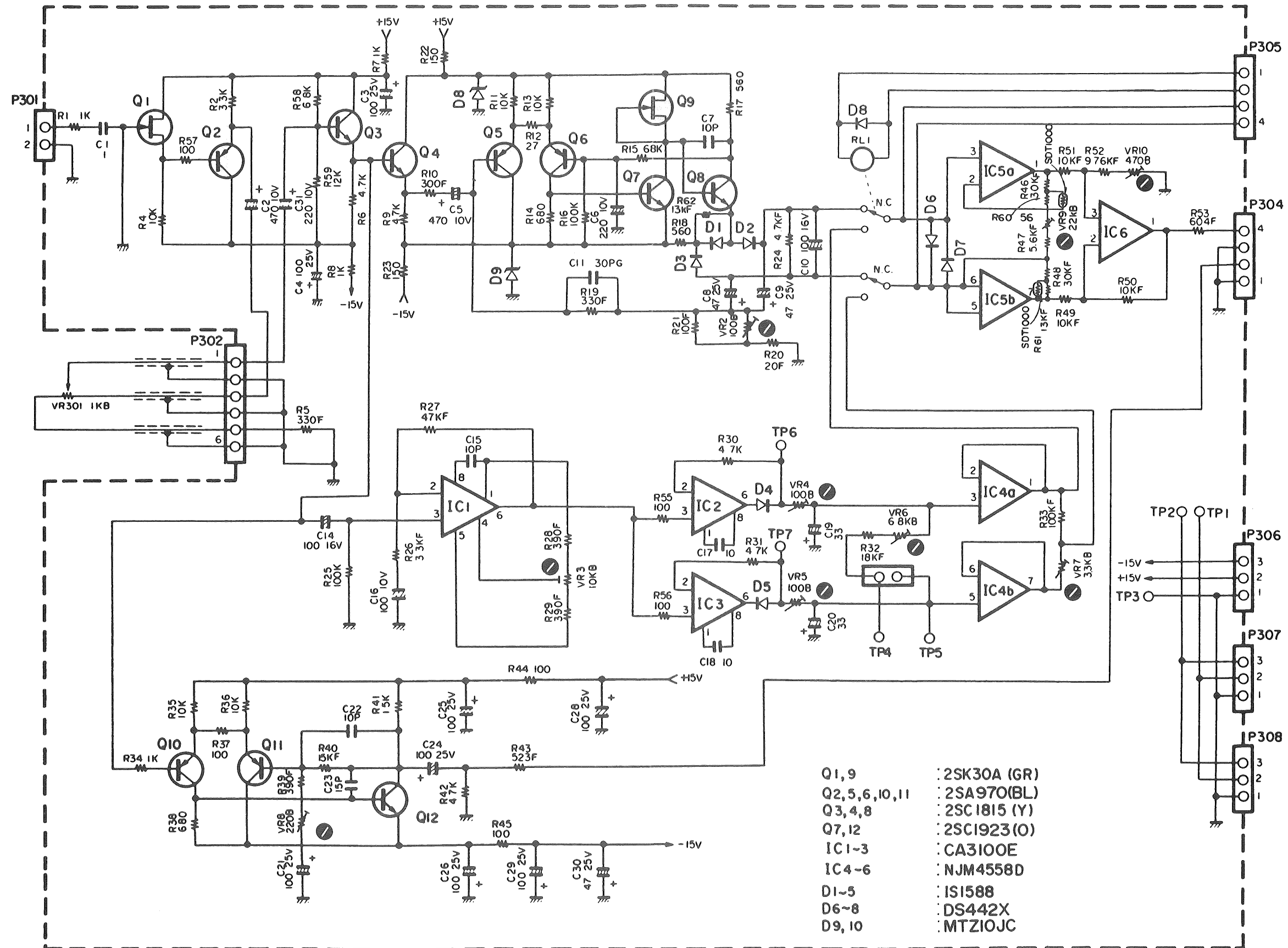
CIRCUIT DIAGRAM

INPUT UNIT (X73-1380-00)



CIRCUIT DIAGRAM

OUTPUT UNIT (X73-1390-00)

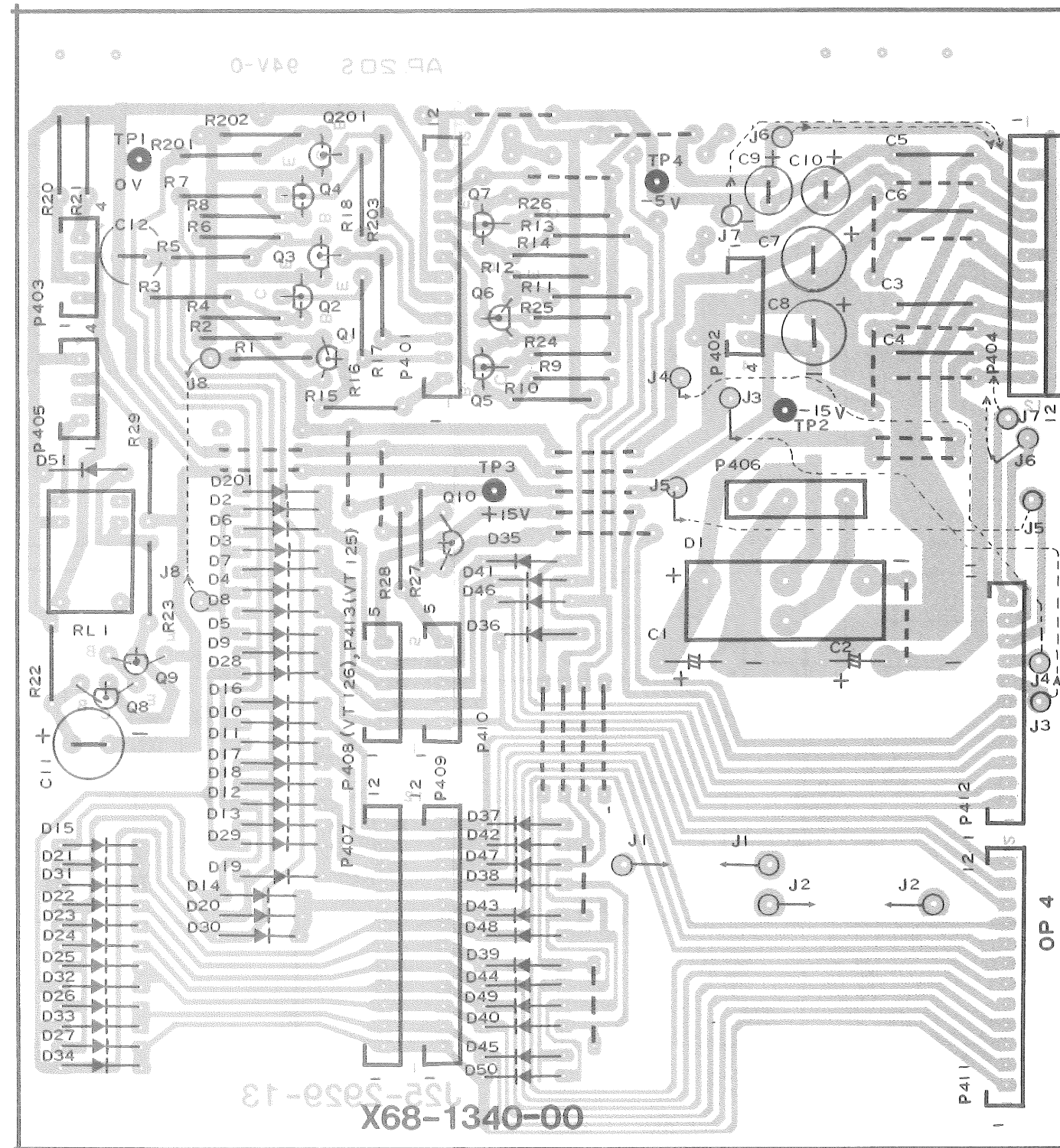


- | | |
|------------------|---------------|
| Q1, 9 | : 2SK30A (GR) |
| Q2, 5, 6, 10, 11 | : 2SA970(BL) |
| Q3, 4, 8 | : 2SC1815 (Y) |
| Q7, 12 | : 2SC1923(O) |
| IC1-3 | : CA3100E |
| IC4-6 | : NJM4558D |
| D1-5 | : 1S1588 |
| D6-8 | : DS442X |
| D9, 10 | : MTZ10JC |

P.C. BOARD

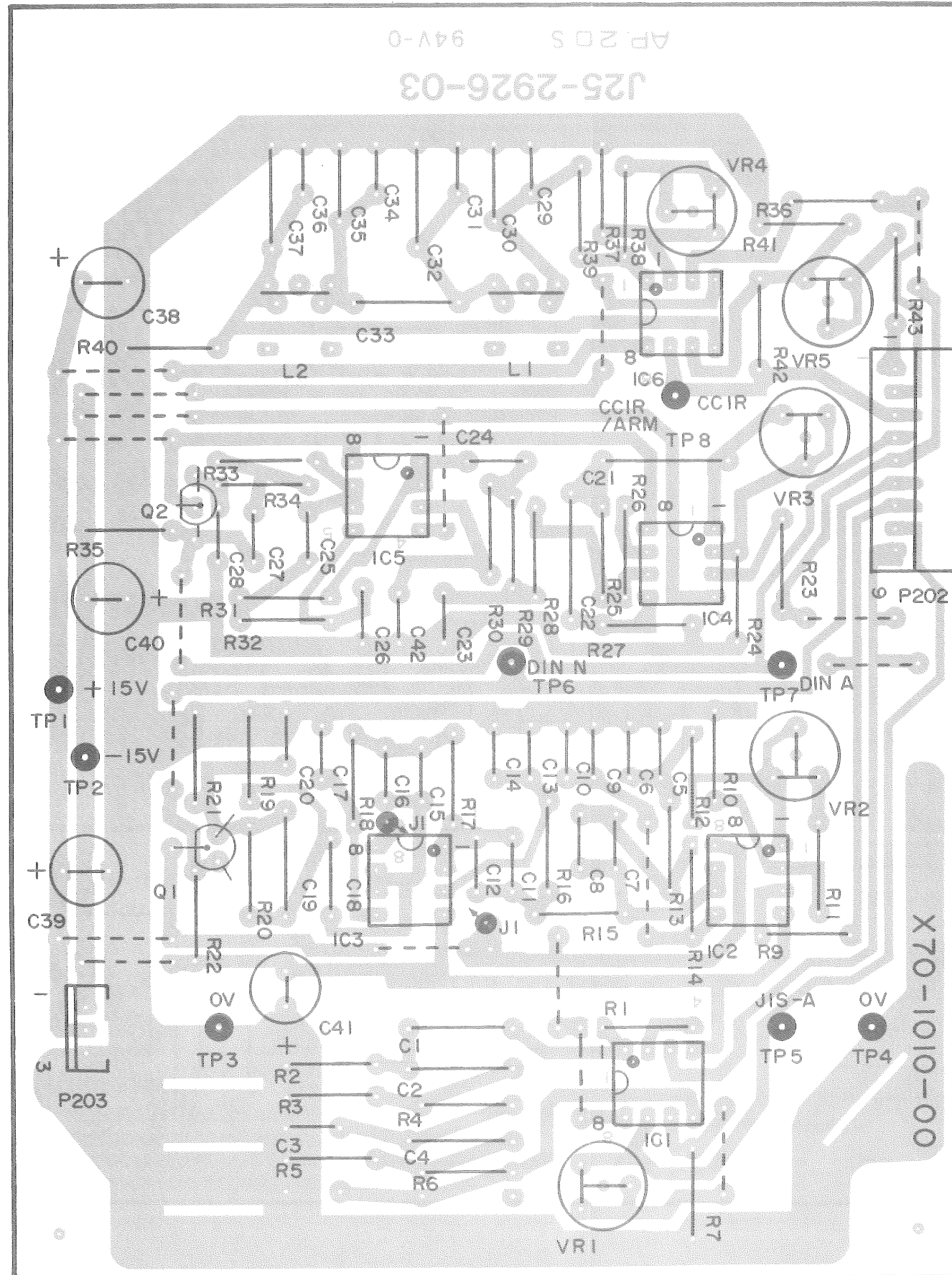
POWER & CONTROL UNIT (X68-1340-00)

Parts side view

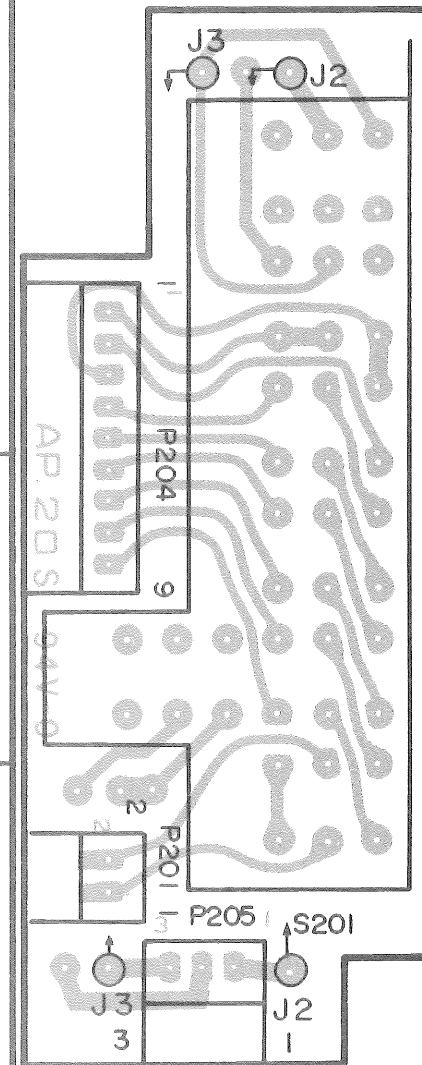


P.C. BOARD

FILTER UNIT (X70-1010-00)



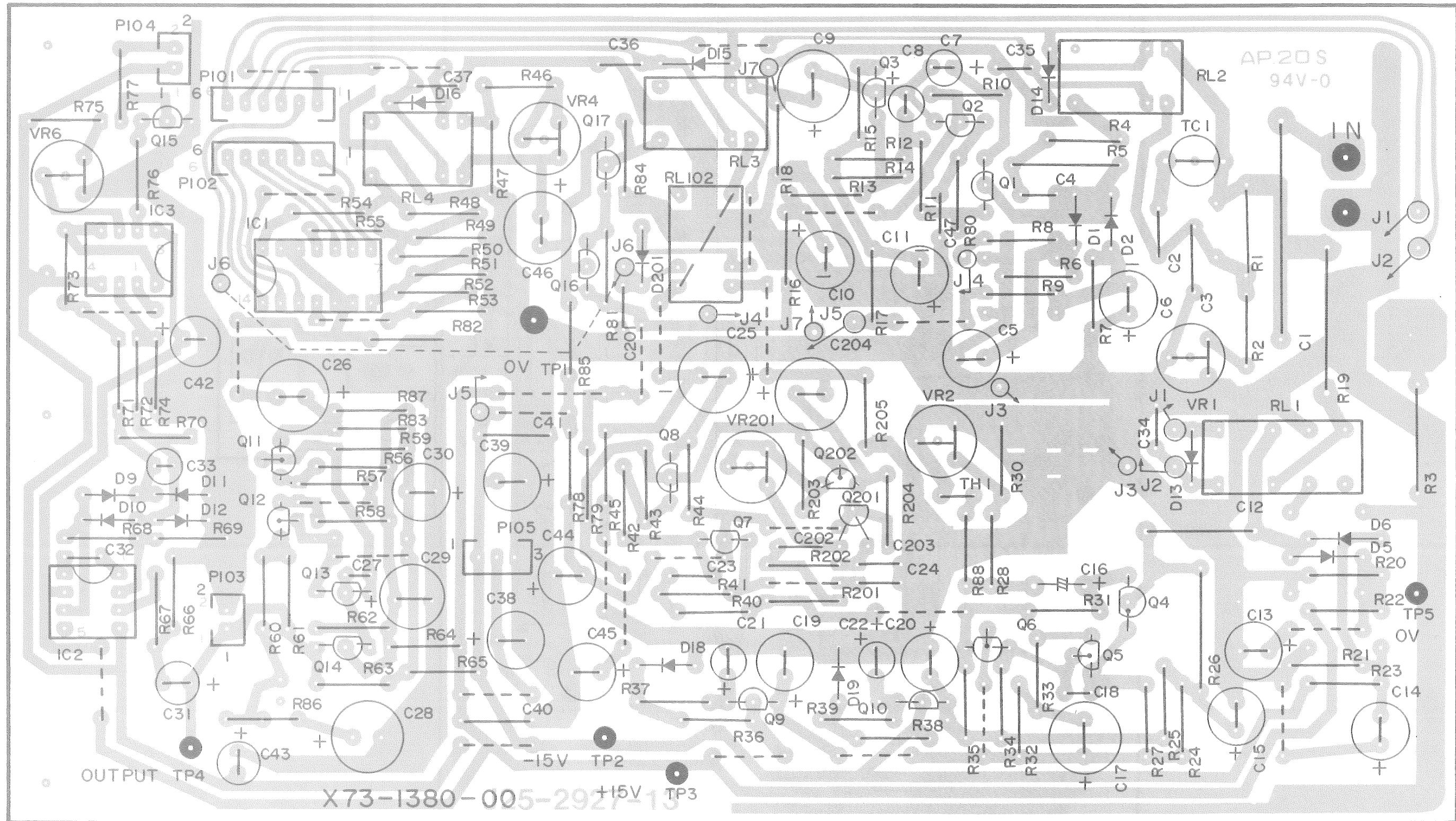
Pattern side view



P.C. BOARD

INPUT UNIT (X73-1380-00)

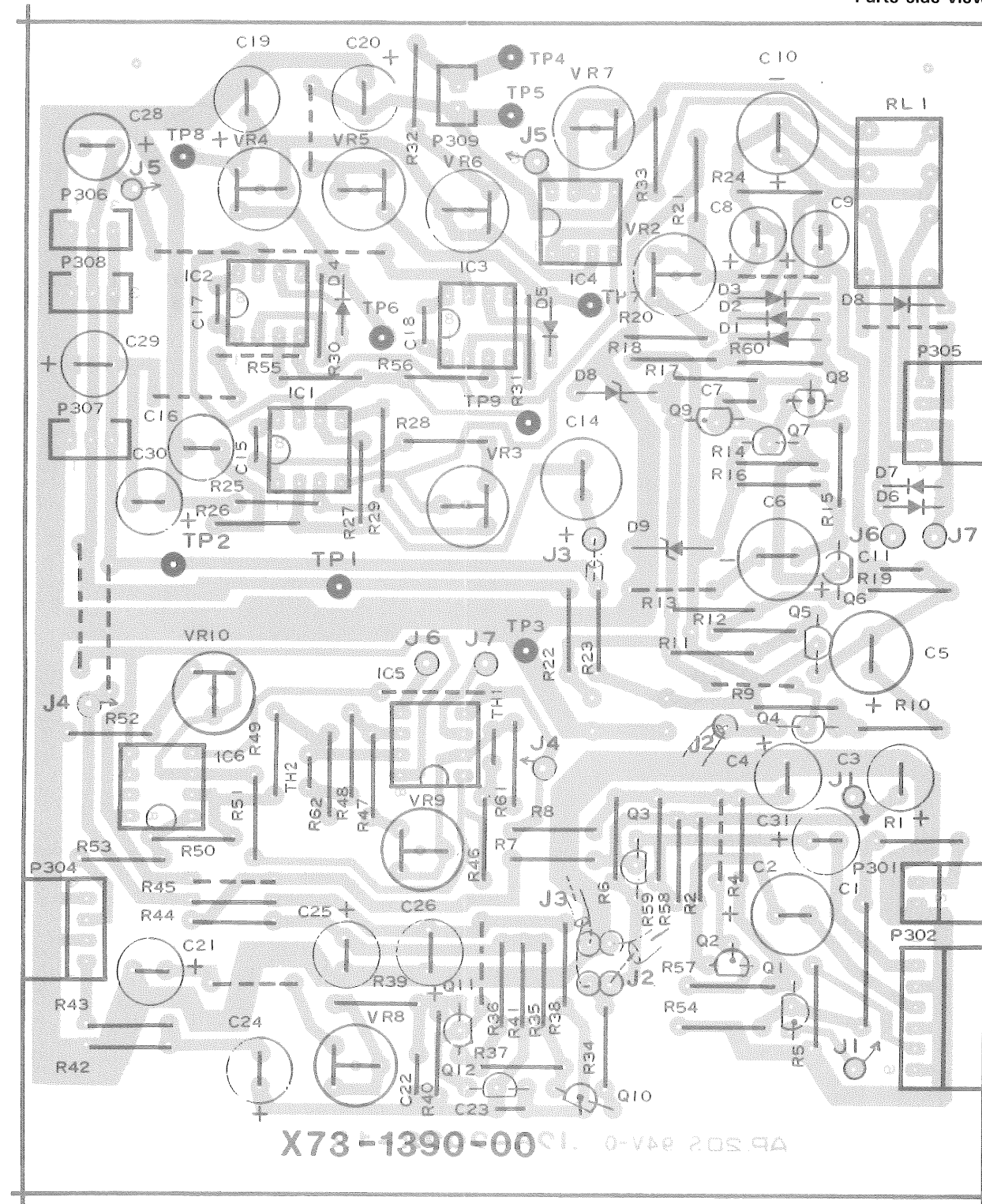
Pattern side view



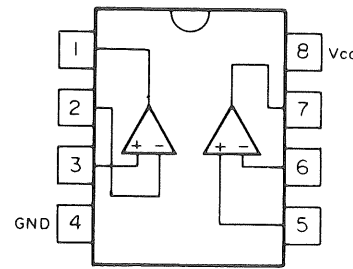
P.C. BOARD

OUTPUT UNIT (X73-1390-00)

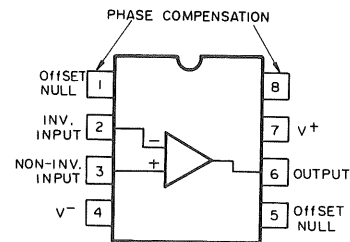
Parts side view



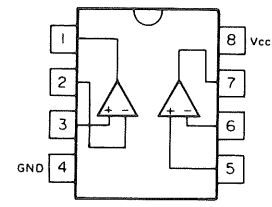
SEMICONDUCTORS



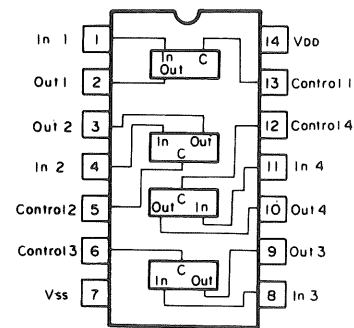
TL082CP



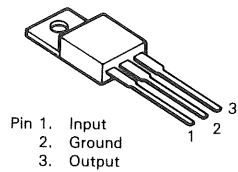
CA3100E



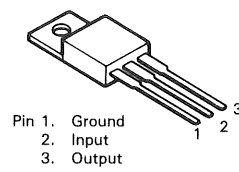
NJM4558D



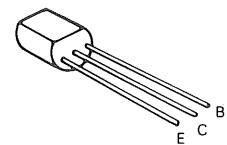
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MC14066BCP



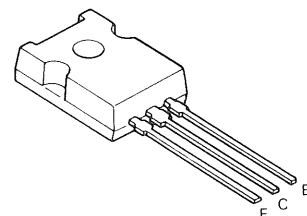
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LM7815CT



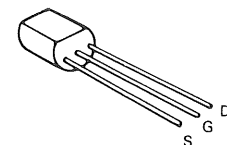
LM79M05CT
LM7915CT



2SA733 (Q)
2SA970 (BL)
2SC1815 (Y)
2SC1923 (O)

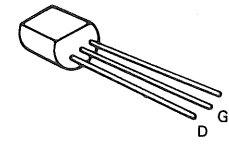


2SC3419 (Y)

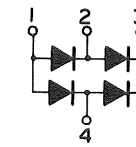
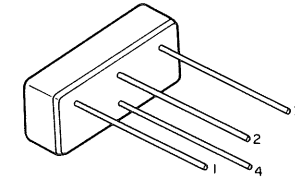


2SK30A (GR)

SEMICONDUCTORS



2SK68A (L)
2SK163 (K)



SIRBA40

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KENWOOD CORPORATION
17-5, 2-chome, Shibuya, Shibuya-ku, Tokyo 150, Japan