

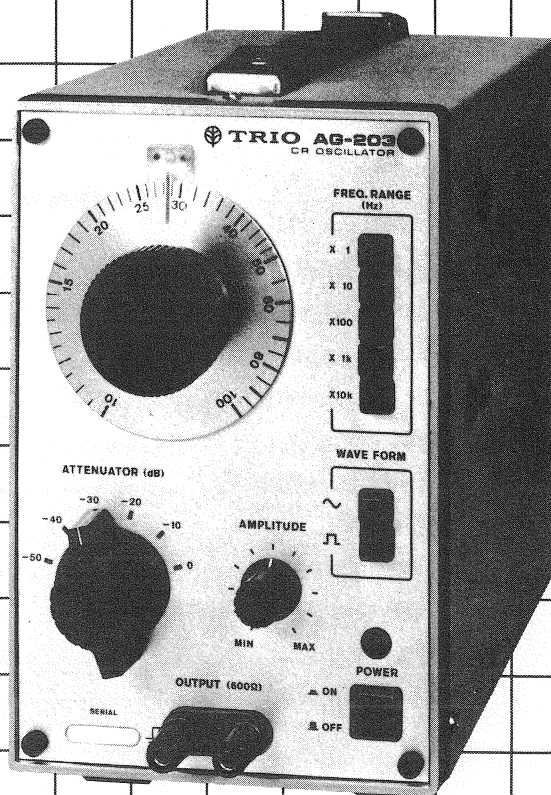


TRIO

SERVICE MANUAL

AG-203

CR OSCILLATOR



OUTLINES/CONTENTS

OUTLINES

MODEL AG-203 is the most popular audio generator which offers the highest performance characteristics such as wide frequency range, high output, and low distortion factor. The oscillating frequency is continuously variable from 10 Hz to 1 MHz, maximum output voltage is 7V rms, and output impedance is only 600Ω.

This type of audio generator is applicable to acoustic measurements for frequency and phase characteristics and for distortion factor. It is also used as a modulation signal source.

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SPECIFICATIONS

Frequency Range	
x 1 Range	10 Hz ~ 100 Hz
x 10 Range	100 Hz ~ 1 kHz
x 100 Range	1 kHz ~ 10 kHz
x 1 k Range	10 kHz ~ 100 kHz
x 10 k Range	100 kHz ~ 1 MHz
Frequency Accuracy	$\pm(3\% + 1 \text{ Hz})$

SINE WAVE CHARACTERISTICS

Output Voltage (no load)	7V rms or more
Frequency Characteristic 10 Hz ~ 1 MHz	$\pm 0.5 \text{ dB}$
(Reference Frequ 1 kHz)	
Distortion Factor	
400 Hz ~ 20 kHz	0.1% or less
100 Hz ~ 100 kHz	0.3% or less (10 range for 100 Hz)
50 Hz ~ 200 kHz	0.5% or less
20 Hz ~ 500 kHz	1% or less
10 Hz ~ 1 MHz	1.5% or less

SQUARE WAVE CHARACTERISTICS

Output Voltage (no load)	10V p-p or more
Sag	5% or less (at 50 Hz)
Rise and Fall Times	200ns or less
Overshoot	2% or less (at 1 kHz, max. output)
Duty Ratio	50% $\pm 5\%$ (at 1 kHz, max. output)

EXTERNAL SYNCHRONIZATION CHARACTERISTICS

Synchronizing Range	$\pm 1\%/V$
Max. Allowable Input Voltage	10V rms
Input Impedance	Approx. 10 k Ω
Output Impedance	600 Ω $\pm 10\%$
Output Attenuator	0 dB, -10 dB, -20 dB, -30 dB, -40 dB and -50 dB in 6 steps (accuracy: $\pm 1 \text{ dB}$ at 600 Ω load)

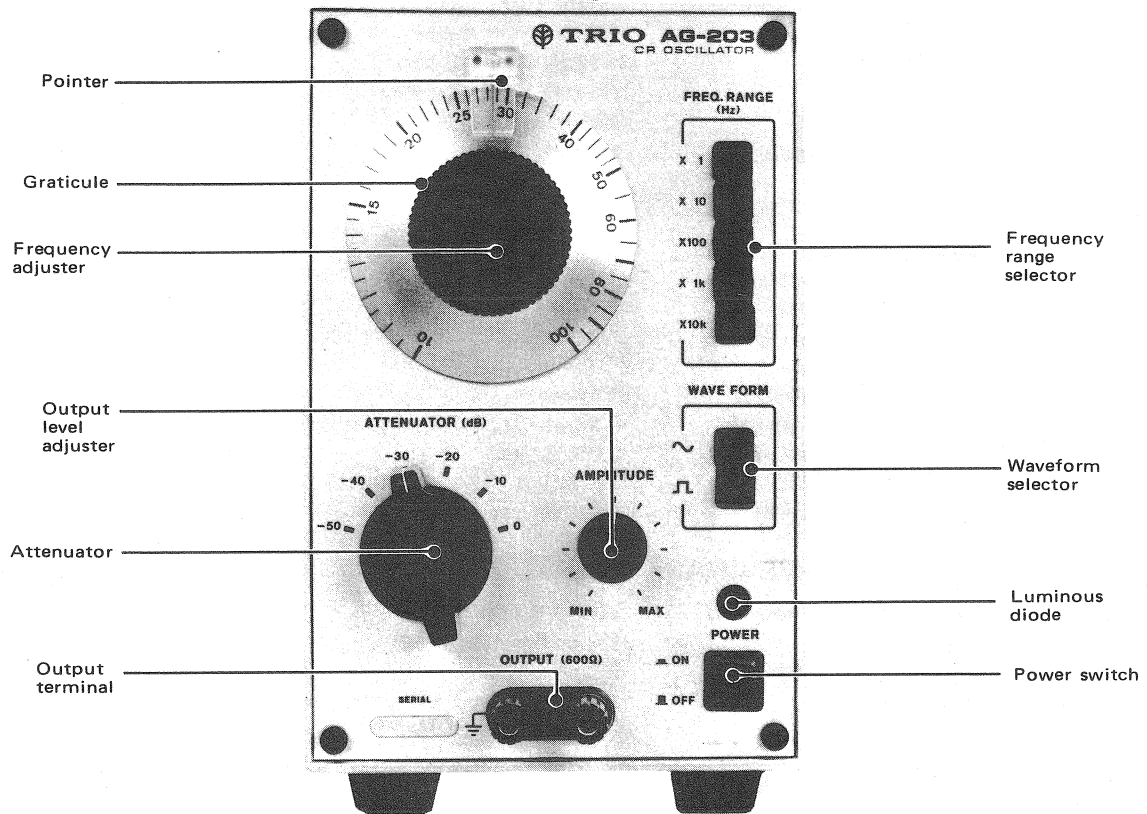
STABILITY AGAINST POWER SOURCE VOLTAGE VARIATION

(with respect to variation of 100V $\pm 10\%$)

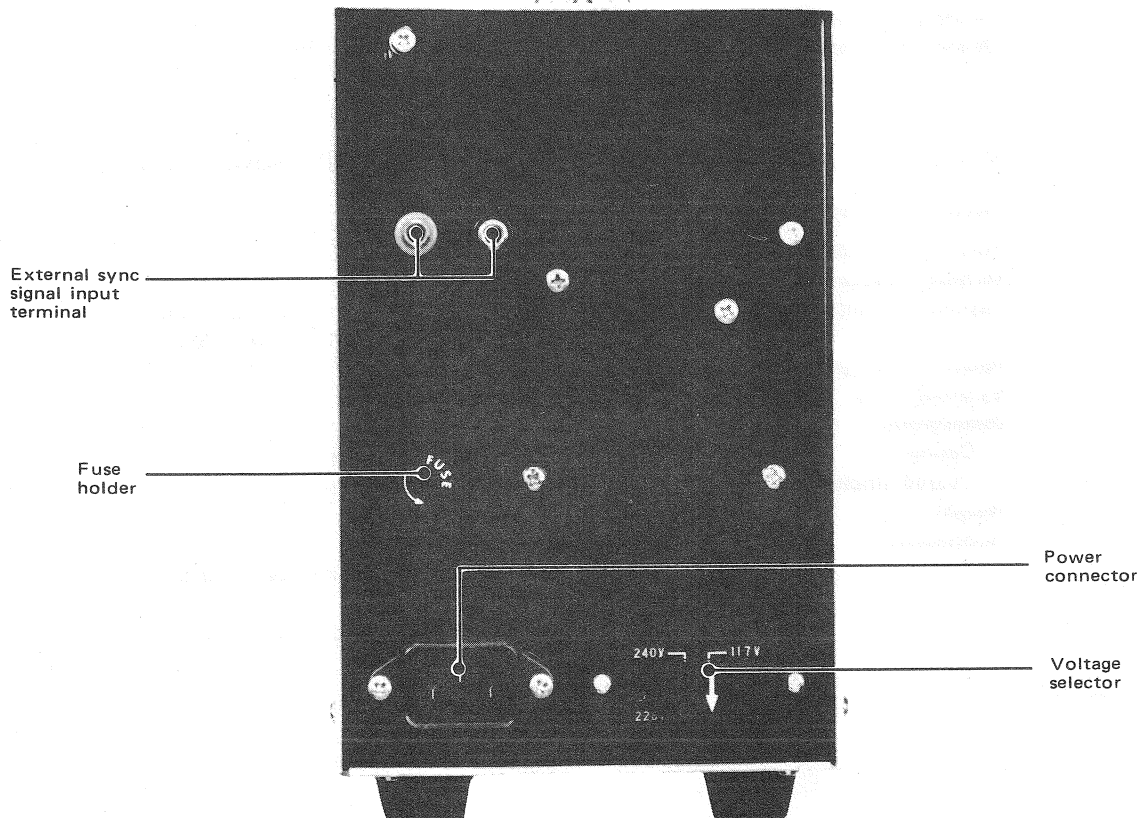
Frequency Drift	Within $\pm 0.5\%$
Output Voltage Variation	Within $\pm 0.5\text{dB}$
Operating Temperature	0 ~ 50°C (relative humidity: Less than 90%) AC 100V (120V, 220V or 240V), 50 ~ 60 Hz
Power Consumption	5 watts
External View	See Fig. 2 on page 9.
Dimensions	
Casing	128(W) x 238(D) x 190(H) mm
Overall (including knobs)	130(W) x 268(D) x 215(H) mm
Weight	2.9 kg
Accessories	Power cord (1) Output cord: one red and black test cord with basket clip and banana plug Banana plug: red (1) and black (1) Fuse: 0.1A (2) and 0.2A (2) Instruction manual (1)

EXTERNAL AND NAME OF PARTS

Front Panel



Rear Panel



CIRCUIT DESCRIPTION

1. SUMMARY

When reading the following descriptions, refer to the block diagram (Fig. 1) and the schematic diagram.

The sine wave signal generated by the Wien bridge oscillator circuit is fed through the WAVEFORM selector switch set to the “~” position to the OUTPUT control, by means of which it is adjusted to any desired voltage.

If the WAVEFORM switch is in the “□” position, the sine wave signal is shaped into the square wave and the voltage is also adjusted by the OUTPUT control.

The signal voltage thus adjusted is applied to the output circuit, where its impedance is appropriately converted, and then delivered through an output attenuator to the output terminal. The attenuator provides selectable attenuations of 0 dB through -50 dB in 10 dB steps at 600Ω of output impedance.

2. WIEN BRIDGE OSCILLATOR CIRCUIT

The Wien bridge oscillator circuit elements consist of the resistance elements, which may be switched over for 5 ranges by the FREQ. RANGE switch, and the variable capacitor controlled by the FREQUENCY dial.

These elements provide a means of varying the oscillating frequency continuously over 10 times its frequency in one range, thus determining any desired frequency within the entire frequency range from 10 Hz to 1 MHz.

The amplifier circuit for the oscillator circuit is composed of a 2-stage differential amplifier and an output stage, employing a DC amplifier circuit. The first stage is a high input impedance circuit with FET while the driver stage is a wide band, high amplification type circuit with PNP transistors featuring high cut-off frequency. The output stage is an SEPP circuit using complementary transistors. The output voltage is fed back in positive polarity through

the oscillator elements to form an oscillating circuit, while it is also fed back in negative polarity through the non-linear thermistor to stabilize the amplitude.

3. SQUARE WAVE SHAPING CIRCUIT

The square wave shaping circuit is a Schmidt-trigger circuit in which the sine wave signal from the oscillator circuit is shaped into a square wave. It is composed of an emitter coupled Schmidt-trigger circuit and a buffer amplifier, thus providing sufficient rising and falling characteristics.

4. OUTPUT CIRCUIT

The output circuit converts the impedance of signal from the OUTPUT control and feeds the signal to the output attenuator at a low impedance. It is an SEPP-OCL circuit employing complementary transistors to provide sufficiently low output impedance characteristics over the range from DC to 1 MHz.

5. OUTPUT ATTENUATOR

The 6-position output attenuator selects attenuations of 0 dB to -50 dB in 10 dB steps. In the 0 dB position with the OUTPUT control turned fully clockwise, the output voltage (sine wave at no-load time) is more than 7V rms.

6. POWER SUPPLY

The power supply circuit is powered by AC 240V (100V, 120V or 220V) and delivers DC±22V sufficiently stabilized by large-capacity smoothing capacitors (2200μF x 2) and a voltage stabilizer.

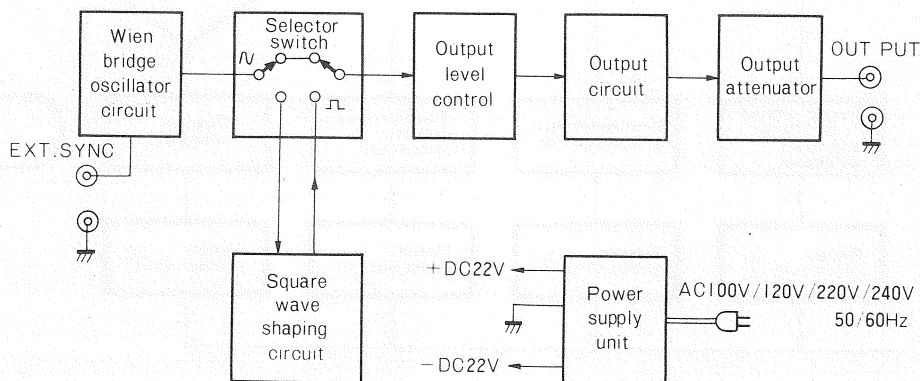
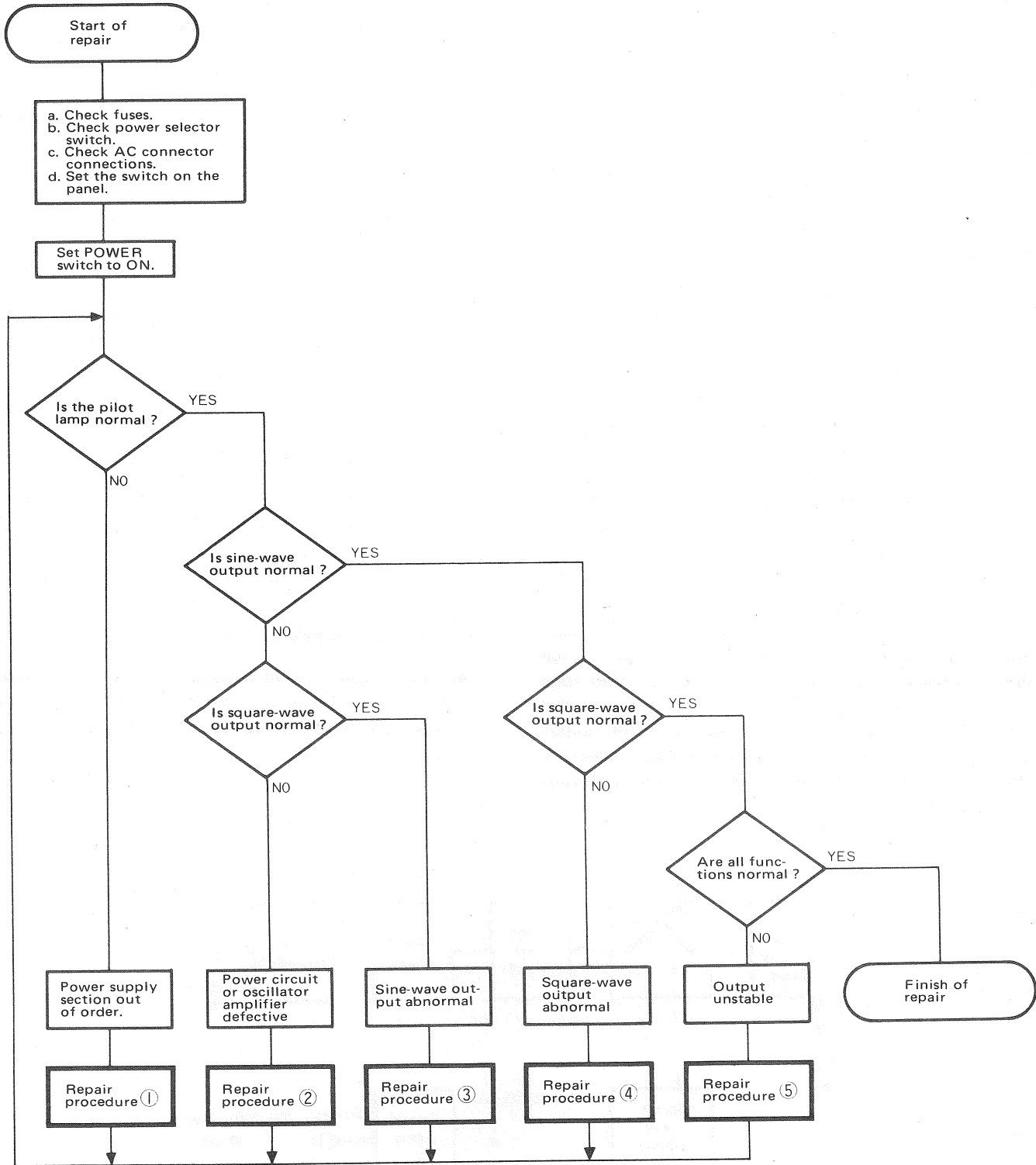


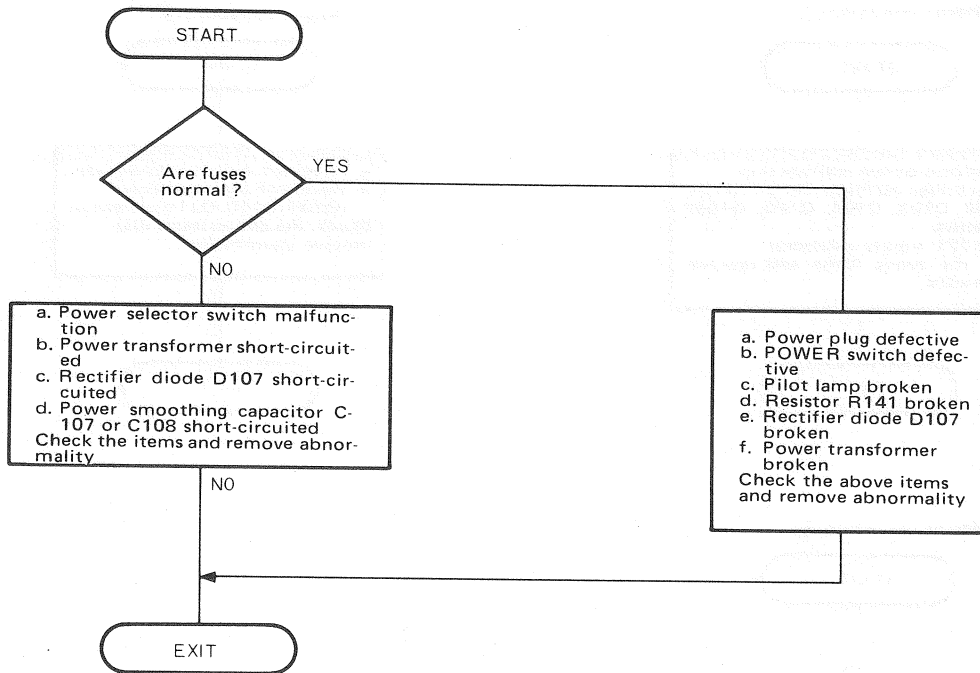
Fig. 1 Block Diagram

TROUBLESHOOTING

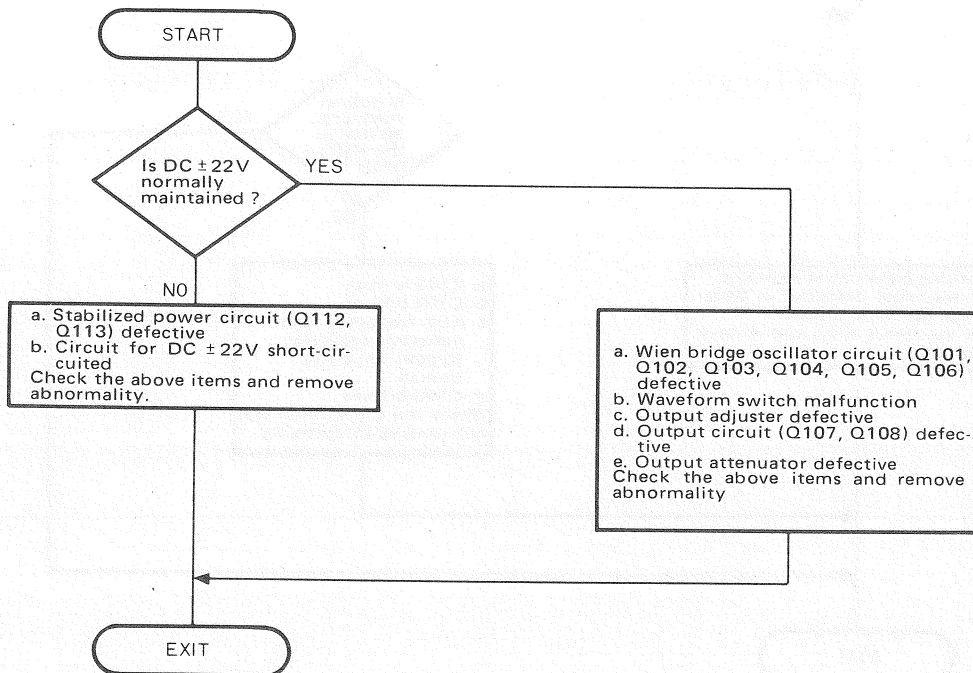


TROUBLESHOOTING

Repair procedure ①

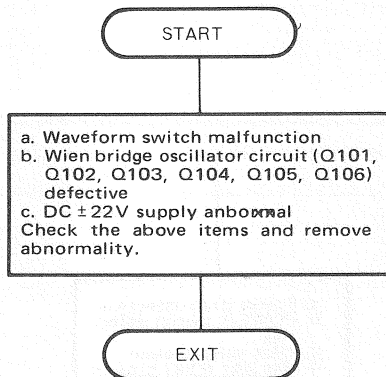


Repair procedure ②

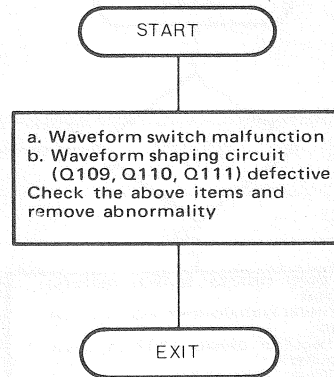


TROUBLESHOOTING

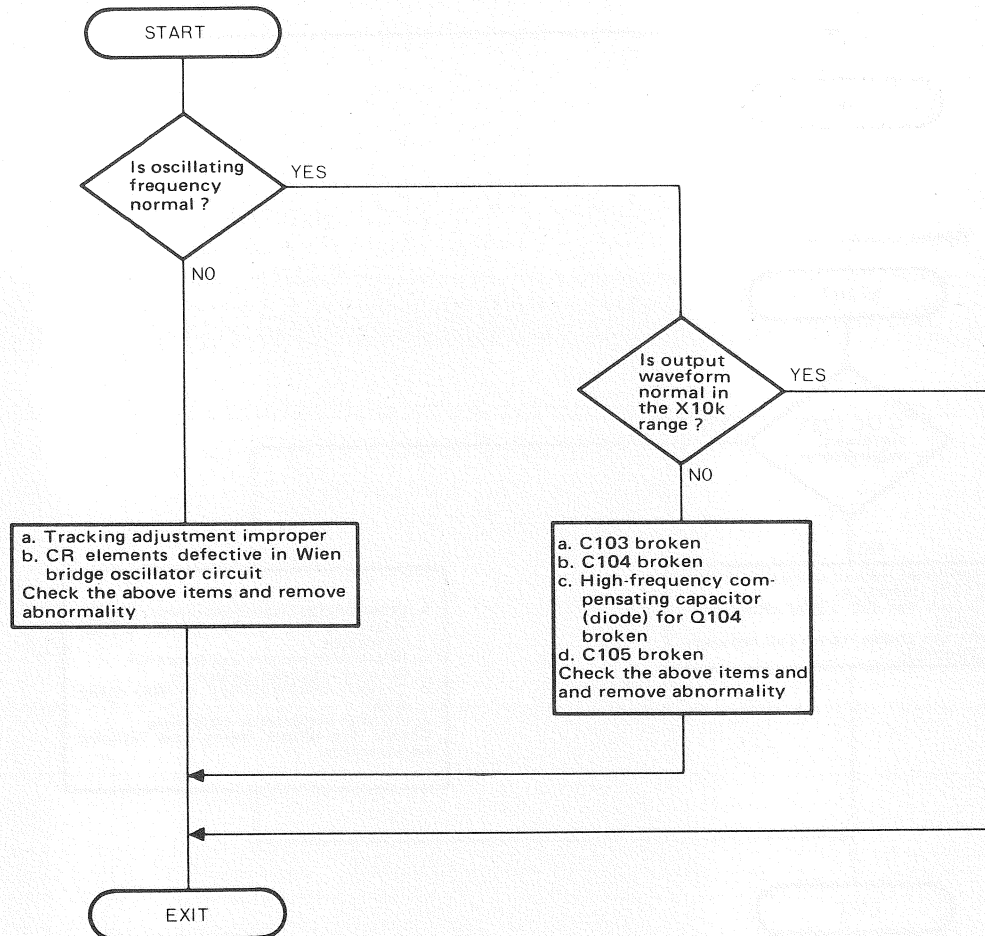
Repair procedure ③



Repair procedure ④



Repair procedure ⑤



ADJUSTMENTS

All the circuits of AG-203 are factory adjusted prior to shipment and no further adjustments are required, except for the frequency dial which may need readjustment for proper tracking, although this dial is also preadjusted at the factory. If readjustment is required, proceed to the adjusting work using accurate test equipment. Note that the power supply voltage must be calibrated before making adjustment (See Fig. 2).

1. Connect a frequency counter to OUTPUT terminal (4).
2. Remove the knob of the frequency dial, then loosen the set-screws on the dial.
3. Set FREQ. RANGE switch (6) to X 100 and adjust the shaft of the dial until the frequency counter indicates 1 kHz.
4. Set the dial to "10" position and tighten the set-screws, making sure that the shaft stays as it is. Check that the frequency counter is indicating 1 kHz, then secure the knob to the dial.
5. Set the dial to "100" position and adjust TC101 for a reading of 10 kHz on the frequency counter.
6. Set FREQ. RANGE switch (6) to X 1 and the frequency dial (8) to "10" position. Adjust VR101 until the frequency counter indicates 10 Hz.
7. Set FREQ. RANGE switch (6) to X 10k and the frequency dial (8) to "100" position. Adjust TC102 to 1 MHz on the frequency counter.

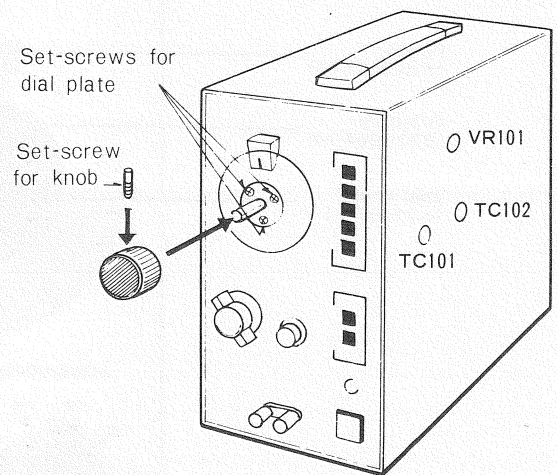
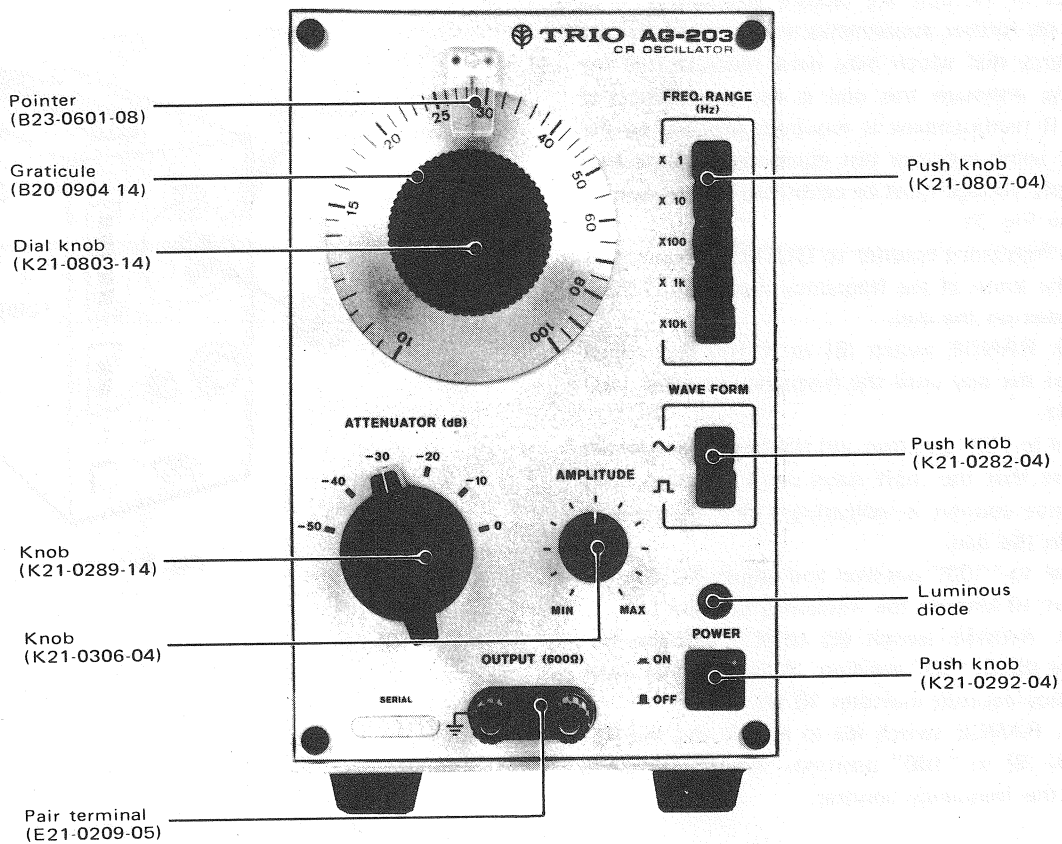


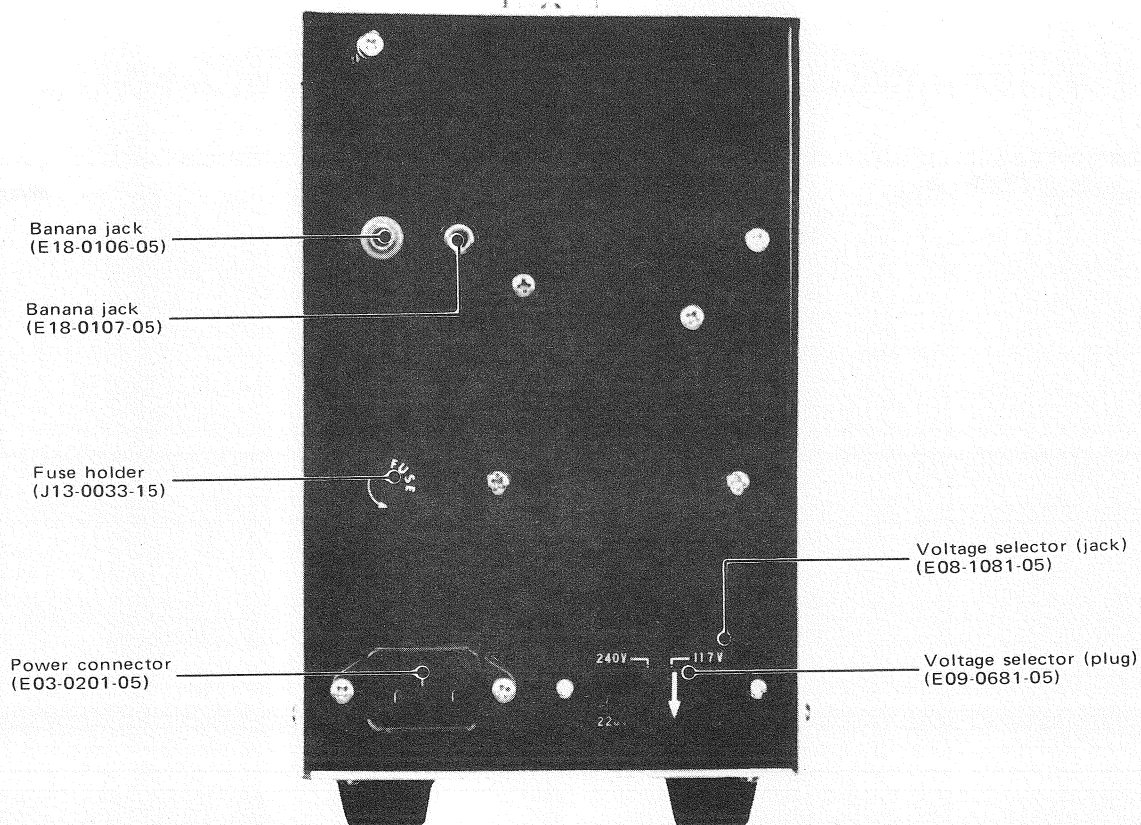
Fig. 2

PARTS ALIGNMENT

Front Panel

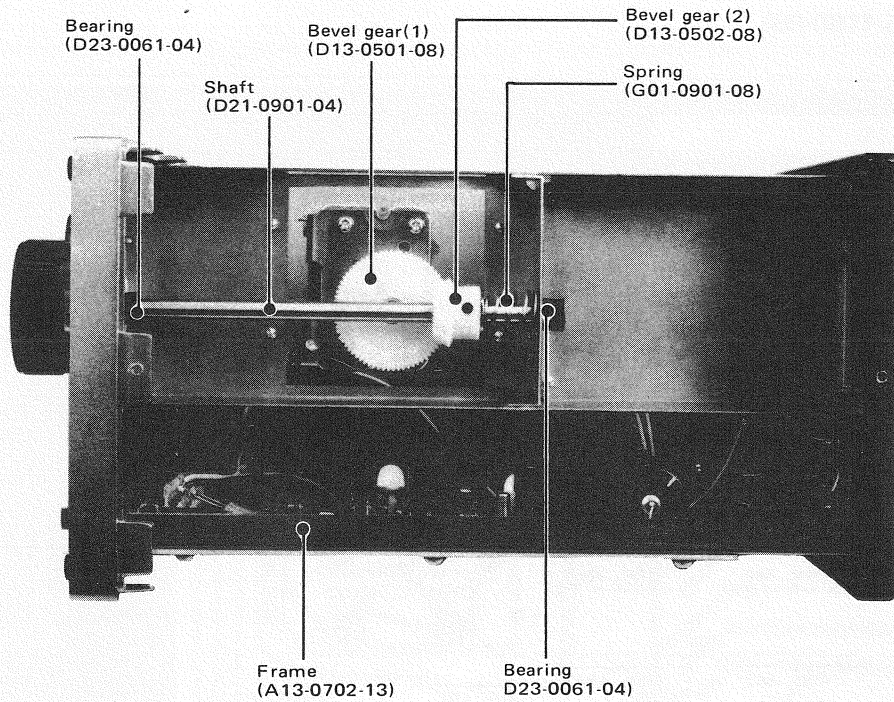


Rear Panel

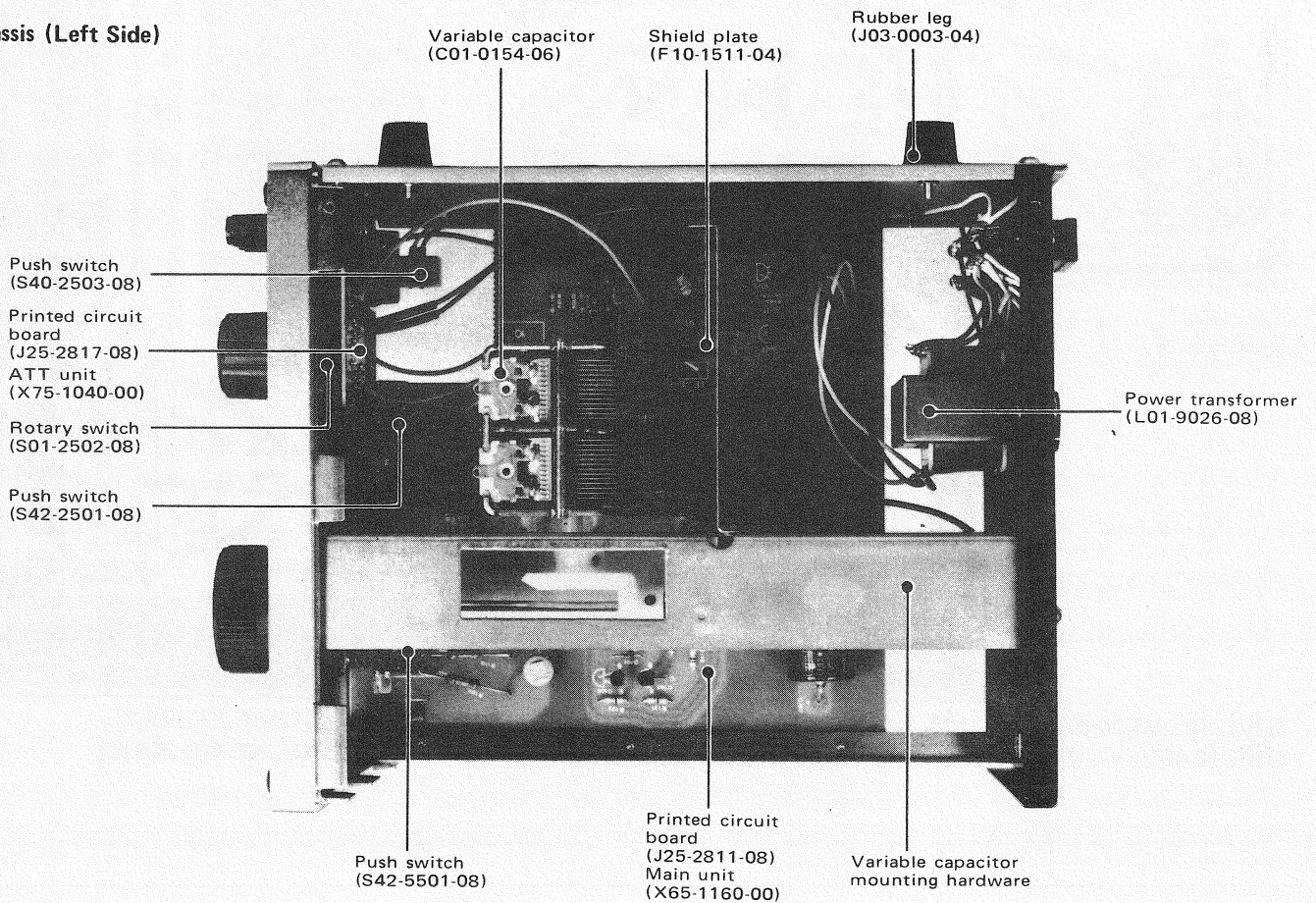


PARTS ALIGNMENT

Chassis (Upper)

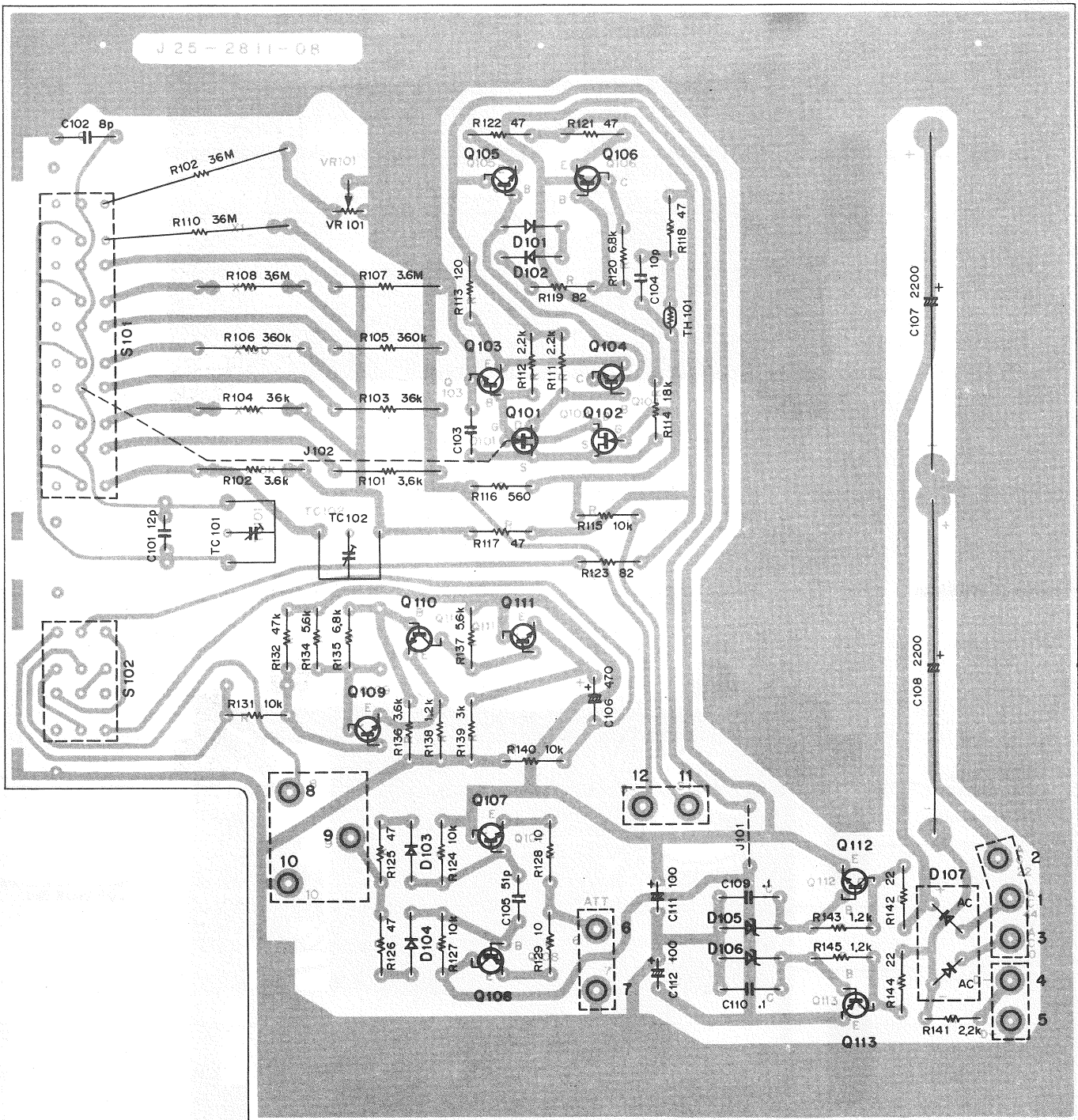


Chassis (Left Side)



PC BOARD

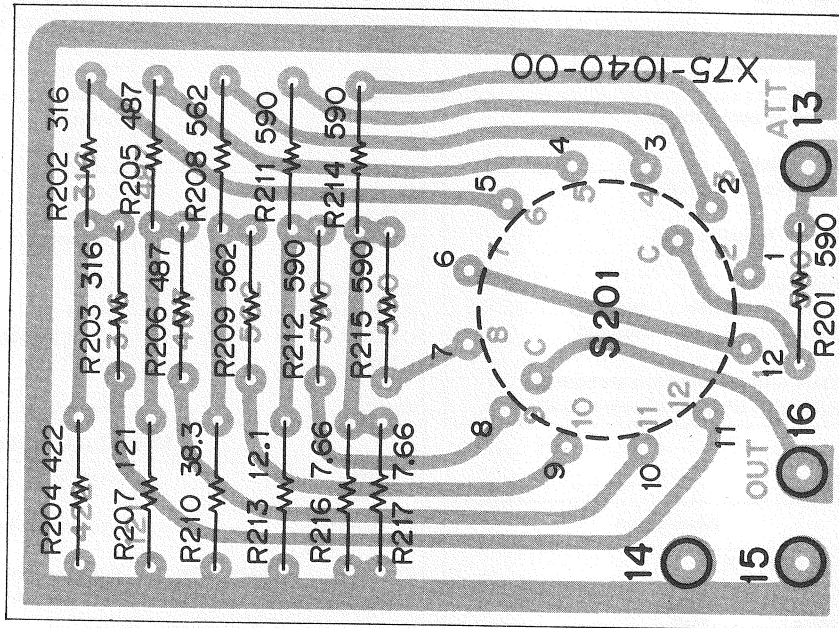
MAIN UNIT (X65-1160-00)



Q101, 102:MK10-(E), Q103, 104:2N4248, Q105, 110, 111:2SC1222(Y), Q106:2SA640(Y), Q107:2SC495(Y),
 Q108:2SA505(Y), Q109:2N2369A, Q112:2SC1096, Q113:2SA634, D101~104:1S1588, D105, 106:RD-24A(L)

PC BOARD

ATT UNIT (X75-1040-00)



PARTS LIST

TOTAL

Ref. No.	Parts No.	Description	Ref. No.	Parts No.	Description
MISCELLANEOUS					
—	A01-0809-12	Case	—	E03-0201-05	Power connector
—	A10-1409-13	Chassis	—	E08-1081-05	Voltage selector (jack)
—	A13-0702-13	Frame	—	E09-0681-05	Voltage selector (plug)
—	A20-2708-03	Panel	—	E18-0106-05	Terminal, type banana
—	A21-0811-08	Ornament panel	—	E18-0107-05	Terminal, type banana (black)
—	A23-1606-03	Rear panel	—	E21-0209-05	Pair terminal
—	A40-0703-03	Bottom plate	—	E30-0095-05	Cord (black)
—	B07-0189-04	Push escutcheon	—	E30-0096-05	Cord (red)
—	B07-0190-04	Push escutcheon	—	E91-0003-05	Mini-gator clip with black insulator
—	B20-0904-14	Graticule	—	E91-0004-05	Mini-gator clip with red insulator
—	B23-0601-08	Pointer	—	E91-0016-05	Banana tip (black)
—	B40-2703-04	Serial plate	—	E91-0015-05	Banana tip (red)
—	B41-0702-04	Voltage indication label	—	F05-2012-05	Fuse (0.2A)
—	B50-2818-00	Instruction manual	—	F05-1012-05	Fuse (0.1A)
VC1a, b	C01-0154-05	Variable capacitor	—	F10-1511-04	Shield plate
—	D13-0501-08	Bevel gear (1)	—	G01-0901-08	Spring
—	D13-0502-08	Bevel gear (2)	—	H01-2812-08	Packing case (individual packing)
—	D21-0901-04	Shaft	—	H10-2802-02	Packing material, foamed styrene
—	D23-0061-04	Bearing	—	H20-1703-08	Protection cover
			—	H25-0801-08	Polyethylene bag

PARTS LIST

Ref. No.	Parts No.	Description
-	J03-0003-04	Rubber leg
-	J13-0033-15	Fuse holder
-	J21-2820-04	Variable capacitor mounting hardware
-	J42-0038-04	Hall bush
-	K01-0058-25	Grip
-	K21-0282-04	Knob (push)
-	K21-0289-14	Knob
-	K21-0292-04	Knob (push) (orange)
-	K21-0306-04	Knob
-	K21-0803-04	Dial knob
-	K21-0807-04	Knob (push) (blue)
-	L01-9026-08	Power transformer
-	S40-2503-08	Push switch
-		Variable resistor 5kΩ (B)
-		Luminous diode BU-107
-	X65-1160-00	Main unit (Printed circuit board)
-	X75-1040-00	ATT unit (Printed circuit board)

MAIN UNIT (X65-1160-00)

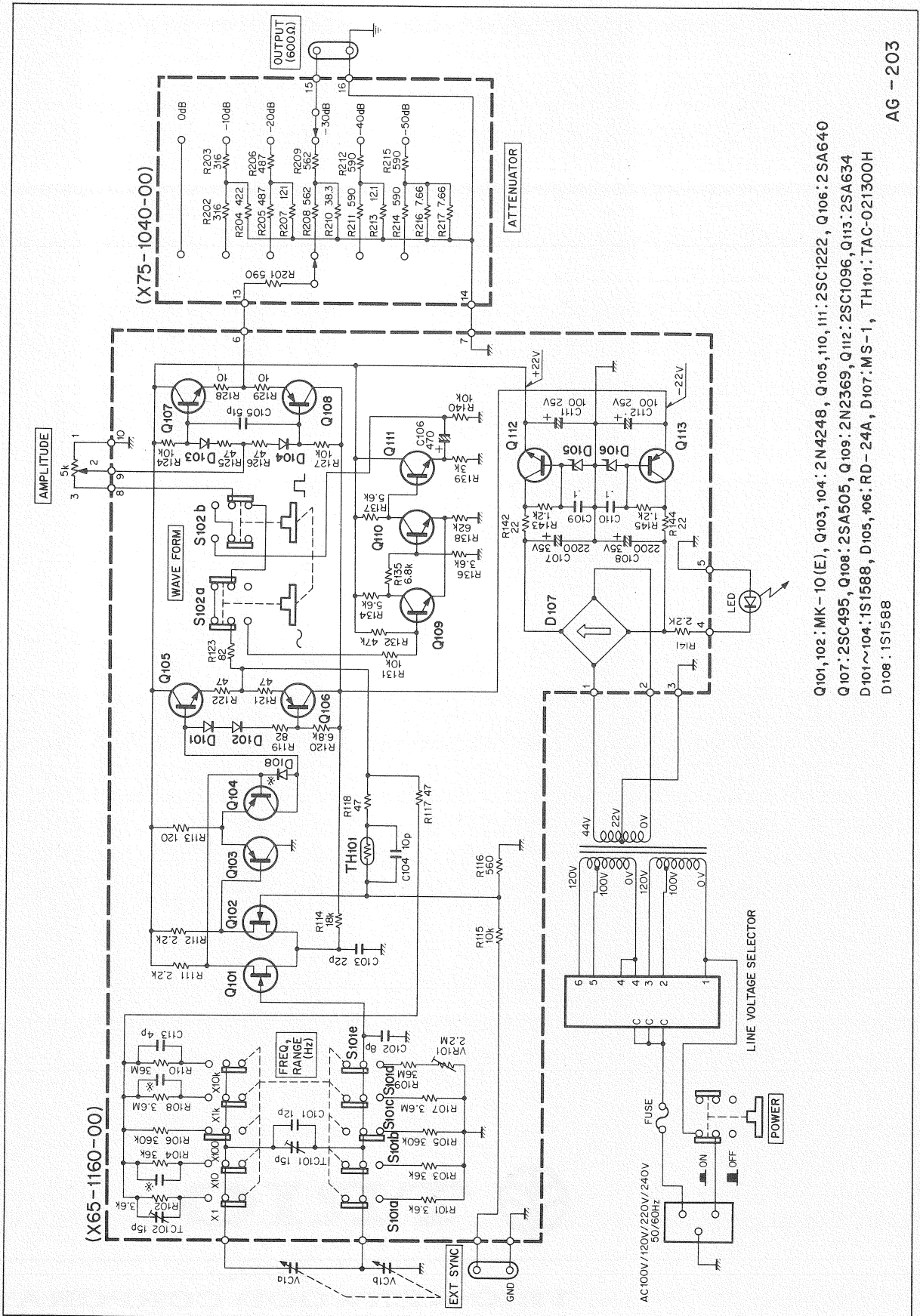
Ref. No.	Parts No.	Description
CAPACITOR		
C101		Mica 12pF
C102		Mica 8pF
C103		Mica 22pF
C105		Mica 51pF
C106		Electrolytic 470μF 25V
C107, 108		Electrolytic 2200μF 35V
C109, 110		Mylar 0.1μF
C111, 112		Electrolytic 100μF 25V
C113		Mica 4pF
C104		Mica 10pF
RESISTOR		
R101, 102		Metal film 3.6kΩ ±1% 1/4W
R103, 104		Metal film 36kΩ ±1% 1/4W
R105, 106		Metal film 360kΩ ±1% 1/4W
R107, 108		Metal film 3.6MΩ ±1% 1/4W
R109, 110		Metal film 36MΩ ±1% 1/4W
R111, 112	PD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W
R113	PD14BY2E121J	Carbon 120Ω ±5% 1/4W
R114	PF14BY2E183J	Carbon 18kΩ ±5% 1/4W
R115	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W
R116	PD14BY2E561J	Carbon 560Ω ±5% 1/4W
R117, 118	PD14BY2E470J	Carbon 47Ω ±5% 1/4W
R119	PD14BY2E820J	Carbon 82Ω ±5% 1/4W
R120	PD14BY2E682J	Carbon 6.8kΩ ±5% 1/4W
R121, 122	PD14BY2E470J	Carbon 47Ω ±5% 1/4W
R123	PD14BY2E820J	Carbon 82Ω ±5% 1/4W
R124	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W
R125, 126	PD14BY2E470J	Carbon 47Ω ±5% 1/4W
R127	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W
R128, 129	PD14BY2E100J	Carbon 10Ω ±5% 1/4W
R131	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W
R132	PD14BY2E473J	Carbon 47kΩ ±5% 1/4W
R134	PD14BY2E562J	Carbon 5.6kΩ ±5% 1/4W
R136	PD14BY2E682J	Carbon 6.8kΩ ±5% 1/4W
R136	PD14BY2E362J	Carbon 3.6kΩ ±5% 1/4W
R137	PD14BY2E562J	Carbon 5.6kΩ ±5% 1/4W
R138	PD14BY2E122J	Carbon 1.2kΩ ±5% 1/4W
R139	PD14BY2E302J	Carbon 3.0kΩ ±5% 1/4W
R140	PD14BY2E103J	Carbon 10kΩ ±5% 1/4W
R141	PD14BY2E222J	Carbon 2.2kΩ ±5% 1/4W
R142	PD14BY2E220J	Carbon 22Ω ±5% 1/4W

Ref. No.	Parts No.	Description
R143	PD14BY2E122J	Carbon 1.2kΩ ±5% 1/4W
R144	PD14BY2E220J	Carbon 22Ω ±5% 1/4W
R145	PD14BY2E122J	Carbon 1.2kΩ ±5% 1/4W
SEMICONDUCTOR		
Q101, 102		Field effect transistor MK10-(E)
Q103, 104		Transistor 2N4248
Q105		Transistor 2SC1222(Y)
Q106		Transistor 2SA640(Y)
Q107		Transistor 2SC495(Y)
Q108		Transistor 2SA505(Y)
Q109		Transistor 2N2369A
Q110, 111		Transistor 2SC1222(Y)
Q112		Transistor 2SC1096
Q113		Transistor 2SA634
D101~104		Diode 1S1588
D105, 106		Diode RD-24A(L)
D107		Diode bridge MS-1
D108		Diode 1S1588
TH101		Thermistor TAC-021300H
MISCELLANEOUS		
VR101		Semi-fixed resistor 2.2MΩB
TC101, 102		Trimmer 15pF
S101a~e	S42-5501-08	Push switch
S102a, b	S42-2501-08	Push switch
-	J25-2811-08	Printed circuit board

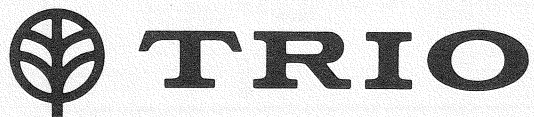
ATT UNIT (X75-1040-00)

Ref. No.	Parts No.	Description
RESISTOR		
R201		Metal film 590Ω ±1% 1/3W
R202, 203		Metal film 316Ω ±1% 1/3W
R204		Metal film 422Ω ±1% 1/3W
R205, 206		Metal film 487Ω ±1% 1/3W
R207		Metal film 121Ω ±1% 1/3W
R208, 209		Metal film 562Ω ±1% 1/3W
R210		Metal film 38.3Ω ±1% 1/3W
R211, 212		Metal film 590Ω ±1% 1/3W
R213		Metal film 12.1Ω ±1% 1/3W
R214, 215		Metal film 590Ω ±1% 1/3W
R216, 217		Metal film 7.66Ω ±1% 1/3W
MISCELLANEOUS		
S201, a, b	S01-2502-08	Rotary switch
-	J25-2817-08	Printed circuit board

SCHEMATIC DIAGRAM



- Q101, 102: MK-10(E), Q103, 104: 2N4248, Q105, 110, 111: 2SC1222, Q106: 2SA640
- Q107: 2SC495, Q108: 2SA505, Q109: 2N2369, Q112: 2SC1096, Q113: 2SA634
- D101~104: 1S1588, D105, 106: RD-24A, D107: MS-1, TH101: TAC-021300H
- D108: 1S1588



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