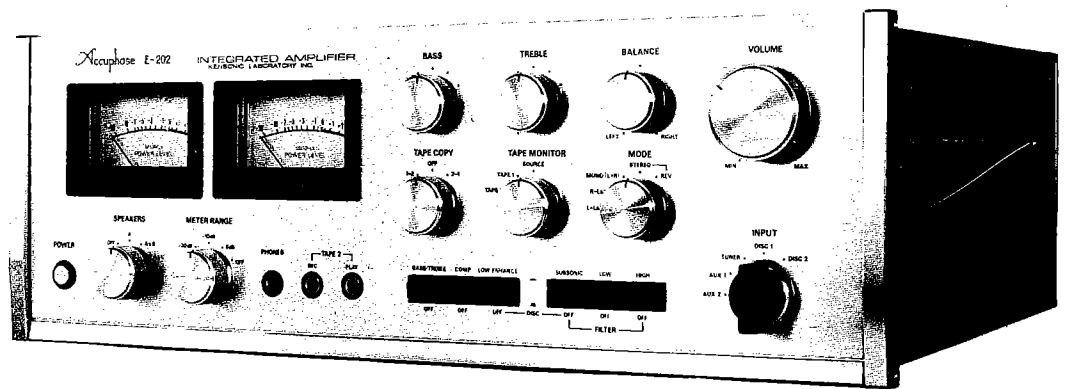


2

# Accuphase

INTEGRATED STEREO AMPLIFIER E-202



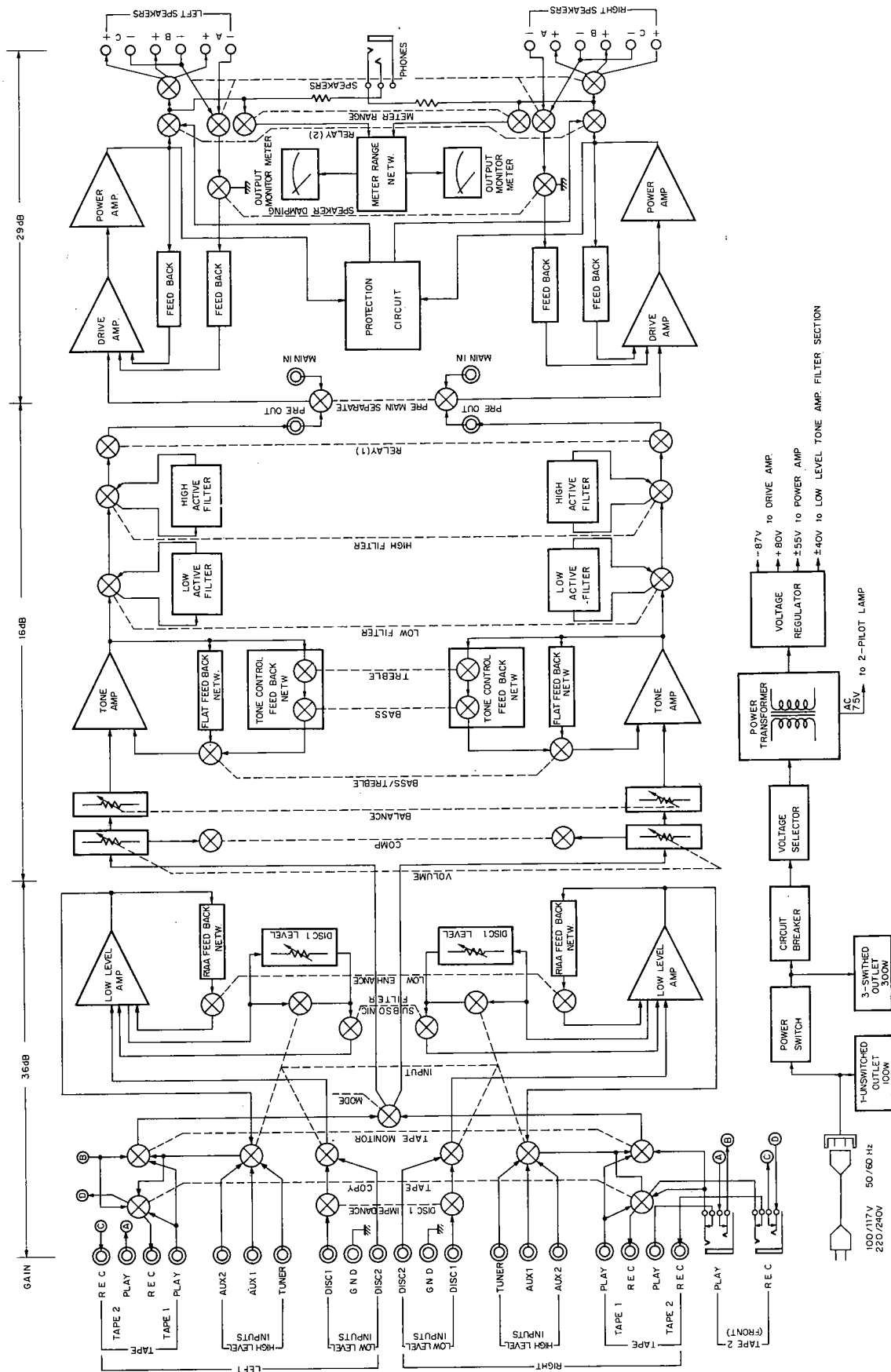
## Service Information

STARTING WITH SERIAL NO. E4Y001

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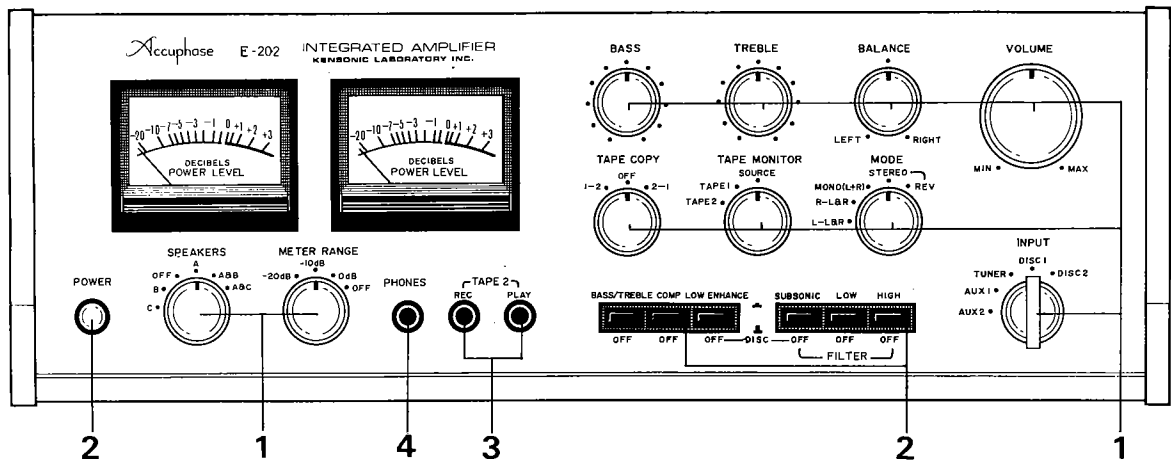
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# BLOCK DIAGRAM

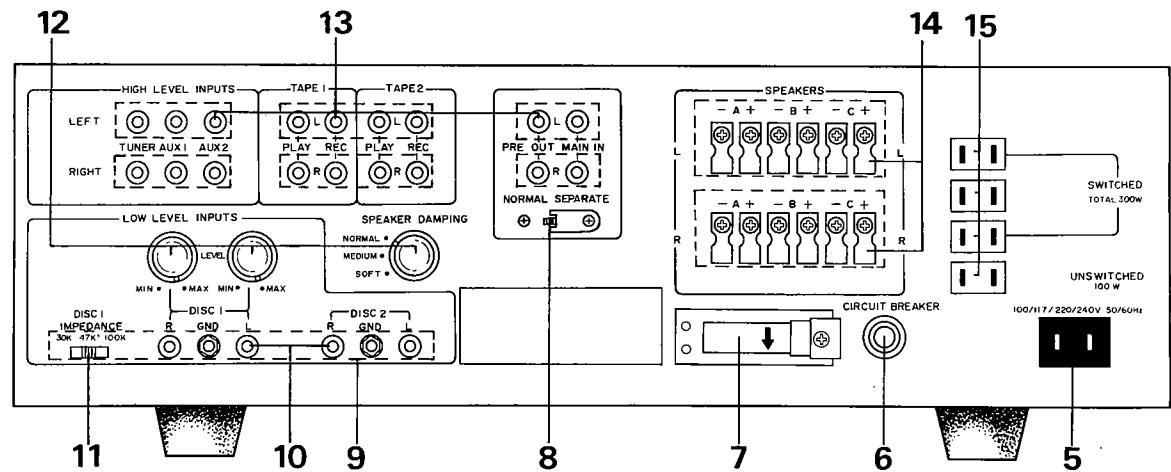


# EXTERNAL VIEW

## FRONT



## REAR



## PARTS LIST

| No. | Description  | Part No.                     | Remarks               |             |                      |
|-----|--|------------------------------|-----------------------|-------------|----------------------|
| 1   | Knob for VOLUME  | 381-4003-00                  | Ref. EXPLODED VIEW ⑩⑪ |             |                      |
|     | INPUT  | 381-3002-04                  |                       |             |                      |
|     | BALANCE, METER RANGE, BASS, TREBLE, MODE, TAPE COPY, TAPE MONITOR, SPEAKERS. | 381-2603-00                  |                       |             |                      |
|     | 2  | Push-button for Power Switch |                       | 389-1202-04 | Ref. EXPLODED VIEW ⑫ |
|     | 3  | Push Switch Assembly         |                       | 389-5001-04 |                      |
| 4   | Tape Jack  | 302-1301-00                  | for TAPE 2            |             |                      |
| 5   | Phone Jack   | 302-1201-00                  |                       |             |                      |
| 6   | AC Connector Plug  | 301-3201-00                  |                       |             |                      |
| 7   | Circuit Breaker  | 311-0051-00                  | 5A                    |             |                      |

| No. | Description                    | Part No.    | Remarks                            |
|-----|--------------------------------|-------------|------------------------------------|
| 7   | Voltage Selector Jack          | 302-4001-00 |                                    |
|     | Voltage Selector Plug          | 301-4001-00 |                                    |
|     | Voltage Selector Fixed Bracket | 248-0001-14 |                                    |
| 8   | Slide Switch                   | 350-1201-00 | for Separate SW.                   |
| 9   | DISC Input Assembly            | 716-0009-00 |                                    |
| 10  | Pin Jack                       | 302-0901-00 | 2-pin with ground terminal.        |
| 11  | Slide Switch                   | 350-0202-00 | for Impedance Selector.            |
| 12  | Knob                           | 385-1801-04 | for DISC LEVEL & DAMPING Selector. |
|     | 13                             | Pin Jack    |                                    |
| 14  | Pin Jack                       | 302-0301-00 | 3-pin                              |
| 15  | Pin Jack                       | 302-0201-00 | 2-pin                              |
| 16  | Speaker Terminal               | 313-5062-00 |                                    |
| 17  | AC Outlet                      | 305-1201-00 |                                    |

## HOW TO REPLACE THE FOLLOWING PARTS

### POWER TRANSISTOR

Ref: Internal View 2 6  
Exploded View 6 15

#### Left Channel

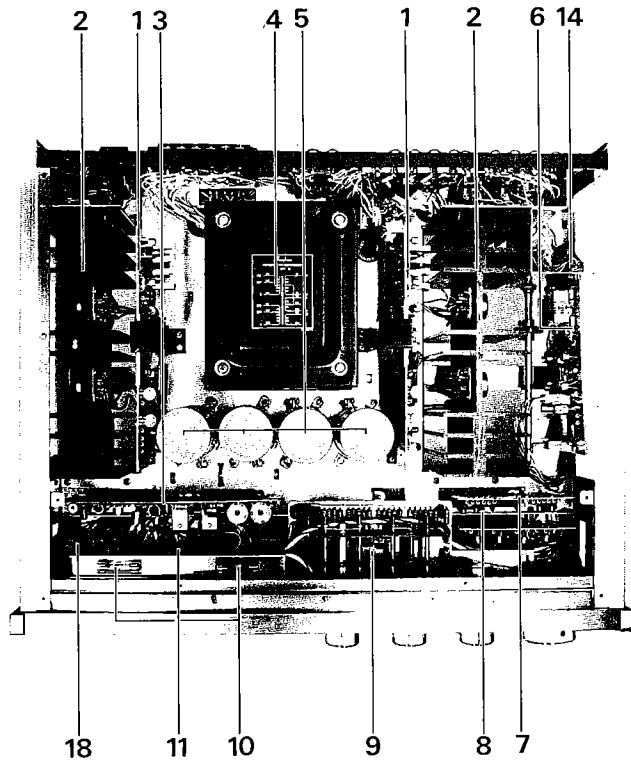
1. Remove the left Side Plate held by 6 screws.
2. Transistors located above the heat sink can be replaced after removing the transistor locking screws.

#### Right Channel

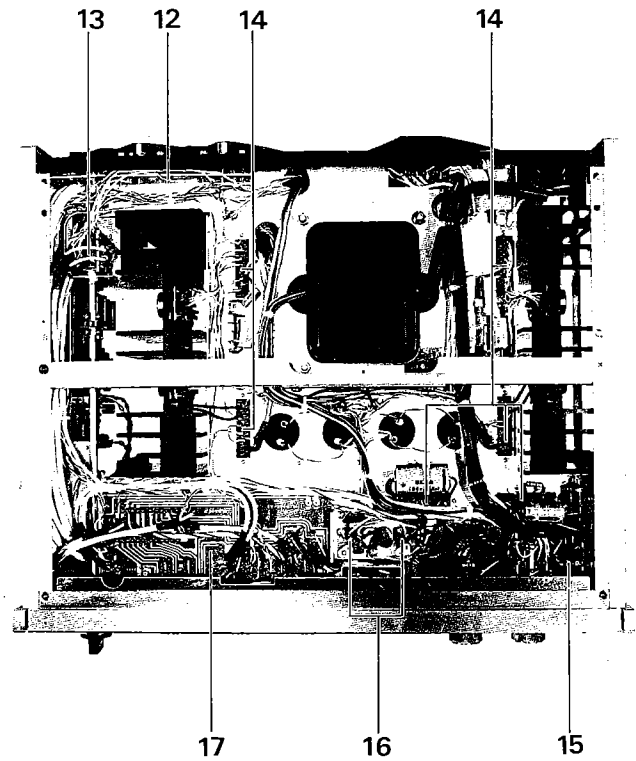
1. Remove the Top Plate, (6 screws)
2. Remove the Side Plate (6 screws).
3. Remove the L-shaped bracket (adjacent to the Side Plate) that holds the Equalizer Amp Assembly in place. Take out Assembly.
4. Replace transistor after taking off transistor locking screws.

# INTERNAL VIEW

TOP SIDE



BOTTOM SIDE



## PARTS LIST

| No. | Description                         | Part No.       | Remarks            |
|-----|-------------------------------------|----------------|--------------------|
| 1   | Main Drive Assembly                 | 710-0002-00    |                    |
|     | Printed Circuit Board Fixed Bracket | 248-0014-04    |                    |
|     | Hexa Boss                           | 251-6951-14    |                    |
| 2   | Heat Sink                           | 240-0002-02    | for Power TR.      |
|     | Power Transistor                    | 2SA679-R or Y  |                    |
|     | Power Transistor                    | 2SC1079-R or Y |                    |
|     | Transistor Socket                   | 300-0001-00    | for Power TR.      |
|     | Transistor Insulation               | 318-0001-00    |                    |
|     | Varistor                            | STV-4H         |                    |
| 3   | Power Supply Assembly               | 719-0004-00    |                    |
| 4   | Power Transformer                   | 510-3001-00    |                    |
| 5   | Electrolytic Capacitor              | CE62W1J103LG   | 10000 $\mu$ F 63WV |
| 6   | Equalizer AMP. Assembly             | 711-0002-00    |                    |
| 7   | Tone AMP. Assembly                  | 712-0002-00    |                    |
| 8   | Filter AMP. Assembly                | 714-0004-00    |                    |
| 9   | Tone Control Assembly               | 716-0006-00    |                    |

| No. | Description                     | Part No.     | Remarks             |
|-----|---------------------------------|--------------|---------------------|
| 10  | Pilot Lamp 8V/300mA             | 176-5201-00  |                     |
|     | Pilot Lamp Socket               | 306-1001-00  |                     |
| 11  | Meter Circuit Assembly          | 716-0008-00  |                     |
|     | Fuse (1A)                       | 310-0101-00  | 3pcs.               |
| 12  | DISC Input Assembly             | 716-0009-00  | Ref. EXTERNAL VIEW⑨ |
| 13  | Rotary Switch                   | 332-6201-00  | Ref. EXPLODED VIEW⑩ |
| 14  | Printed Circuit Board Connector | 303-1001-00  | 10-pin              |
|     | Printed Circuit Board Connector | 303-1401-00  | 14-pin              |
| 15  | Power Push Switch               | 354-1002-00  | Ref. EXPLODED VIEW⑪ |
| 16  | Diode                           | 1S2724(+)(-) |                     |
|     | Transistor Socket               | 300-0101-00  | for 1S2724          |
|     | Transistor Insulator            | 318-0101-00  | for 1S2724          |
| 17  | Pushbutton Switch Assembly      | 716-0007-00  | Ref. EXPLODED VIEW⑫ |
| 18  | Relay                           | 362-2401-00  |                     |
|     | Relay Fixed Bracket             | 247-0026-04  |                     |

### METER

Ref: Exploded View 13

1. Remove the Top Plate (6 screws).
2. Remove front panel knobs (10).
3. Remove Front Panel (4 locking screws).
4. Remove the 4 screws holding the Meter Fixed Bracket which can then be taken out toward the front.
5. Meter can be replaced after unscrewing the 4 locking nuts located above the Meter Fixed Bracket.

### FRAME

Ref. Exploded View 4 5 6

1. Remove Top, Bottom and Side Plate (6 screws each).
2. Remove Frame locking screws (9 on right, 11 on left).

(note; the corner of the Frame Assembly has a reinforcing 'Frame Fixed Plate' held in place by 6 screws.)

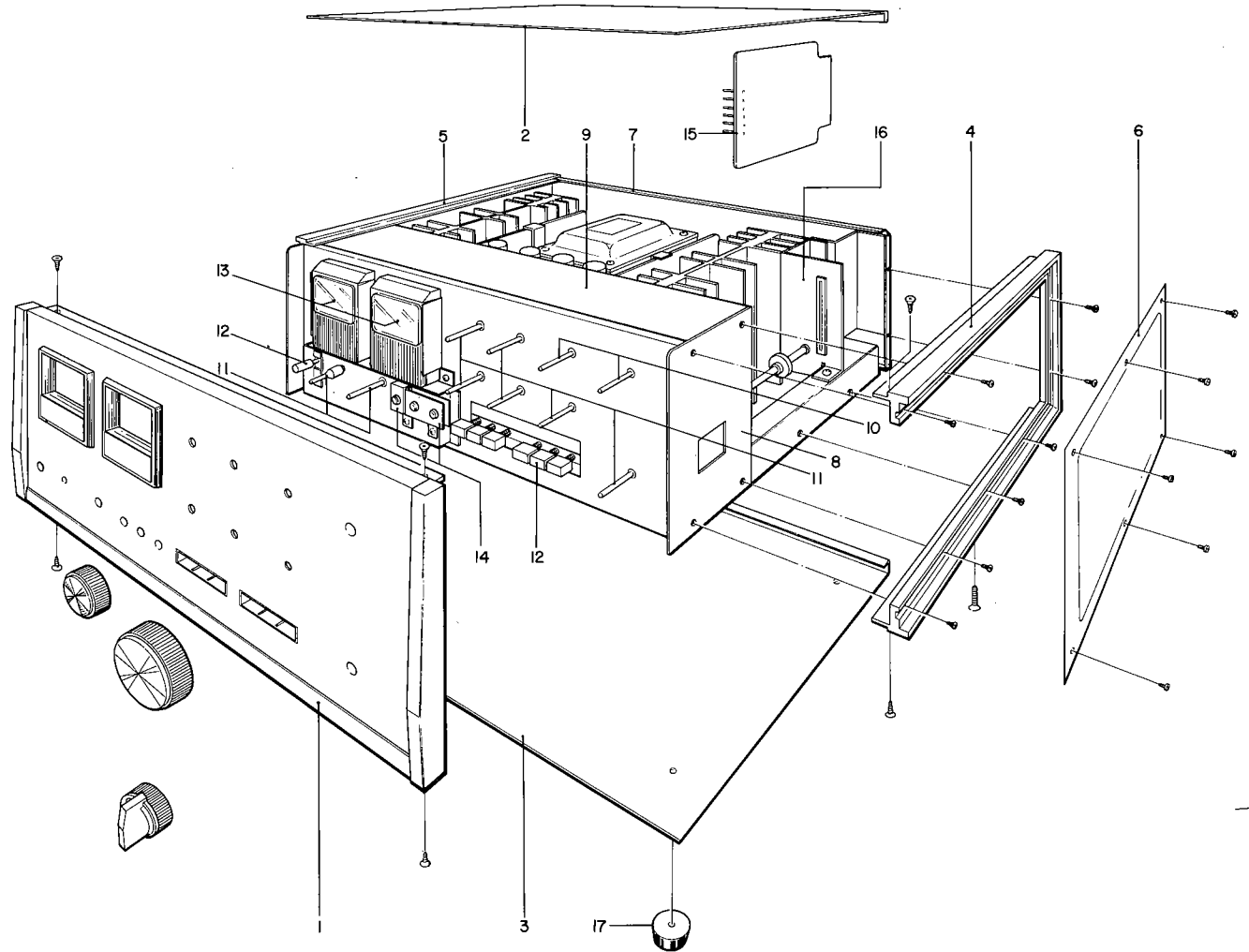
3. Frame can now be taken off the unit and any section can be replaced, after removing it from the Frame Fixed Bracket.

### RELAY

Ref. Internal View 18

1. Remove Top and left Side Plate (6 screws each).
2. Remove Power Supply Assembly.
3. The Relay Fixed Bracket is fixed to the top of the Sub Chassis with 2 screws. The Relay section can be taken off after removing these screws.

# EXPLODED VIEW



## PARTS LIST

| No. | Description                           | Part No.    | Remarks                  | No. | Description                 | Part No.    | Remarks                    |
|-----|---------------------------------------|-------------|--------------------------|-----|-----------------------------|-------------|----------------------------|
| 1   | Panel Assembly                        | 130-0004-03 |                          | 10  | Variable Resistor           |             | Ref. EXTERNAL VIEW①        |
|     | Front Panel                           | 131-0004-02 |                          |     | VOLUME                      | 573-2001-00 |                            |
|     | Panel End Cap (L)                     | 132-0005-04 |                          |     | BALANCE                     | 573-2303-00 |                            |
|     | Panel End Cap (R)                     | 132-0006-04 |                          |     | DISC LEVEL                  | 573-2202-00 | Located Rear Panel.        |
|     | Panel End Spacer                      | 250-1001-14 |                          | 11  | Rotary Switch               |             | Ref. EXTERNAL VIEW①        |
|     | Meter Frame                           | 113-0006-03 |                          |     | INPUT                       | 332-6201-00 |                            |
|     | Push-button Frame                     | 113-0008-04 | for Push Switch Assembly |     | Shaft                       | 203-5002-04 |                            |
|     | Push-button Frame                     | 113-0007-04 | for Power Switch         |     | Shaft Coupling              | 282-0001-04 |                            |
|     | Jack Frame                            | 113-0009-04 |                          |     | MODE                        | 332-5301-00 |                            |
| 2   | Top Plate                             | 150-0003-02 |                          |     | TAPE COPY                   | 332-3001-00 |                            |
| 3   | Bottom Plate                          | 155-0003-02 |                          |     | TAPE MONITOR                | 332-3001-00 |                            |
| 4   | Frame Assembly (R)                    | 112-0002-22 |                          |     | BASS                        | 336-1502-00 | Ref. Tone Control Assembly |
|     | Frame D                               | 112-1004-23 | Upper                    |     | TREBLE                      | 336-1503-00 | Ref. Tone Control Assembly |
|     | Frame E                               | 112-1005-23 | Lower                    |     | METER RANGE                 | 332-4003-00 |                            |
|     | Frame C                               | 112-1003-04 | Back                     |     | SPEAKERS                    | 333-6001-00 |                            |
|     | Frame Fixed Bracket                   | 244-0001-04 |                          |     | Shaft                       | 203-5001-00 |                            |
|     | Screw (Flat Head B Type Self Tapping) | 613-0308-01 | 3×8mm                    |     | SPEAKER DAMPING             | 333 3002-00 | Ref. EXTERNAL VIEW②        |
| 5   | Frame Assembly (L)                    | 112-0001-22 |                          | 12  | Push-button Switch for      |             | Ref. EXTERNAL VIEW②        |
|     | Frame A                               | 112-1001-23 | Upper                    |     | Power Switch                | 354-1002-00 |                            |
|     | Frame B                               | 112-1002-23 | Lower                    |     | Push Switch Assembly        | 354-6402-00 |                            |
|     | Frame C                               | 112-1003-04 | Back                     | 13  | Power Meter                 | 178-2002-00 |                            |
|     | Frame Fixed Bracket                   | 244-0001-04 |                          |     | Meter Fixed Bracket         | 246-0003-03 |                            |
|     | Screw (Flat Head B Type Self Tapping) | 613-0308-01 | 3×8mm                    | 14  | Phone Jack Fixed Bracket    | 247-0028-04 | Ref. EXTERNAL VIEW③④       |
| 6   | Side Plate                            | 151-0002-02 |                          |     | Tape Jack Fixed Bracket     | 247-0029-04 |                            |
| 7   | Rear Panel                            | 135-0004-02 |                          | 15  | Equalizer AMP. Assembly     | 711-0002-00 |                            |
| 8   | Sub Chassis                           | 111-3001-02 |                          | 16  | Rotary Switch Fixed Bracket | 247-0025-03 |                            |
| 9   | Sub Chassis Shield Cover              | 230-0011-02 |                          | 17  | Plastic Foot                | 238-0001-04 |                            |

# MISCELLANEOUS

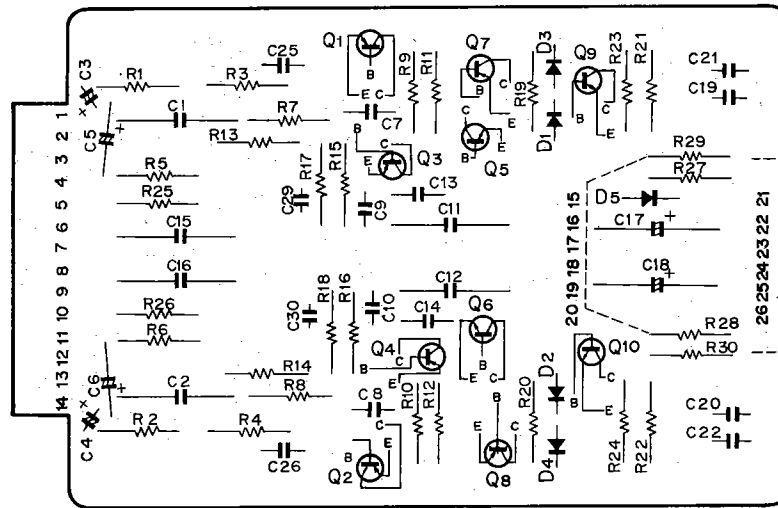
| No.         | Description               | Part No.    | Remarks  |
|-------------|---------------------------|-------------|--|
| Q3, 4, 7, 8 | Transistor                | 2SA679-R-K  |  |
| Q1, 2, 5, 6 | Transistor                | 2SC1079-R-K |  |
| D1          | Diode                     | IS2724(+)   |  |
| D2          | Diode                     | IS2724(-)   |  |
| D5          | Diode                     | IBZ-61      |  |
| D3, 4       | Varistor                  | STV-4H      |  |
|             | Screw for                 |             | (1)Binding Head B Type Self Tapping Screw<br>(2)Pan Head B Type Self Tapping Screw<br>(3)Pan Head ISO Metric Screw<br>(4)Flat Head B Type Self Tapping Screw |
|             | Top Plate                 | 614-0306-02 | 3x8mm (1) 6pcs.  |
|             | Nylon Washer              | 637-1031-50 | 6pcs.  |
|             | Front Panel               | 613-0308-01 | 3x8mm (4) 4pcs.  |
|             | Panel End Cap             | 617-0315-01 | 3x15mm (2) 4pcs.   |
|             | Frame Assembly            | 613-0308-01 | 3x8mm (4) L10pcs.<br>R 8pcs.   |
|             | Frame Assembly            | 603-0410-01 | 4x10mm 4pcs.   |
|             | Side Plate                | 614-0308-02 | 3x8mm (1) 12pcs.   |
|             | Rear Panel                | 614-0308-02 | 3x8mm (1) 10pcs.   |
|             | Bottom Plate              | 614-0308-02 | 3x8mm (1) 6pcs.  |
|             | Power Transistor          | 600-0312-01 | 3x12mm (3) 16pcs.  |
|             | Diode (IS2724)            | 600-0308-01 | 3x8mm (3) 4pcs.  |
|             | Plastic Foot              | 600-0414-01 | 4x14mm (3) 4pcs.   |
| R001        | Oxide Metal Film Resistor | RS143FA471J | 470Ω ± 5% 3.16W  |
| R002        | Oxide Metal Film Resistor | RS143AA272J | 2.7kΩ ± 5% 1W  |

| No.       | Description                        | Part No.      | Remarks            |
|-----------|------------------------------------|---------------|--------------------|
| R101, 102 | Carbon Film Resistor               | RD142HA183J   | 18kΩ ± 5% ½W       |
| R103-108  | Carbon Film Resistor               | RD142HA472J   | 4.7kΩ ± 5% ½W      |
| R201, 202 | Carbon Film Resistor               | RD142HA223J   | 22kΩ ± 5% ½W       |
| R319, 320 | Carbon Film Resistor               | RD142HA222J   | 2.2kΩ ± 5% ½W      |
| 323, 324  |                                    |               |                    |
| R301, 302 | Cement Coated Wire Wound Resistor  | RW983HG100J   | 10Ω ± 5% 5W        |
| R303-306  | Cement Coated Metal Plate Resistor | RW993DR22J    | 0.22Ω ± 5% 2W      |
| R307, 308 | Oxide Metal Film Resistor          | RS143DA821J   | 820Ω ± 5% 2W       |
| R309, 310 | Carbon Film Resistor               | RD142HA821J   | 820Ω ± 5% ½W       |
| R311, 312 | Carbon Film Resistor               | RD142HA162J   | 1.6kΩ ± 5% ½W      |
| R313, 314 | Carbon Film Resistor               | RD142HA681J   | 680Ω ± 5% ½W       |
| R315, 316 | Carbon Film Resistor               | RD142HA751J   | 750Ω ± 5% ½W       |
| R317, 318 | Carbon Film Resistor               | RD142HA102J   | 1kΩ ± 5% ½W        |
| R321, 322 | Carbon Film Resistor               | RD142HA682J   | 6.8kΩ ± 5% ½W      |
| C001-004  | Electrolytic Capacitor             | CE62W1J103LG  | 10000μF 63WV       |
| C005      | Electrolytic Capacitor             | CE02W2A 331   | 330μF 100WV        |
| C006-009  | Ceramic Capacitor                  | CK45E2H103P   | 0.01μF ±100% 500WV |
| C101, 102 | Tantalum Solid Capacitor           | CS15E1V4R7M   | 4.7μF ±20% 35WV    |
| C103-109  | Ceramic Capacitor                  | CK45E2H102P   | 1000pF ±100% 500WV |
| C301, 302 | Metallized Film Capacitor          | CQ93M2E104M   | 0.1μF ±20% 250WV   |
| C010      | Mylar Film Capacitor               | CQ93M2E103MUL | 0.01μF             |
|           | Power Supply Cord                  | 680-2201-00   | Accessory          |
|           | Carton Box                         |               |                    |
|           | Outer Box                          | 800-0004-00   |                    |
|           | Inner Box                          | 801-0004-00   |                    |
|           | Front Protector                    | 803-0006-00   |                    |
|           | Rear Protector                     | 803-0004-00   |                    |

# EQUALIZER AMP. ASSEMBLY (711-0002-00)

## PRINTED CIRCUIT BOARD

\*Printed circuit board as seen from the reverse side.



## PARTS LIST

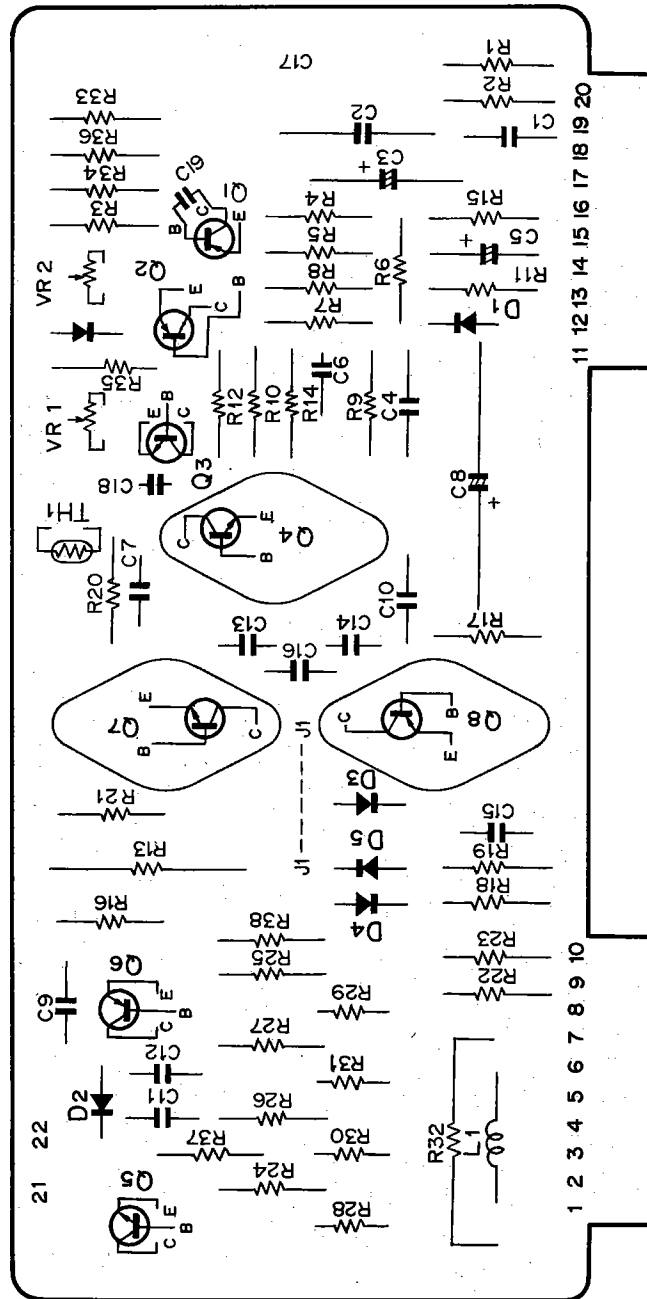
| No.               | Description                         | Part No.          | Remarks        |
|-------------------|-------------------------------------|-------------------|----------------|
|                   | Connector Plug                      | 304-0603-00       |                |
|                   | Printed Circuit Board Fixed Bracket | 284-0002-04       |                |
| Q1, 2, 3, 4, 7, 8 | Transistor                          | 2SA776-GR         |                |
| Q5, 6             | Transistor                          | 2SC1416A-GR or BL |                |
| Q9, 10            | Transistor                          | 2SC1451-B or V    |                |
| D1, 2, 3, 4       | Silicon Diode                       | 1S1555            |                |
| D5                | Zener Diode                         | XZ-122            |                |
| R1, 2, 5, 6       | Carbon Film Resistor                | RD142HA104J       | 100kΩ ± 5% ½W  |
| R3, 4, 25, 26     | Carbon Film Resistor                | RD142HA914J       | 910kΩ ± 5% ½W  |
| R7, 8             | Carbon Film Resistor                | RD142HA182J       | 1.8kΩ ± 5% ½W  |
| R9, 10            | Metal Film Resistor                 | RN142HA473JO      | 47kΩ ± 5% ½W   |
| R11, 12           | Carbon Film Resistor                | RD142HA392J       | 3.9kΩ ± 5% ½W  |
| R13, 14           | Carbon Film Resistor                | RD142HA3921G      | 3.92kΩ ± 2% ½W |
| R15, 16           | Carbon Film Resistor                | RD142HA1783F      | 178kΩ ± 1% ½W  |
| R17, 18           | Metal Film Resistor                 | RN142HA245JL      | 2.4MΩ ± 5% ½W  |

| No.           | Description                | Part No.     | Remarks               |
|---------------|----------------------------|--------------|-----------------------|
| R19, 20       | Carbon Film Resistor       | RD142HA333J  | 33kΩ ± 5% ½W          |
| R21, 22       | Carbon Film Resistor       | RD142HA122J  | 1.2kΩ ± 5% ½W         |
| R23, 24       | Carbon Film Resistor       | RD142HA123J  | 12kΩ ± 5% ½W          |
| R27, 28       | Carbon Film Resistor       | RD142HA103J  | 10kΩ ± 5% ½W          |
| R29, 30       | Carbon Film Resistor       | RD142HA561J  | 560Ω ± 5% ½W          |
| C1, 2, 15, 16 | Metallized Film Capacitor  | CQ93M2E105M  | 1μF ±20% 250WV        |
| C3, 4         | Tantalum Solid Capacitor   | CS15E1C2R2M  | 2.2μF ±20% 16WV       |
| C5, 6         | Tantalum Solid Capacitor   | CS15E1C4R7M  | 4.7μF ±20% 16WV       |
| C7, 8         | Mica Capacitor             | CM93D2A050D  | 5pF ±0.5pF 100WV      |
| C9, 10        | Polystyrene Film Capacitor | CQ08S2B431G  | 430pF ±2% 125WV       |
| C11, 12       | Polystyrene Film Capacitor | CQ08S2B112G  | 1100pF ±2% 125WV      |
| C13, 14       | Polystyrene Film Capacitor | CQ08S2B201G  | 200pF ±2% 125WV       |
| C17, 18       | Electrolytic Capacitor     | CE02W1E330   | 33μF 25WV             |
| C19-22        | Ceramic Capacitor          | CK45F1H103Z  | 0.01μF ±80% -20% 50WV |
| C29, 30       | Ceramic Capacitor          | CC45SL1H180K | 18pF ±10% 50WV        |

# MAIN DRIVE ASSEMBLY (710-0002-00)

PRINTED CIRCUIT BOARD

\* Printed circuit board as seen from the reverse side.



## PARTS LIST

| No.      | Description   | Part No.       | Remarks |
|----------|---------------|----------------|---------|
| Q1, 2    | Transistor    | 2SA620-WLH5    |         |
| Q3       | Transistor    | 2SC1451-G or B |         |
| Q4       | Transistor    | 2SC515-A       |         |
| Q5       | Transistor    | 2SC1416-GR     |         |
| Q6       | Transistor    | 2SA776-GR      |         |
| Q7       | Transistor    | 2SC1431-2-1    |         |
|          |               | or 2-2         |         |
| Q8       | Transistor    | 2SA762-2-1     |         |
|          |               | or 2-2         |         |
| D1       | Zener Diode   | XZ-162         |         |
| D2, 3, 6 | Silicon Diode | 1S1555         |         |

| No.   | Description          | Part No.    | Remarks                 |
|-------|----------------------|-------------|-------------------------|
| D4, 5 | Silicon Diode        | 1S1553      |                         |
| TH1   | Thermistor           | 5TP-31L     |                         |
| L1    | Choke Coil 2mH       | 706-0001-00 |                         |
| VR1   | Potentiometer 100ΩB  | 581-0121-00 | for Bias Current Adj.   |
| VR2   | Potentiometer 4.7kΩB | 581-0531-00 | for Center Voltage Adj. |
| R1    | Carbon Film Resistor | RD142HA472J | 4.7kΩ ± 5% 1/2W         |
| R2    | Carbon Film Resistor | RD142HA105J | 1MΩ ± 5% 1/2W           |
| R3    | Carbon Film Resistor | RD142HA304J | 300kΩ ± 5% 1/2W         |
| R4, 5 | Carbon Film Resistor | RD142HA101J | 100Ω ± 5% 1/2W          |
| R6    | Carbon Film Resistor | RD142HA183J | 18kΩ ± 5% 1/2W          |
| R7    | Carbon Film Resistor | RD142HA133J | 13kΩ ± 5% 1/2W          |



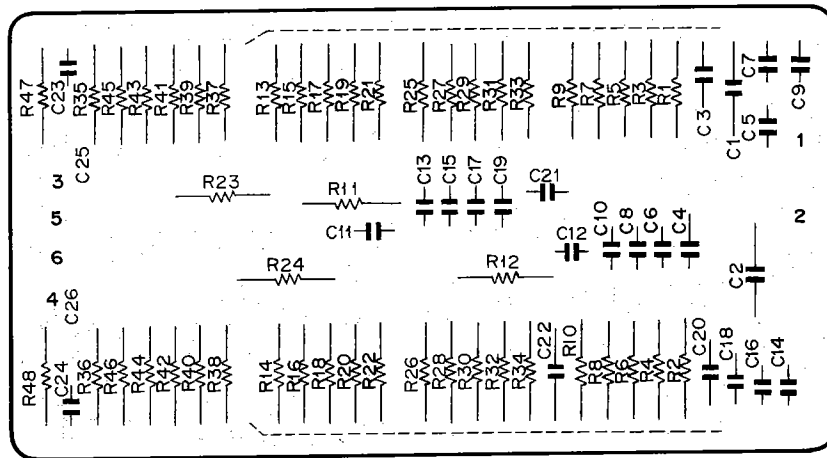
| No.        | Description                        | Part No.    | Remarks          |
|------------|------------------------------------|-------------|------------------|
| R8, 18, 19 | Carbon Film Resistor               | RD142HA242J | 2.4kΩ ± 5% ½W    |
| R9         | Carbon Film Resistor               | RD142HA154J | 150kΩ ± 5% ½W    |
| R10        | Carbon Film Resistor               | RD142HA222J | 2.2kΩ ± 5% ½W    |
| R11        | Carbon Film Resistor               | RD142HA302J | 3kΩ ± 5% ½W      |
| R12, 6     | Carbon Film Resistor               | RD142HA102J | 1kΩ ± 5% ½W      |
| R13        | Oxide Metal Film Resistor          | RS143FA562J | 5.6kΩ ± 5% 3.16W |
| R14        | Carbon Film Resistor               | RD142HA150J | 15Ω ± 5% ½W      |
| R15        | Oxide Metal Film Resistor          | RS143AA182J | 1.8kΩ ± 5% 1 W   |
| R17        | Carbon Film Resistor               | RD142HA112J | 1.1kΩ ± 5% ½W    |
| R22, 23    | Oxide Metal Film Resistor          | RS143AA560J | 56Ω ± 5% 1 W     |
| R24-27     | Oxide Metal Film Resistor          | RS143AA681J | 680Ω ± 5% 1 W    |
| R28-31     | Cement Coated Metal Plate Resistor | RW993F1R0J  | 1Ω ± 5% 3.16W    |
| R32        | Cement Coated Wire Wound Resistor  | RW983HG100K | 10Ω ± 10% 5 W    |
| R33        | Carbon Film Resistor               | RD142HA103J | 10kΩ ± 5% ½W     |
| R34        | Carbon Film Resistor               | RD142HA221J | 220Ω ± 5% ½W     |
| R35        | Carbon Film Resistor               | RD142HA153J | 15kΩ ± 5% ½W     |
| R36        | Carbon Film Resistor               | RD142HA512J | 5.1kΩ ± 5% ½W    |

| No.        | Description                 | Part No.     | Remarks                |
|------------|-----------------------------|--------------|------------------------|
| R37, 38    | Carbon Film Resistor        | RD142HA4R7J  | 4.7Ω ± 5% ½W           |
| C1         | Polystyrene Film Capacitor  | CQ08S2B470J  | 470pF ± 5% 125WV       |
| C2         | Metallized Film Capacitor   | CQ93M2E474M  | 0.47μF ± 20% 250WV     |
| C3         | Electrolytic Capacitor      | CE02W1A101   | 100μF 10WV             |
| C4, 6      | Mica Capacitor              | CM93D2A050D  | 5pF ± 0.5pF 100WV      |
| C5         | Electrolytic Capacitor      | CE04W1H010   | 1μF 50WV               |
| C7, 11, 12 | Ceramic Capacitor           | CK45F1H473Z  | 0.047μF +80% -20% 50WV |
| C8         | Electrolytic Capacitor      | CE02W1J221   | 220μF 63WV             |
| C9, 10     | Polystyrene Film Capacitor  | CQ08S2B331J  | 330pF ± 5% 125WV       |
| C13, 14    | Mica Capacitor              | CM93D2A151J  | 150pF ± 5% 100WV       |
| C15, 16    | Ceramic Capacitor           | CK45F2H103P  | 0.01μF +100% -0% 500WV |
| C18        | Mica Capacitor              | CQ93D2A100D  | 10pF ± 0.5% 100WV      |
| C19        | Ceramic Capacitor           | CC45SL1H220K | 22pF ± 10% 50WV        |
|            | Nut                         | 633-2031-01  | 3mm for Q4, 7, 8       |
|            | Lockwasher                  | 639-2031-01  | for Q4, 7, 8           |
|            | Pan Head ISO Metallic Screw | 600-0312-01  | 3×12mm for Q4, 7, 8    |

## tone control switch assembly (716-0006-00)

PRINTED CIRCUIT BOARD

\* Printed circuit board as seen from the reverse side.



## PARTS LIST

| No.                     | Description          | Part No.    | Remarks       |
|-------------------------|----------------------|-------------|---------------|
| SB-1                    | Rotary Switch        | 336-1502-00 | for BASS      |
| ST-1                    | Rotary Switch        | 336-1503-00 | for TREBLE    |
| R1, 2                   | Carbon Film Resistor | RD142HA103J | 10kΩ ± 5% ½W  |
| R3, 4                   | Carbon Film Resistor | RD142HA273J | 27kΩ ± 5% ½W  |
| R5, 6                   | Carbon Film Resistor | RD142HA683J | 68kΩ ± 5% ½W  |
| R7, 8                   | Carbon Film Resistor | RD142HA204J | 200kΩ ± 5% ½W |
| R9, 10                  | Carbon Film Resistor | RD142HA334J | 330kΩ ± 5% ½W |
| R11, 12, 33, 34, 35, 36 | Carbon Film Resistor | RD142HA105J | 1MΩ ± 5% ½W   |
| R13, 14                 | Carbon Film Resistor | RD142HA682J | 6.8kΩ ± 5% ½W |
| R15, 16                 | Carbon Film Resistor | RD142HA332J | 3.3kΩ ± 5% ½W |
| R17, 18                 | Carbon Film Resistor | RD142HA242J | 2.4kΩ ± 5% ½W |
| R19, 20, 21, 22         | Carbon Film Resistor | RD142HA202J | 2kΩ ± 5% ½W   |
| R23, 24                 | Carbon Film Resistor | RD142HA272J | 2.7kΩ ± 5% ½W |
| R25, 26                 | Carbon Film Resistor | RD142HA514J | 510kΩ ± 5% ½W |
| R27, 28                 | Carbon Film Resistor | RD142HA563J | 56kΩ ± 5% ½W  |
| R29, 30                 | Carbon Film Resistor | RD142HA154J | 150kΩ ± 5% ½W |

| No.             | Description          | Part No.     | Remarks           |
|-----------------|----------------------|--------------|-------------------|
| R31, 32         | Carbon Film Resistor | RD142HA364J  | 360kΩ ± 5% ½W     |
| R37, 38         | Carbon Film Resistor | RD142HA393J  | 39kΩ ± 5% ½W      |
| R39, 40         | Carbon Film Resistor | RD142HA223J  | 22kΩ ± 5% ½W      |
| R41, 42         | Carbon Film Resistor | RD142HA183J  | 18kΩ ± 5% ½W      |
| R43, 44         | Carbon Film Resistor | RD142HA153J  | 15kΩ ± 5% ½W      |
| R45, 46         | Carbon Film Resistor | RD142HA123J  | 12kΩ ± 5% ½W      |
| R47, 48         | Carbon Film Resistor | RD142HA432J  | 4.3kΩ ± 5% ½W     |
| C1, 2           | Mylar Film Capacitor | CQ93M1H124JZ | 0.12μF ± 5% 50WV  |
| C3, 4           | Mylar Film Capacitor | CQ93M1H393JZ | 0.039μF ± 5% 50WV |
| C5, 6           | Mylar Film Capacitor | CQ93M1H183JZ | 0.018μF ± 5% 50WV |
| C7, 8           | Mylar Film Capacitor | CQ93M1H822JZ | 8200pF ± 5% 50WV  |
| C9, 10, 15, 16  | Mylar Film Capacitor | CQ93M1H223JZ | 0.022μF ± 5% 50WV |
| C11, 12, 13, 14 | Mylar Film Capacitor | CQ93M1H392JZ | 3900pF ± 5% 50WV  |
| C17, 18         | Mylar Film Capacitor | CQ93M1H682JZ | 6800pF ± 5% 50WV  |
| C19, 20         | Mylar Film Capacitor | CQ93M1H332JZ | 3300pF ± 5% 50WV  |
| C21, 22         | Mylar Film Capacitor | CQ93M1H102JZ | 1000pF ± 5% 50WV  |
| C23, 24         | Mica Capacitor       | CM93D2A561J  | 560pF ± 5% 100WV  |

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## 42 4140 3938 37 36 3534 33 32 31

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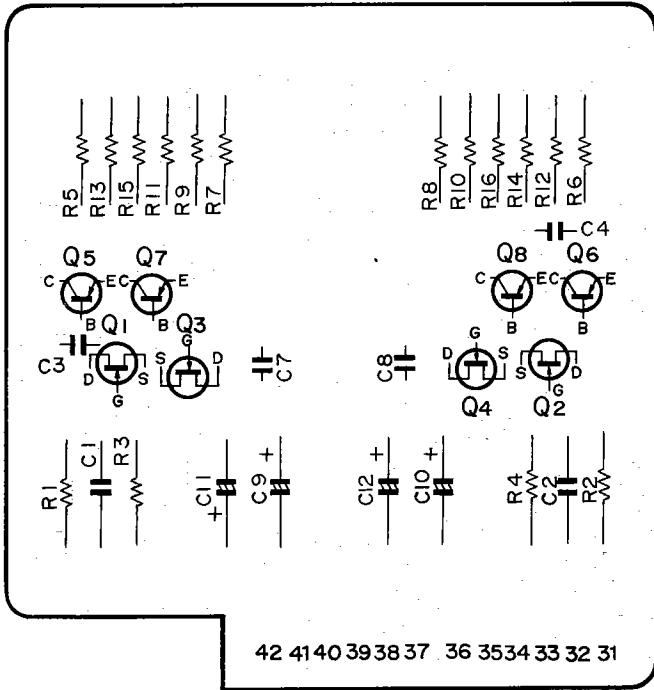
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###### 42 4140 3938 37 36 3534 33 32 31

###### 42 4140 3938 37 36 3534 33 32 31

## PRINTED CIRCUIT BOARD

\*Printed circuit board as seen from the reverse side.



## PARTS LIST

| No.            | Description               | Part No.          | Remarks            |
|----------------|---------------------------|-------------------|--------------------|
| Q1, 2, 3, 4    | Connector Jack            | 304-5602-00       |                    |
| Q5, 6, 7, 8    | Junction FET              | 2SK30A-GR         |                    |
|                | Transistor                | 2SA620-WLH-4 or 5 |                    |
| R1, 2          | Metal Film Resistor       | RN142HA225JL      | 2.2MΩ ± 5% 1/2W    |
| R3, 4          | Carbon Film Resistor      | RD142HA221J       | 220Ω ± 5% 1/2W     |
| R5, 6, 7, 8    | Carbon Film Resistor      | RD142HA682J       | 6.8kΩ ± 5% 1/2W    |
| R9, 10         | Carbon Film Resistor      | RD142HA752J       | 7.5kΩ ± 5% 1/2W    |
| R11, 12        | Carbon Film Resistor      | RD142HA562J       | 5.6kΩ ± 5% 1/2W    |
| R13, 14        | Carbon Film Resistor      | RD142HA203J       | 20kΩ ± 5% 1/2W     |
| R15, 16        | Carbon Film Resistor      | RD142HA560J       | 56Ω ± 5% 1/2W      |
| C1, 2          | Metallized Film Capacitor | CQ93M2E224M       | 0.22μF ± 20% 250WV |
| C3, 4          | Mica Capacitor            | CM93D2A470J       | 47pF ± 5% 100WV    |
| C7, 8          | Mica Capacitor            | CM93D2A050D       | 5pF ± 0.5pF 100WV  |
| C9, 10, 11, 12 | Electrolytic Capacitor    | CE04W1H4R7        | 4.7μF 50WV         |

# 30 2928 27 26 25 24 23 22 21 20 19

## 30 2928 27 26 25 24 23 22 21 20 19

### 30 2928 27 26 25 24 23 22 21 20 19

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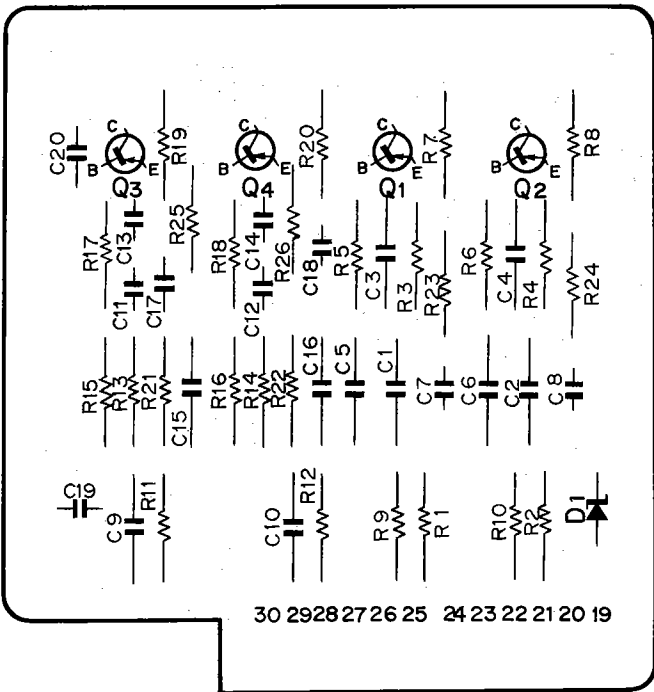
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## PRINTED CIRCUIT BOARD

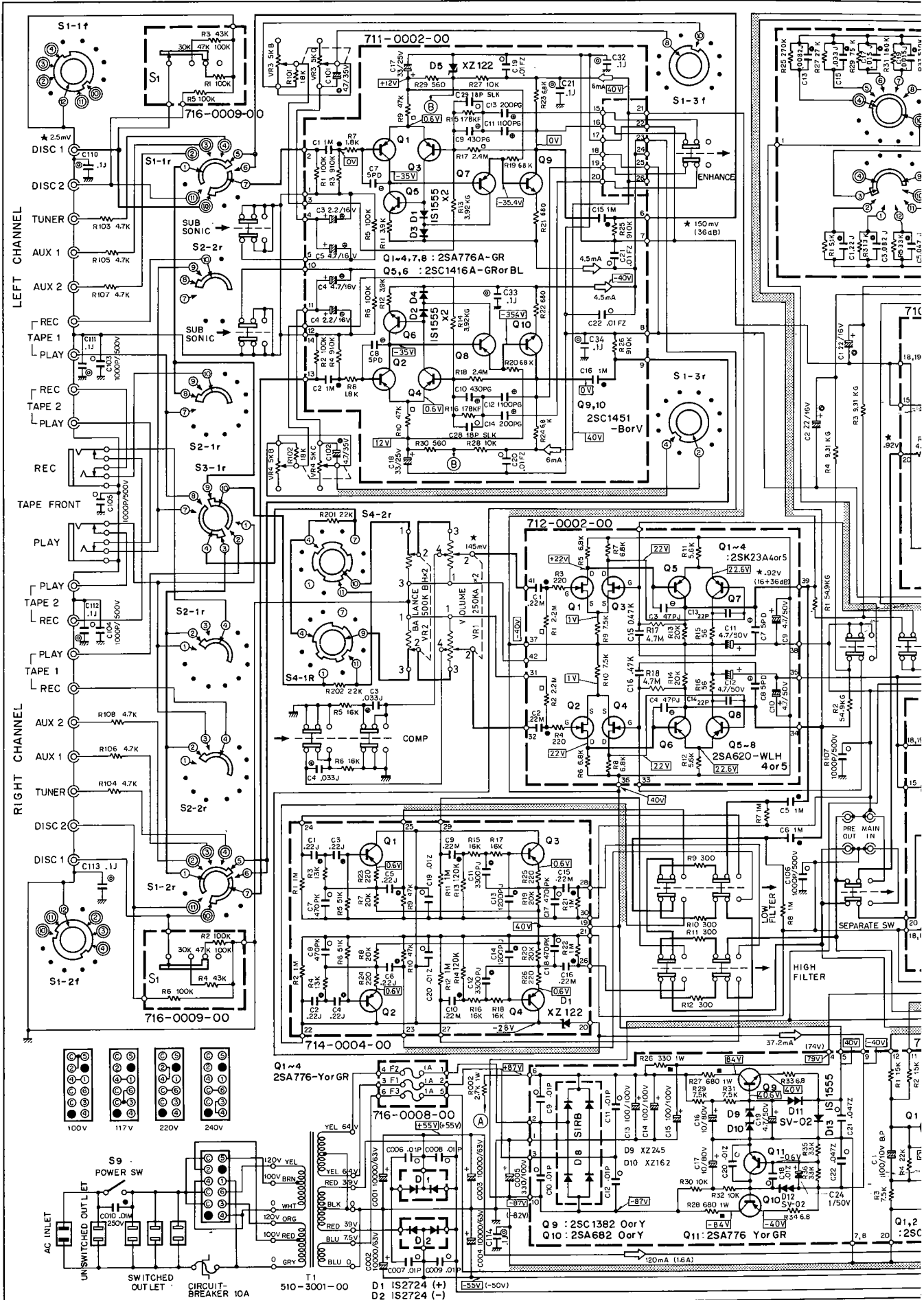
\*Printed circuit board as seen from the reverse side.

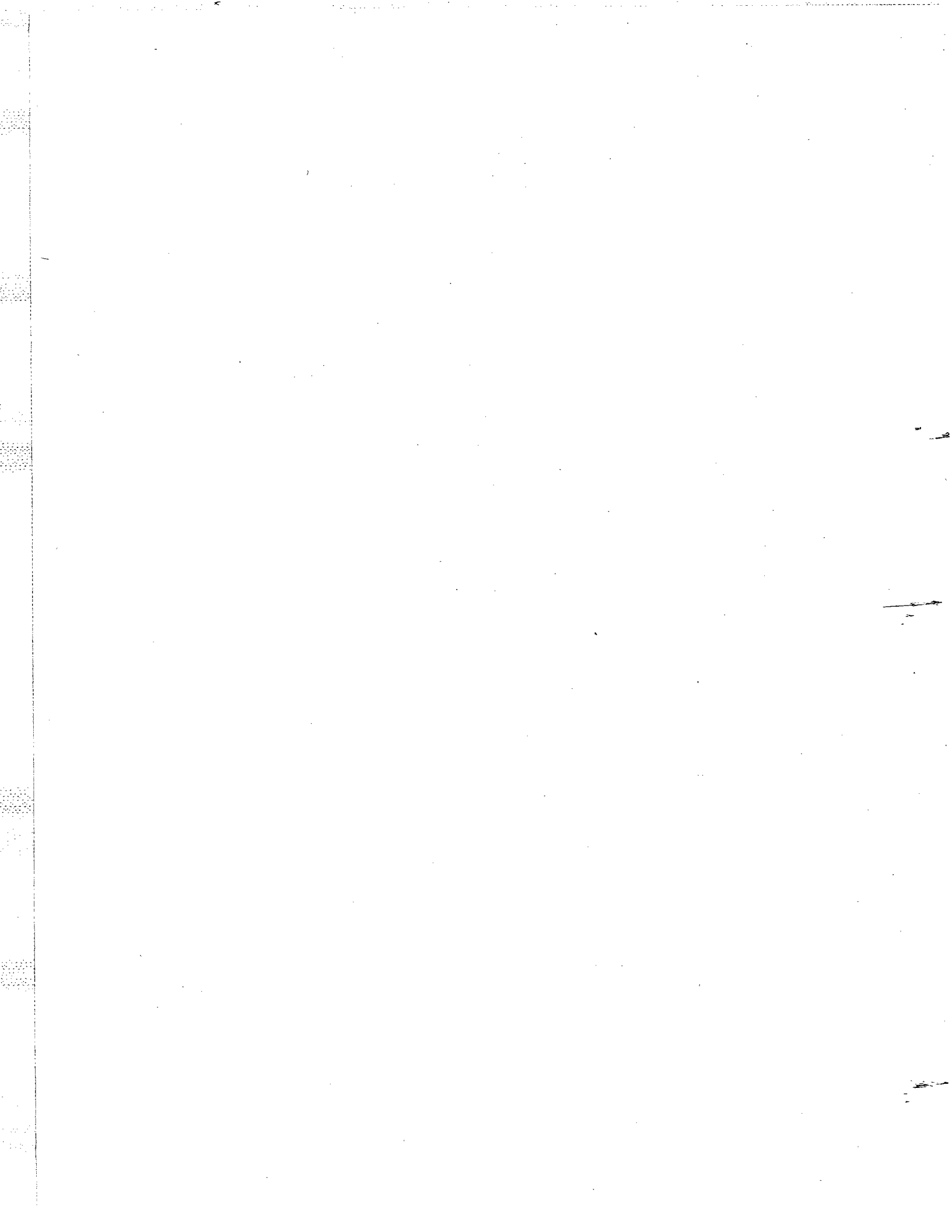


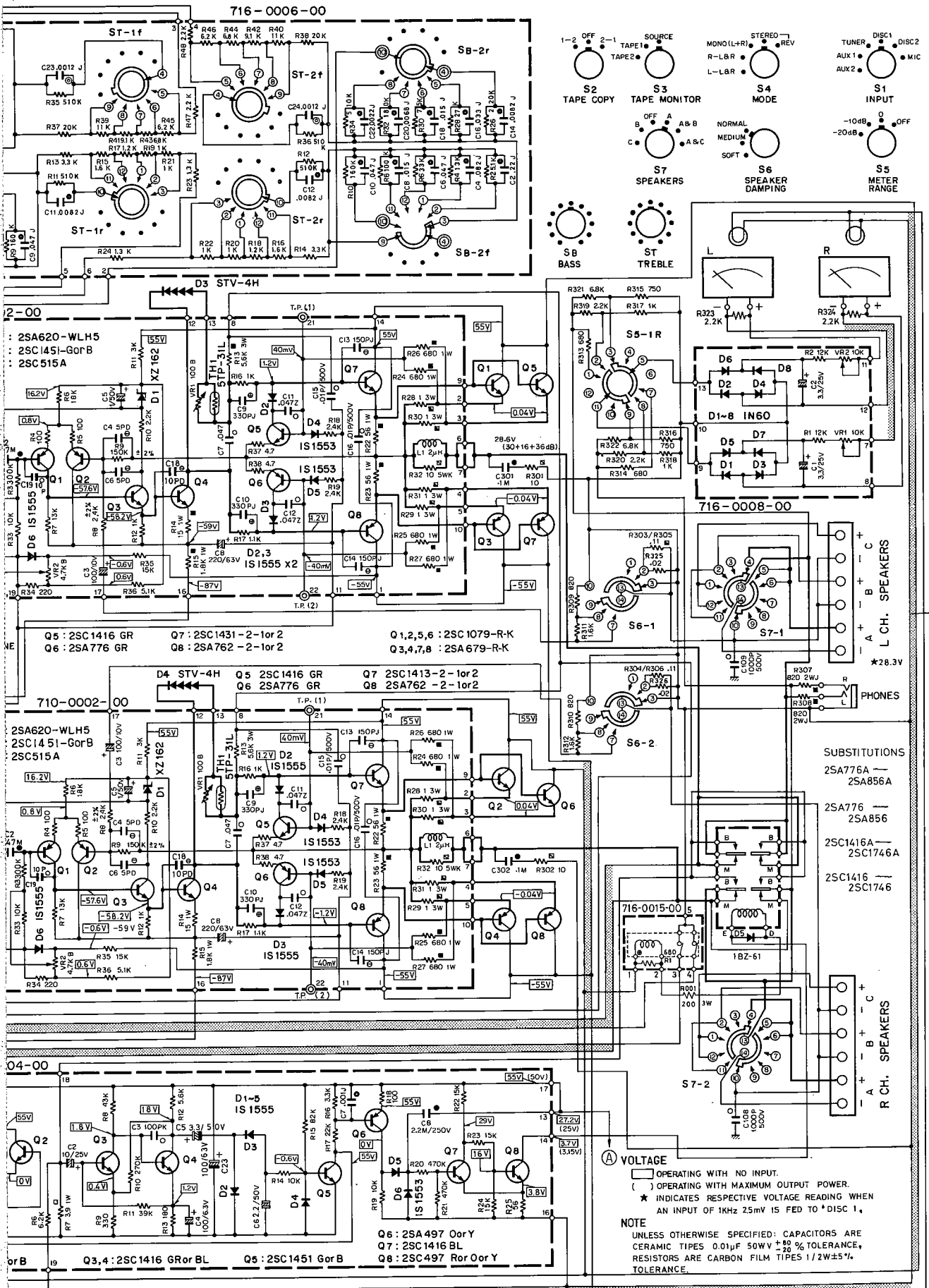
## PARTS LIST

| No.                   | Description               | Part No.     | Remarks                |
|-----------------------|---------------------------|--------------|------------------------|
| Q1, 2, 3, 4           | Connector Jack            | 304-5602-00  |                        |
| D1                    | Zener Diode               | XZ-122       |                        |
| R1, 2, 11, 12, 21, 22 | Carbon Film Resistor      | RD142HA105J  | 1MΩ ± 5% 1/2W          |
| R3, 4                 | Carbon Film Resistor      | RD142HA133J  | 13kΩ ± 5% 1/2W         |
| R5, 6                 | Carbon Film Resistor      | RD142HA513J  | 51kΩ ± 5% 1/2W         |
| R7, 8, 19, 20         | Carbon Film Resistor      | RD142HA203J  | 20kΩ ± 5% 1/2W         |
| R9, 10                | Carbon Film Resistor      | RD142HA473J  | 47kΩ ± 5% 1/2W         |
| R13, 14               | Carbon Film Resistor      | RD142HA124J  | 120kΩ ± 5% 1/2W        |
| R15, 16, 17, 18       | Carbon Film Resistor      | RD142HA163J  | 16kΩ ± 5% 1/2W         |
| R23, 24, 25, 26       | Carbon Film Resistor      | RD142HA221J  | 220Ω ± 5% 1/2W         |
| C1, 2, 3, 4, 5, 6     | Mylar Film Capacitor      | CQ93M1H224JZ | 0.22μF ± 5% 50WV       |
| C7, 8, 17, 18         | Ceramic Capacitor         | CK45B1B471J  | 470pF ± 5% 50WV        |
| C9, 10, 15, 16        | Metallized Film Capacitor | CQ93M2E224M  | 0.22μF ± 20% 250WV     |
| C11, 12               | Mylar Film Capacitor      | CQ93M1H332JZ | 3300pF ± 5% 50WV       |
| C13, 14               | Mylar Film Capacitor      | CQ93M1H122JZ | 1200pF ± 5% 50WV       |
| C19, 20               | Ceramic Capacitor         | CK45F1H103Z  | 0.01μF ± 80% -20% 50WV |

# SCHEMATIC DIAGRAM







2-00  
 2SA620-WLH5  
 2SC1451-GorB  
 2SC515A

Q5 : 2SC1416 GR    Q7 : 2SC1431 - 2-1or2  
 Q6 : 2SA776 GR    Q8 : 2SA762 - 2-1or2

Q1,2,5,6 : 2SC1079-R-K  
 Q3,4,7,8 : 2SA679-R-K

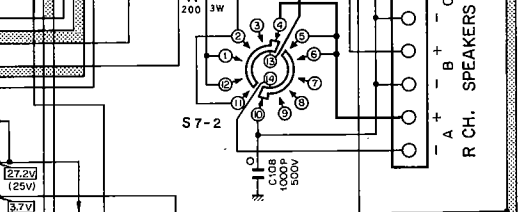
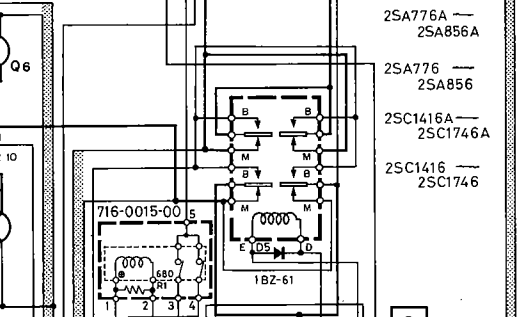
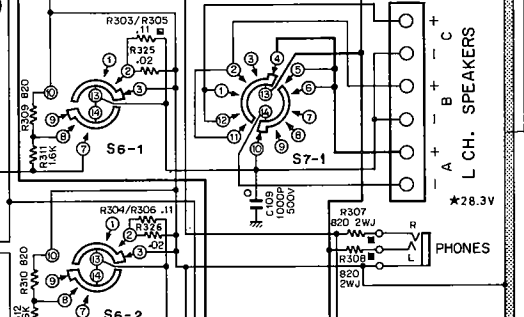
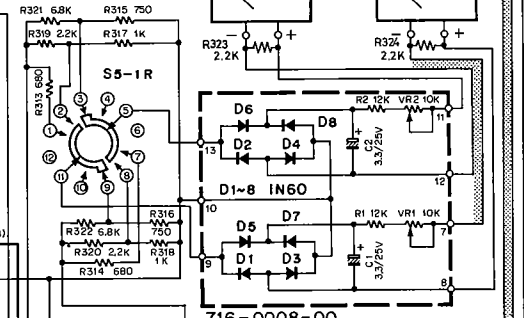
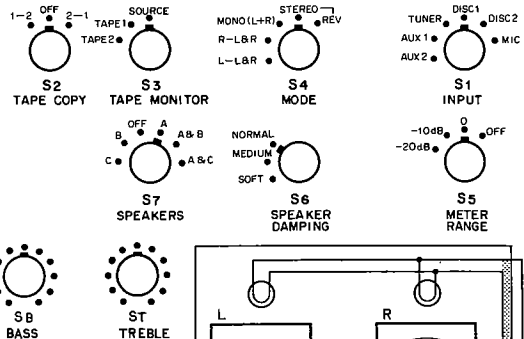
710-0002-00

2SA620-WLH5  
 2SC1451-GorB  
 2SC515A

Q5 : 2SC1416 GR    Q7 : 2SC1413 - 2-1or2  
 Q6 : 2SA776 GR    Q8 : 2SA762 - 2-1or2

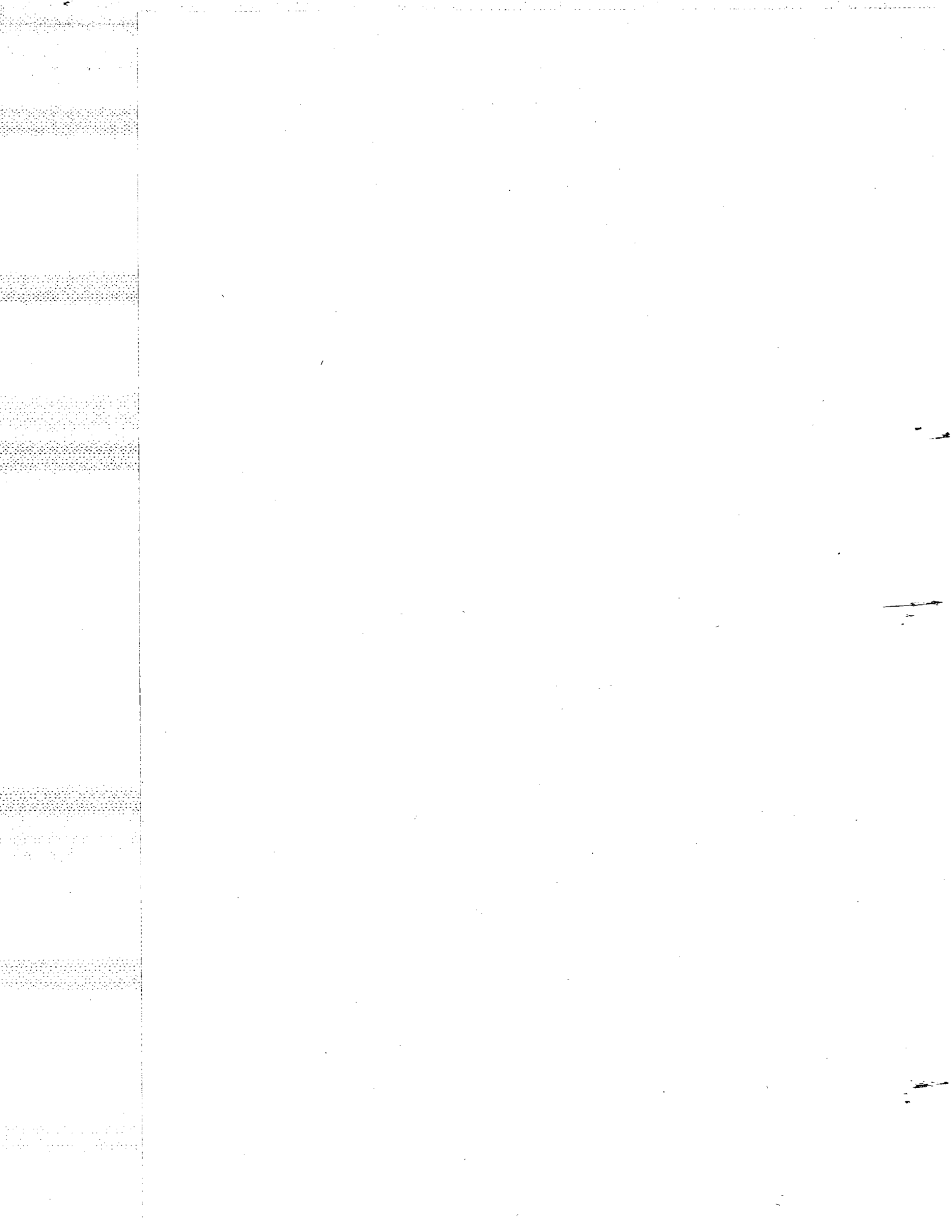
04-00

Q3,4 : 2SC1416 GRor BL    Q5 : 2SC1451 GorB  
 Q6 : 2SA497 OorY    Q7 : 2SC1416 BL  
 Q8 : 2SC497 RorOorY



**VOLTAGE**  
 [Symbol] OPERATING WITH NO INPUT.  
 ( ) OPERATING WITH MAXIMUM OUTPUT POWER.  
 \* INDICATES RESPECTIVE VOLTAGE READING WHEN AN INPUT OF 1KHz 25mV IS FED TO \*DISC 1.

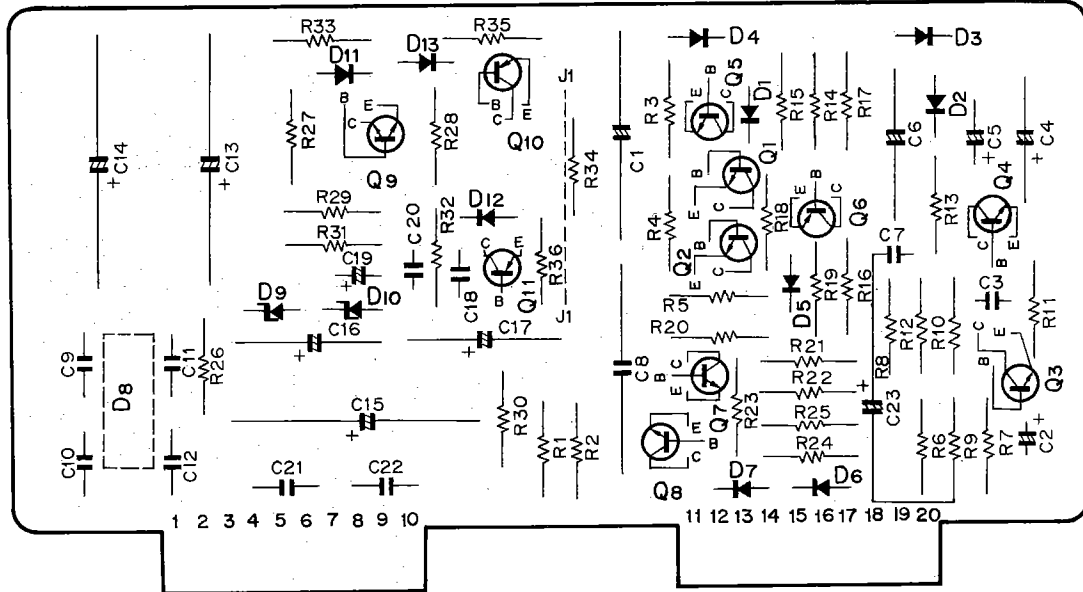
**NOTE**  
 UNLESS OTHERWISE SPECIFIED: CAPACITORS ARE CERAMIC TYPES 0.01uF 50VW ±5% TOLERANCE, RESISTORS ARE CARBON FILM TYPES 1/2W±5% TOLERANCE.



# POWER SUPPLY ASSEMBLY (719-0004-00)

PRINTED CIRCUIT BOARD

\*Printed circuit board as seen from the reverse side.



## PARTS LIST

| No.                | Description                 | Part No.         | Remarks           |
|--------------------|-----------------------------|------------------|-------------------|
|                    | Heat Sink                   | 240-1002-04      | for Q9, 10        |
|                    | Transistor Spacer           | 250-0001-00      | for Q6, 8         |
| Q1, 2, 5           | Transistor                  | 2SC1451-GorB     |                   |
| Q3, 4              | Transistor                  | 2SC1416-GRorBL   |                   |
| Q6                 | Transistor                  | 2SA497-O or Y    |                   |
| Q7                 | Transistor                  | 2SC1416-BL       |                   |
| Q8                 | Transistor                  | 2SC497-R, O or Y |                   |
| Q9                 | Transistor                  | 2SC1382-O or Y   |                   |
| Q10                | Transistor                  | 2SA682-O or Y    |                   |
| Q11                | Transistor                  | 2SA776-Y or GR   |                   |
| Q1, 2, 3, 4, 5, 13 | Silicon Diode               | 1S1555           |                   |
| D6                 | Silicon Diode               | 1S1553           |                   |
| D8                 | Silicon Diode               | S1RB-40          |                   |
| D9                 | Zener Diode                 | XZ-245           |                   |
| D10                | Zener Diode                 | XZ-162           |                   |
| D11, 12            | Silicon Diode               | SV-02            |                   |
|                    | Screw (Pan Head ISO Metric) | 600-0306-01      | 3x6mm for Q9, Q10 |
| R1, 2, 22, 23, 24  | Carbon Film Resistor        | RD142HA153J      | 15kΩ ± 5% ½W      |
| R3, 29, 31         | Carbon Film Resistor        | RD142HA752J      | 7.5kΩ ± 5% ½W     |
| R4, 5, 17          | Carbon Film Resistor        | RD142HA223J      | 22kΩ ± 5% ½W      |
| R6                 | Carbon Film Resistor        | RD142HA622J      | 6.2kΩ ± 5% ½W     |
| R7                 | Metal Film Resistor         | RN143AA3R9J      | 3.9Ω ± 5% 1W      |
| R8                 | Carbon Film Resistor        | RD142HA433J      | 43kΩ ± 5% ½W      |
| R9                 | Carbon Film Resistor        | RD142HA331J      | 330Ω ± 5% ½W      |
| R10                | Carbon Film Resistor        | RD142HA274J      | 270kΩ ± 5% ½W     |
| R11                | Carbon Film Resistor        | RD142HA393J      | 39kΩ ± 5% ½W      |

| No.             | Description                    | Part No.        | Remarks                |
|-----------------|--------------------------------|-----------------|------------------------|
| R12             | Carbon Film Resistor           | RD142HA562J     | 5.6kΩ ± 5% ½W          |
| R13             | Carbon Film Resistor           | RD142HA181J     | 180Ω ± 5% ½W           |
| R14, 19, 30, 32 | Carbon Film Resistor           | RD142HA103J     | 10kΩ ± 5% ½W           |
| R15             | Carbon Film Resistor           | RD142HA823J     | 82kΩ ± 5% ½W           |
| R16             | Carbon Film Resistor           | RD142HA332J     | 3.3kΩ ± 5% ½W          |
| R18             | Carbon Film Resistor           | RD142HA101J     | 100Ω ± 5% ½W           |
| R20, 21         | Carbon Film Resistor           | RD142HA474J     | 470kΩ ± 5% ½W          |
| R25             | Carbon Film Resistor           | RD142HA560J     | 56Ω ± 5% ½W            |
| R26             | Oxide Metal Film Resistor      | RS143AA331JG    | 330Ω ± 5% 1W           |
| R27, 28         | Oxide Metal Film Resistor      | RS143AA681J     | 680Ω ± 5% 1W           |
| R33, 34         | Carbon Film Resistor           | RD142HA130J     | 13Ω ± 5% ½W            |
| R35, 36         | Carbon Film Resistor           | RD142HA333J     | 33kΩ ± 5% ½W           |
| C1              | Bipolar Electrolytic Capacitor | CE02D1A101 (BP) | 100μF 10WV             |
| C2              | Electrolytic Capacitor         | CE04W1E100      | 10μF 25WV              |
| C3              | Ceramic Capacitor              | CC45SL1H101K    | 100pF ±10% 50WV        |
| C4              | Electrolytic Capacitor         | CE02W0J101      | 100μF 63WV             |
| C5              | Electrolytic Capacitor         | CE04W1H3R3      | 3.3μF 50WV             |
| C6              | Bipolar Electrolytic Capacitor | CE02D1H4R7 (BP) | 2.2μF 50WV             |
| C7              | Mylar Film Capacitor           | CQ93M1H102JZ    | 1000pF ± 5% 50WV       |
| C8              | Metallized Film Capacitor      | CQ91M2E225M     | 2.2μF ±20% 250WV       |
| C9, 10, 11, 12  | Ceramic Capacitor              | CK45F2H103P     | 0.01μF +100% -0% 500WV |
| C13, 14, 15     | Electrolytic Capacitor         | CE02W2A101      | 100μF 100WV            |
| C16, 17         | Electrolytic Capacitor         | CE02W1K100      | 10μF 80WV              |
| C18, 20         | Ceramic Capacitor              | CK45F1H103Z     | 0.01μF +80% -20% 50WV  |
| C19             | Electrolytic Capacitor         | CE04W1H4R7      | 4.7μF 50WV             |
| C21, 22         | Ceramic Capacitor              | CK45F1H473Z     | 0.047μF +80% -20% 50WV |
| C23             | Electrolytic Capacitor         | CE02W1J101      | 100μF 63V              |

## METER CIRCUIT ASSEMBLY (716-0008-00)

## DISC INPUT ASSEMBLY (716-0009-00)

### PARTS LIST

| No.                     | Description            | Part No.    | Remarks      |
|-------------------------|------------------------|-------------|--------------|
|                         | Fuse Holder            | 306-1001-00 |              |
|                         | Fuse                   | 310-0101-00 | 1A           |
| D1, 2, 3, 4, 5, 6, 7, 8 | Germanium Diode        | IN60        |              |
| VR1, 2                  | Potentiometer          | 581-0141-00 | 10kΩ         |
| R1, 2                   | Carbon Film Resistor   | RD142HA123J | 12kΩ ± 5% ½W |
| C1, 2                   | Electrolytic Capacitor | CE02W1E3R3  | 3.3μF 25WV   |

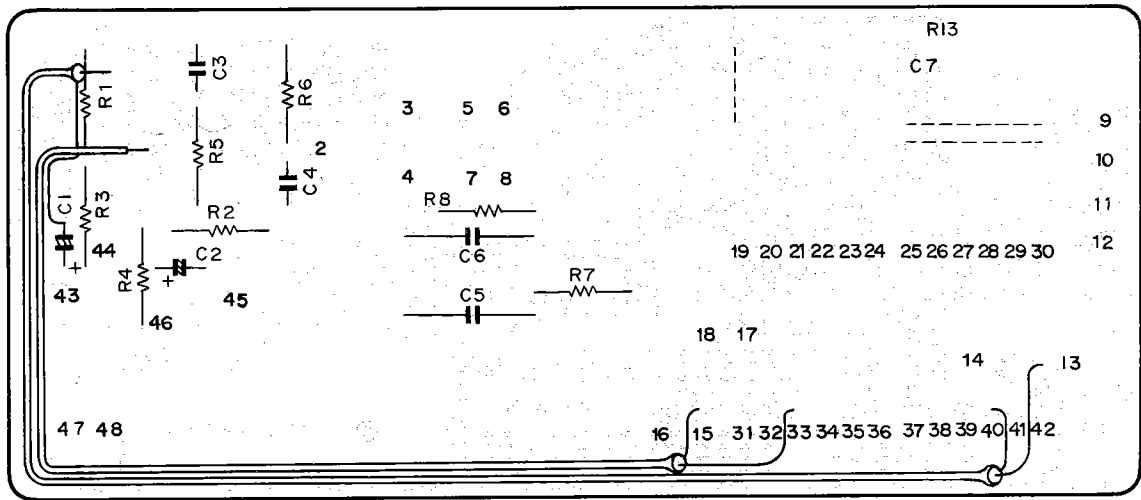
### PARTS LIST

| No.         | Description                   | Part No.    | Remarks                |
|-------------|-------------------------------|-------------|------------------------|
|             | Pin Jack with Ground Terminal | 302-0901-00 | for DISC 1, 2          |
| S1          | Slide Switch                  | 350-0202-00 | for IMPEDANCE SELECTOR |
| R1, 2, 5, 6 | Carbon Film Resistor          | RD142HA104J | 100kΩ ± 5% ½W          |
| R3, 4       | Carbon Film Resistor          | RD142HA433J | 43kΩ ± 5% ½W           |

# PUSH-BUTTON SWITCH ASSEMBLY (716-0007-00)

PRINTED CIRCUIT BOARD

\*Printed circuit board as seen from the reverse side.

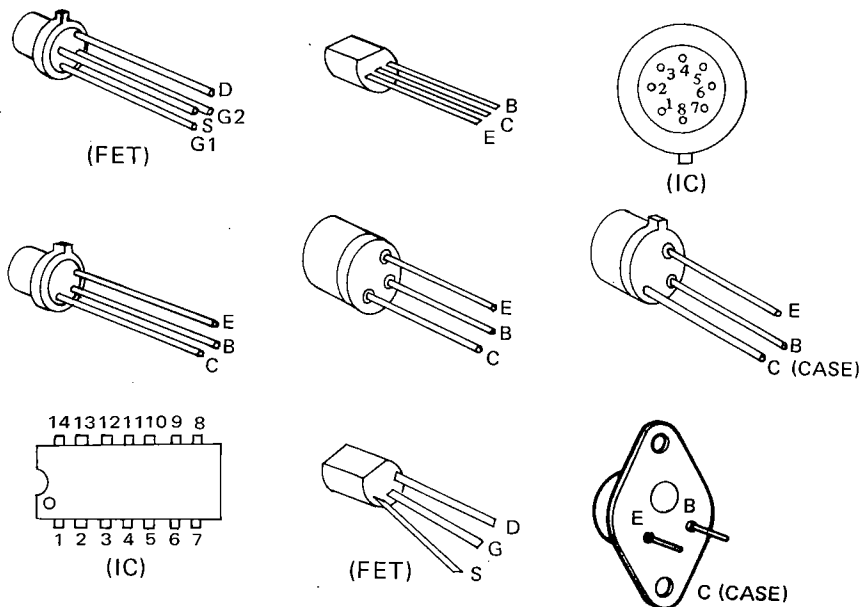


## PARTS LIST

| No.   | Description          | Part No.     | Remarks        |
|-------|----------------------|--------------|----------------|
|       | Connector Plug       | 304-0602-00  |                |
|       | Push-button Switch   | 345-6402-00  |                |
| R1, 2 | Carbon Film Resistor | RD142HA5492G | 54.9kΩ ± 2% ½W |
| R3, 4 | Carbon Film Resistor | RD142HA1002G | 10kΩ ± 2% ½W   |
| R5, 6 | Carbon Film Resistor | RD142HA163J  | 16kΩ ± 5% ½W   |

| No.            | Description               | Part No.     | Remarks           |
|----------------|---------------------------|--------------|-------------------|
| R7, 8          | Carbon Film Resistor      | RD142HA105J  | 1MΩ ± 5% ½W       |
| R9, 10, 11, 12 | Carbon Film Resistor      | RD142HA301J  | 300Ω ± 5% ½W      |
| C1, 2          | Tantalum Solid Capacitor  | CS15E1C100M  | 10μF ± 20% 16WV   |
| C3, 4          | Mylar Film Capacitor      | CQ93M1H333JZ | 0.033μF ± 5% 50WV |
| C5, 6          | Metallized Film Capacitor | CQ93M2E105M  | 1μF ± 20% 250WV   |

## TRANSISTOR LEADS





# CIRCUIT DESCRIPTION

The bias current of a Main Drive amplifier must be stable under all operating conditions.

This is particularly so in the case of Main Drive amplifiers whose every stage is direct-coupled since instability in any one stage will adversely affect current flow in the final output stage. Good stability is ensured in this Integrated Amplifier with the following methods. (Refer to the Main Drive Amplifier Assembly No.710-0002-00 in the schematic diagram)

1. A fixed voltage is applied with a constant voltage power supply, which employs a silicon diode (D1) to the emitters of Q1, Q2 that make up the first stage differential amplifier circuit. In addition silicon diodes D1, D2, D3 and D4 are inserted in the collector circuit to stabilize the current of the following stage for Q13 to Q15 and Q14 to Q16 where Darlington amplification is employed.
2. Heat compensation is provided to assure constant current drive to the final stage with a silicon varistor (D3:STV-4H which is mounted beneath the power transistor heat sink), a thermistor (TH1: TP-31L connected to Q7 2SC1431), and potentiometer VR1 that are all employed to the collectors of Q4. The bias current for the final stage is the sum total requirement of the power transistors (L channel: Q1, Q3, Q5 and Q7 or R channel: Q2, Q4, Q6 and Q8) and is set at 60 – 100mA. Power consumption during no signal condition is limited to this small current drain and so creates hardly any heat. If the amplifier is operated continuously at an average power output of 20 watts, both sides of the upper top plate should heat up to about 35 degrees centigrade (about 95 degrees fahr.). If the amplifier is operated continuously at full power to deliver a single frequency signal, it may heat up as high as 70 degrees centigrade (160 degrees fahr.). If only one side of this amplifier heats up, bias current adjustment should be made, as explained on the following page, after the heat compensating elements have first been checked and found in order. Bias current adjustment is also necessary when the Main Drive Assembly printed-circuit board or the power transistors are replaced.

## A. BIAS CURRENT ADJUSTMENT

This amplifier is equipped with testing points TP1 and TP2 as shown in Fig. for bias current adjustment. This current is calculated from the voltage that is measured across these test points, as follows:

1. After the amplifier has been serviced and restored to normal, connect speakers or dummy loads to it. If there is an input signal, then cut the signal off.
2. Connect a volt-ohm-multitester or voltmeter with an interior impedance of more than 100KΩ/V and full scale range of 0.3V across TP1 (+) and TP2 (-).
3. Adjust Main Drive Assembly **VR1** (see Fig.) so that the meter indicates 0.05V which represents a current flow of 50mA. (Turning VR1 in clockwise direction increases the current flow.)
4. Adjust **VR1** for the opposite channel in the same manner, and then adjust the center voltage following the procedure as explained paragraph B.
5. Reset the Speaker Switch to the position where a load is connected feed a signal into the amplifier confirm if it is operating normally
6. Let amplifier warm up thoroughly with an output of one watt for approximately 15 minutes.

7. Now cut the input signal off, connect the voltmeter again to the testing points and adjust VR1 so that the meter indicates 0.08V which represents about 80mA.

**Note 1:** The Power Level Meter will deflect even under no signal conditions if the center voltage is not correctly at "0" potential. In such a case, switch off the load (set SPEAKERS switch to OFF position) and adjust the center voltage first, as explained in the following paragraph, before attempting to make this bias adjustment.

**2:** Bias current above is calculated as follows:

$$I = V/R$$

where V is the voltmeter reading,

and R is 0.67 ohms (the resistance of the power transistor emitter resistor).

## B. CENTER VOLTAGE ADJUSTMENT

The output terminals of a direct coupled, positive-negative dual power supply type amplifier should be at "0" electric potential in terms of DC. This voltage can be kept to within ±200mV with an ordinary circuit design, which does not employ the aid of a voltage adjustment circuit. However, this power amplifier is equipped with such an adjustment circuit to ensure further stability. Its adjustment is made as follows.

1. Connect the same type of voltmeter that was used for bias adjustment across unloaded speaker terminal and set the SPEAKERS switch to the corresponding position.
2. Switch power ON and, under no signal conditions adjust **VR2** of the Main Drive Assembly (see Fig.) so that the meter indicates 0 volts.

## C. POWER LEVEL METER ADJUSTMENT

The power level meter on this amplifier is adjusted to indicate 0dB when the amplifier produces an output of 100W at 8 ohm load. It can be readjusted as follows if it is suspected that meter indications may be abnormal.

1. Connect an 8 ohm 100 watts dummy load and VTVM to an open speaker terminal.
2. Feed a 1 kHz signal, and set volume control to maximum position to get an output of 100 watts (28.28V).
3. With METER RANGE switch set at "0dB" position, adjust VR1 (right channel) and VR2 (left channel) (see Fig.) so that the Power Level meter indicates 0dB.

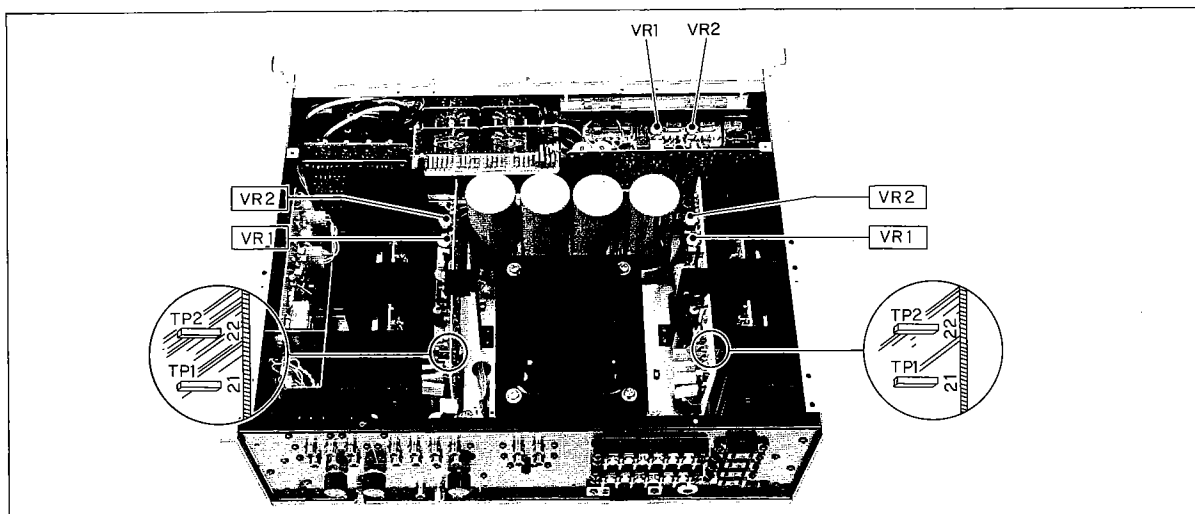


Figure TEST POINT AND ADJUSTMENT POTENTIOMETERS

# PROTECTION CIRCUIT DESCRIPTION

This unit has, in addition, four other protection circuit, namely: an ASO (Area of Safety Operation) limiter circuit, an abnormal load impedance detector circuit, an abnormal DC output voltage detector circuit and a relay control circuit which triggers a relay in the output load circuit. These various protection circuit are described below.

## 1. ASO LIMITER CIRCUIT

This circuit employs Q5, Q6, D2, D3, D4 and D5 which are located in the Main Drive Assembly (710-0002-00). In Case of a short circuit in the speaker connecting network, or when the load impedance drops to an abnormally low value, this circuit limits the input signal level to the B-class driver transistors Q7 and Q8. This serves to clip their output and protect the power transistors by keeping them working within the area of safe operation (ASO).

A special feature of this circuit is that it protects the power transistors against exceptionally strong pulse surges of short duration without having to activate the circuit breaking protection relay.

### —Checking the circuit

Obtain a 20V output when delivered into a 4 ohm load. Then change the load value to 2 ohm. Clipping should then occur identically on both the positive and negative cycles of an output signal waveform.

## 2. ABNORMAL LOAD IMPEDANCE PROTECTION CIRCUIT

If AC power is turned ON when the output impedance happens to be extremely low or non-existent as in the case of a shorted or near-short speaker circuit, this situation is quickly detected by this circuit which then prevents the load circuit relay from closing. This protection circuit employs Q3, Q4, Q5, D3 and D4 which are located within the Power Supply Assembly (719-0004-00).

When power is turned on under normal conditions, an AC line frequency signal is applied to Q3 via terminal 19 of the Power Supply Assembly. This is amplified by Q3 and Q4, and is supplied as a minus voltage to the base of Q5 after being rectified by the voltage doubler rectifier D2 and D3. This causes Q5 to turn OFF and permits normal operation of the Relay Control Circuit to close the relay shortly after power is turned on. In case of an abnormally low load impedance, or a short circuited output, however, the AC line frequency signal is not applied to Q3. Q5 is then biased by R15 (82 Kohms) which turns it ON. This causes the relay control circuit to keep the relay open and prevent connection to the output load.

### —Checking this circuit

If the relay does not close after AC power is turned on, check the following. Voltage across R14 of D3 should be more than  $-3V$ .

## 3. DC OUTPUT VOLTAGE DETECTOR CIRCUIT

When a large, very low frequency voltage is applied to the speakers, or when a high DC voltage is created in the output circuit due to a fault in the power transistor circuit, damage may be caused to the speakers. This protection circuit prevents this possibility by causing the relay to open the speaker circuit and consists of Q1, Q2 and D1 in the Power Supply Assembly (719-0004-00). When the output voltage potential is "+", Q1 is turned ON. When it is "-", Q2 is turned ON. This reduces the collector voltage and triggers the relay to break the speaker circuit. For signal frequencies above 7Hz, however, the relay will remain closed up to the full rated power output due to the time constant of C1. For signal frequencies below 7Hz, the relay will break the speaker circuit before full power is reached.

### —Checking the circuit action

Set the Speaker Selector Switch to the position where no load is connected and apply a 5Hz signal. With meter sensitivity set at 0dB, the relay should break the speaker circuit before a 0dB output is reached.

## 4. LOAD CONNECTING RELAY CONTROL CIRCUIT

This circuit consists of Q6, Q7, Q8, D5 and D6 located in the Power Supply Assembly (719-0004-00). It controls relay action in accordance with signals from the protection circuits explained in "2" and "3" above. In addition, it has two other functions, namely to prevent the relay from closing for an interval of about 4 seconds after power is turned ON and enable circuits to stabilize. It also breaks the speaker circuit when power is turned OFF and prevents reproduction of residual output energy.

### —Checking circuit action

#### a. When power turned ON

Stages preceding Q6 have no relation to this circuit action. For a 4 second interval immediately after power is turned on capacitor C8 is charging. This causes Q7 to remain at ON and Q8 at OFF, and the relay remains open. After about 4 seconds creates a "0" base bias which causes Q7 to turn OFF and Q8 to turn ON to close the relay.

#### b. Circuit action in case of trouble

When an abnormal situation occurs, as explained under "2" and "3" above, action of these respective circuits causes Q6 to turn ON. This further causes Q7 to turn ON, and Q8 to turn OFF. The relay which was open in the case of "2" remains open. The relay which was closed in the case of "3" then opens. Power transistors and speakers are thus protected in this manner.

#### c. When power is OFF.

As explained in "2" above, the relay opens when power is turned OFF and cuts off the speakers simultaneously to prevent reproduction of residual output energy.

# CHECKING THE POWER SUPPLY

A circuit breaker is provided in the power supply on the primary side of the power transformer. It functions if a fault should occur in the supply circuit to the power transistors or in the power transformer.

Moreover, a fuse protects the power transformer from overheating in case of a short circuit in the secondary circuit that may not trigger the primary side circuit breaker.

It is located on the printed circuit board that is mounted behind the Power Meter. It should be checked in the following cases.

- When the Power Meter Lamp does not light → F3 (1A)
- When the Load Circuit Breaker Relay does not work after AC power is switched ON. → F1, F2 (1A)

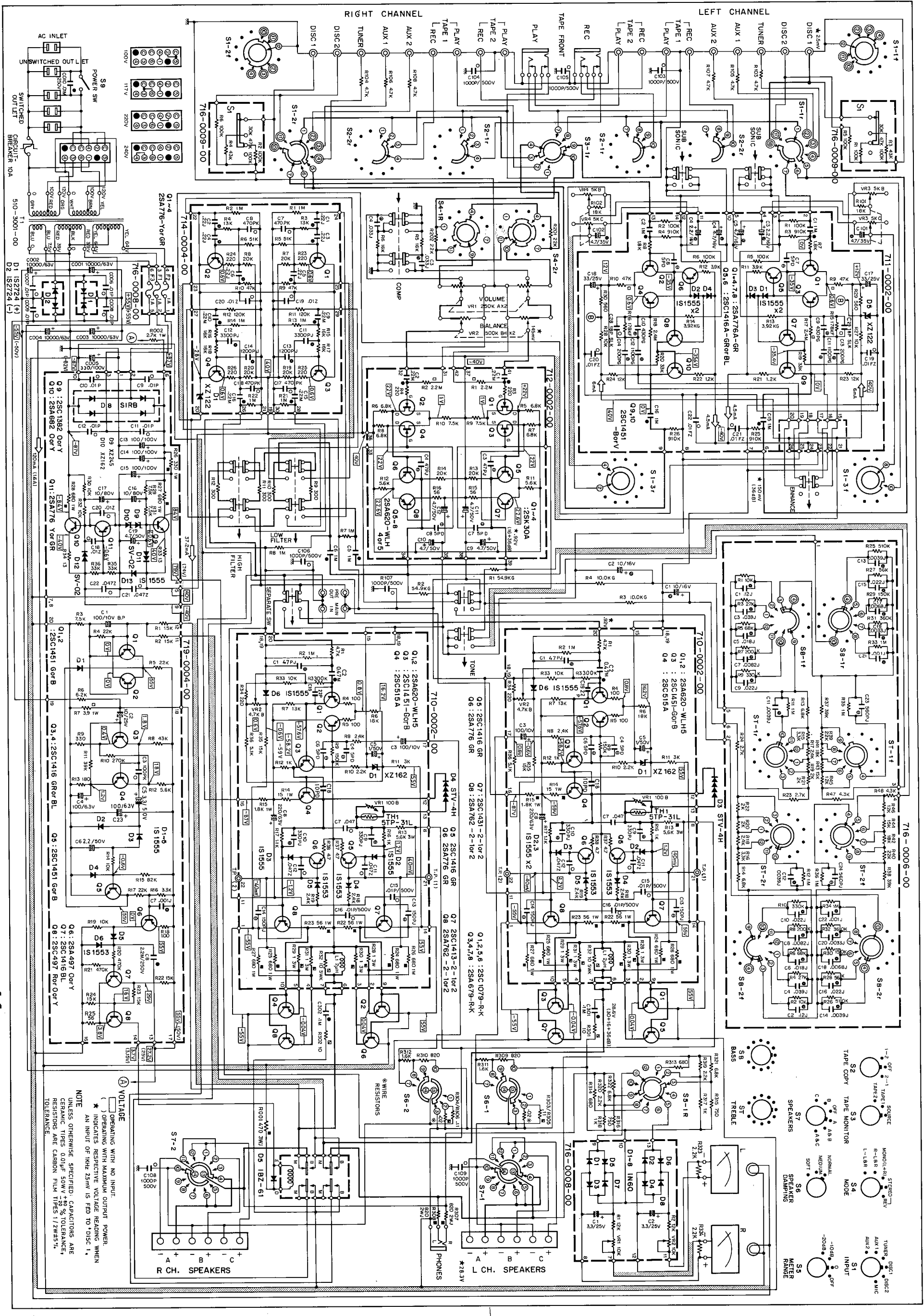
**Note:** To replace this fuse, remove the two screws which hold down the circuit board. Then pull the board straight out to the rear, and the fuse will become accessible.

## THE MARK OF CAPACITOR AND RESISTORS ON THE SCHEMATIC DIAGRAM

- : METAL FILM RESISTORS
- : OXIDIZED METAL FILM RESISTORS
- ▣ : CEMENT COATED WIRE WOUND RESISTORS
- ▤ : CEMENT COATED METAL PLATE RESISTORS
- : CERAMIC CAPACITORS
- ⊖ : MICA CAPACITORS
- ⊕ : TANTALUM SOLID CAPACITORS
- : METALLIZED FILM CAPACITOR
- ⊕ : POLYSTYRENE FILM CAPACITORS
- ⊙ : MYLAR FILM CAPACITORS

Unless otherwise specified: Capacitors are ELECTROLYTIC Types; Resistors are CARBON FILM Types, 1/2 watt, and  $\pm 5\%$  tolerance:

**Indicated values of parts the schematic diagram may be changed in case of performance improvement.**



# IFICATIONS

## PERFORMANCE GUARANTY:

Products of Accuphase guarantee specifications stated.

## POWER OUTPUT:

140 RMS watts continuous per channel into 4 ohms  
100 RMS watts continuous per channel into 8 ohms  
50 RMS watts continuous per channel into 16 ohms  
(with both channels operating simultaneously at any frequency from 20Hz to 20,000Hz)

## HARMONIC DISTORTION: (High Level Input to Main Output)

will not exceed 0.1% at rated power output  
will not exceed 0.05% at half of rated power output

## INTERMODULATION DISTORTION: (High Level Input to Main Output)

will not exceed 0.1% at rated power output for any combination of frequencies between 20Hz and 20,000Hz

## FREQUENCY RESPONSE:

Main Amp. Input: +0, -0.2dB  
High Level Input: +0, -0.5dB  
Low Level Input: +0, -1.0dB

## DAMPING FACTOR: (at 8 ohms load, 20Hz to 20,000Hz)

(at rated power output from 20Hz to 20,000Hz)  
with "SPEAKER DAMPING" switch set to:  
"NORMAL" "MEDIUM" "SOFT"

Over 20

## INPUT SENSITIVITY AND IMPEDANCE:

Disc 1: 2.55mV\*, 30 kohms, 47 kohms, 100 kohms  
Disc 2: 2.5mV; 47 kohms  
High Level Input: 160mV; 100 kohms  
Main Amp. Input: 1.0V; 100 kohms  
(\*2.5-5mV variable)

## MAXIMUM INPUT FOR LOW LEVEL INPUT:

Disc 1: 300mV RMS at disc level control maximum for 1KHz  
Disc 1: 600mV RMS at disc level control minimum for 1KHz  
Disc 2: 300mV RMS

## OUTPUT LEVEL AND IMPEDANCE:

Preamp. Output: 1.0V, 600 ohms (at rated input level)  
Tape Rec. 1, 2: 160mV, 200 ohms (at rated input level)

## HEADPHONE JACK:

For listening with low impedance (4-32 ohms) dynamic stereo headphones

## VOLTAGE AMPLIFICATION IN DECIBELS:

Main Amp. Input to Output: 29dB  
High Level Input to Preamp. Output: 16dB (at VOLUME control maximum)  
Low Level Input to Tape Rec. 36dB (Disc 1 level control provides 8dB variation)

## HUM AND NOISE:

Main Amp. Input: 94dB below rated output  
High Level Input: 80dB below rated output  
Low Level Input: 74dB below rated output  
10-step Rotary Switch for both channels with ON-OFF switch. Tone is varied in 2dB steps.

## BASS/TREBLE controls:

BASS turnover frequency: 400Hz,  $\pm 10$ dB at 100Hz  
TREBLE turnover frequency: 2.5KHz,  $\pm 10$ dB at 10,000Hz

## VOLUME control:

Less than 1dB tracking error.  
ON position boosts low frequencies for low level listening.

## COMPENSATOR:

+9dB boost at 50Hz when the volume knob is adjusted to -30dB position.

## DISC LOW ENHANCEMENT (for Disc Input):

+1dB at 100Hz to RIAA standard characteristics with "LOW ENHANCE" switch set to ON position.

## FILTERS:

Disc Subsonic Filter; 25Hz cutoff 6dB/oct  
Low Filter; 30Hz cutoff 18dB/oct  
High Filter; 5KHz cutoff 12dB/oct

## POWER LEVEL METER:

Meter is calibrated to read 0dB when amplifier produces 100 watts into 8 ohms load.

## METER RANGE

switch is provided to increase meter sensitivity by 10dB or 20dB.

## OUTPUT LOAD IMPEDANCE:

4, 8 and 16 ohms  
Voltage selector for 100V, 117V, 220V, 240V 50/60Hz operation

## POWER REQUIREMENT:

Consumption: 70 watts at zero signal output  
375 watts at rated power output into 8 ohms load

## SEMICONDUCTOR COMPLIMENT:

53 Transistors, 4 FET's, 44 diodes, 2 Thermistors  
455 mm (18 inches) wide, 152 mm (6 inches) high, 355 mm (14 inches) deep

## DIMENSIONS:

19.5 kg (42.9 lbs) net, 23.8 kg (52.3 lbs) in shipping carton.

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Accuphase