

ONKYO SERVICE MANUAL

AUTOMATIC 4-CHANNEL RECEIVER

TS-500



INDEX

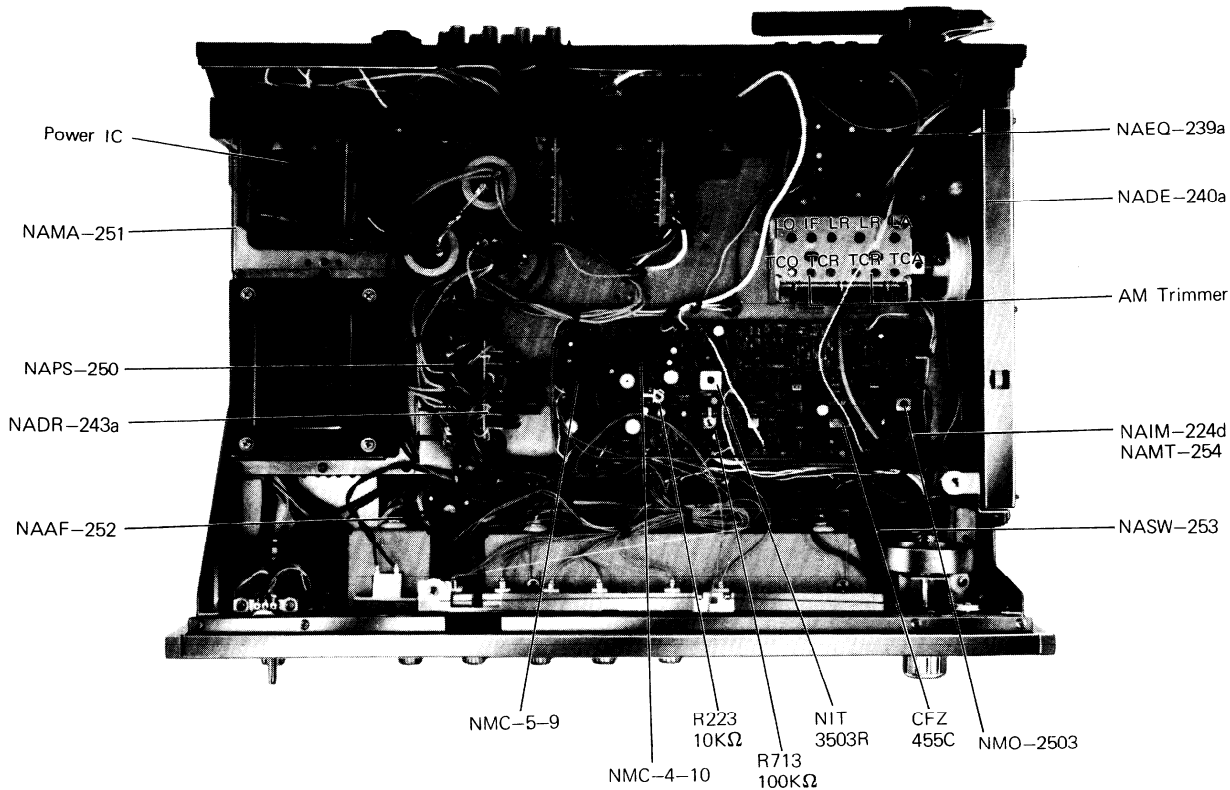
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SPECIFICATIONS

| | | | |
|---------------------------|---|--|--|
| TUNER SECTION | | | |
| Tuning Range | FM:88–108MHz AM:530–1605kHz | Frequency Response | 20–30,000Hz (± 1 dB) |
| Sensitivity | FM:1.8 μ V(IHF) AM:40 μ V 150 μ V/m | Power Bandwidth | 20–20,000Hz (–3dB, THD 0.5%) |
| Intermediate Frequency | FM:10.7MHz AM:455kHz | Sensitivity and Impedance | PHONO:2.5mV/50k Ω AUX:200mV/50k Ω TAPE PLAY–1/–2:200mV/ 50k Ω TAPE REC–1/–2:200mV/ 100k Ω |
| Capture Ratio | FM:2dB | BASS Control | ± 8 dB at 100Hz |
| Image Rejection Ratio | FM:70dB AM:35dB | TREBLE Control | ± 8 dB at 10kHz |
| IF Rejection Ratio | FM:90dB AM:40dB | Signal to Noise Ratio | PHONO:65dB (IHF C NETWORK) AUX, TAPE:75dB(IHF C NETWORK) |
| Signal to Noise Ratio | FM:70dB AM:40dB | Loudness Control | +7dB at 100Hz, +4.5dB at 10kHz |
| Alternate Channel att. | FM:65dB | Filter Low | 70Hz (6dB/oct) |
| AM Suppression Ratio | FM:50dB | High | 6kHz (6dB/oct) |
| Harmonic Distortion | FM MONO:0.4% FM ST:0.8% AM:1% | Dimensions | 534W \times 425D \times 140Hmm 21" 16-3/4" 5-1/2" |
| Frequency Response | FM:20–15,000Hz ± 1.5 dB | Weight | 15.5Kgr. 34lbs. |
| Stereo Separation | FM ST:40dB at 400Hz 30dB at 100– 10,000Hz | Semiconductors | FET:9 Transistors:94 Diodes:66 ICs:8 |
| Muting Level | FM:20 μ V | Specifications and features are subject to change without notice. | |
| Stereo Lamp Level | FM ST:20 μ V | | |
| Tuning Meter | Signal Strength Meter | | |
| Amplifier Section | | | |
| Power Output | 200W (IHF 4 Ω) | | |
| Dynamic | 140W(IHF 8 Ω) | | |
| Continuous | 30W \times 4 (4 Ω 4-channel driven at 1kHz) 25W \times 4 (8 Ω 4-channel driven at 1kHz) 19W \times 4 (8 Ω 4-channel driven at 20–20,000Hz) 50W \times 2 (8 Ω 2-channel driven at 1kHz, BTL connection) | | |
| Total Harmonic Distortion | 0.5% at Rated Power | | |
| Damping Factor | 30 (8 Ω 1kHz) | | |

CHASSIS LAYOUT TOP VIEW



FM, AM, ALIGNMENT PROCEDURE

INSTRUMENT REQUIRED

1. AM and FM sweep generator
2. AM and FM signal generator
3. Vacuum tube voltmeter (V.T.V.M.) AC/DC
4. Oscilloscope
5. Distortion meter
6. Stereo Modulator

GENERAL ALIGNMENT CONDITIONS

1. Signal input should be kept low as possible.
2. Standard modulation is 400Hz 30% (AM)
400Hz 100% (FM.MONO), pilot 10% Sub & Main 90% (FM.ST)
3. Standard output is 500mW (2.0V, 8Ω)

| STEP | CONNECT SIGNAL SOURCE TO- | SET SIGNAL TO- | CONNECT OUTPUT INDICATOR TO- | SET RADIO DIAL TO- | ADJUST | ADJUST FOR | REMARKS | STEP |
|------|---|---------------------|---|---------------------|--|------------------------------|---|------|
| 1 | Set Program Mode Switch to "Auto" Set Selector Switch to "AUX" | | | | | | | 1 |
| 2 | No Signal | | V.T.V.M. to across "SW-OUT" terminal (NAMT-254) | | Variable Resistor R1302 (2.2KΩ) (NAMT-254) | Adjust the voltage to - 1V. | | 2 |
| 3 | Set Program Mode Switch to "DISCRETE" (CD-4) Set Amp Mode Switch to "4ch" Set Selector Switch to "AM" | | | | | | | 3 |
| 4 | AM Sweep Generator to-AM Ant. | 455KHz | Oscilloscope to-across "AM OUT" terminal (NAIM-224d) | Quiet Point on Band | X104 CFZ-455C | Maximum Symmetrical response | Usually not necessary to adjust | 4 |
| 5 | AM Signal Generator to-AM Ant through a standard radiating loop | 515KHz (modulated) | V.T.V.M. or oscilloscope to-across "SPEAKER" terminal | Lower end | L107 NMO-2503 (Red) | Maximum | Repeat steps 3 and 4 as necessary to obtain Maximum sensitivity on stations | 5 |
| 6 | | 1680KHz (modulated) | | Upper end | AM Trimmer (OSC. side) | Maximum | | 6 |

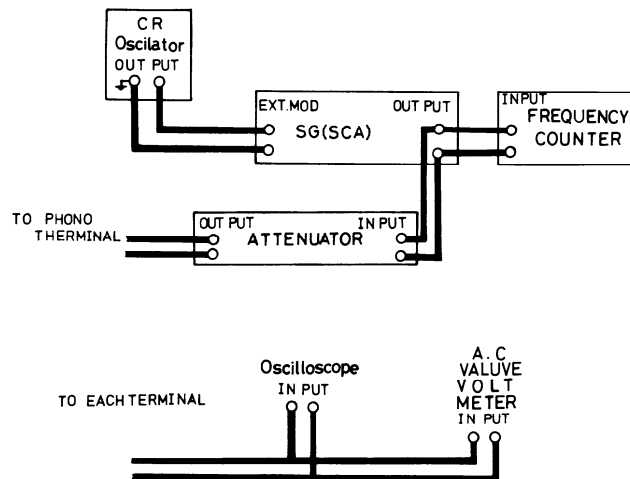
| STEP | CONNECT SIGNAL SOURCE TO- | SET SIGNAL TO- | CONNECT OUTPUT INDICATOR TO- | SET RADIO DIAL TO- | ADJUST | ADJUST FOR | REMARKS | STEP |
|------|---|--|--|---|------------------------------------|--|---|------|
| 7 | | 600KHz (modulated) | | 600KHz (Tuned to Signal) | L001 NMA-2509 (Coil Antenna) | Maximum | Repeat steps 5 and 6 as necessary | 7 |
| 8 | " | 1400KHz (modulated) | " | 1400KHz (Tuned to Signal) | AM Trimmer (Ant. side) | Maximum | | 8 |
| 9 | Set Radio Selector Switch to "FM" | | | Set Muting Switch to "OFF" | | | | 9 |
| 10 | FM Sweep Generator to "FM IN" terminal (NAIM-224d) | ±0.3MHz Sweep Centered at 10.7MHz | Oscilloscope to-across "IP2" (FM DET) terminal (NAIM-224d) | Quiet Point on Band | L105 NIT-3503R Top Bottom | Maximum "S" curve Lineality | Not necessary to adjust for Symmetrical response or Zero Voltage | 10 |
| 11 | No Signal | | Tuning Indicator may be used as the output indicator. | Quiet Point Where FM Signals are not received | L105 NIT-3503R Top | The Tuning Indicator comes to the center. | | 11 |
| 12 | FM Signal Generator to-across FM Ant. terminal through a matching network | 92MHz (100% Mod.) | V.T.V.M. to-across "SPEAKER" terminal | 92MHz | LO on FM Front end | Maximum | Repeat steps 10 and 11 as necessary | 12 |
| 13 | | 104MHz (100% Mod.) | | 104MHz | TCO on FM Front end | Maximum | | 13 |
| 14 | | 88MHz (100% Mod.) | | 88MHz (Tuned to Signal) | LA LR (2 points) on FM Front end | Maximum | Repeat steps 12 and 13 as necessary | 14 |
| 15 | | 108MHz (100% Mod.) | | 108MHz (Tuned to Signal) | TCA TCR (2 points) on FM Front end | Maximum | | 15 |
| 16 | | 98MHz (100% Mod.) | | 98MHz (Tuned to Signal) | IF (TOP & Bottom) on FM Front end | Maximum | | 16 |
| 17 | | 98MHz (100% Mod.) | Distortion meter to-across "SPEAKER" terminal | Tuned to Signal | L105 NIT-3503R Bottom | Minimum Distortion | Less than 0.3% | 17 |
| 18 | Set Radio Selector Switch to "FM" | | | Set Muting Switch to "ON" | | | | 18 |
| 19 | FM Signal Generator to-across FM Ant. terminal through a matching network | 98MHz (100% Mod.) | Oscilloscope to-across "SPEAKER" terminal | Tuned in and out | Variable Resistor R713 (100KΩ) | When tuned out, no noise. When tuned in, Signal. | Signals are not necessarily Squelching by turning R713 counter clockwise. | 19 |
| 20 | Set Radio Selector Switch to "FM AUTO" | | | Set Muting Switch to "OFF" | | | | 20 |
| 21 | " | 98MHz (Pilot Sig. 19KHz 10%) 1mv input | V.T.V.M. to-across "TP3" terminal (NAIM-224d) | Tuned to Signal | L201 NMC-4-10 | Maximum | R223 (10KΩ) center | 21 |
| 22 | " | 98MHz (Pilot Sig. 19KHz 1KHz R ch 90% | V.T.V.M. to-across "SPEAKER" terminal (R ch) | " | L202 NMC5-9 | Maximum | | 22 |
| 23 | " | 98MHz (Pilot Sig. 19KHz 10%) Main & Sub Sig. 1KHz L ch 90% | " (R ch) | " | Variable Resistor R223 (10KΩ) | Minimum | Retouch slightly Repeat Steps 23 and 24 as necessary | 23 |
| 24 | " | " R ch 90% | " (L ch) | " | " | " | " | 24 |

DEMODULATOR ALIGNMENT PROCEDURE

- (1) Voltage Controlled Oscillator (V.C.O.) Alignment
- (2) 30KHz Level Adjustment
- (3) Demodulated Voltage Alignment
- (4) Automatic Noise Reduction System (A.N.R.S.) Alignment

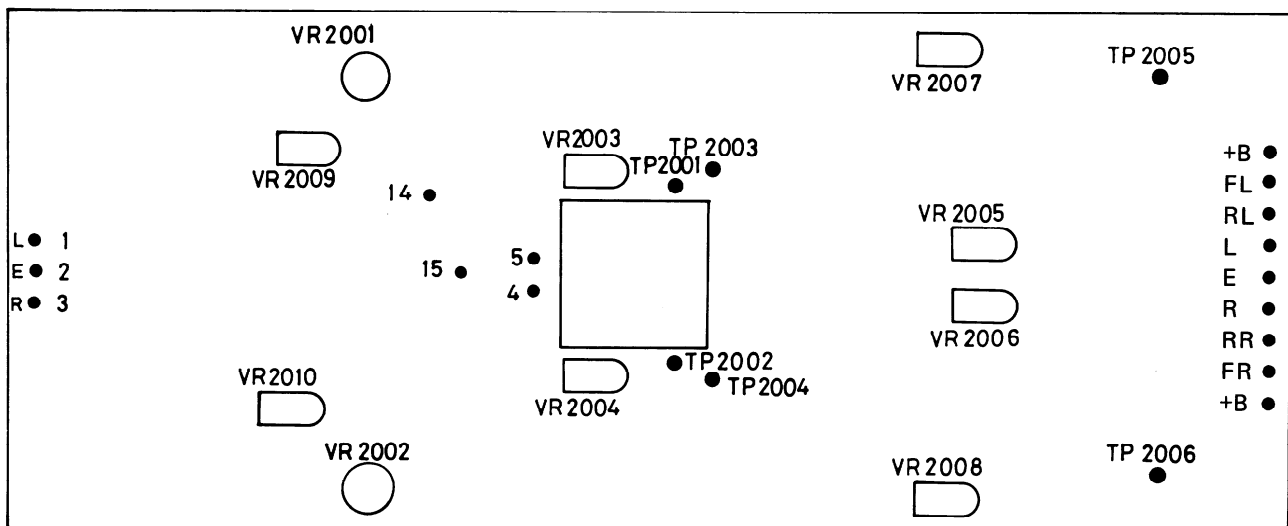
INSTRUMENT REQUIRED

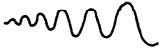

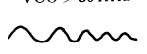
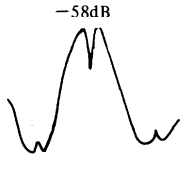


- CR oscillator
- SCA signal generator
- Oscilloscope
- Vacuum tube voltmeter (V.T.V.M.)
- Attenuator
- Test record (4DE-503, RG-1256, RG-1257)



Preliminary

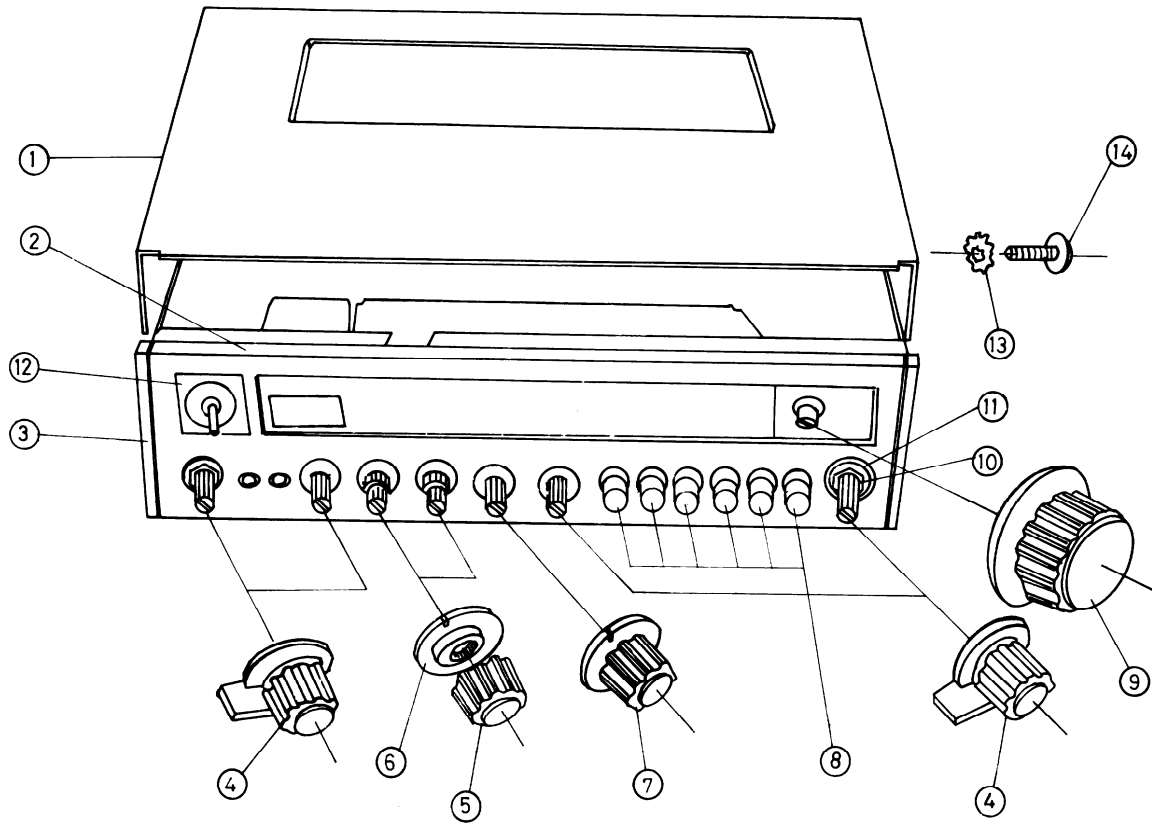
1. Connect instruments.
2. Set the receiver's selector switch to PHONO.
3. Set program mode switch to DISCRETE.
4. Connect lead wire between the junction of pin 15 on the printed circuit board (NADE-240a) and chassis ground. Then MUTING ON works.



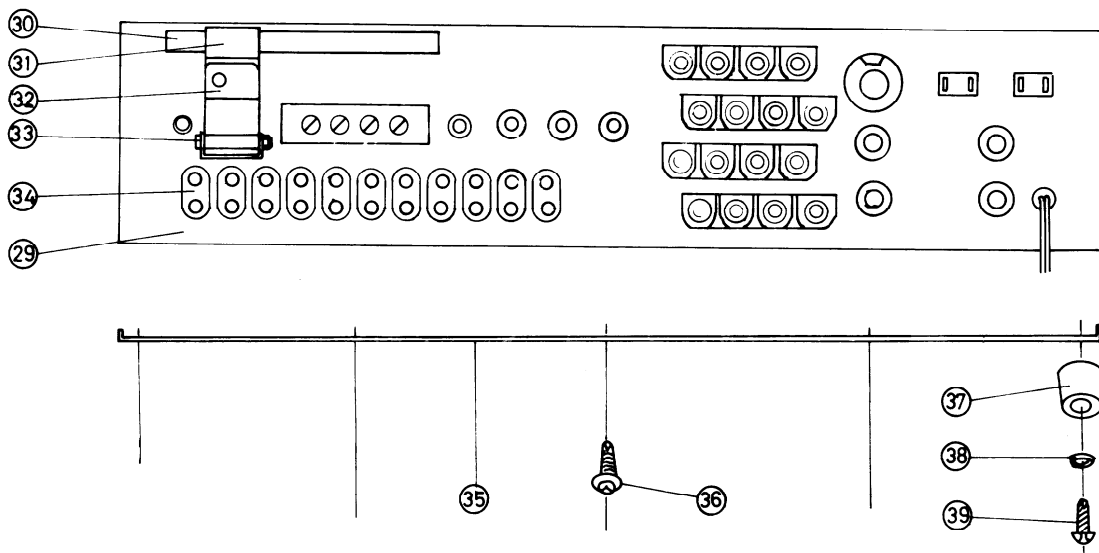
| STEP | CONNECT SIGNAL SOURCE TO- | SET SIGNAL TO- | | CONNECT OUTPUT INDICATOR TO- | ADJUST | ADJUST FOR | REMARKS |
|---|---|--|--|-------------------------------|-------------------|------------------------|---|
| | | SCA S.G. | TEST RECORD | | | | |
| V.C.O. Alignment | | | | | | | |
| | Tune VCO'S frequency to SCA SG's frequency. | | | | | | VCO < 30 KHz  VCO = 30 KHz  VCO > 30 KHz  |
| 1 | PHONO terminal (L) | 30KHz -110dBS | RG-1256 Band 9 | Oscilloscope to-across TP2003 | VR2001 (2.2KB) | Zero beat | |
| 2 | PHONO terminal (R) | | | Oscilloscope to-across TP2004 | VR2002 (2.2KB) | | |
| 30KHz Level Adjustment | | | | | | | |
| 3 | PHONO terminal (L) | 30KHz -57dBS Modulation is 400Hz, deviation is 4KHz. | RG1257 Band 4 & 5 or 4DE503 Side A No 5 | Oscilloscope to-across TP2003 | VR2009 | Just before distorted. | -58dB  |
| 4 | PHONO terminal (R) | | | Oscilloscope to-across TP2004 | VR2010 | | -67dB  -57dBS  |
| Demodulated Voltage Alignment | | | | | | | |
| 5 | PHONO terminal (L) | 30KHz -50dBS Modulation is 1KHz, deviation is 1.3KHz. | RG1256 Band 8 | V.T.V.M. to-across TP2003 | VR2003 | Output is -15dBS. | |
| 6 | PHONO terminal (R) | | | V.T.V.M. to-across TP2004 | VR2004 | | |
| ANRS Alignment Remove lead wire between the junction of pin 15 and chassis ground. | | | | | | | |
| 7 | CR oscillator to-TP2001 | 15KHz, -25dBS | VTVM to across TP2003 (INPUT INDICATOR) | VTVM to across TP2005 | VR2007 | -22.5dBS | |
| 8 | | 600Hz -25dBS | | | VR2005 | -23.5dBS | |
| 9 | CR oscillator to-TP2002 | 15KHz -25dBS | VTVM to across TP2004 (INPUT INDICATOR) | VTVM to across TP2006 | VR2008 | -22.5dBS | |
| 10 | | 600Hz -25dBS | | | VR2006 | -23.5dBS | |

MECHANICAL DISASSEMBLIES

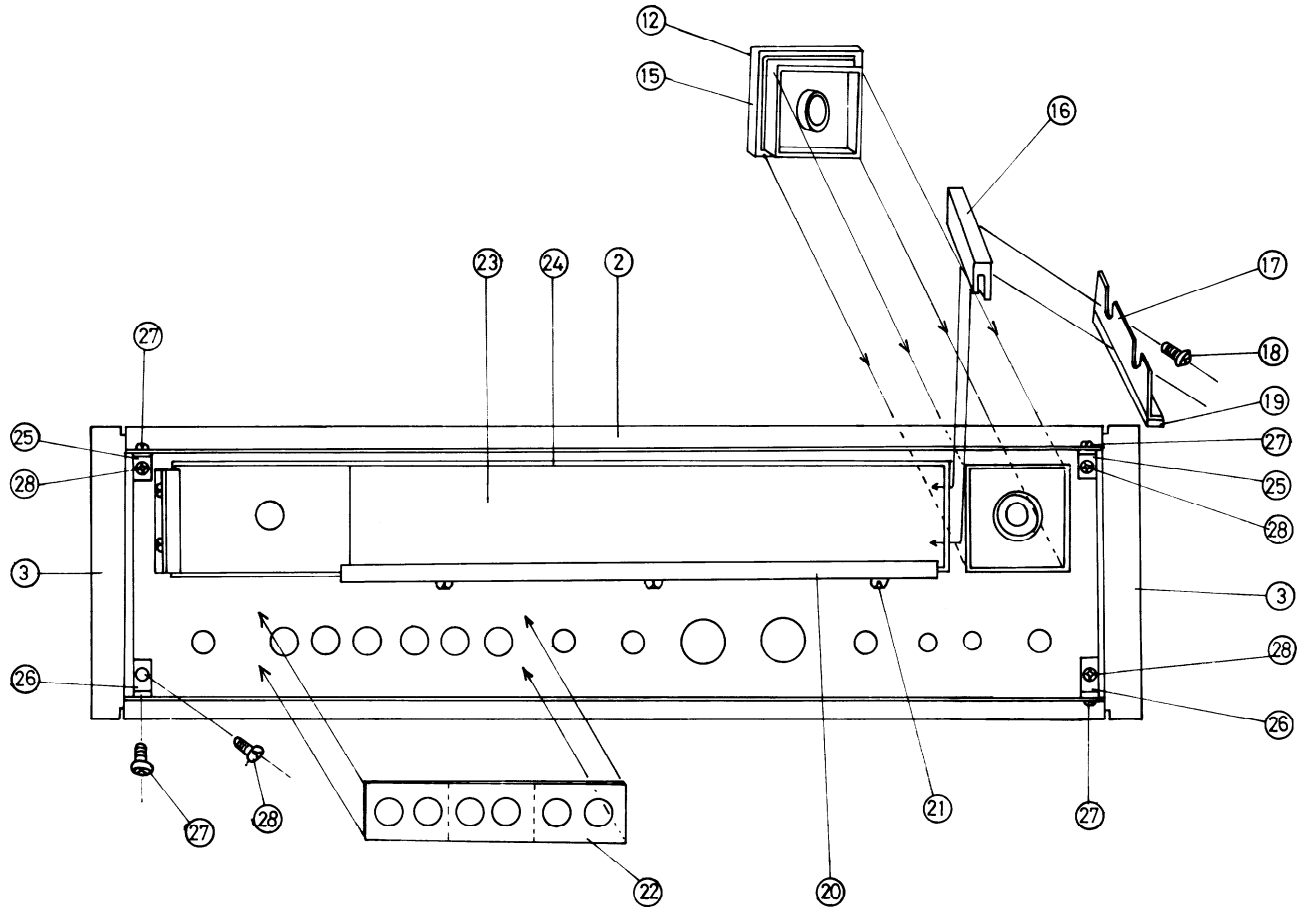
Front View



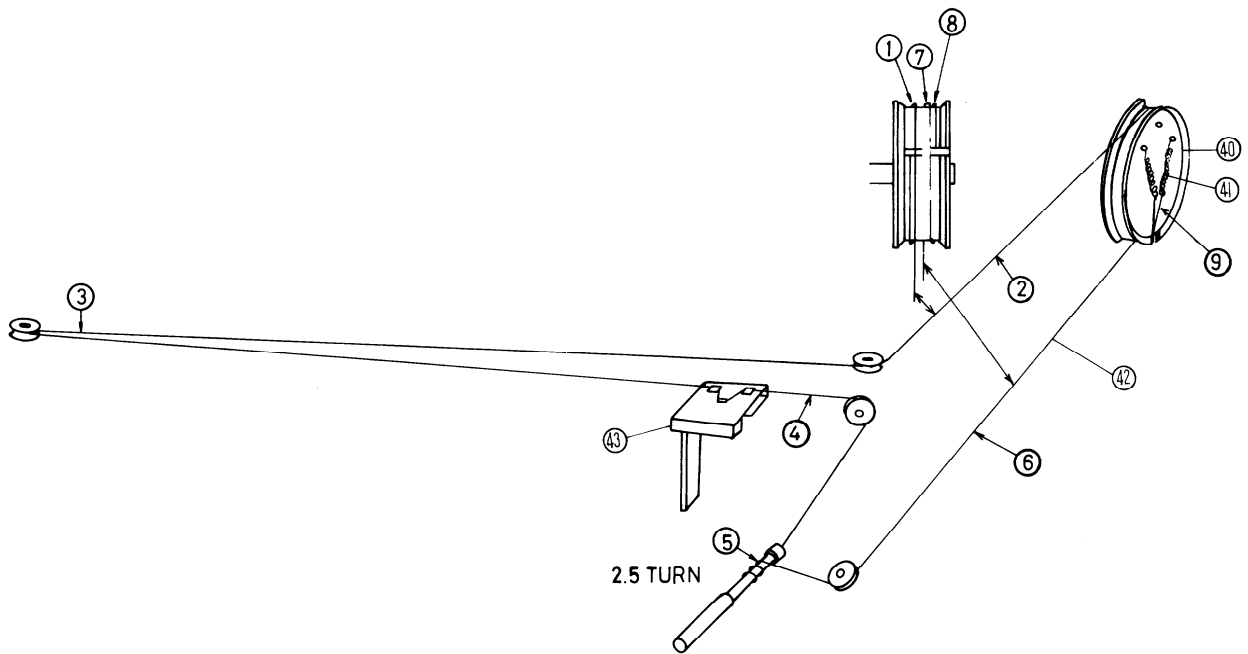
Rear View



Front Panel Rear View



Dial Cord Arrangement



CABINET PARTS LIST

| KEY NO. | PARTS NO. | DESCRIPTION | SPECIFICATIONS | Q'TY | STOCK NO. | REMARKS |
|---------|-----------|---------------------|----------------|------|-----------|--|
| 1 | A501 | AMP BOX assembly | | 1 | 281014-1 | |
| 2 | A514 | Front Panel | | 1 | 281016 | |
| 3 | A515 | End Cap | | 2 | 280319 | |
| 4 | A802 | Knob-Speaker | | 4 | 283056 | Speakers Amp mode Program mode Selector |
| 5 | A803 | Knob-Bass (Small) | | 2 | 283053 | Bass Treble |
| 6 | A804 | Knob-Bass (Large) | | 2 | 283054-3 | Bass Treble |
| 7 | A806 | Knob-Volume | | 1 | 283050 | Volume |
| 8 | A807 | Knob-Push | | 6 | 283123 | |
| 9 | A801 | Knob-Tuning | | 1 | 283051 | Tuning |
| 10 | A533 | Washer | W3x10F(t=0.5) | 2 | 87619014 | |
| 11 | A532 | Nut | N-9F(P=0.75) | 2 | 8631901 | |
| 12 | A531 | Plate-Balance | | 1 | 281018 | |
| 13 | A503 | Toothed lock Washer | M5-AB | 4 | 87555015 | |
| 14 | A502 | Truss Screw | 4T+20F-N | 4 | 82454020 | |
| 15 | A530 | Panel-Balance | | 1 | 281017 | |
| 16 | A522 | Flame Holder-S | | 2 | 280323 | |
| 17 | A523 | Bracket-Flame | | 2 | 280339-1 | |
| 18 | A519 | Binder Screw | 3B+6F-N | 6 | 82543006 | |
| 19 | A524 | Neoprene Sheet | | 2 | 280261 | |
| 20 | A521 | Flame Holder-L | | 1 | 280338 | |
| 21 | A526 | Binder Screw | 3B+5F-N | 7 | 82513005 | |
| 22 | A528 | Knob Guide | | 3/2 | 280502-1 | |
| 23 | A525 | Glass Plate | | 1 | 280259-1 | |
| 24 | A520 | Dial Flame | | 1 | 280322-1 | |
| 25 | A516 | Joiner-L | | 2 | 280352-1 | |
| 26 | A517 | Joiner-B | | 2 | 280449 | |
| 27 | A519 | Binder Screw | 3B+6F-N | 6 | 82543006 | (18) |
| 28 | A518 | Tapping Screw | 3STS+6BQ | 4 | 834130062 | |
| 29 | A071 | Back Panel | | 1 | 270778 | |
| 30 | L001 | Coil-Antenna | NMA-2509 | 1 | 232025 | |
| 31 | A072 | Antenna Holder | | 1 | 270204 | |
| 32 | A073 | Antenna Stay | | 1 | 270205 | |
| 33 | A075 | Antenna Screw | | 1 | 801112 | |
| 34 | P809 | Jack-Pin | NTM-2WPBL-E1 | 2 | 250170 | |
| 35 | A506 | Bottom Cover | | 1 | 280951 | |
| 36 | A510 | Tapping Screw | 3STW+8BQ | 4 | 831130082 | |
| 37 | A507 | Rubber Cushion | | 4 | 280560 | |
| 38 | A508 | Washer | W4x10F | 4 | 87614010 | |
| 39 | A509 | Tapping Screw | 4STS+12BQ | 4 | 834140122 | |
| 40 | A004 | Dial Drum | | L1 | 270220-1 | |
| 41 | A007 | Spring-Dial Drum | SP-14A | 2 | 273803 | |
| 42 | A009 | Dial String | Nylon 0.3mm | 1.2m | 273902 | |
| 43 | A103 | Pointer assembly | | 1 | 270535 | |
| | A033 | Dial Plate | | 1 | 270780 | |
| | A034 | Back Plate | | 1 | 2670781 | |
| | A037 | Drive Shaft | | 1 | 270218 | |

PARTS LIST

| PARTS NO. | DESCRIPTION | SPECIFICATION | Q'TY | STOCK NO. | |
|----------------|---------------------------|------------------|------|------------|--|
| U1 | IF & MPX Amp assembly | NA-IM224d | 1 | 13872524d | |
| U2 | EQ Amp assembly | NAEQ-239a | 1 | 13872539a | |
| U3 | DE Amp assembly | NADE-240a | 1 | 13872540a | |
| U4 | SW Amp assembly | NASW-253 | 1 | 13872553 | |
| U5 | MT Amp assembly | NAMT-254 | 1 | 13872554 | |
| U6 | AF Amp assembly | NAAF-252 | 1 | 13872552 | |
| U7 | PA Amp assembly | NAMA-251R | 1 | 13872551r | |
| U8 | PA Amp assembly | NAMA-251L | 1 | 13872551l | |
| U9 | PS Amp assembly | NAPS-250 | 1 | 13872550 | |
| U10 | DR Amp assembly | NADR-243a | 1 | 13872543a | |
| U11 | FM Front End | FL-322U | 1 | 240005 | |
| D001, D004 | Zener Diode | BZ-240 | 2 | 223907 | |
| D002, D003 | Silicon Diode | 10D2 | 2 | 223805 | |
| D005 | Germanium Diode | 1N60FM | 1 | 2231031 | |
| PL801 - PL805 | Pilot lamp | 6.3V250mA | 5 | 210001 | |
| PL806 | Pilot lamp | 6.3V0.05AW-3S | 1 | 210016 | |
| PL807 - PL809 | Pilot lamp | 6.3V0.05AW-3 | 4 | 210015 | |
| PL811 | Pilot lamp | 6.3V0.05AW-2 | 4 | 210014 | |
| PL810 | Pilot lamp | 6.3V0.05AW-2 | 4 | 210014 | |
| PL812 - PL814 | Pilot lamp | 6.3V0.05AW-2 | 4 | 210014 | |
| T001 | Transformer-Power | NPT-564ADGQ | 1 | 230064 | |
| L001 | Coil-Antenna | NMA-2509UL | 1 | 232025 | |
| T002 | Coil-Balloon | NBLN-1 | 1 | 233026 | |
| C002, C003 | Capacitor-Electrolytic | CE62W35V4700S-R | 2 | 3504030A | |
| C004 | Capacitor-Electrolytic | CE62W50V470X2S-R | 1 | 3504037A | |
| C006 | Capacitor-Electrolytic | CE02W35W470B | 3 | 351764711A | |
| C010, C011 | Capacitor-Electrolytic | CE02W50V470B | 1 | 351784711A | |
| C008 | Capacitor-Electrolytic | CE02W50V470B | 1 | 351784711A | |
| R001 | Control Resistor Variable | CVS100KW35A | 1 | 5104015A | |
| R016, R017 | Resistor Variable | N24R10KB10M | 2 | 5171004 | |
| R018 (R019) | Resistor Variable | N24RG50KB10M | 1 | 5177003 | |
| S807 | Switch-Rotary | NRS-485-30Y-APUL | 1 | 250264 | |
| S808 | Switch-Rotary | NRS-282-30Y-AS | 1 | 250265 | |
| S809 | Switch-Rotary | NRS-365-30Y-A | 1 | 250266 | |
| S810 | Switch-Rotary | NRS-484-30Y-A | 1 | 250267 | |
| S811 | Klixon | 9700-26-11 | 1 | 252009 | |
| P801, P802 | Jack-Stereo Headphone | XG-7716 | 2 | 250078 | |
| M101 | Tuning Indicator | NIND-0500S32 | 1 | 243023 | |
| PL801a, PL805a | Socket Pilot lamp | PLS-G1 | 5 | 213002 | |
| F901 - F904 | Fuse | 3A-T(SS-2) | 4 | 252006 | |
| F905 | Fuse | 5A-T(ST-2)UL | 1 | 252004 | |
| F906 | Fuse | 3A-T(Leadtype) | 1 | 252021 | |
| F905 | Fuse | 3A | 1 | 252021 | |
| F901a - F904a | Fuseholder | S-N1301 | 4 | 250080 | |
| P-807 | Terminal | NTM-4PUNI | 1 | 250136 | |
| P-808 | Jack-Pin | NTM-1PBL1-H1 | 1 | 250141 | |
| P-809, P-810 | Jack-Pin | NTM-2WPBL-E1 | 2 | 250170 | |
| P-811 | Jack-Pin | NTM-6WPBL-E1 | 3 | 250171 | |
| P812, P813 | Jack-Pin | NTM-6WPBL-E1 | 3 | 250171 | |

BALANCE
CD-4 ADJUST
30KHz LEVEL
SPEAKERS
AMP MODE
PROGRAM MODE
SELECTOR

AC110V/120V

PRINTED MATTER & PACKING

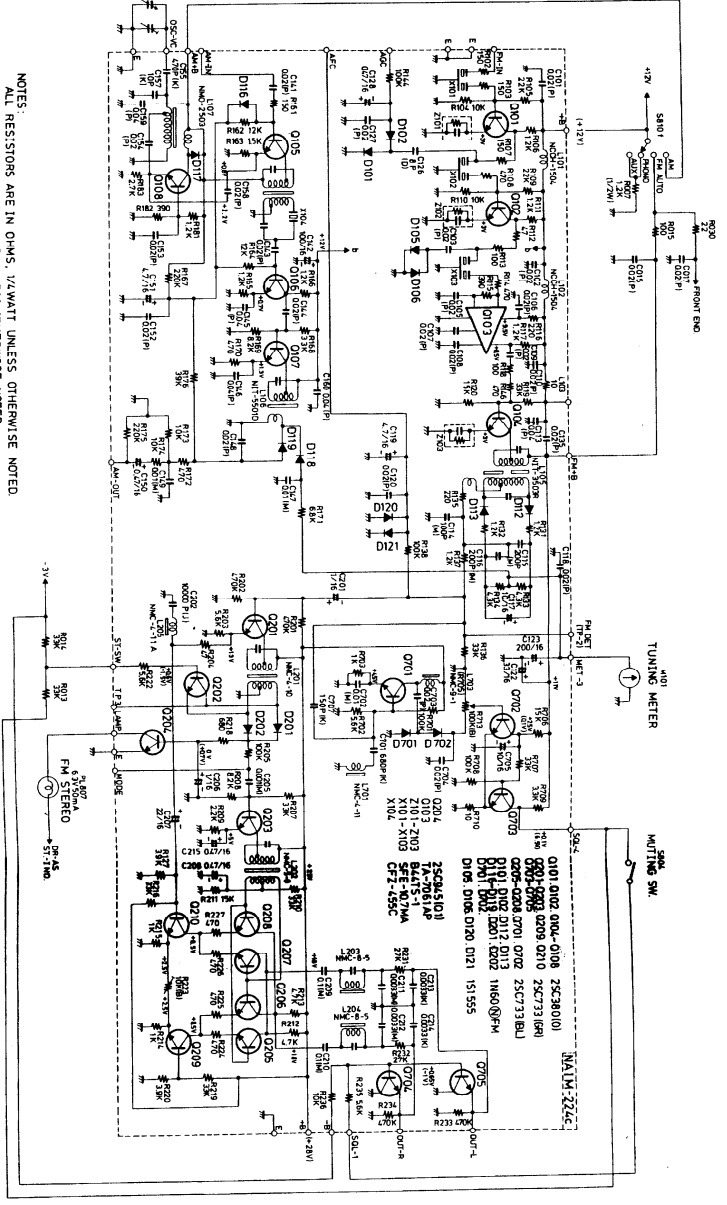
| | | | | | |
|------|---------------------|---------|---|----------|--|
| A851 | Master Carton Box | | 1 | 290461 | |
| A852 | Side Pad | | 2 | 290458-1 | |
| A853 | Amp Cover | | 1 | 290460 | |
| A907 | Instruction Booklet | | 1 | 293226-1 | |
| A902 | Warranty Card | | 1 | 293036 | |
| A903 | Caution Label | | 1 | 293041 | |
| A906 | Warranty Notes | | 1 | 293078 | |
| A910 | Silicon Cloth | | 1 | 292017 | |
| A911 | FM ANT AS | TFD-2US | 1 | 253071 | |
| A912 | Polyethylene Bag | 230X320 | 3 | 290078 | |
| A913 | Shorted Pinplug | PO-107 | 2 | 250153 | |
| A914 | Pinplug (Red) | SQ-4151 | 4 | 250091 | |
| A915 | Pinplug (Black) | SQ-4152 | 4 | 250092 | |

NAIM-224d

| | | | | | |
|-------------|-----------------|------------|----|---------|--|
| Q101, Q102 | Transistor | 2SC380(0) | 7 | 2210123 | |
| Q104 - Q108 | Transistor | 2SC733(GR) | 8 | 2210085 | |
| Q201 - Q203 | Transistor | 2SC733(BL) | 6 | 2210086 | |
| Q209 - Q210 | Transistor | 2SC945(Q1) | 1 | 2210355 | |
| Q703 - Q705 | IC | TA-7061AP | 1 | 222402 | |
| Q205 - Q208 | IC | TA-7061AP | 1 | 222402 | |
| Q701 - Q702 | IC | TA-7061AP | 1 | 222402 | |
| Q204 | IC | TA-7061AP | 1 | 222402 | |
| Q103 | IC | TA-7061AP | 1 | 222402 | |
| D101, D102 | Germanium Diode | 1N60(N)FM | 12 | 2231031 | |
| D112, D113 | Germanium Diode | 1N60(N)FM | 12 | 2231031 | |
| D116 - D119 | Germanium Diode | 1N60(N)FM | 12 | 2231031 | |
| D201, D202 | Germanium Diode | 1N60(N)FM | 12 | 2231031 | |
| D701 | Germanium Diode | 1N60(N)FM | 12 | 2231031 | |

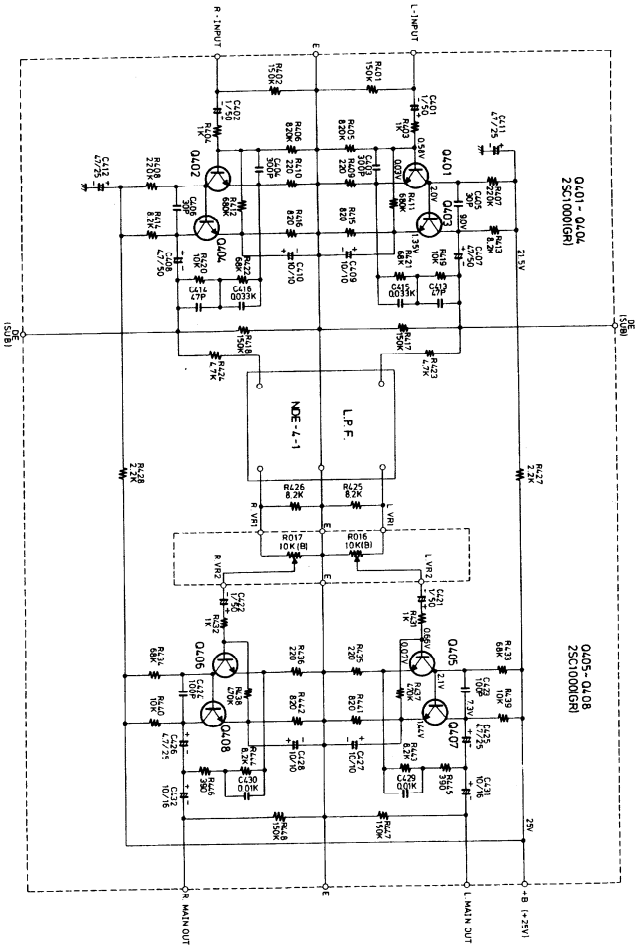
| PARTS NO. | DESCRIPTION | SPECIFICATION | Q'TY | STOCK NO. | |
|--|------------------------|------------------|------|------------|--------------------|
| NASW-253 | | | | | |
| S801 - S806 | Switch-Push | NPS-142LA2 | 6 | 250262 | |
| NAMT-254 | | | | | |
| Q301, Q302 Q304, Q305 Q307 | Transistor | 2SC1000(GR) | 9 | 2210285 | |
| Q322 - Q325 | Transistor | 2SC1000(BL) | 9 | 2210286 | |
| Q309 - Q317 | Transistor | 2SK30(Y) | 2 | 2210274 | |
| Q303, Q306 | Transistor | 2SA493(GR) | 3 | 2210235 | |
| Q318 - Q320 | Transistor | 2SC734(Y) | 1 | 2210064 | |
| Q326 | Germanium Diode | 1N60(N)FM | 12 | 2231031 | |
| D301 - D312 | Silicon Diode | 10D2 | 1 | 223805 | |
| D313 | Capacitor-Aluminium | AL04B25V0.47MS | 6 | 392154797 | |
| C301, C302 C376 - C379 C360, C361 C305, C306 C309, C310 C322 - C335 C338 - C343 C336, C337 C352, C353 C372 - C375 | Capacitor-Electrolytic | CE04W50V1S | 15 | 352780101A | |
| C329 | Capacitor-Electrolytic | CE04W50V0.47S | 2 | 352784791A | |
| C314 | Capacitor-Electrolytic | CE04W50V3.3S | 6 | 352780331 | |
| C313 | Capacitor-Electrolytic | CE04W25W220S | 1 | 352752211A | |
| C358, C359 | Capacitor-Electrolytic | CE04W16V47S | 1 | 352744701A | |
| C362, C363 | Capacitor-Electrolytic | CE04W16V10S | 1 | 352741001A | |
| C350, C351 | Capacitor-Electrolytic | CE04W25V4.7S | 4 | 352750471A | |
| C366, C367 | Capacitor-Electrolytic | CE04W6.3V100S | 2 | 352721011A | |
| R1302 | Capacitor-Electrolytic | CE02W50V1B | 2 | 351780101 | |
| | Resistor-Semi Fixed | R-HK 2.2KB | 1 | 5225005 | |
| | Relay | NRL4P1A-DC12 | 1 | 250255 | |
| NAAF-252 | | | | | |
| Q501 - Q508 | Transistor | 2SC1000(GR) | 8 | 2210285 | |
| Q509, Q510 | Transistor | 2SC1000(BL) | 2 | 2210286 | |
| C501 - C504 | Capacitor-Aluminium | AL04B6.3V2.2MS | 4 | 392120227 | |
| C509 - C512 | Capacitor-Electrolytic | CE04W50V3.3S | 8 | 352780331A | |
| C551, C552 C555, C556 | Capacitor-Electrolytic | CE04W50V1S | 8 | 352780101A | |
| C525 - C528 | Capacitor-Electrolytic | CE04W25V220S | 2 | 352752211A | |
| C533 - C536 | Capacitor-Electrolytic | CE04W25V4.7S | 2 | 352750471A | |
| C541, C557 | Capacitor-Electrolytic | CE04W25V4.7S | 2 | 352750471A | |
| C547, C548 | Resistor-Variable | N24RQL250KB30 | 1 | 5174004 | 4 gang Volume |
| R501 | Resistor-Variable | N24RKL100KB3020H | 2 | 5104014 | 4 gang Bass Treble |
| R529 - R533 | Resistor-Variable | | | | |
| NAMA-251R & L | | | | | |
| Q601R,L Q1601R,L | IC | STK-032 | 4 | 222003 | |
| C601R,L C1601R,L | Capacitor-Electrolytic | CE04W25V4.7S | 4 | 35270471A | |
| C605R,L C607R,L C1605R,L C1607R,L | Capacitor-Electrolytic | CE04W35V10S | 8 | 352761001A | |
| C609R,L C610R,L C1609R,L C1610R,L | Capacitor-Electrolytic | CE04W25V47S | 8 | 352754701A | |
| NADR-243a | | | | | |
| Q801 | Transistor | 2SC734(Y) | 1 | 2210064 | |
| Q802 | Transistor | 2SA495(Y) | 1 | 2210404 | |
| Q803 | Transistor | 2SD234(Y) | 1 | 2200020 | |
| D801, D802 D805, D806 | Diode-Silicon | 10D2 | 4 | 223805 | |
| D803 | Diode-Zener | WZ-192 | 1 | 223927 | |
| C805 | Capacitor-Electrolytic | CE04W25V1000S | 1 | 352751021A | |
| C806 | Capacitor-Electrolytic | CE04W10V2200S | 1 | 352732221A | |
| C807 | Capacitor-Electrolytic | CE02W50V1B | 1 | 351780101 | |
| NAPS-250 | | | | | |
| Q901 | Transistor | 2SD234(Y) | 1 | 2200020 | |
| D901, D902 | Diode-Silicon | S5151 | 2 | 223819 | |
| D903, D904 | Diode-Silicon | 10D2 | 2 | 223805 | |
| D905 | Diode-Zener | WZ-310 | 1 | 223909 | |
| D907 | Diode-Zener | WZ-120 | 1 | 223910 | |
| D906 | Diode-Zener | BZ-240 | 1 | 223907 | |
| C903 | Capacitor-Electrolytic | CE04W35V470S | 1 | 352764711A | |
| C911 | Capacitor-Electrolytic | CE04W25V220S | 1 | 352752211A | |
| C905 | Capacitor-Electrolytic | CE04W16V100S | 1 | 352741011A | |

CIRCUIT DIAGRAM and CIRCUIT BOARD-COMPONENT LOCATION NAIM-224D(IF&MRX Amp assembly)



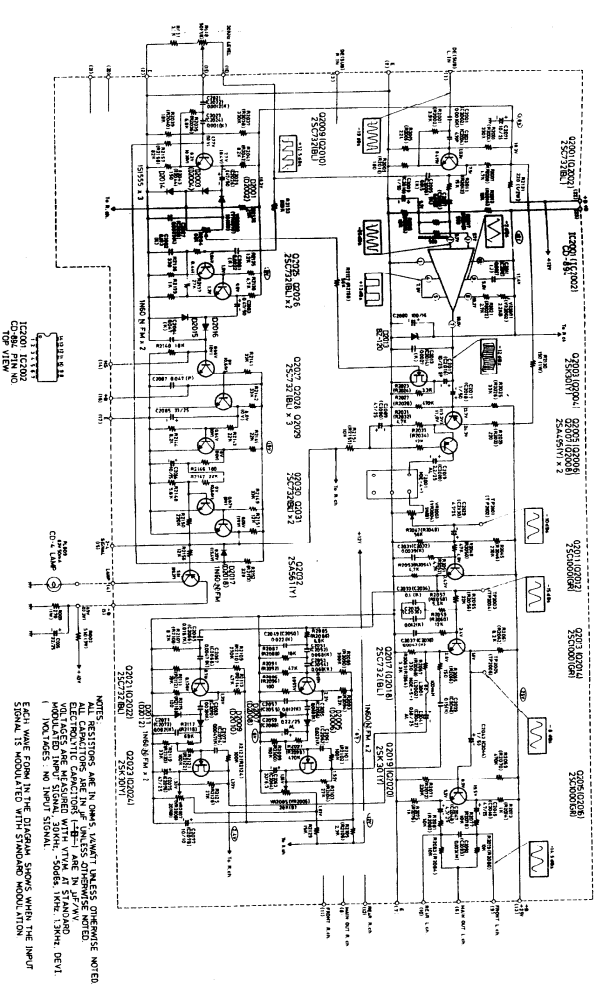
NOTES:
 ALL RESISTORS ARE IN OHMS, 1/4WATT UNLESS OTHERWISE NOTED.
 ALL CAPACITORS ARE IN UF UNLESS OTHERWISE NOTED.
 ALL VOLTAGES ARE IN VDC UNLESS OTHERWISE NOTED.
 VOLTAGES ARE MEASURED WITH VT VM AT NO INPUT SIGNAL.
 | VOLTAGES: FM STEREO.

NAEQ-239a (Equalizer Amp assembly)



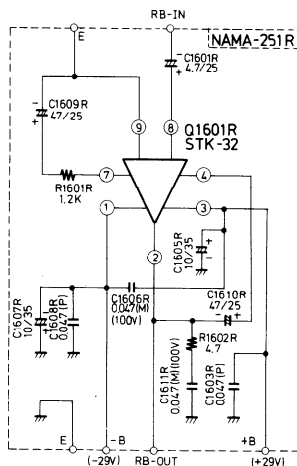
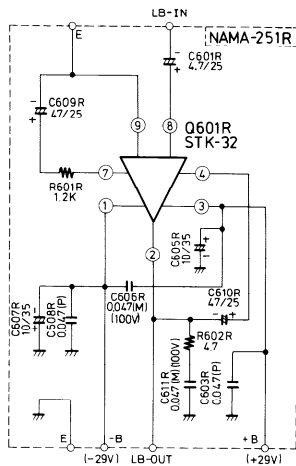
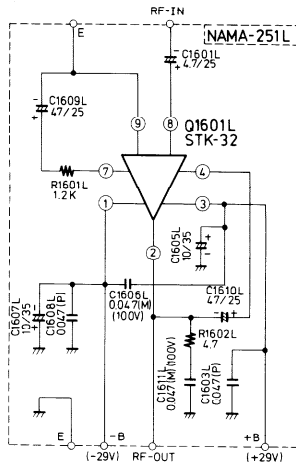
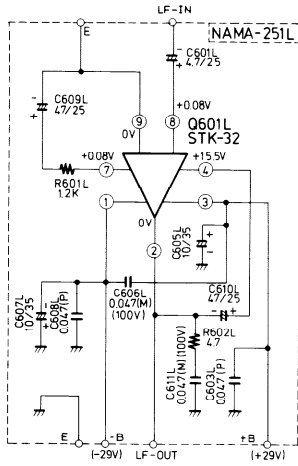
NOTES:
 ALL RESISTORS ARE IN OHMS, V/WATT UNLESS OTHERWISE NOTED.
 ALL CAPACITORS ARE IN μ F UNLESS OTHERWISE NOTED.
 ELECTROLYTIC CAPACITORS ($\frac{-}{+}$) ARE IN μ F/VV.
 VOLTAGES ARE MEASURED WITH V1VM AT NO INPUT SIGNAL.

NADE-240a (Demodulator Amp assembly)

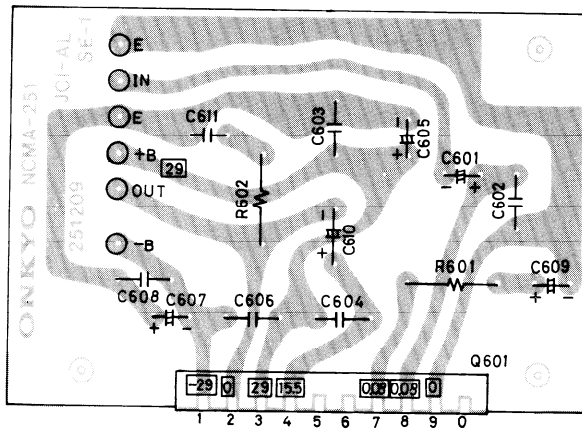


NOTES:
 ALL RESISTORS ARE IN OHMS, V/WATT UNLESS OTHERWISE NOTED.
 ALL CAPACITORS ARE IN μ F UNLESS OTHERWISE NOTED.
 ELECTROLYTIC CAPACITORS ($\frac{-}{+}$) ARE IN μ F/VV.
 VOLTAGES ARE MEASURED WITH V1VM AT NO INPUT SIGNAL.
 EACH WAVE FORM IN THE DIAGRAM SHOWS WHERE THE INPUT SIGNAL IS MODULATED WITH SINUSOID MODULATION.

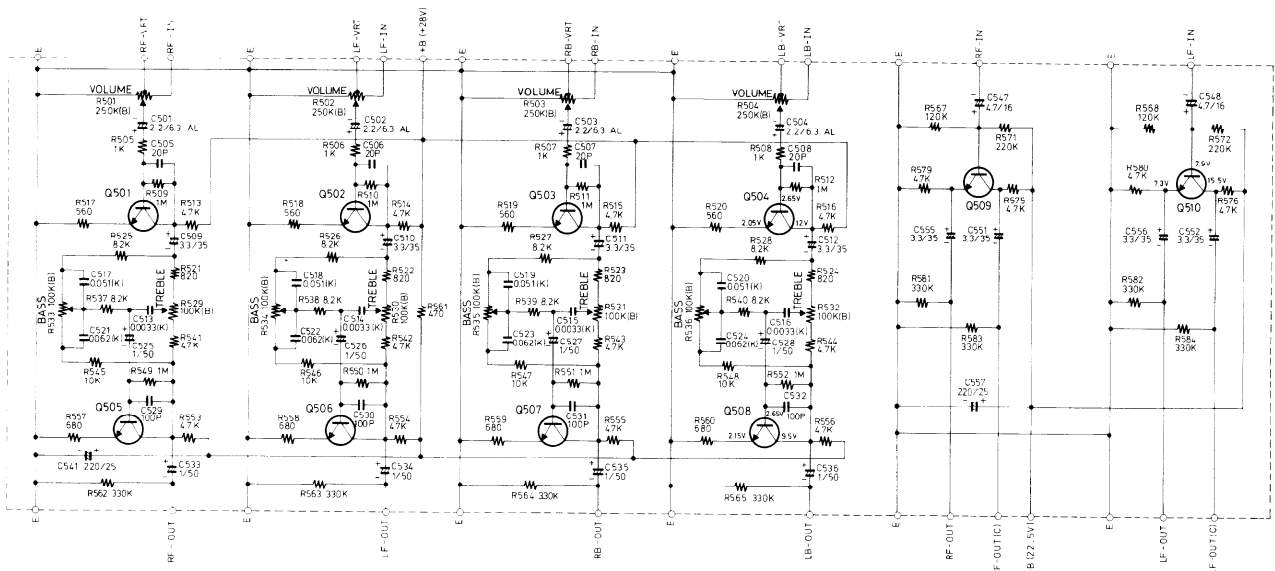
NAMA-251R,L(Power Amp assembly)



NOTES:
 ALL RESISTORS ARE IN OHMS, 1/4WATT UNLESS OTHERWISE NOTED.
 ALL CAPACITORS ARE IN μF UNLESS OTHERWISE NOTED.
 ELECTROLYTIC CAPACITORS ($\text{---}||\text{---}$) ARE IN $\mu\text{F}/\text{WV}$
 VOLTAGES ARE MEASURED WITH V.T.V.M AT NO INPUT SIGNAL.



NAAF-252(Pre-Amp assembly)

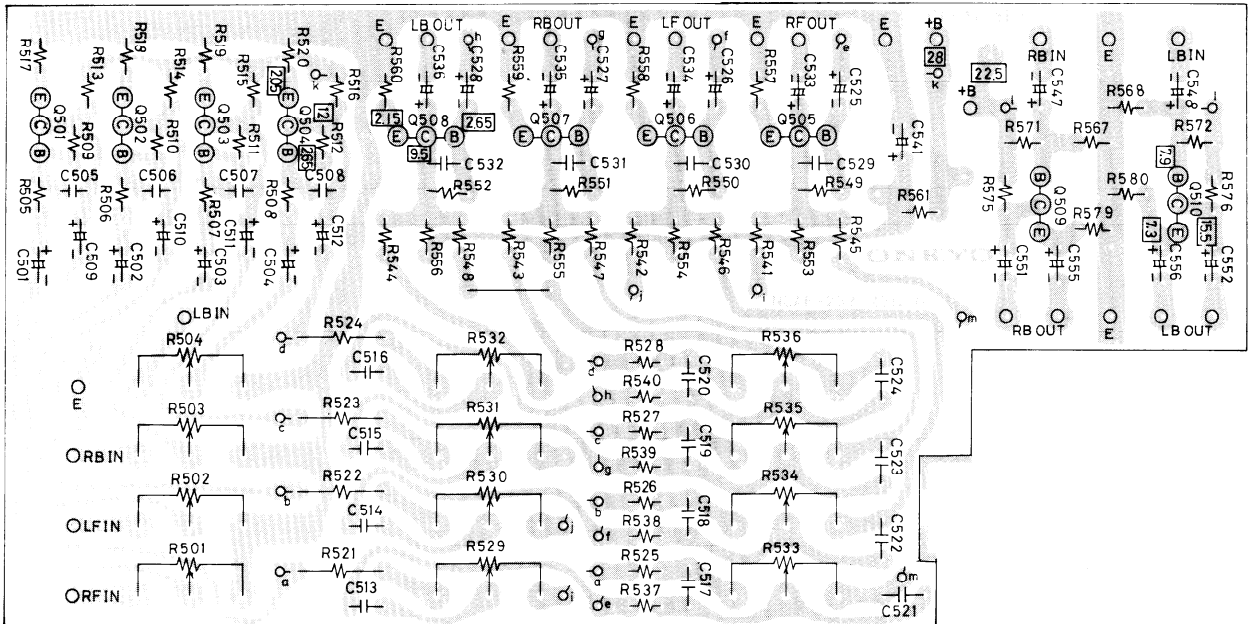


NOTES

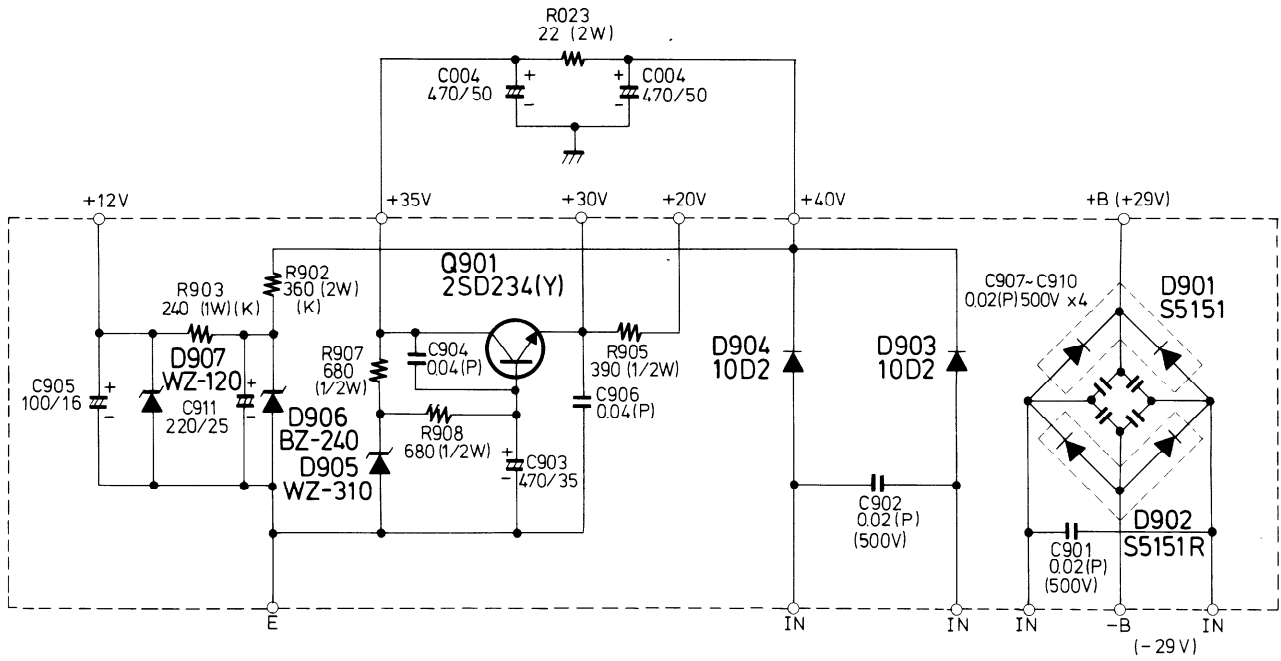
Q501-Q508 2N632A-71 or 2N1000(GRI)
 Q509 Q510 2N1000(BL)
 ALL RESISTORS ARE IN OHMS, 1/4WATT UNLESS OTHERWISE NOTED.
 ALL CAPACITORS ARE IN μF UNLESS OTHERWISE NOTED.
 ELECTROLYTIC CAPACITORS (—|—) ARE IN μF/VV
 VOLTAGES ARE MEASURED WITH V.T.V.M AT NO INPUT SIGNAL

RESISTOR

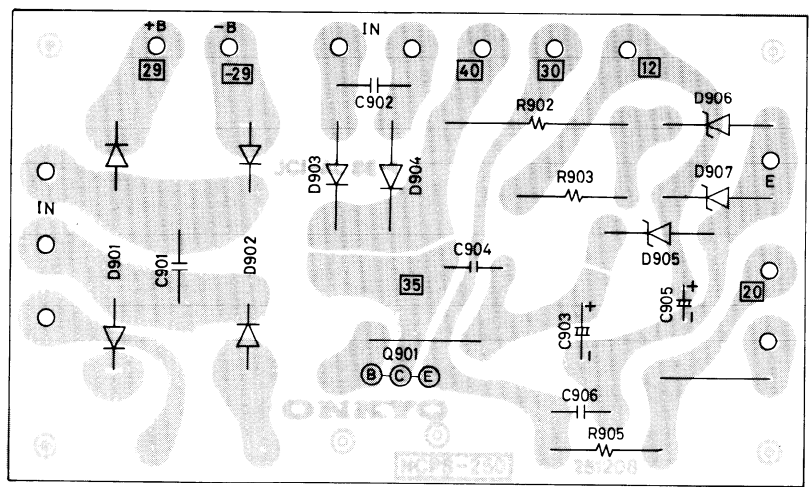
R501-R504 (VOLUME) 250K(B)
 R529-R532 (TREBLE) 100K(B)
 R533 R536 (BASS) 100K(B)



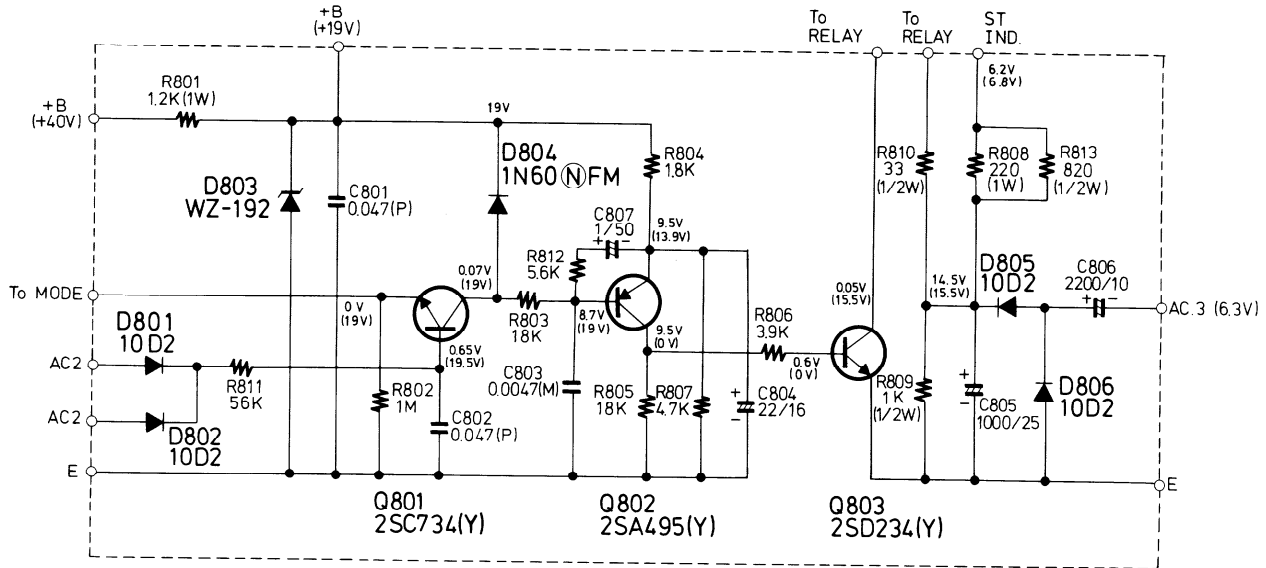
NAPS-250(Power Supply assembly)



NOTES :
 ALL RESISTORS ARE IN OHMS, 1/4WATT UNLESS OTHERWISE NOTED.
 ALL CAPACITORS ARE IN μ F UNLESS OTHERWISE NOTED.
 ELECTROLYTIC CAPACITORS (+ μ -) ARE IN μ F/WV.
 VOLTAGES ARE MEASURED WITH V.T.V.M AT NO INPUT SIGNAL.



NADR-243a(Drive Amp for Matrix Relay)



NOTES:

- ALL RESISTORS ARE IN OHMS, 1/4WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS ($-\text{+}\text{||}\text{-}$) ARE IN $\mu\text{F}/\text{WV}$.
- VOLTAGES ARE MEASURED WITH V.T.V.M AT PROGRAM MODE-CD-4.
- () VOLTAGES : AT PROGRAM MODE-2CH.

LINE VOLTAGE AND FUSE

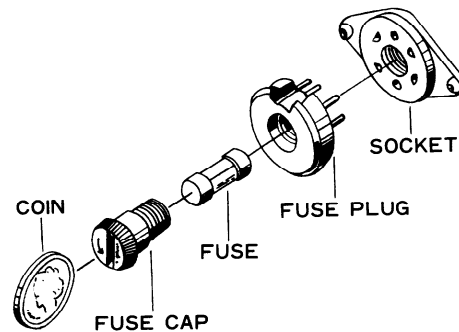
The model TS-500 operates on one of the four line voltages, 110V, 120V, 220V and 240V. Set the unit to the proper line voltage by following the procedure described below.

CHANGING LINE VOLTAGE SETTING AND FUSE

Turn the fuse cap located on the line voltage selector counter-clockwise.

Then remove the fuse plug from the unit. Put the fuse plug back so that the proper line voltage mark can be seen through the cut on the edge of the plug.

Whenever the position of the selector is changed, check the rating of the fuse. A 3.0A fuse is for 220V or 240V operation and a 5.0A fuse for 110V or 120V operation.



FUSE REPLACEMENT

When the fuse has blown, remove the fuse cap and replace the fuse with new one. See Fig. 1.

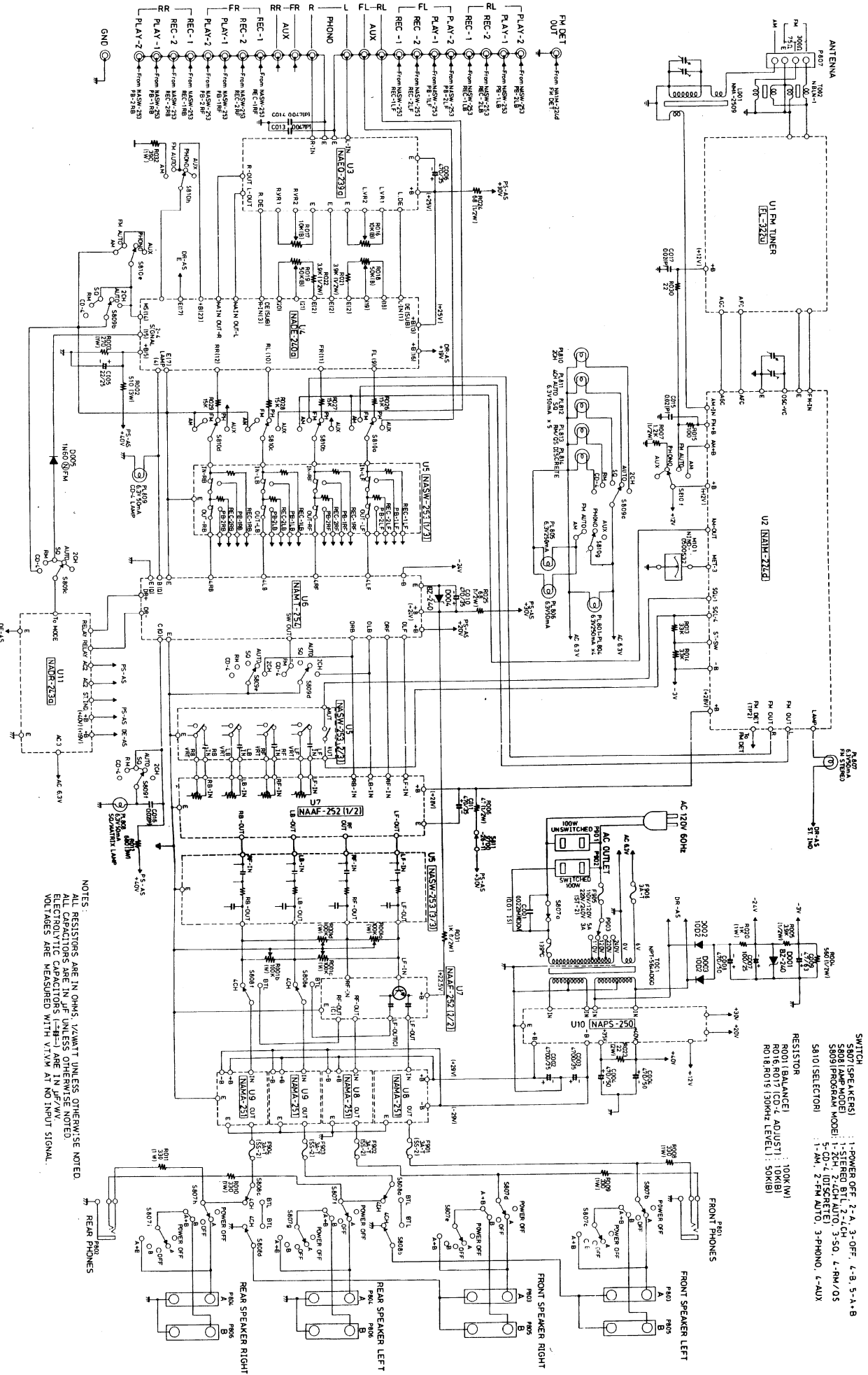
The fuses are as follows.

| | |
|-----------------|------------------------|
| AC fuse | 3A-T(ST-2)UL(220/240V) |
| | 5A-T(ST-2)UL(110/120V) |
| Pilot lamp fuse | 3A-T(lead type)UL |
| Speaker fuse | 3A-T(SS-2)UL |

REPLACEMENT OF THE POWER IC.

- 1 Take off the Back Panel. (off 4 screws)
- 2 Take off the Heat Sink.
- 3 Replace the Power IC.

CIRCUIT DIAGRAM

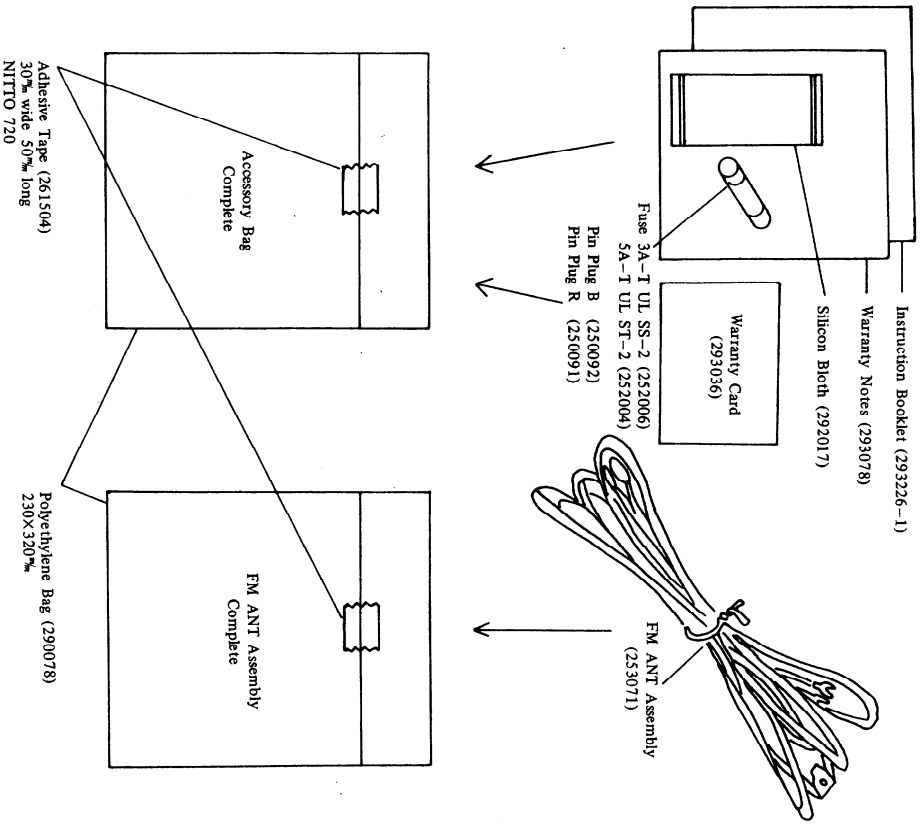


- SWITCH**
 S807 (SPEAKERS) : 1-POWER OFF, 2-A, 3-OFF, 4-B, 5-A, 6-B
 S808 (AMP-MODE) : 1-2FL, 2-2FL, 3-2FL, 4-AUTO, 5-SO, 6-FM/O5
 S809 (PHONO-MODE) : 1-2FL, 2-2FL, 3-2FL, 4-AUTO, 5-SO, 6-FM/O5
 S810 (SELECTOR) : 1-AM, 2-FM AUTO, 3-PHONO, 4-AUX
- RESISTOR**
 R001 (BALANCE) : 100K (1W)
 R002 (BALANCE) : 100K (1W)
 R003 (BALANCE) : 100K (1W)
 R004 (BALANCE) : 100K (1W)
 R005 (BALANCE) : 100K (1W)
 R006 (BALANCE) : 100K (1W)
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 R200 (BALANCE) : 100K (1W)

NOTES:
 ALL RESISTORS ARE IN OHMS, VARYING UNLESS OTHERWISE NOTED
 ALL CAPACITORS ARE IN P.F. UNLESS OTHERWISE NOTED
 ELECTROLYTIC CAPACITORS (E-#) ARE IN P.F. V.V.
 VOLTAGES ARE MEASURED WITH V.T.M. AT NO INPUT SIGNAL.

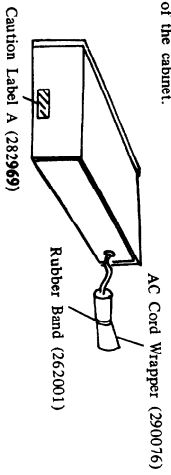
PACKING PROCEDURE

Complete instruction booklets and others.
Put the following things as illustrated in the polyethylene bag and stick the tape on the polyethylene bag each.

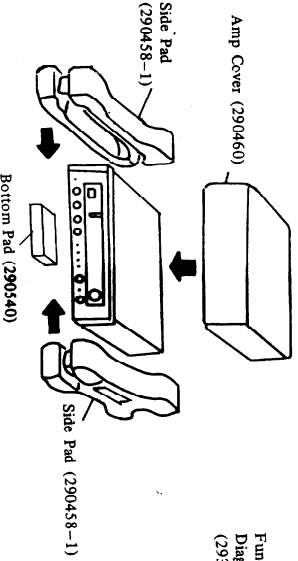


* In case of TX-220 universal type, see page 16.

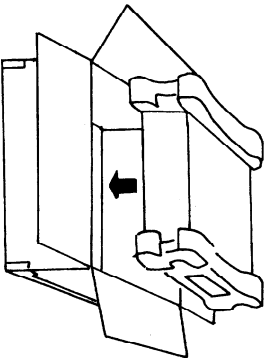
1. Wrap the AC cord with the AC cord wrapper and pass the rubber band round the AC cord wrapper.
2. Stick the caution label on the right side of the cabinet.



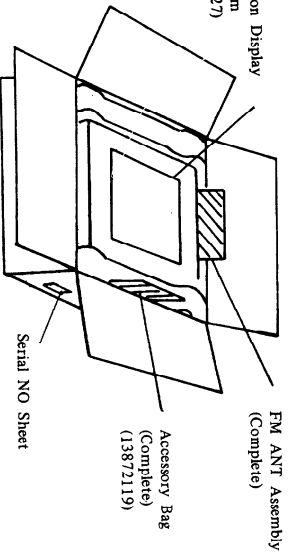
3. Cover the set with the Amp cover (polyethylene) and fix the side pad.



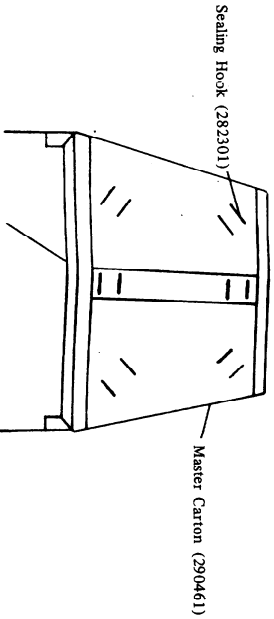
5. Put the set in the master carton and match the front mark of the carton and the front of the set.



6. Put the accessory bag (Complete), FM ANT Assembly (Complete) and a sheet of Function Display Diagram, before shutting the flap of the carton. Then stick two sheets of Serial NO Sheet both sides.

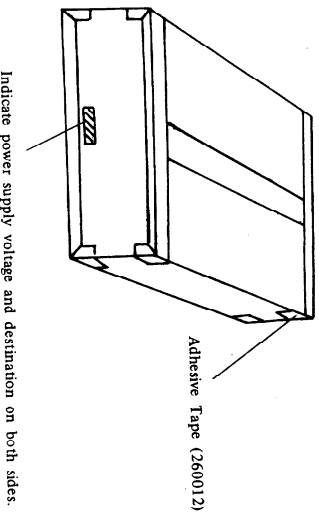


4. Fix the flap of the bottom of the master carton with sealing hooks and stick the tape on the bottom.



Adhesive Tape (260012)
DAMPION NITTO light brown 50% wide 3600% long.

7. Shut the flap of the carton and stick the tape.



Indicate power supply voltage and destination on both sides.