SERIAL NO. 3075

ONKYO® SERVICE MANUAL

QUARTZ LOCKED
FM/AM STEREO RECEIVER
MODEL TX-5000

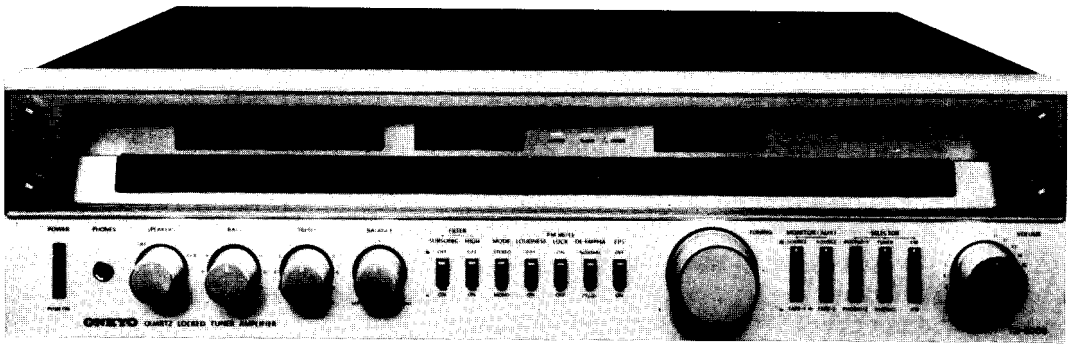


TABLE OF CONTENTS

ONKYO®
AUDIO COMPONENTS

SPECIFICATIONS

AMPLIFIER SECTION

Output Power:	65 watts per channel, min. RMS, at 8 ohms both channels driven, from 20 Hz to 20,000 Hz, with no more than 0.03% total harmonic distortion.	
Total Harmonic Distortion:	0.03% at rated power 0.028% at 1 watt output	
IM Distortion:	0.03% at rated power 0.028% at 1watt output	
Damping Factor:	50 at 8 ohms	
Frequency Response:	15 Hz – 30,000 Hz (±1 dB)	
RIAA Deviation:	20 Hz – 20,000 Hz (±0.5 dB)	
Sensitivity & Impedance:	Phono:	2.5 mV, 50 kohms
	Tape Play:	150mV, 50 kohms
	Tape Rec:	150 mV, 3.5 kohms (PH)
Phono Overload:	200 mV R.M.S. at 1 kHz, 0.03% T.H.D.	
Signal-to-Noise Ratio:	Phono:	76 dB (IHF "A" weighted, 1 watt output, 5 mV input) 86 dB ("A" weighted, 10 mV input)
	Tape:	80 dB (IHF "A" weighted, 1 watt output 0.5 V input) 95 dB ("A" weighted)
Residual Hum & Noise:	0.8mV at Volume Control: min. ("A" weighted)	
Tone Controls:	Bass:	±12 dB at 100 Hz
	Treble:	±10 dB at 10 kHz
Filters:	High:	6 kHz, 12 dB/oct.
	Subsonic:	10 Hz, 12 dB/oct.
Loudness (–40 dB):	+8 dB at 40 Hz +5 dB at 20 kHz	

TUNER SECTION

FM:

Tuning Range:	88 – 108 MHz	
Usable Sensitivity:	Mono:	10.3 dBf, 1.8μV
	Stereo:	17.2 dBf. 4.0μV
50 dB Quieting Sensitivity:	Mono:	14.7 dBf, 3μV
	Stereo:	37.2 dBf, 40μV
Capture Ratio:	1.4 dB	
Image Rejection Ratio:	90dB	
IF Rejection Ratio:	100 dB	
Spurious Rejection Ratio:	1/2 IF 90 dB	
Signal-to-Noise Ratio:	Mono:	73 dB
	Stereo:	68 dB
Alternate Channel Att:	70 dB	
AM Suppression Ratio:	55 dB	
Harmonic Distortion:	Mono:	0.15%
	Stereo:	0.3%
Frequency Response:	30 Hz – 15,000 Hz (±1.5 dB)	
Stereo Separation:	40 dB at 1 kHz 33 dB at 100 Hz – 10,000 Hz	
Subcarrier Suppression:	60 dB	
Muting Level:	17.2 dBf, 4 μV	
Stereo Threshold:	17.2 dBf, 4 μV	
Quartz Lock Level:	17.2 dBf, 4 μV	

AM:

Tuning Rage:	525 – 1,620 kHz
Usable Sensitivity:	25 μV
Image Rejection Ratio:	45 dB
IF Rejection Ratio:	40 dB
Signal-to-Noise Ratio:	40 dB
Harmonic Distortion:	0.8%

GENERAL

Power Supply:	AC 120 volts, 60 Hz	
Outputs:	Speaker A & B, Phones, Tape Rec Out 1 & 2, AC Outlet (x 2), EPS OUT (PRE OUT)	
Inputs:	Phono 1 & 2, Tape Play 1 & 2, EPS IN (MAN IN) FM and AM Antennas	
Antennas:	FM:	300 ohms balanced and 75 ohms unbalanced
	AM:	built-in ferrite core antenna and external terminal
Semiconductors:	2 FETs, 51 transistors, 16 ICs, 50 diodes, 1 fluorescent digital display tube	
Dimensions (WxHxD):	540 x 146 x 400 mm 21-1/4" x 5-3/4" x 15-3/4"	
Weight:	15 kg, 33 lbs	

Specifications and features are subject to change without notice.

CIRCUIT DESCRIPTIONS

TUNER SECTION

A major feature of the FM tuner section of the TX-5000 is the Quartz Locked system which detects any difference in frequency between the IF signal and the reference signal generated by the crystal osillator.

Another important feature of this equipment is the Touch sensor circuit.

When the TUNING knob is touched by hand, the quartz locked circuit is deactivated, permitting the tuned frequency to be freely varied just as in conventional equipment.

POWER AMPLIFIER SECTION

A major feature of the power amplifier section is the servo operational amplifier system.

1. QUARTZ LOCKED CIRCUIT

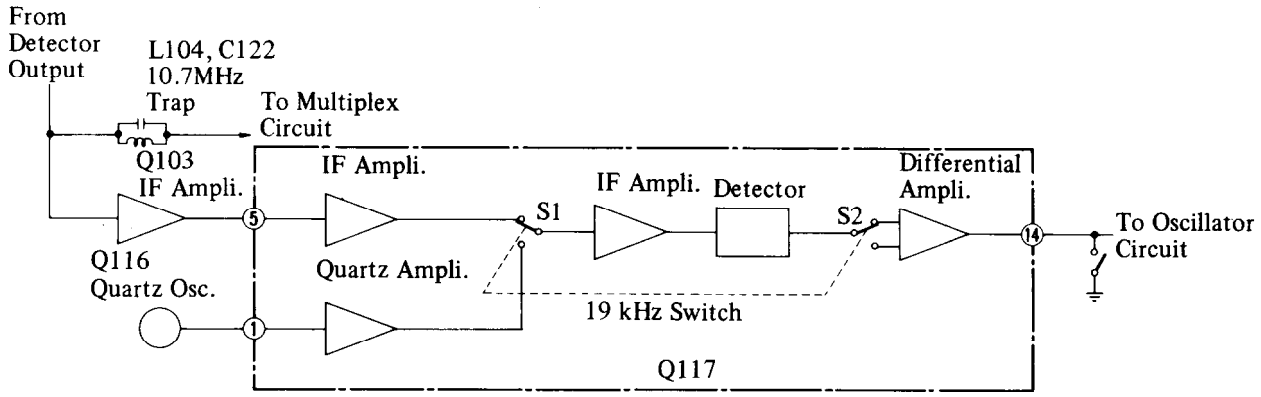


Fig. 1

The quartz locked circuit compares the frequency difference between the 10.7MHz reference signal and the IF signal, the difference being used to subsequently drive the AFC circuit.

A 10.7MHz component is extracted from the quadrature detector output by the L104 and C122 trap circuit, amplified by the Q103 IC, and applied to pin no. 5 of the Q117 IC. An accurate 10.7MHz reference signal is generated by the quartz oscillator, and applied to pin no. 1 of the same IC. A 19kHz square wave is obtained from pin no. 10 of the PLL IC, and applied to pin no. 3 of Q117. The IF signal and the quartz oscillator reference signal are switched back and forth in a 19kHz cycle, and passed on the detector and amplification stages. When S1 and S2 and both connected to the IF signal line, the IF frequency is detected, resulting is the generation of a voltage whose level corresponds to the IF frequency. This voltage is then applied to one of the differential amplifier inputs. When S1 and S2 are then both switched across to the quartz oscillator signal line, the quartz oscillator reference signal is detected, converted into the corresponding voltage, and applied to the other input of the differential amplifier. The difference between the IF detector DC component and quartz oscillator detector component is then amplified, appearing at pin no. 14 of the IC. This voltage serves as the AFC circuit control voltage. Any slight drift or deviation in the detector transformer will therefore result in the same amount of drift in both lines, thereby maintaining a constant difference. Precise local oscillator frequency will thus be kept at all times.

2. MUTING CITCUIT

The muting circuit is activated by the combined effects of the IF component, noise component, and zero cross detector output. The IF level detector and zero cross detector circuit are incorporated in the quadrature IC, the output appearing at pin no. 12. This pin is switched to high level when the IF level drops below the muting level, but is switched back to low level when the IF level exceeds the muting level again. The detection of noise above 100kHz in the composite signal will also result in pin no. 12 being switched to high level. Consequently, when all detector circuit outputs are switched to low level, the Q110 transistor is cut off, and the Q112 transistor turned on, followed by the LOCKED lamp turning on. At the same time, Q111 is also turned on, and Q205 turned off, resulting in the STEREO lamp turning on (if the tuned station is broadcasting in stereo). Q209 and Q210 are also turned off, resulting in the appearance of an FM broadcast output signal at the receiver's output terminals.

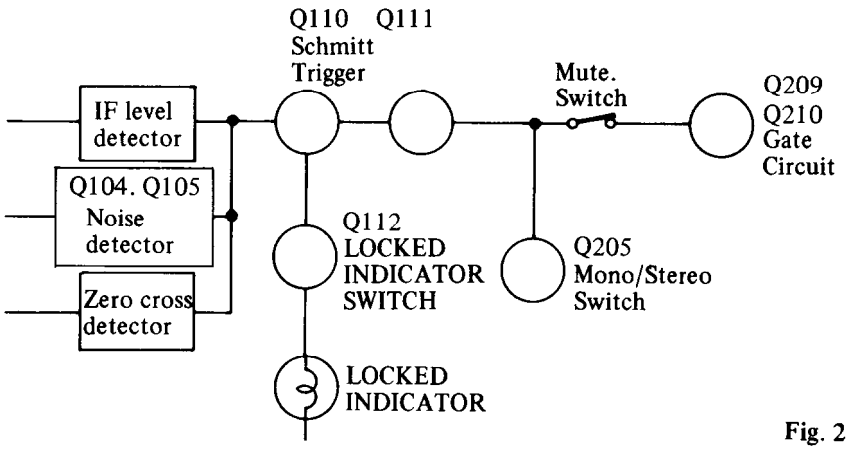


Fig. 2

3. TOUCH SENSOR CIRCUIT

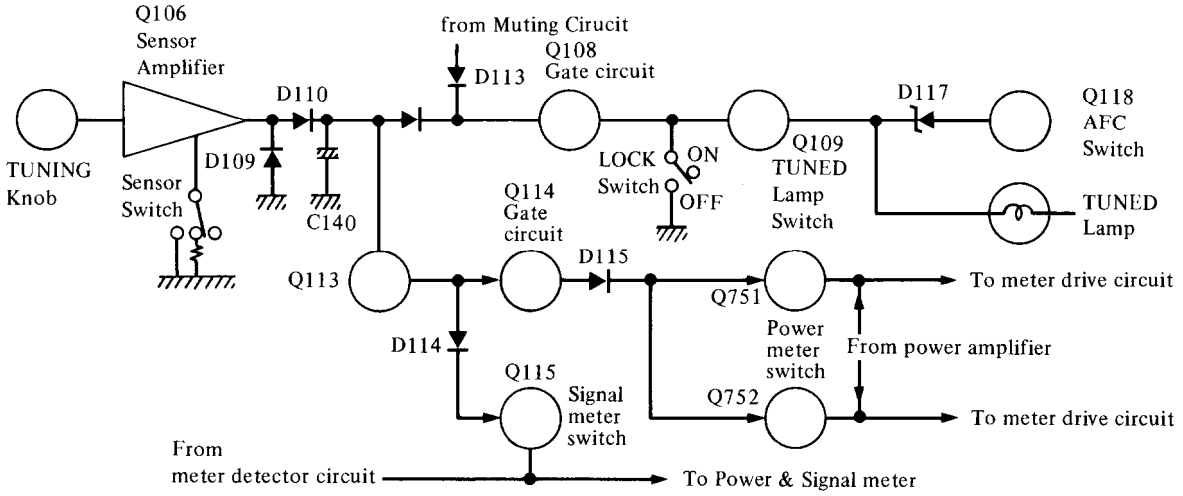


Fig. 3

The purpose of this circuit is to operate both the power/signal strength meter and quartz locked circuit switching transistors.

(1) Servo locked circuit switching circuit

In order to ensure accurate tuning, the quartz locked circuit is turned off automatically once the tuning knob is touched, and also when the muting circuit is switched off.

When a station is turned, Q108 will turn off and Q109 turn on (since Q110 will already be off and Q111 on), resulting in the TUNED lamp turning on. And since Q118 will turn off when Q109 turns on, the quatz locked circuit will also begin to operate.

When the tuning knob is touched, a certain amount of hum is induced.

This hum is amplified by Q117, rectified by 109 and D110 into a DC signal, and applied to Q108 is consequently turned on, resulting in the quartz locked circuit being switched off. If, however, the hum level is rather low, the tuned lamp might not turn on even when the tuning knob is touched. If this happens reset the back panel sensor switch to either the Normal or High position.

(2) Power signal strength meter

When the tuning knob is not being operated, this meter displays the level of power applied to be right speaker system. The instant the tuning knob is touched, the meter changes to display the signal strength of the radio broadcast.

When the tuning knob is touched, Q113 turns on. And since Q114 and Q115 turn off and Q751 and Q752 turn on, and power/signal strength meter is changed to signal strength meter from power meter.

4. SERVO OPERATIONAL AMPLIFIER

In order to achieve a greater degree of fidelity in waveform transmission, and to remove the large capacitance capacitors (which have questionable effect on the quality of sound) from the NFB, DC amplifier designs are being more and more widely used in amplifiers today. The TX-5000, however, has advanced even further by adopting the recently developed Servo Operational Amplifier which features a truly superb quality of sound, and performs considerably better than the now conventional DC amplifiers.

The major circuit feature of the Servo Operational Amplifier (see outline in Fig. 4) is the servo feedback loop which has no effect whatsoever on the main signal. In other words, if the signal feedback factor is β_1 and the servo feedback factor β_2, the $0 \fallingdotseq \beta_2 \ll \beta_1 \ll 1$ relation holds true within the signal bandwhdth, while $\beta_2 \gg 1$ holds true in the subsonic region down to DC. For this purpose, a servo feedback amplifier was necessary. And since it was also necessary to include a high-cut filter, and suppress signal amplifier drift at higher DC gain plus 1/f noise and other subsonic region components, a -6dB/oct high-cut mirror integrating circuit (see Fig. 4) has been

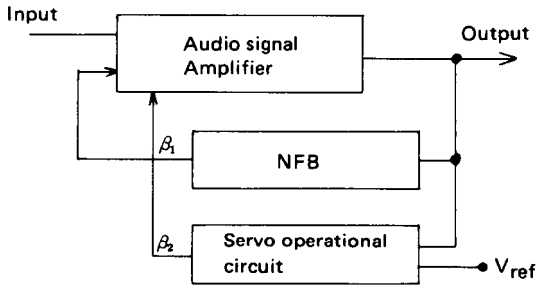


Fig. 4

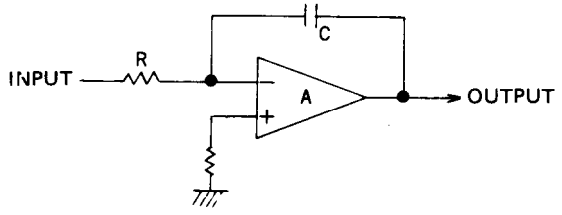


Fig. 5

employed. The Vref in Fig. 1-1serves as the input voltage required to keep the system output DC voltage at OV.

In the block diagram for the actual Servo Operational amplifier (see Fig. 6), Rf and RB constitute the signal feedback loop, while A2 and A3 form the servo feedback loop.

Hence, the subsonic frequencies are effectively cut just as if by coupling capacitor. But unlike capacitors, the output impedance of the servo operational amplifier decreases at lower frequencies (coupling capacitor impedance increases at corresponding frequencies) due to a greater amount of feedback. Since, however, in actual circuits the second stage is driven at a suitable impedance level, and the output impedance of the amplifier itself is made sufficiently large enough (to improve stability) by connecting a resistanee γ_0 in series, the output impedance is kept constant at γ_0 with coupling capacitors, on the other hand, the increased impedance at lower frequencies naturally results in an increase in thermal noise (directly related to effective impedance) in the low frequency region.

Although servo feedback circuit integrating capacitors of large leakage current, or high DC resistance and inductance are undesirable, the effects are nowhere near as serious as the insertion of a capacitor in the signal path.

Assuming that A1, A2, A3 $\gg$ 1, the input/output characteristics T(ω) may be expressed as,

$$T(\omega) = \frac{R_N(Rf + R_B)}{A2 \cdot Rf \cdot R_B} \left[\frac{1 + \frac{j\omega}{\omega_1}}{1 + \frac{j\omega}{\omega_2}} \right]$$

where $\omega_0 = \frac{1}{CR}$, $\omega_1 = \frac{\omega_0}{A_2}$, $\omega_2 = \frac{R_F}{R_N}\omega_0$

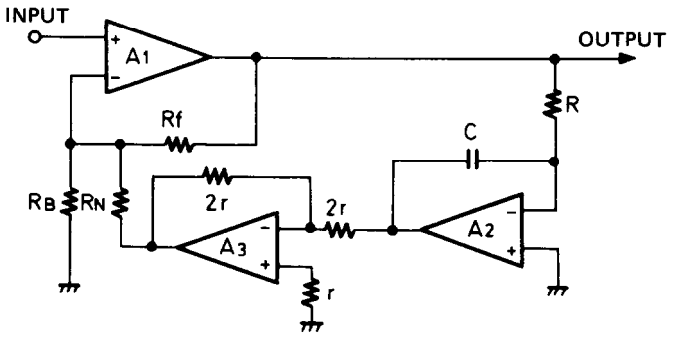


Fig. 6

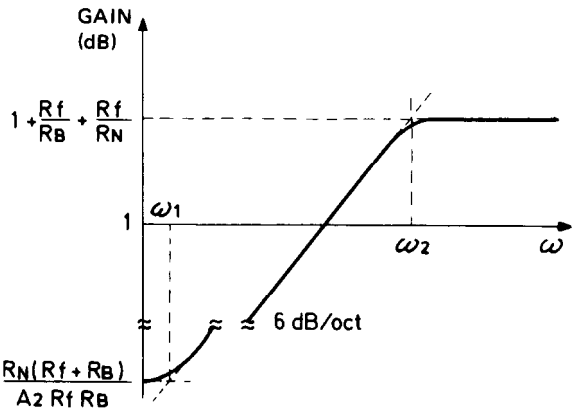


Fig. 7

The frequency response is a shown in Fig. 7, ω2 being about 0.3Hz ~ 2Hz. A3 is phase inverted in order to prevent positive feedback in the DC region.

5. PROTECTION CIRCUIT

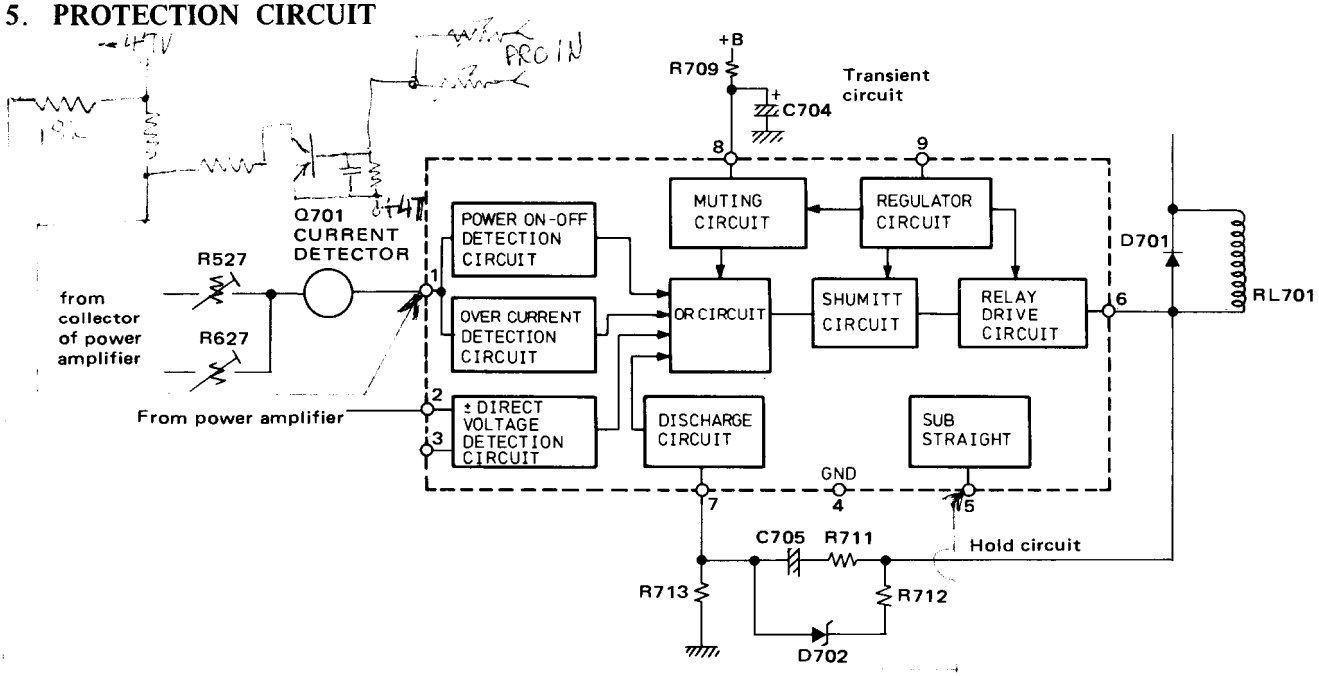


Fig. 8

The protection circuit is operated:

(1) when the B circuit is unstable when the power is turned ON (approximately 5 seconds)

(2) when the speaker terminals are shorted and abnormal current has flowed in the power amplifier thru this low impedance.

(3) when the center voltage has increased because of trouble at the differential amplifier, etc.

EXPLODED VIEW

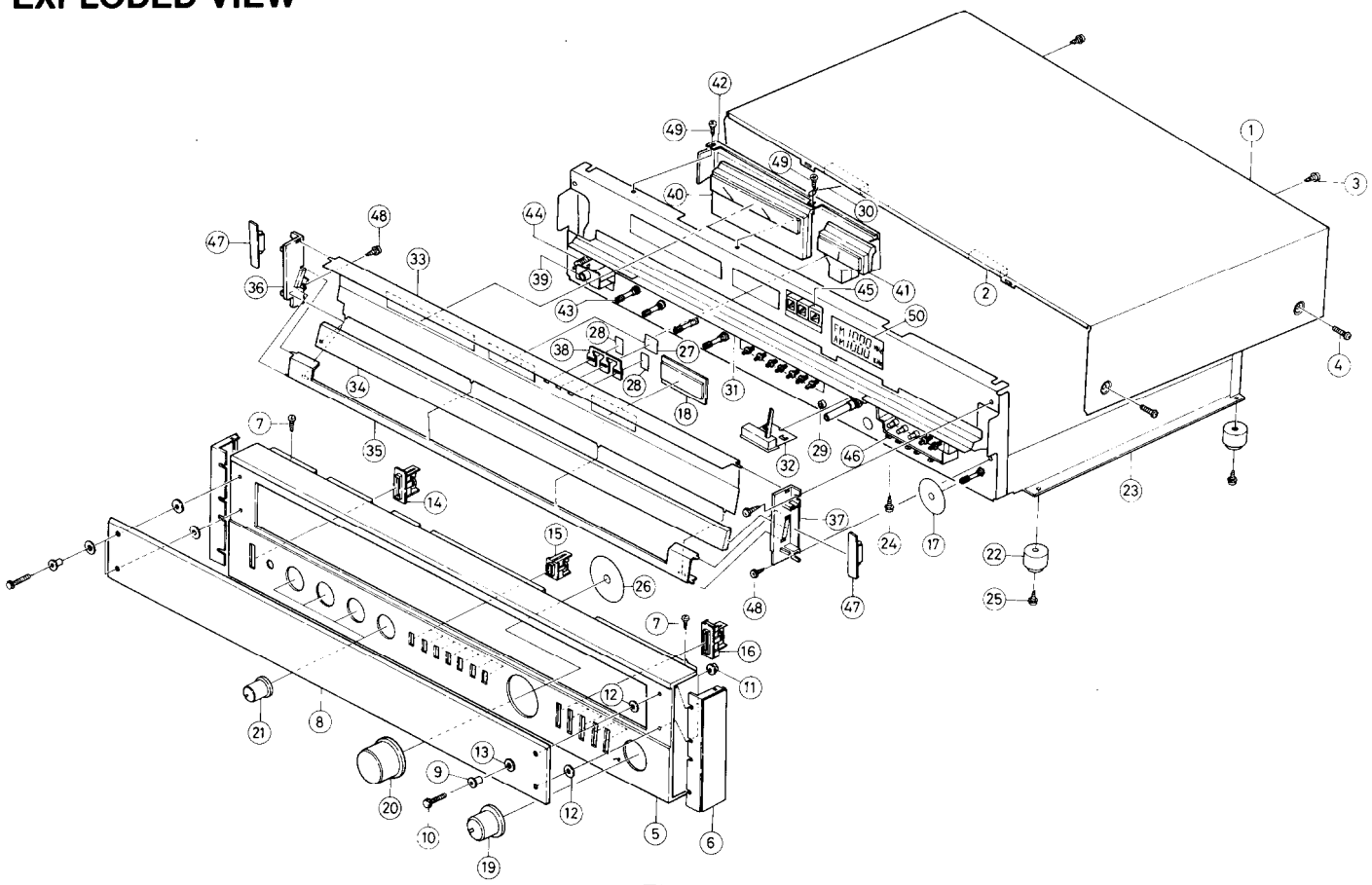


Fig. 9

EXPLODED VIEW – PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION
1	28184074	Top cover
2	28140020	4tx10x40, Cushion
3	834430062	3STS+6BQ(BC), Tapping screw
4	838440109	4TTB+10C(BC), Tapping screw
5	13569121	Front panel ass'y (5, 6, 14, 15)
6	28125077	End cap
7	834130062	3STS+6BQ, Tapping screw
8	28191052	Dial glass
9	27270014	Spacer
10	27300038A	Special screw
11	86213010	WN3x10FN, Nut
12	870051	10x3.5x1.5t, Washer
13	870052	10x6x1.5t, Washer
14	27267063	Guide
	27180049	Spring
	28320398	Knob
15	27267065	Guide
	27180049	Spring
	28320399	Knob
16	27267064	Guide
	27180049	Spring
	28320398	Knob
17	28140126	Cushion
18	28191051	Plate for display
19	28320396	Volume control knob
20	28320408	Tuning knob
21	28320397	Tone control knob
22	280889	Leg
23	27170073	Bottom board
24	831130082	3STW+8BQ, Tapping screw
25	831130162	3STW+16BQ, Tapping screw
26	28140185	Cushion
27	261013	Tape (Green)
28	261014	Tape (Red)
29	27185006	Dial pulley
30	27180057	Spring
31	27130192	Bracket for dial pointer
32	13549131	Pointer ass'y
33	28133024	Back plate
34	28130089	Dial plate
35	27190067	Holder for dial plate
36	27250043	Lamp case (L)
37	27250044	Lamp case (R)
38	28198527	Facet
39	25045018	LJ-100-J, Stereo headphone jack
40	243129	NIND-0500S129 (Pointer: Red) Signal strength and output level meter
41	243130	NIND-0250S130 (Pointer: Red), Center meter
42	26130193	Bracket for meter
43	25030150	NRS-144-40Y. Speaker selecter switch
44	25035047	NPS-111L12P, Power switch
45	210083	PL14V0.06AW-3, Locked, Tuned, and Stereo indicator lamp
46	210082	PL12V0.06AW-1, Selector indication lamp.
47	13569574B	NAPL-474b, Dial illumination lamp P.C.B.
48	831130082	3STW+8BQ, Tapping screw
49	834130062	3STS+6BQ, Tapping screw
50	212007	FIP6A8S, Fluorescent indicator tube

DISASSEMBLY

Top Cover

Remove the four screws (4) holding the top cover and side bracket.

Remove the two screws (3) holding the top cover and back panel.

Front Panel

Remove the top cover.

Remove the TUNING knob.

Remove the five screws holding the front panel and front bracket.

Bottom board

Remove the four screws (24) holding the bottom board and chassis.

Remove the four screws (25) holding the bottom board and legs.

Meters

Remove the top panel.

Remove the two screws holding the lamp bracket and front bracket.

Dial Glass

Remove the four screws holding the dial glass and front panel.

Notes: The dial glass has been mounted by applying an 800 gr torque to the screws.
If the dial glass is removed during repairs, and a torque driver is available, apply 800 gr torque to the screws when replacing. If however, a torque driver is not available, simply tighten the screws by hand.
When replacing the dial glass, insert all relevant component parts (9-13) in accordance with the exploded view.

Pointer Lamp

Remove the top cover and front panel.

Replace the pointer ass'y.

Power Amplifier Transistors

Remove the top cover and bottom board.

Remove the two screws holding the chassis and radiator from bottom side.

Remove the screw holding the radiator and radiator bracket (R) from right side.

Remove a screw holding the radiator and radiator bracket (L) from left side.

Tone control p.c.b.

Remove the top cover, bottom board and front panel.

Remove the three nuts on the Bass, Treble and Balance volume shaft.

Remove the two screws holding the switch and front bracket.

Remove the four screws holding the front bracket and chassis from both sides.

SERVICE PROCEDURES

Sensor Switch (SENSOR)

This switch enables the quartz lock system for automatic FM tuning to be matched with the various operating conditions. Set it at LOW initially. Switch to NORM or HIGH if the TUNED lamp does not instantly turn off when you touch the tuning knob.

Power Meter/Signal Strength Meter

When the tuning is not being operated, this meter displays the level of power applied to the right speaker system. The instant the tuning knob is touched, the meter changes to display the signal strength of the riado broadcast being received at that moment. Tune a station so the needle moves as far to the right as possible.

PRECAUTIONS

1. For continued protection against fire hazard, replace only with same type and same rating fuse.
   AC fuse 5A (ST-6) PARTS NO. 252050
2. Replacement for power, complementary and driver transistors, if necessary, must be made from the same beta (HFE) group as the original type.
3. All CMOS devices have diode input protection against adverse electrical environments such as static discharge.
   Unfortunately, there can be severe electrical environments during the process of handling. For example, static voltages generated by a person walking across a common waxed floor have been measured in the 4 to 15 kV range (depending on humidity, surface conditions, etc.). These static voltages are potentially disastrous when discharged into a CMOS input considering the energy stored in the capacity ($\approx$ 300 pF) of the human body at these voltage levels.
   Present CMOS gate protection structures can generally protect against overvoltages. This is usually sufficient except in the servere cases. Following are some suggested handling procedures for CMOS devices, many of which apply to most semiconductor devices.
   1. All MOS devices should be stored or transported in materials that are somewhat conductive. MOS devices must not be inserted into conventional plastic "snow" or plastic trays.
   2. All MOS devices should be placed on a grounded bench surface and operators should ground themselves prior to handing devices, since a worker can be statically charged with respect to the bench surface.
   3. Nylon clothing should no be worn while handling MOS circuits.
   4. When lead straightening or hand soldering is necessary, provide ground straps for the apparatus used.
   5. Double check test equipment setup for proper polarity of voltage before conducting parametric of functional testing.
   6. All unused device inputs should be connected to V_{DD} or V_{SS}.

COMPONENT LOCATION

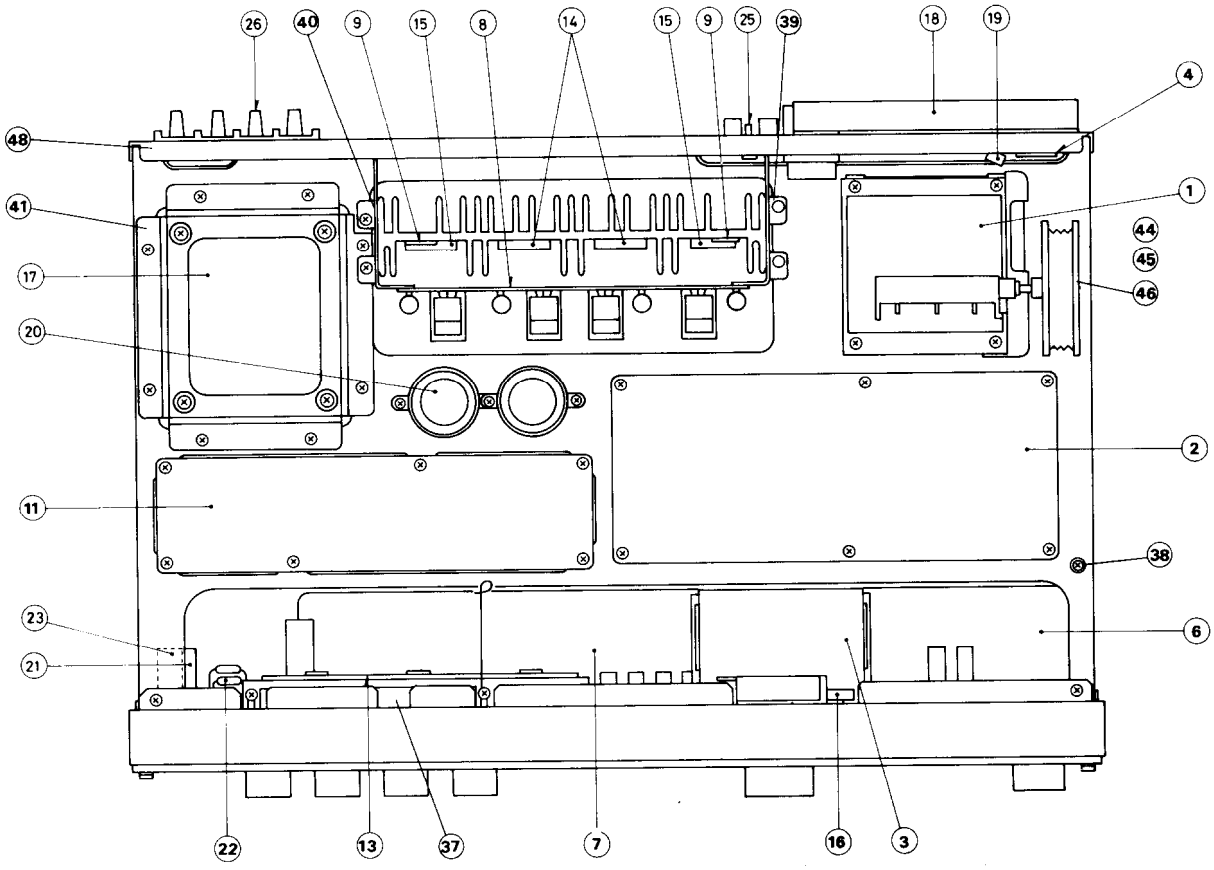


Fig. 10 TOP VIEW

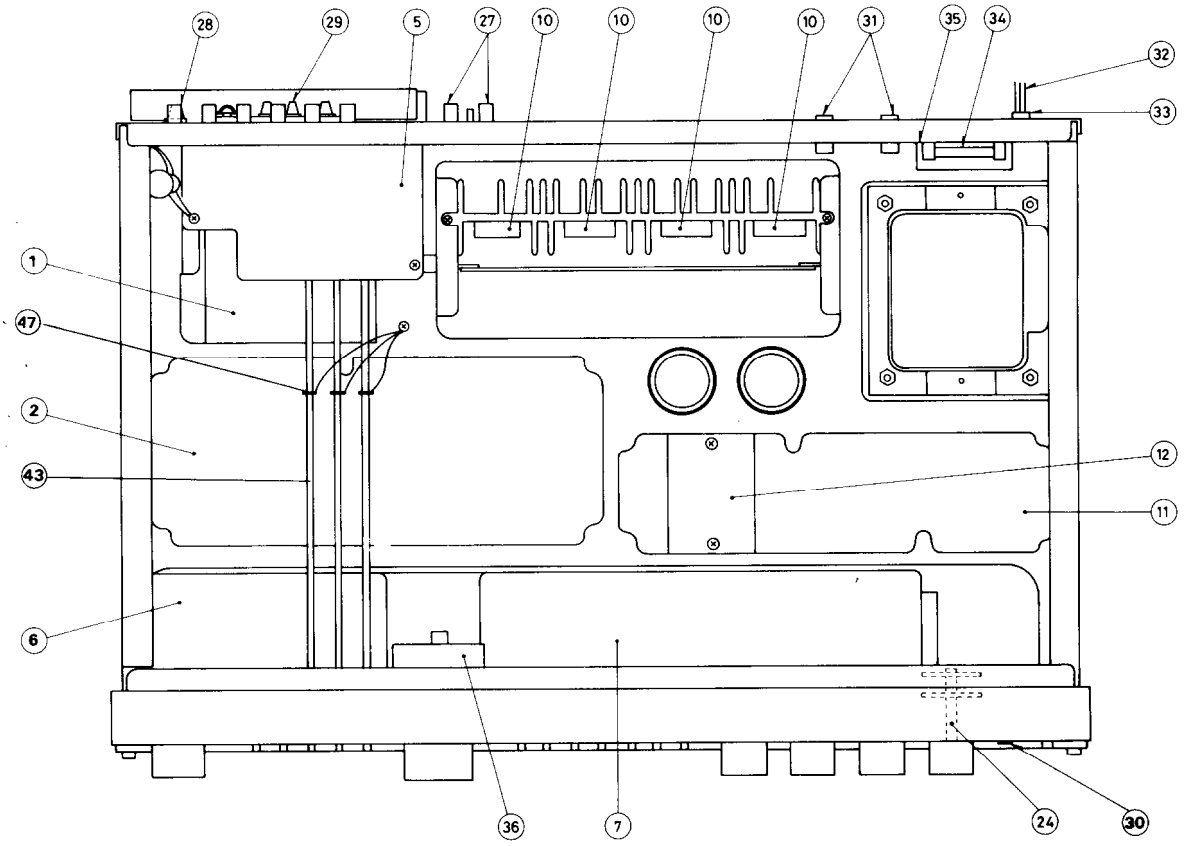


Fig. 11 BOTTOM VIEW

COMPONENT LOCATION – PARTS LIST

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1		13569500	NARF-800, Front end p.c.b.
2		13569501	NAIMX-801, FM/AM tuner p.c.b.
3		13569502	NADIS-802, Display circuit p.c.b.
4		13569505	NAPJ-805, Phono input terminal p.c.b.
5		13569506	NASW-806, Switch circuit p.c.b.
6		13569507	NAEQ-807, Equalizer amplifier p.c.b.
7		13569508	NAAF-808, Tone amplifier p.c.b.
8		13569509	NADA-809, Power amplifier p.c.b.
9		13569510	NACC-810, Thermal detector p.c.b.
10		13569511	NAWT-811, Power amplifier transistor p.c.b.
11		13569512	NAPCS-812, Protector and voltage regulator circuit p.c.b.
12		13569513	NARC-813, Rectifier circuit p.c.b.
13		13549587	NAPL-787, Meter illumination lamp p.c.b.
14	Q508, Q608	2201102, 2201103, 2201012 or 2201013	2SD845(R), 2SD845(O), 2SD745(R) or 2SD745(Q) Power amplifier transistor
15	Q509, Q609	2201092, 2201093, 2201022 or 2201023	2SB755(R), 2SB755(O), 2SB705(R) or 2SB705(Q) Power amplifier transistor
16	Q266	212007	F1P6A8S, Fluorescent indicator tube
17	T901	230354	NPT-699D, Power transformer
18	L001	232066	NMA-3012, AM bar antenna
19	L01	233026	NBLN-1, Balun transformer
20	C906, C907	3504135	15,000μF, 50V, Elect. capacitor
21	C951	3500057	0.01μF, 125V, CS capacitor
22	R551, R651	441623314	330Ω, 1W, Metal oxide film resistor
23	S901	25035047	NPS-111L12P, Power siwtch
24	S801	25030150	NRS-144-40Y, Speaker selector switch
25	S815	25065016	NSS-2327, Sensor switch
26	P801, P802	25060038	NTM-4PRMN09, Speaker terminal
27	P804	25045025	NPJ-4PRBL03, EPS terminal
28	P809	25060008	Ground terminal
29	P810	25060021B	NTM-3PUM1, Antenna terminal
30	P811	25045018	LJ-100-H, Stereo headphone jack
31	P901, P902	25050032	S-I6444-01, AC outlet
32	W901	253099A	AS-UC-3, Power supply cord
33	W901a	270025	SR-3P-4, Strainrelief
34	F901	252050	5A(ST-6), AC fuse
35	F901a	25050032	H0438A, Fuseholder
36		27205021	Drive shaft
		27300071	Bearing
37	A001	27110102	Front bracket
38		27185006	Dial pulley
39		27140341	Radiator bracket (A)
40		27140342	Radiator bracket (B)
41		27130077B	Bracket for power transformer
42		27160063	Radiator
43		27260034	Shaft
		28320135	Joint
44		270760A	Dial drum
45		273803	SP-14A, Spring for dial drum
46		273903	Stringing
47		800204	Nut
48		27120204	Back panel 8.60

ALIGNMENT PROCEDURES

INSTRUMENTS REQUIRED

1. DC Voltmeter
2. AM Sweep Generator
3. AM/FM Signal Generator
4. AC VTVM
5. Oscilloscope
6. Monitorscope
7. Distortion Analyzer
8. Stereo Modulator
9. Frequency Counter

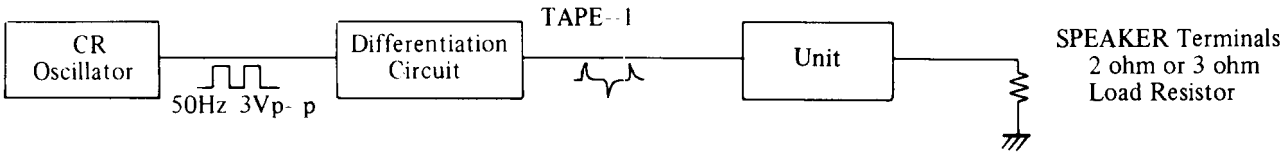
GENERAL ALIGNMENT CONDITIONS

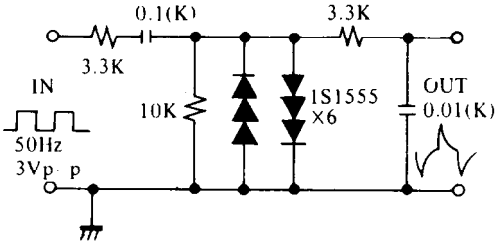
1. Signal input should be kept as low as possible.
2. Standard modulation is 400Hz 30% (AM), 1kHz 100% (FM MONO), pilot 9% sub and main 91%(FM STEREO).
3. Standard knob position
   - SPEAKERS . . . . . A
   - BASS, TREBLE & BALANCE . . . . . Center
   - HIGH/SUBSONIC FILTER . . . . . OFF
   - MODE, EPS . . . . . STEREO
   - DE-EMPHA . . . . . NORMAL
   - LOUDNESS . . . . . OFF
   - MUTING LOCK . . . . . OFF
   - TAPE 1, 2 . . . . . OFF (SOURCE)

(1) IDLING CURRENT ADJUSTMENT

Connect the DV Voltmeter between ID and VCT terminals.
Adjust the voltage to 19±2mV with R514. (Left channel)
Adjust the voltage to 19±2mV with R614. (Righ channel)
NOTES: Adjust after switching on for 5 minutes.
Open load.
VOLUME . . . . . Minimum
TAPE MONITOR-1 . . . . . ON

(2) CURRENT DETECTOR CIRCUIT ADJUSTMENT





Differentiation Circuit

Apply a tone burst signal to the TAPE-1 terminals. Connect a 2Ω hollow resistor to the speaker terminals, and adjust variable resistor R527 (Lch) or R627 (Rch) so that the relay is operated at maximum volume. Connect a 3Ω hollow resistor to the speaker terminals. Confirm the realy is not operated at maximum volume.

. NOTES: Adjust after switching on for 5 minutes.
VOLUME – Maximum

(3) CENTER VOLTAGE CHECK

When the transistor of the differential amp, the power amplifier or the constant current circuit has been replaced, check the center voltage.
Connect a DC VTVM between the CT-E terminals and check if the reading of the DC VTVM is within ±10mV.
Perform this check 5 minutes after the power switch has been set to ON..

(4) OUTPUT INDICATOR METER ADJUSTMENT

Connect the AF oscillator to the TAPE-1 input termnals, set it to 1kHz.
Connect to 8Ω hollow resistor and AC VTVM to the speaker terminals.
Adjust the output voltage to 20V with the VOLUME.
Adjust the semi-fixed resistor of R757 or R758 until the output meter pointer deflects to the 50W mark on the meter.

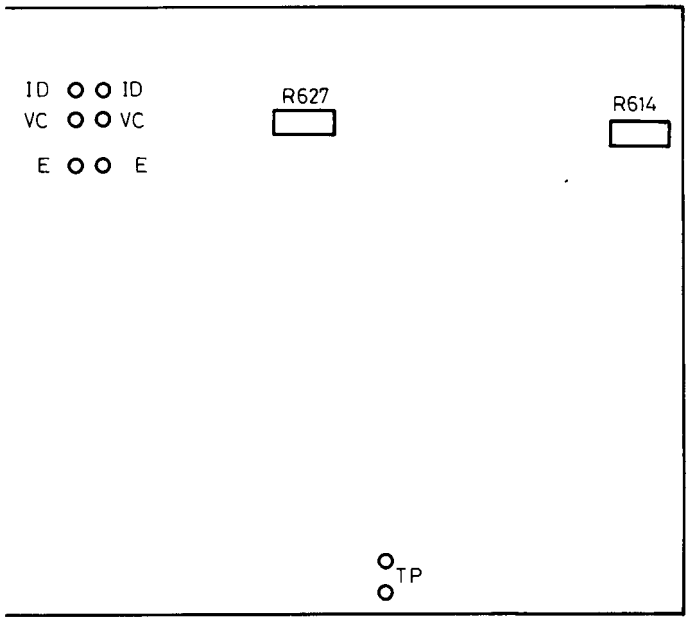
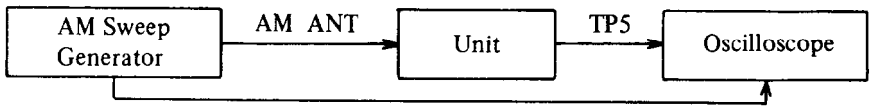


Fig. 12.

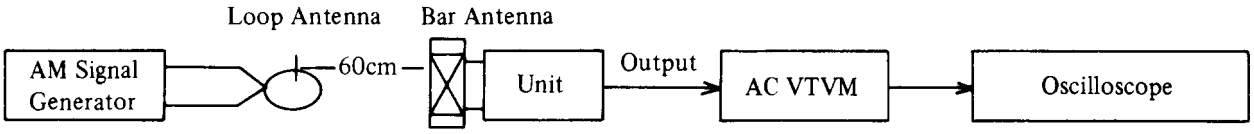
(5) AM IF ALIGNMENT

1. Set SELECTOR switch to AM.
2. Set radio dial to quiet point.



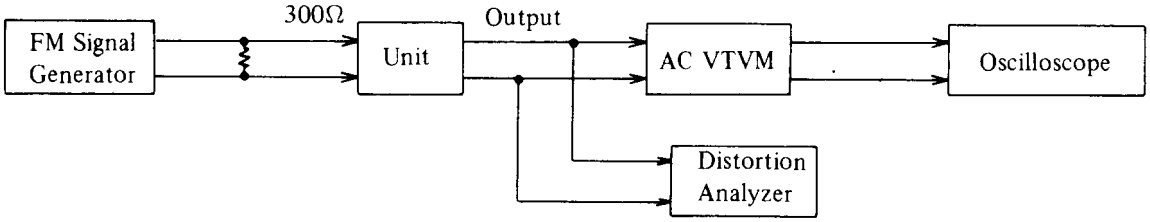
Set signal	Adjust	Oscilloscope	Remarks
455kHz	X201	Maximum Symmetrical Response	Usually not necessary to adjust

(6) AM RF ALIGNMENT



Step	Set Signal	Set Radio Dial	Adjust	VTVM reading	Remarks
1	515kHz 400Hz 30%	Lower end (515kHz)	L201	Maximum	Repeat steps 1 and 2 as necessary
2	1680kHz 400Hz 30%	Upper end (1680kHz)	TC5	Maximum	
3	600kHz 400Hz 30%	600kHz	L01	Maximum	Repeat steps 3 and 4 as necessary
4	1400kHz 400Hz 30%	1400kHz	TC2	Maximum	

(7) FM FRONT END ALIGNMENT



Step	FM Signal Generator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	No signal	Quiet Point	L103 Bottom	Tuning Indicator	Center	Repeat Steps 1 and 2 as necessary
2	98MHz 65dBf (60dB) 1kHz 75kHz devi.	98MHz	L103 Top	Distortion Analyzer	Minimum	
3	90MHz 65dBf (60dB) 1kHz 75kHz devi.	90MHz	L007	Tuning Indicator	Center	Repeat Steps 3 and 4 as necessary
4	106MHz 65dBf (60dB) 1kHz 75kHz devi.	106MHz	TC6		Center	
5	90MHz 20dBf (15dB) 1kHz 75kHz devi.	90MHz	L001 L002 L003	AC VTVM or Oscilloscope	Maximum	Repeat Steps 5 and 6 as necessary
6	106MHz 20dBf(15dB) 1kHz 75kHz devi.	106MHz	TC1 TC3 TC4		Maximum	
7	98MHz 65dBf(60dB) 1kHz 75kHz devi.	98MHz	L005	Distortion Analyzer	Minimum	

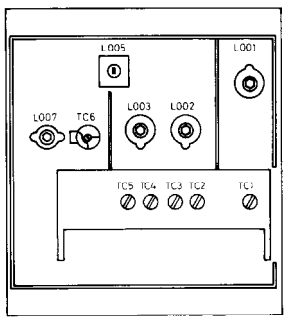
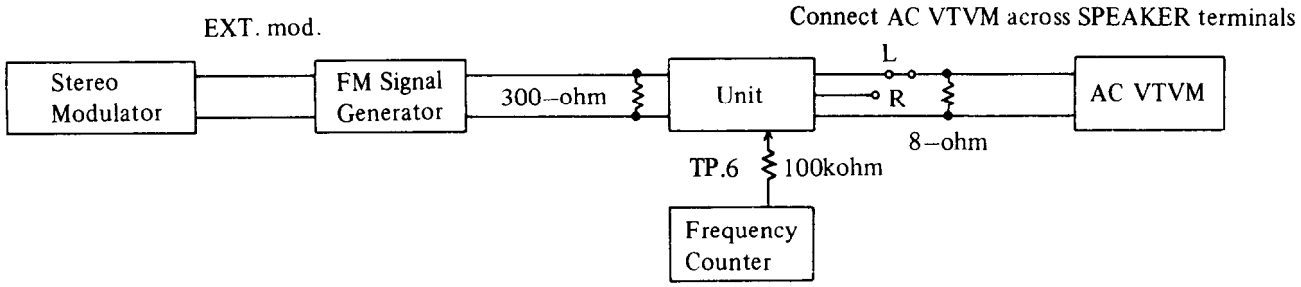


Fig. 13.

(8) MULTIPLEX ALIGNMENT



Step	FM Signal Generator	Stereo Modulator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	98MHz no mod. 65dBf (60dB)	–	98MHz	R224	Frequency Counter	19000±19Hz	
2	STEREO INDICATOR should light up when stereo program is being received.						
3	98MHz EXT. Mod. 65dBf (60dB)	Pilot Sig. 9% Main & Sub Sig. 1 kHz Lch 91%	98MHz	R250	AC VTVM Right ch.	Minimum	Repeat Steps 3 & 4 as necessary Same separation
4	Same as above	Pilot Sig. 9% Main & Sub Sig. 1 kHz Rch 91%	98MHz		AC VTVM Left ch.	Minimum	

(9) QUARTZ LOCKED CIRCUIT ALIGNMENT

1. Connect the signal generator to the ANTENNA terminals and the DC voltmeter to the Q117 detector output (pin nos. 10). T.P. 3
2. Set the SG output to 98MHz, 1kHz, 75kHz devi. 65dBf (60dB).
3. Tune the receiver to 98MHz.
4. Adjust the voltage to 3.5V with a detector coil of L107.
5. Place a short circuit across TP3 (pin nos. 10 and 11).
6. Then adjust the semi-fixed resistor R187 to bring the TP4 (pin no. 14) output voltage to zero.
7. Remove a short circuit across TP3.
8. Adjust the semi-fixed resistor R179 to bring the TP4 output voltage to zero.

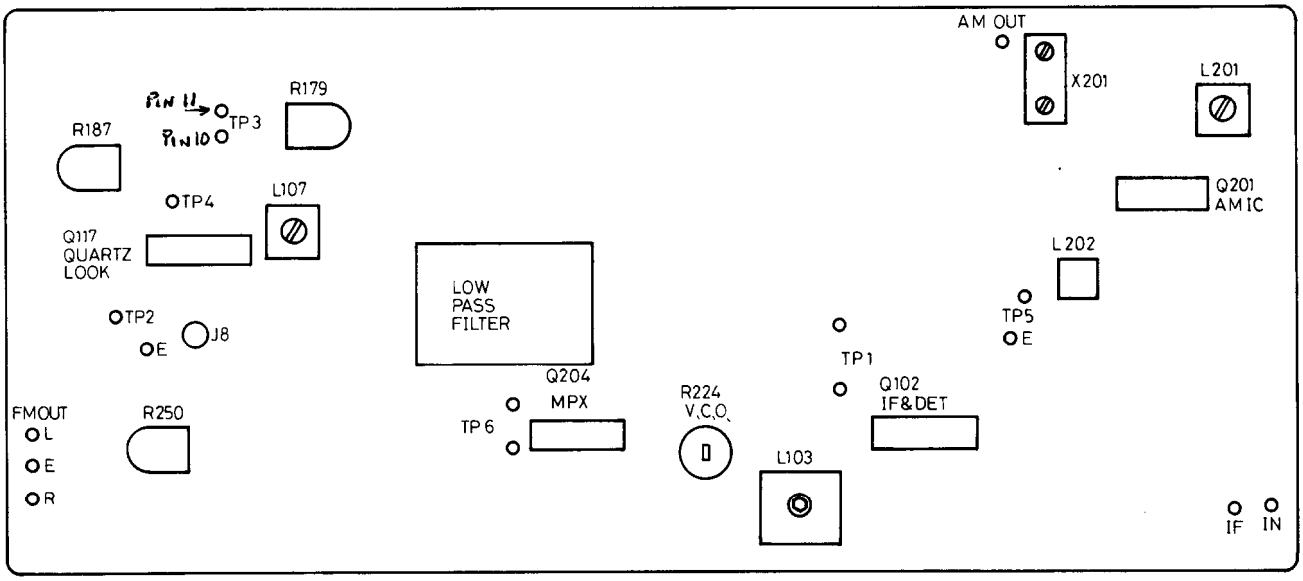


Fig. 14

BLOCK DIAGRAM

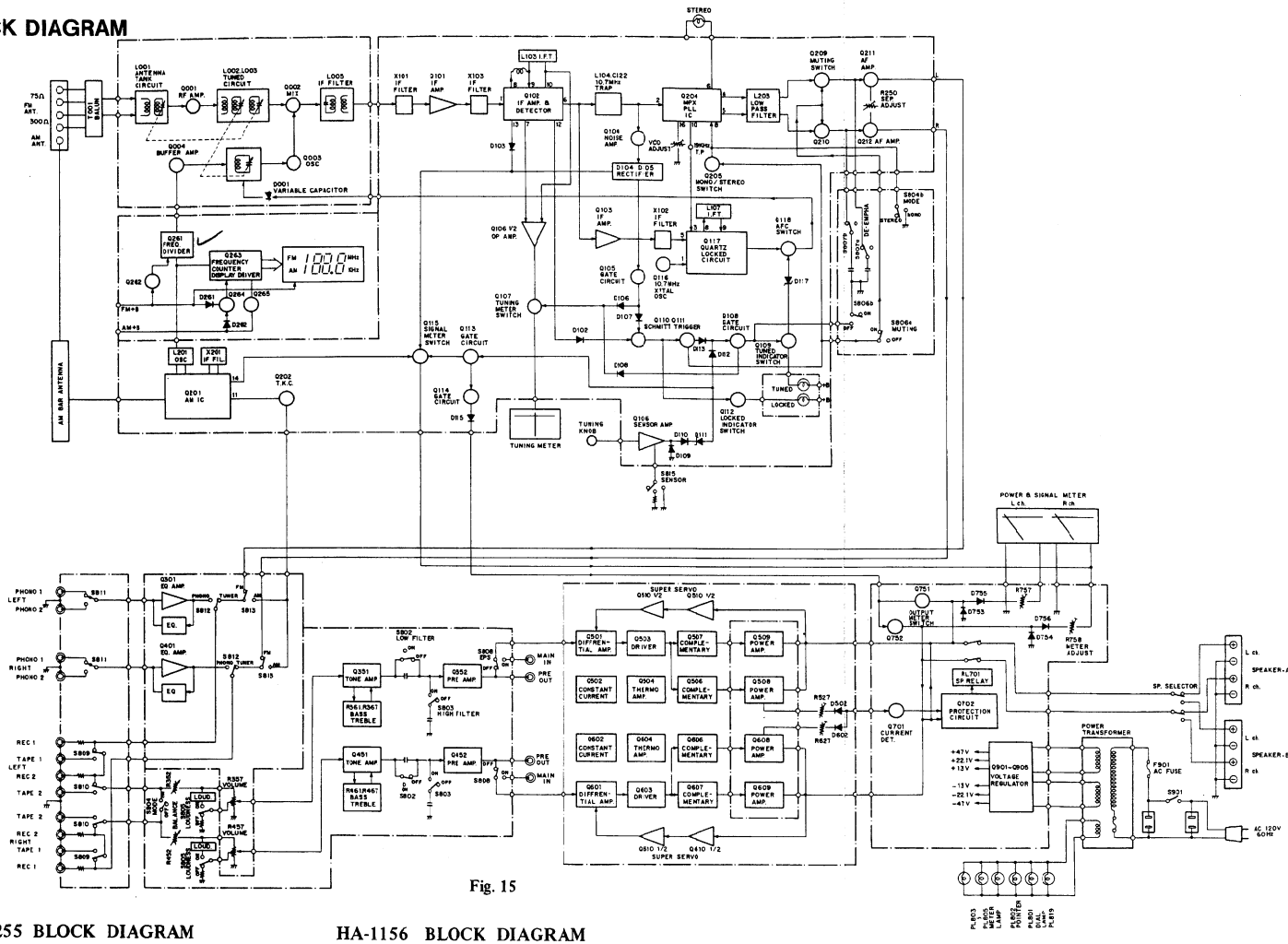


Fig. 15

HA-11255 BLOCK DIAGRAM

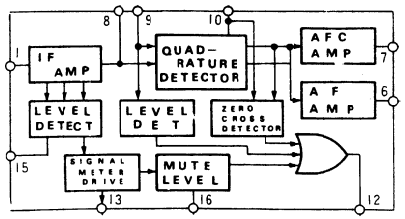


Fig. 16

HA-1156 BLOCK DIAGRAM

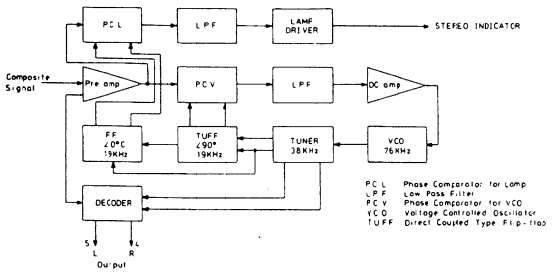


Fig. 17

HA-1151 EQUIVALENT CIRCUIT

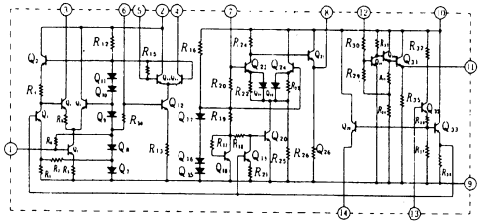


Fig. 18.

NJM4558, 4559 EQUIVALENT CIRCUIT

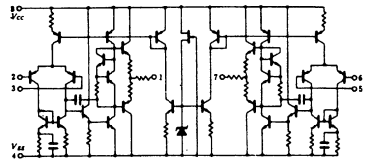


Fig. 19

BA-661 BLOCK DIAGRAM

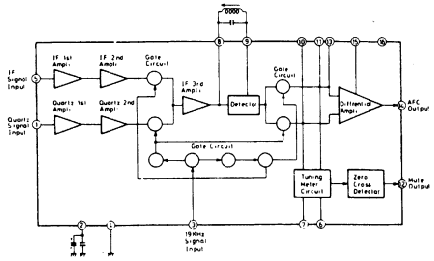


Fig. 20

TA-7302P EQUIVALENT CIRCUIT

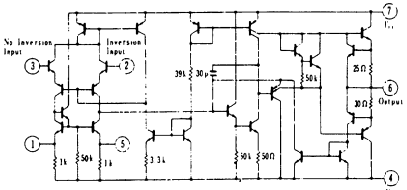


Fig. 21

BA-402 EQUIVALENT CIRCUIT

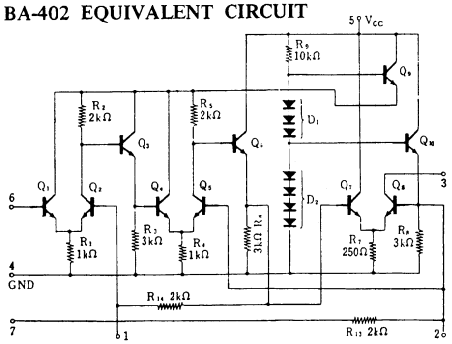
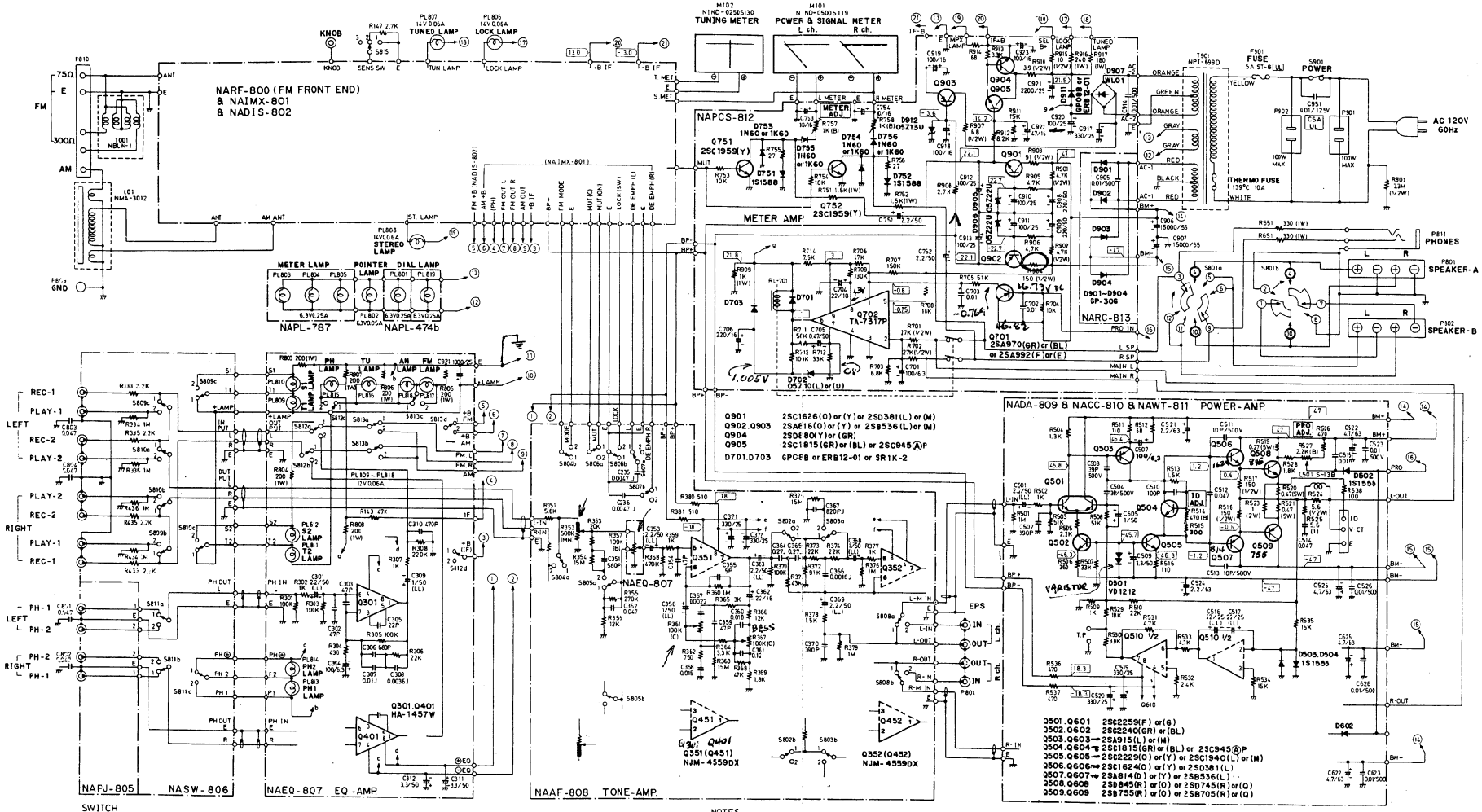


Fig. 22

ONKYO CORPORATION

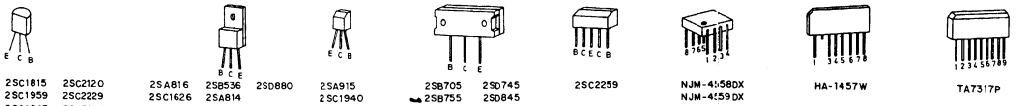
SCHEMATIC DIAGRAM
MODEL TX-5000



SWITCH

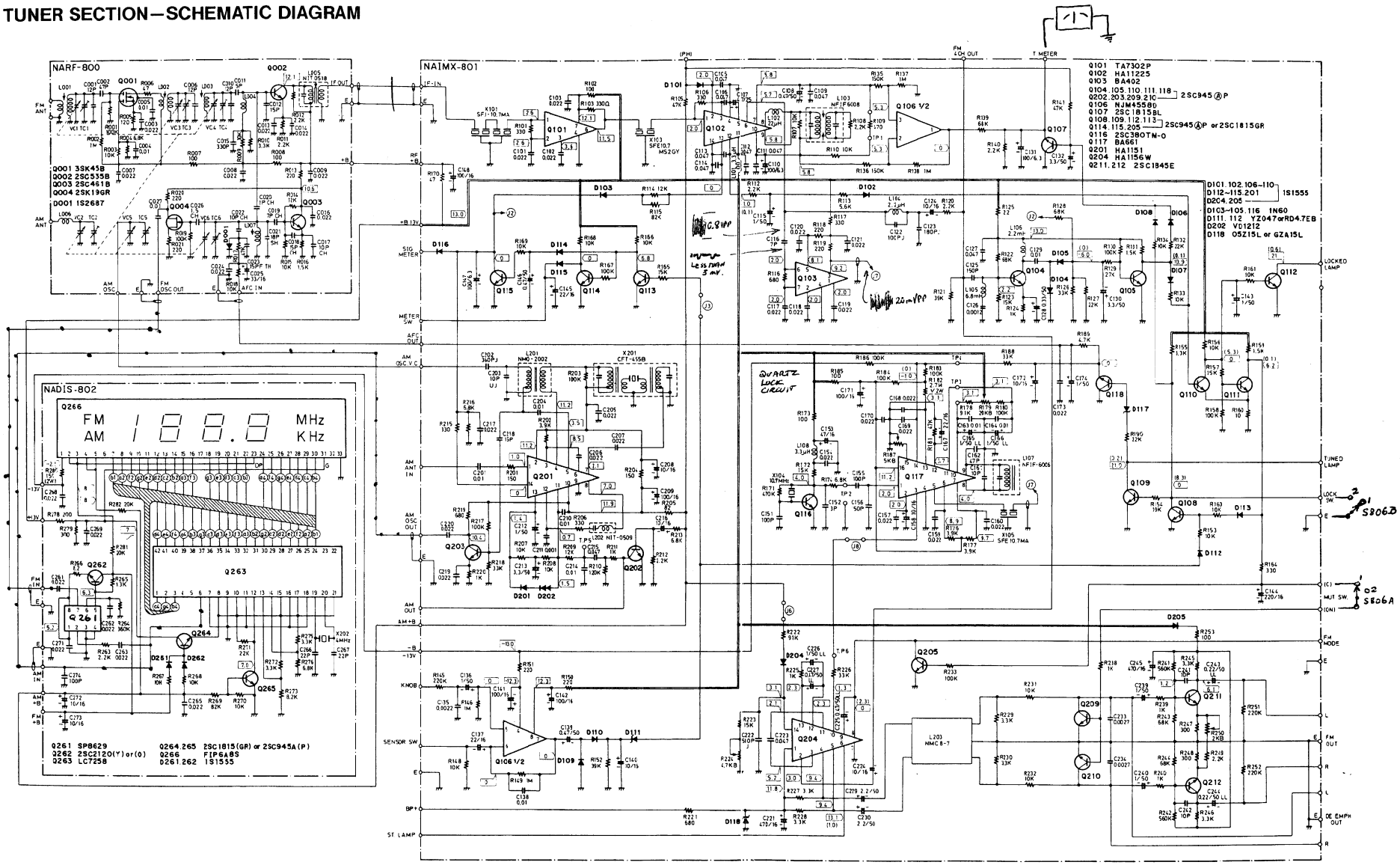
S801	SPEAKERS	1-OFF, 2-A, 3-B, 4-A+B	
S802	SUB FILTER	1-OFF, 2-ON	
S803	HIGH FILTER	1-OFF, 2-ON	
S804	MODE	1-STEREO, 2-MONO	
S805	LOUDNESS	1-OFF, 2-ON	
S806	MUTING / LOCK	1-ON, 2-OFF	
S807	DE EMPH	1-NORMAL, 2-25μSEC	
S808	EPS	1-OFF, 2-ON	
S809	TAPE MONITOR-1	1-SOURCE, 2-TAPE-1	
S810	TAPE MONITOR-2	1-SOURCE, 2-TAPE-2	
S811	PHONO SELECTOR	1-PHONO-1, 2-PHONO-2	
S812	SELECTOR	1-TUNER, 2-PHONO	
S813	TUNER SELECTOR	1-FM, 2-AM	
S815	HUM SENSOR	1-HIGH, 2-NORMAL, 3-LOW	
S901	POWER	1-ON, 2-OFF	

NOTES
ALL RESISTORS ARE IN OHMS 1/4WATT UNLESS OTHERWISE NOTED.
ALL CAPACITORS ARE IN μF UNLESS OTHERWISE NOTED
ELECTROLYTIC CAPACITORS (+B—) ARE IN μF/WV.
VOLTAGE (MEASURED WITH V.T.V.M.) (NO INPUT SIGNAL).

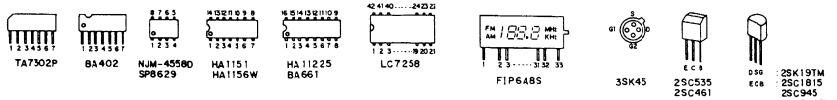


2SA970 2SC1815 2SC2120 2SA816 2SB536 2SD880 2SA915 2SB705 2SD745 2SC2259 NJM-4558DX HA-1457W TA7317P
2SA992 2SC1959 2SC2229 2SC1626 2SA814 2SC1940 2SB755 2SD845 NJM-4559DX
2SC945(A) 2SC1845 2SC2240 2SD381 2SC1624

TUNER SECTION—SCHEMATIC DIAGRAM



NOTES
ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE NOTED.
ALL CAPACITORS ARE IN μF, 50WV UNLESS OTHERWISE NOTED.
ELECTROLYTIC CAPACITORS (+ —) ARE IN μF/WV.
VOLTAGE (MEASURE WITH V.T.V.M.) ☐ V DC VOLTAGE (NO INPUT SIGNAL).
( ) V DC VOLTAGE (FM STEREO).



ONKYO CORPORATION

LC7258 PIN ARRANGEMENT

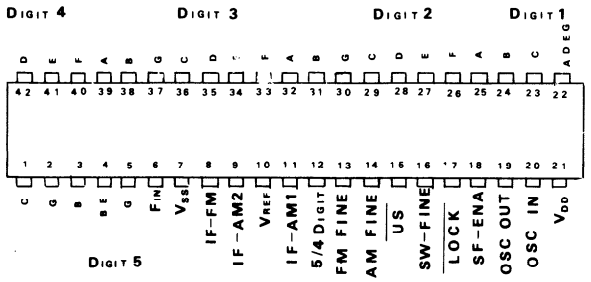


Fig. 23

BLOCK DIAGRAM

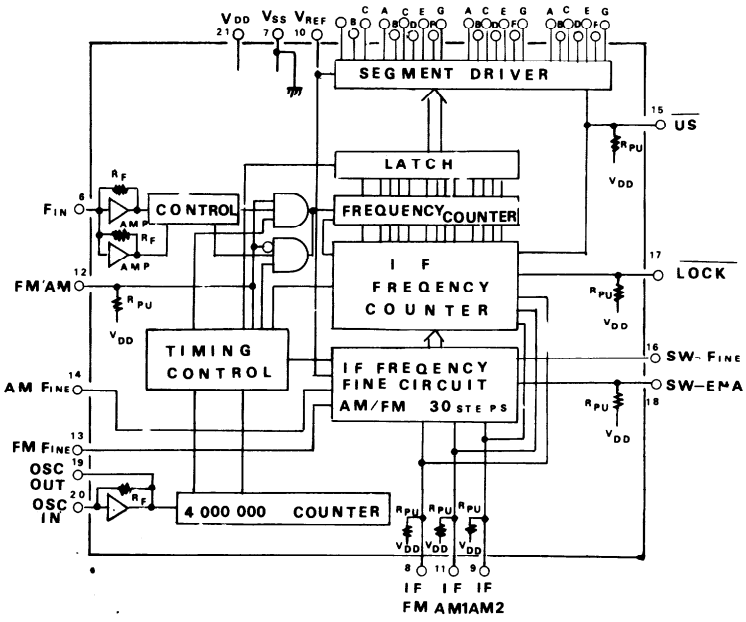
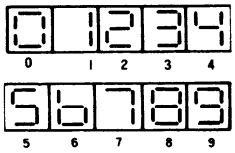


Fig. 24

OUTPUT INDICATION



SP8629 (1/100 PRESCALER)

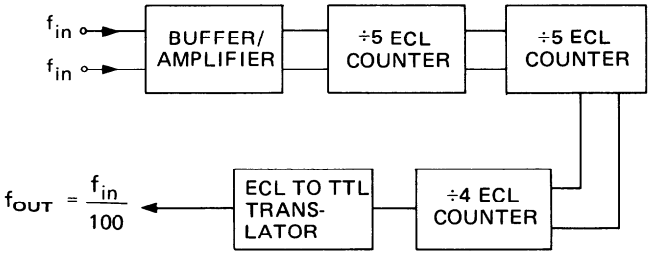


Fig. 25

PIN ARRANGEMENT Q261 SP8629

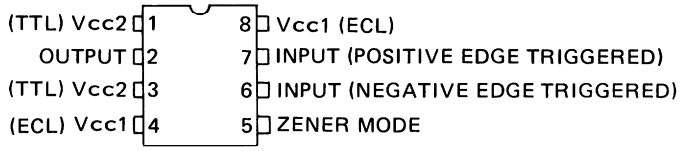


Fig. 26

HA-1457W EQUIVALENT CIRCUIT

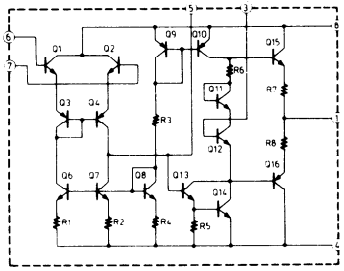


Fig. 27

TA7317P BLOCK DIAGRAM

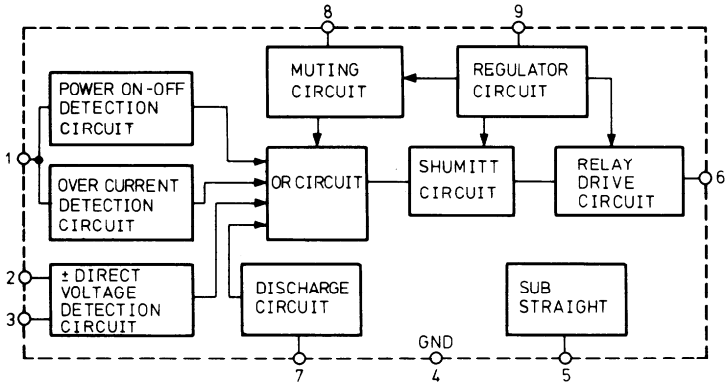


Fig. 28

PRINTED CIRCUIT BOARD—PARTS LIST

FRONT END PC BOARD (NARF-800) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Transistors	
Q001	2211012	3SK45(B)
Q002	2210882	2SC535(B)
Q003	2211342	2SC461(B)
Q004	2211815	2SK19TM(GR)
	Diode	
D001	223110	1S2687
	Coils	
L001	233224	NFA-3031
L002	233225	NFRF-3026
L003	233226	NFRF-3027
L004	233152	NFT-1503
L005	233085	NIT-0518
L006	233152	NFT-1503
L007	233090	NFO-3003
	Capacitors	
C025	352743301	33μF,16V, Elect.
VC001	3050006	NVC-20FQ 327WD02, Variable
TC6	3060009	NTC-06P08, Trimmer

AM/FM TUNER PC BOARD (NAIMX-801) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	ICs	
Q101	222452	TA-7302P
Q102	222540	HA11225
Q103	222468	BA402
Q106	222465	NJM-4558D
Q117	222469	BA661
Q201	222418	HA1151
Q204	222419	HA1156W
	Transistors	
Q104, Q105	2210746	2SC945A(P)
Q107	2211256	2SC1815(BL)
Q108, Q109	2210746 or	2SC945A(P) or
	2211255	2SC1815(GR)
Q110, Q111	2210746	2SC945A(P)
Q112-Q115	2210746 or	2SC945A(P) or
	2211255	2SC1815(GR)
Q116	2211823	2SC380TM(O)
Q118	2210746	2SC945A(P)
Q202, Q203	2210746	2SC945A(P)
Q205	2210746 or	2SC945A(P) or
	2211255	2SC1815(GR)
Q209, Q210	2210746	2SC945A(P)
Q211, Q212	2211733	2SC1845(E)
	Diodes	
D101, D102	223105	1S1555
D103-D105	223103	1N60
D106-D110	223105	1S1555
D111	223943 or	RD4. 7EB or
	224011	YZ-047
D112-D115	223105	1S1555
D116	223103	1N60
D117	224011 or	YZ047 or
	223943	RD4.7EB
D118	224060 or	05Z15-L or
	224115	GZA15-L
D201	223105	1S1555
D202	4000022	VD1212 VARISTOR
D204-D205	223105	1S1555
	Coils	
L101	233024 or	NCCH-1501 or
	233105	NCH-1005
L102	233144	NCH-1020
L103	233143A	NFIF-6008
L104	233121	NCH-3012
L105	233122	NCH-3013
L106	233031	NMC-9-1
L108	233024 or	NCCH-1501 or
	233105	NCH-1005
L201	232065	NMO2002
L203	233032A	NMC-8-7
	Transformers	
L107	233120	NFIF-6006
L202	232041	NIT-0509
	Ceramic filters	
X101	3010018	SFJ10.7MA
X103	3010046	SFE10.7MS2GY
X104	3010015	XTL10.7M
X105	3010006	SFE-10.7MA(RED)
X201	3010012	CFT-455B
	Capacitors	
C107	352750479T	4.7μF, 25V, Elect.
C108	352784799T	0.47μF, 50V, Elect.
C110	352721019T	100μF, 6.3V. Elect.
C115	352780109T	1μF, 50V, Elect.
C124	352741009T	10μF, 16V, Elect.
C128	352783399T	0.33μF, 50V, Elect
C130, C132	352780339T	3.3μF, 50V, Elect.
C131	352721019T	100μF, 6.3V, Elect.
C136	352780109T	1μF, 50V, Elect.
C137	352742209T	22μF, 16V, Elect.
C139	352784799T	0.47μF, 50V, Elect.
C140	352741009T	10μF, 16V, Elect.
C141, C142	352741019T	100μF, 16V, Elect.
C143	352780109T	1μF, 50V, Elect.
C144	352742219T	220μF, 16V, Elect.
C145	352742209T	22μF, 16V, Elect.
C146	352784799T	0.47μF, 50V, Elect.
C147	352721019T	100μF, 6.3V, Elect.
C148	352741019T	100μF, 16V, Elect.
C153	352744709T	47μF, 16V, Elect.
C158	352471009T	10μF, 16V, Elect.
C165, C166	392880107T	1μF, 50V, LL
C167	352742209T	22μF, 16V, Elect.
C171	352741019T	100μF, 16V, Elect.
C172	352741009T	10μF, 16V, Elect.
C174	352780109T	1μF, 50V, Elect.
C202	372523614	360pF±5%, 50V, ST
C208	352741009T	10μF, 16V, Elect.
C209	352741019T	100μF, 16V, Elect.
C212	352780109T	1μF, 50V, Elect.
C213	352780339T	3.3μF, 50V, Elect.
C215	379124737T	0.047μF, 50V, DEW
C216	352741009T	10μF, 16V, Elect.
C221	352744719	470μF, 16V, Elect.
C222	372525114	510pF±5%, 50V, ST
C223	379124737T	0.047μF, 50V, DEW
C224	352741009T	10μF, 16V, Elect.
C225, C227	392884797T	0.47μF, 50V, LL
C226	392880107T	1μF, 50V, LL
C229, C230	352780229T	2.2μF, 50V, Elect.
C233, C234	379122724T	0.0027μF, 50V, DEW
C239, C240	352780109T	1μF, 50V, Elect.
C243, C244	392882297T	0.22μF, 50V, LL
C245	352744719	470μF, 16V, Elect.
	Resistors	
R179	5215022	N08HR20KBC, Semi-fixed
R187	5215020	N08HR5KBC, Semi-fixed
R224	5225019	N10HR4.7KBD, Semi-fixed
R250	5215019	N08HR2KBC, Semi-fixed
	Shielded plate	
	27150103	

FREQUENCY INDICATOR PC BOARD (NADIS-802) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	ICs	
Q261	222588	SP8629
Q263	222589	LC7258
	Transistors	
Q262	2211163 or	2SC2120(O) or
	2211164	2SC2120(Y)
Q264, Q265	2210746 or	2SC945A(P) or
	2211255	2SC1815(GR)
	Diodes	
D261, D262	223105	1S1555
	Fluorescent indicator tube	
Q266	212007	FIP6A8S
	X'tal	
X202	3010045	XTL-4.000M
	Capacitors	
C272, C273	352741009P	10μF, 16V, Elect.
	Resistors	
R277	5225015	N10HR10KBD, Semi-fixed
R280	441721514	150Ω, 2W, Metal oxide film

NOTES:

1. DC voltage are measured with V.T.V.M. to chassis at no signal applied.
2. Capacitor LL: Low leakage current type electrolytic capacitor
   ST: Polystyren film capacitor
   DEW: Non-inductive polyseter film capacitor

TONE AMPLIFIER PC BOARD VIEW FROM BOTTOM SIDE

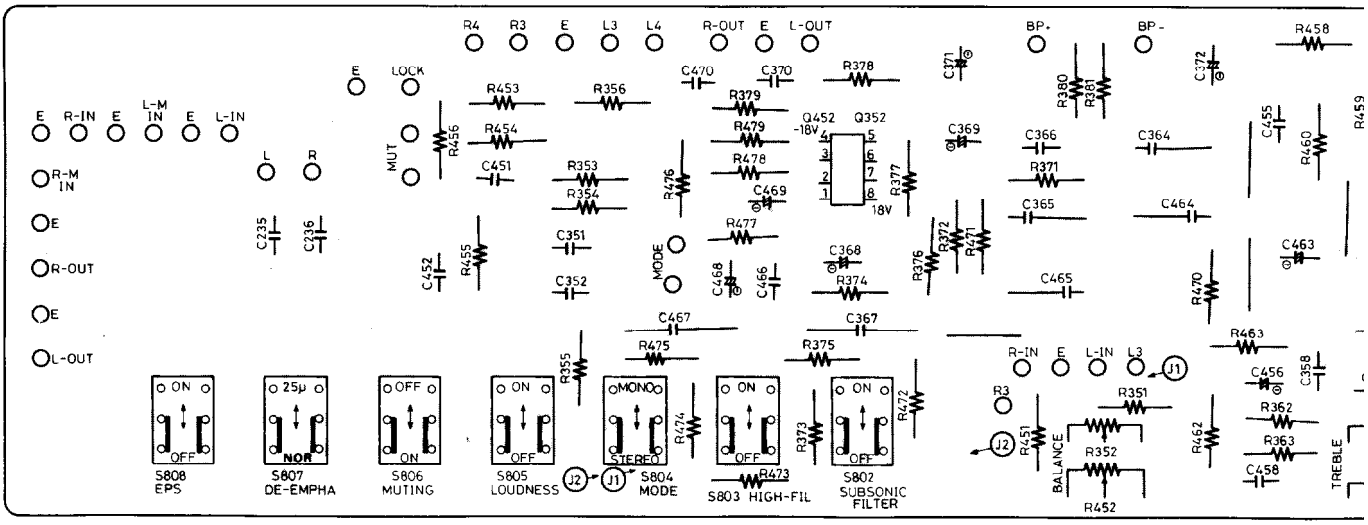


Fig. 38

PRINTED CIRCUIT BOARD—PARTS LIST

PHONO INPUT TERMINAL (NAPJ-805) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
P808	25045069	NPJ-4PDBL34, Phono input terminal

SWTICH PC BOARD (NASW 806) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
S809–S811	25035179	NPS-342-L143, Tape ½, Phono
P805, P806	25045020	NPJ-4PDBL11, Tape input/output terminal

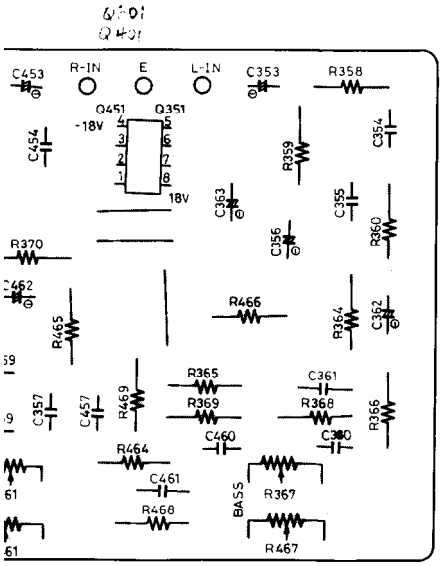
EQUALIZER AMPLI. PC BOARD (NAEQ-807) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	ICs	
Q301, Q401	222471	HA-1457W
	Capacitors	
C301, C401	392880227T	2.2μF, 50V, LL
C304, C404	352721019T	100μF, 6.3V, Elect.
C307, C407	379121034T	0.01μF, 50V, DEW
C308, C408	379123624T	0.0036μF, 50V, DEW
C309, C409	392880107T	1μF, 50V, LL
C311, C312	352780339T	3.3μF, 50V, Elect.
C921	352751029	1,000μF, 25V, Elect.
	Resistors	
R357, R457	5172058	N24RGL41C100KBTP40, Volume control variable
R803–R807	441622014	200Ω, 1W, Metal oxide film

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Switches	
S812, S813	25035177	NPS-242-L141, AM/FM, TUNER/PHONO
	Lamps	
PL809–PL818	210082	PL12V0.06AW-1
	Lamp case	
	27250045	

TONE AMPLIFIER PC BOARD (NAAF-808) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	ICs	
Q351, Q352 Q451, Q452	222534	NJM-4559DX
	Capacitors	
C353, C453	392880227T	2.2μF, 50V, LL
C356, C456	392880107T	1μF, 50V, LL
C362, C462	352742209T	22μF, 16V, Elect.
C363, C463	392880227T	2.2μF, 50V, LL
C367, C467	372528214	820pF±5%, 50V, ST
C368, C468	392880107T	1μF, 50V, LL
C369, C469	392880227T	2.2μF, 50V, LL
C371, C372	352753319	330μF, 25V, Elect.
	Resistors	
R352, R452	5148040	N16RGMC500KMN40, Balance variable
R361, R461	5148038	Nl6RGM11C100KCO40, Treble variable
R367, R467	5148039	N16RGM11C100KCS40, Bass variable



CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Switches	
S802–S808	25035178	NPS-722-L142, EPS, Loudness, Mode, FM muting, de-emphasis, Hi-filter and Low filter

POWER AMPLIFIER PC BOARD (NADA-809) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Transistors	
Q501, Q601	2211371 or 2211372	2SC2259(F) or 2SC2259(G)
Q502, Q602	2211405 or 2211406	2SC2240(GR) or 2SC2240(BL)
Q503, Q603	2211742 or 2211743	2SA915(L) or 2SA915(M)
Q505, Q605	2211633, 2211634, 2211762 or 2211763	2SC2229(O), 2SC2229(Y), 2SC1940(L) or 2SC1940(M)
Q506, Q606	2201173, 2201174 or 2201042	2SC1624(O), 2SC1624(Y) or 2SD381(L)
Q507, Q607	2201183, 2201184 or 2201052	2SA814(O), 2SA814(Y) or 2SB536(L)
Q508, Q608	2201102, 2201103, 2201012 or 2201013	2SD845(R), 2SD845(O), 2SD745(R) or 2SD745(Q)
Q509, Q609	2201092, 2201093, 2201022 or 2201023	2SB755(R), 2SB775(O), 2SB705(R) or 2SB705(Q)

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	ICs	
Q510, Q610	222502	NJM-4558DX
	Diodes	
D501, D601	4000022	VD-1212
D502–D504	223105	1S1555
D602–D604		
	Coils	
L501, L502	231001	S-1.3B
	Capacitors	
C501, C601	392880227T	2.2μF, 50V, LL
C505, C605	352780109T	1μF, 50V, Elect.
C507, C607	352721019T	100μF, 6.3V, Elect.
C509, C609	352780339T	3.3μF, 50V, Elect.
C516, C517	392852207T	22μF, 25V, LL
C616, C617		
C518, C618	352780339T	3.3μF, 50V, Elect.
C519, C520	352753319	330μF, 25V, Elect.
C521, C621	352770229T	2.2μF, 63V, Elect.
C522, C622	352770479T	4.7μF, 63V, Elect.
C524, C624	352770229T	2.2μF, 63V, Elect.
C525, C625	352770479T	4.7μF, 63V, Elect.
	Resistors	
R514, R614	5221019	N10HR470BE, Semi-fixed
R517, R617	441521514	150Ω, ½W, Metal
R518, R618		
R519, R619	4000049	0.27Ω, 5W, Metal plate
R520, R620	4000047	0.47Ω, 5W, Metal plate
R521, R621		
R523, R623	4000067	1Ω, 2W, Metal plate
R524, R624	451530564	5.6Ω, ½W, Metal
R525, R625	451630564	5.6Ω, 1W, Metal
R527, R627	5221007	R-HK2.2KB, Semi-fixed
	Radiators	
	27160029	RAD-07
	Pan head screws	
	82113008	3P+8F-N

CAUTION: Replacement for power, complementary and drive transistor, if necessary, must be made from the same beta group (HFE) as the original type.

THERMAL DETECTOR PC BOARD (NACC-810) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
Q04	2211255, 2211256 or 2210746	2SC1815(GR)' 2SC1815(BL) or 2SC945A(P)

POWER SUPPLY PC BOARD (NAPCS-812) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Transistors	
Q701	2211395, 2211396, 2211792 or 2211793	2SA970(GR), 2SA970(BL), 2SA992(F) or 2SA992(E)
Q751, Q752	2211544	2SC1959(Y)
Q901	2200663, 2200664 2201042 or 2201043	2SC1626(O), 2SC1626(Y), 2SD381(L) or 2SD381(M)
Q902, Q903	2200673, 2200674 2201052 or 2201053	2SA816(O), 2SA816(Y), 2SB536(L) or 2SB536(M)
Q904	2201074 or 2201075	2SD880(Y) or 2SD880(GR)
Q905	2211255, 2211256 or 2210746	2SC1815(GR), 2SC1815(BL) or 2SC945A(P)
	IC	
Q702	222584	TA-7317(P)

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Diodes	
D701, D703	223848, 223849 or 223804	GP-08B, ERB12-01 or SR1K-2
D702	224052 or 224053	05Z10L or 05Z10U
D751, D752	223119	1S1588
D753–D756	223103 or 223132	1N60 or 1K60
D905, D906	224069	05Z22U
D907	223862	WL01 1.30
D911	223848 or 223849	GP08B or ERB12-01
D912	224059	05Z13U
	Capacitors	
C701	352721019T	100μF, 6.3V, Elect.
C704	352732209T	22μF, 10V, Elect.
C705	352784799T	0.47μF, 50V, Elect.
C706	352742219	220μF, 16V, Elect.
C751, C752	352780229T	2.2μF, 50V, Elect.
C753, C754	352741009T	10μF, 16V, Elect.
C908, C909	352782219	220μF, 50V, Elect.
C910–C913	352751019T	100μF, 25V, Elect.
C917	352753319	330μF, 25V, Elect.
C918, C919	352741014T	100μF, 16V, Elect.
C920	352751019T	100μF, 25V, Elect.
C921	352752229	2,200μF, 25V, Elect.
C922	352744709T	47μF, 16V, Elect.
C923	352741019T	100μF, 16V, Elect.
	Resistors	
R751, R752	441621524	1.5kΩ, 1W, Metal oxide film
R757, R758	5215018	N08HR1KBC, Semi-fixed
R903	441529104	91Ω, ½W, Metal oxide film
R904	441521514	150Ω, ½W, Metal oxide film
R907	451530684	6.8Ω, ½W, Metal
R909	441621024	1kΩ, 1W, Metal oxide film
R915	451531004	10Ω, ½W, Metal
R916	441622414	240Ω, 1W, Metal oxide film
R917	441621814	180Ω, ½W, Metal oxide film
	Relay	
RL701	25065113	NRL-2P5A-DC24V-06
	Radiators	
	27160021	RAD-06B
	27160029	RAD-07

RECTIFIER PC BOARD (NARC-813) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
D901–D904	223841	GP-30G

LAMP PC BOARD (NAPL-747b) – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
PL801	210054A	PL6.3V, 250mA, Lamp

METER ILLUMINATION LAMP PC BOARD (NAPL-787) – PARTS LIST

CIRCUT NO.	PARTS NO.	DESCRIPTION
PL803–PL805	210054B	PL6.3V, 0.25A, Lamp

NOTES:
1. DC voltage are measured with V.T.V.M. to chassis at no signal applied.
2. Capacitor LL: Low leakage current type electrolytic capacitor
   ST: Polystyren film capacitor
   DEW: non-inductive polyester film capacitor

STRINGING DIAGRAM

1. Close the variable capacitor complete and tie the dial cord to the spring of the drum.
2. Thread the dial cord in the direction of arrow from ① to ⑤ and wind the dial cord three turns around the tuning shaft counter – clockwise.
3. Thread the dial cord in the direction of arrow from ⑦ to ⑧.
4. Wind the dial cord 1½ turns around the dial drum.

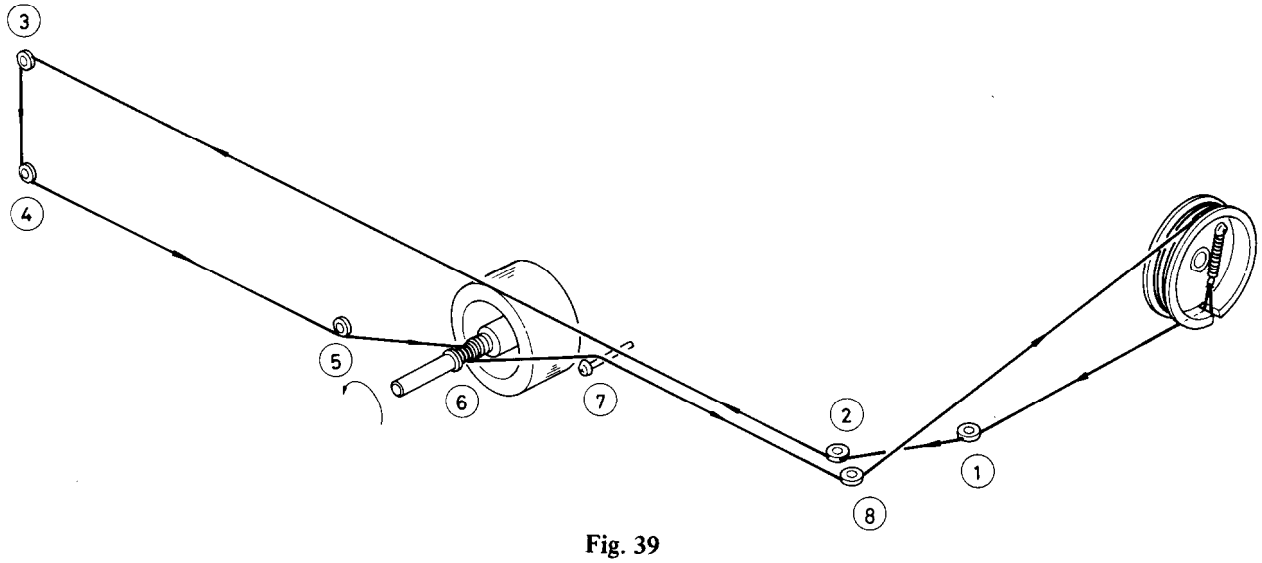


Fig. 39

PACKING PROCEDURES

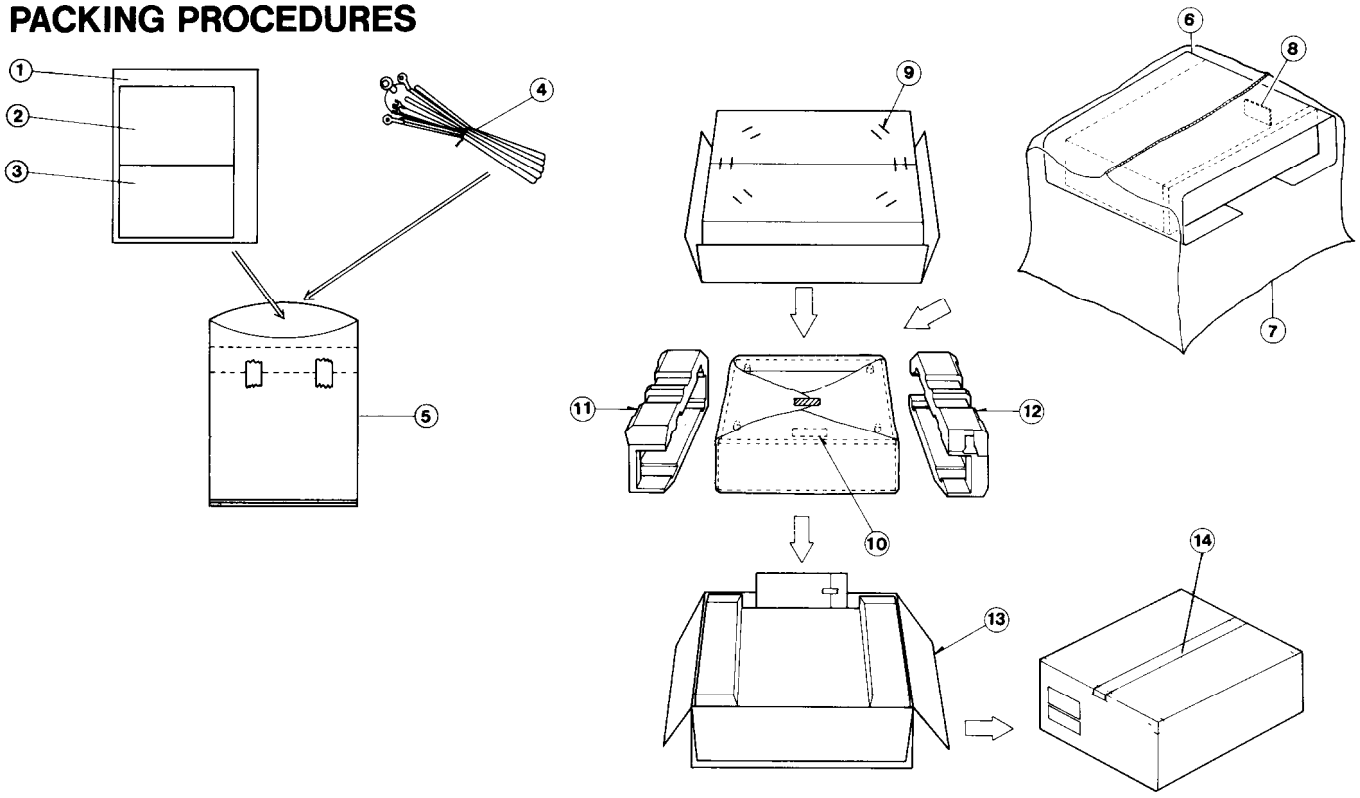


Fig. 40

PACKING PROCEDURES – PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION
1	29340396	Instruction manual
2	29358002	Service station list
3	29365006	Warranty card
4	292064	FM antenna
5	29100006	250x350mm, Poly bag
6	290008-1	500x1,000mm, Protection sheet
7	29100038	720x950mm, Poly bag
8	29360362	Label
9	282301	Sealing hook
10	29360363	Caution label
11	29090482	Pad (R)
12	29090483	Pad (L)
13	29050335	Master carton box
14	260012	W50x170mm, Tape
	29355045	Sensor tag

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