SERVICE DATA
FILE NO.170-069

TOSHIBA

DIGITAL SYNTHESIZER
STEREO RECEIVER

SA-7150

SPECIFICATIONS

Power Output

Continuous Power Output is 150 watts per channel, min. RMS at 8 ohms from 20 to 20,000 Hertz with no more than 0.05% total harmonic distortion.

■ AMPLIFIER SECTION

Power Output	
20 Hz ~ 20 kHz Both channel driven:	230W x 2 4 ohms
1 kHz Both channel driven:	160W x 2 8 ohms
	250W x 2 4 ohms
Total Harmonic Distortion: at 8 ohms rated power output:	0.05%
1W:	0.03%
Intermodulation Distortion:	0.05%
Damping Factor:	50
Input (Sensitivity/ Impedance)	
PHONO 1:	2.5 mV/47K ohms
PHONO 2:	2.5 mV/47K ohms
	100p/200p/470pF
TUNER/AUX.:	150 mV/47K ohms
TAPE:	150 mV/47K ohms
PHONO Overload Level:	350 mV rms at 1 kHz
Output Level	
TAPE REC:	150 mV
DIN:	30 mV
PHI OUT:	1000 mV
Frequency Response	
PHONO (RIAA Equalization):	30 Hz to 15 kHz +0.2 dB -1.0 dB
AUX, TAPE:	10 Hz to 50 kHz +0.2 dB -1.0 dB
Tone Control	
BASS:	±10 dB, (100 Hz)
TREBLE:	±10 dB, (10 kHz)
Turnover Frequency:	200/400 Hz, 2.5 K/5 kHz
Loudness Contour:	+8 dB (100 Hz) +6 dB (10 kHz)
Signal to Noise Ratio (IHF short-circuited A network; rated power)	
PHONO:	80 dB
AUX, TAPE:	95 dB
Filter	
LOW:	20 Hz -6 dB/oct.
HIGH:	7 kHz -6 dB/oct.

■ FM TUNER SECTION

Usable Sensitivity:	Mono 9.8 dBf (1.7 µV)
50 dB Quieting Sensitivity:	Mono 14.7 dBf (3.0 µV)
	Stereo 37.8 dBf (42 µV)
Signal to Noise Ratio:	Mono 75 dB, Stereo 70 dB
Distortion (WIDE/NARROW)	
100 Hz:	Mono 0.08/0.1%
	Stereo 0.1/0.2%
1 kHz:	Mono 0.08/0.1%
	Stereo 0.1/0.2%
6 kHz:	Mono 0.1/0.2%
	Stereo 0.15/0.25%
Frequency Response:	20 Hz to 15 kHz ±0.5 dB
Alternate Channel Selectivity:	(WIDE/NARROW) 50/90 dB
Capture Ratio:	1.0 dB
Spurious Response Ratio:	90 dB
Image Rejection Ratio:	110 dB
IF Rejection Ratio:	100 dB
AM Suppression Ratio:	55 dB
Stereo Separation:	50 dB (1 kHz), 35 dB (30 Hz to 15 kHz)

■ AM TUNER SECTION

Sensitivity:	350 µV/m (IHF, ferrite antenna)
Selectivity:	30 dB
Signal to Noise Ratio:	90 dB
Image Rejection Ratio:	40 dB

■ MISCELLANEOUS

Power Requirements:	AC 120V 60 Hz
Power Consumption:	650 watts (ULI 6.8 A (CSA)
Dimensions (W x H x D):	550 x 200 x 500 (mm)
Weight:	27 Kg

Specifications are subject to change without notice.

TA. TC

CONTENTS

CONNECTION DIAGRAM

• POWER OUTLETS FOR OTHER AUDIO COMPONENTS

Switched: (100W MAX) Since this outlet is switched on and off by the front panel POWER switch, it will be found handy for supplying the power to an audio component frequently used with the SA-7150 such as a turntable or tape deck.

Unswitched: (TOTAL 200W MAX) These outlets are switched on and off only by disconnecting the power cord from the AC mains. They are therefore convenient for use with audio timers and other equipment.

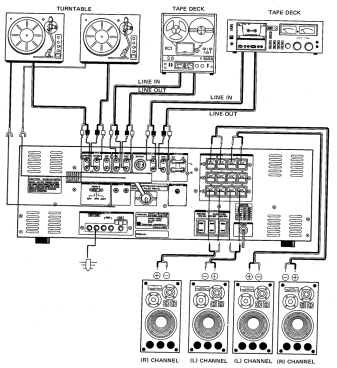


Figure 1.

■ TURNTABLE CONNECTION

Connect the turntable output cables to the PHONO input terminals on the rear panel of the SA-7150. Both sets of input terminals are designed to accept inputs from MM cartridges, but the PHONO 2 input is also coupled to a phono load capacitance selector whereby the input load capacitance of the receiver can be matched more accurately with the cartridge capacitance.
If the turntable is equipped with a ground terminal, connect it to the SA-7150's GND terminal in order to eliminate unnecessary hum and noise.

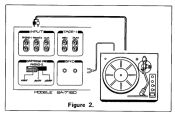


Figure 2.

■ PHONO LOAD CAPACITANCE SELECTOR

The PHONO 2 input terminals are coupled to a phono load capacitance selector switch. This 3-way switch (100pF, 250pF, and 450pF) is to be set according to the type of cartridge employed in the turntable (the cartridge load capacitance normally being quoted in the cartridge's specifications).

■ PRE-OUT MAIN-IN TERMINALS

The Pre-Out/Main-In terminals allow you the flexibility of adding additional sound processing devices such as graphic equalizers, dynamic range expanders, multi-amplifier system etc.

1. First disconnect the U-link connecting the PRE MAIN IN and OUT terminals on the rear panel. (Fig. 8.)
2. Connect the output of the sound processing device to the (MAIN) IN terminals.
3. Connect the input of the device to the (PRE) OUT terminals.

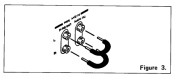


Figure 3.

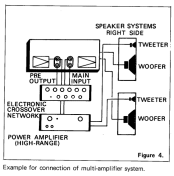


Figure 4.

Example for connection of multi-amplifier system.

■ CONNECTING THE SPEAKER SYSTEMS

Connection of speaker cables to the rear of the receiver requires considerable care. Before starting to connect the speakers, turn the power switch of the receiver off. Connect the right-hand speaker to the R output terminals, and the left-hand speaker to the L output terminals. Be sure that plus (+) terminals and minus (−) terminals are connected to their respective points. Be sure that no bare wires are exposed which could cause short circuiting. Even a temporary short will operate the receiver's protective circuit and no sound will be heard.

NOTE:

SPEAKER	IMPEDANCE
A, B, C	4Ω ~ 16Ω
A+B, B+C, C+A	8Ω ~ 16Ω

FRONT PANEL FACILITIES

STEREO INDICATOR

This red LEDs lights up whenever an FM stereo station is tuned.

DOLBY*FM INDICATOR

This green LED lights up when the DOLBY* FM push-button is pressed for reception of Dolby* FM broadcasts.

SPEAKERS INDICATORS

These green LEDs light up when the corresponding SPEAKERS push-button switches are depressed, irregardless of whether the rear panel speaker terminals are connected or not. But note that only 2 LEDs will light up at any one time. If the third push-button is pressed, all LEDs will automatically turn off (and the speakers also become silent) to indicate mis-operation. If this happens, reset the push-buttons correctly, using a maximum of two pairs of speakers.

AM/FM BAND SELECTOR BUTTON-SWITCHES

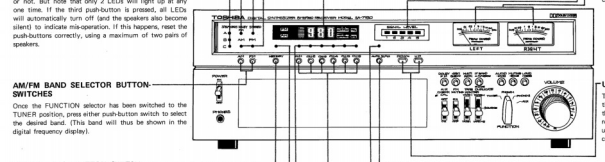
Once the FUNCTION selector has been switched to the TUNER position, press either push-button switch to select the desired band. (This band will thus be shown in the digital frequency display).

MEMORY PUSH-BUTTON SWITCH

This push-button switch is pressed in order to set the frequency of the tuned station in any of the preset channels (see page 11 for full details). Note, however, that the selected preset channel push-button switch must be pressed within the 2-second period that the MEMORY indicator stays on, and that the MEMORY indicator lamp cannot be kept on by keeping this push-button switch depressed.

MEMORY INDICATOR

This red LED lights up for about 2 seconds when the MEMORY button-switch is pressed to preset a station.



AM/FM BAND INDICATOR

These green LEDs light up alternately (once the FUNCTION selector has been switched to the TUNER position) depending on which band selector push-button switch (AM or FM) is pressed.

DIGITAL FREQUENCY DISPLAY

The frequency of the tuned FM or AM station is displayed immediately when the appropriate push-button switches are pressed. When the power is first turned on, the displayed frequency will be at either end of the previously tuned band, but when switching back from other program sources, the frequency of the last tuned station will re-appear automatically.

PRESET CHANNEL PUSH-BUTTON SWITCHES

A total of 6 FM stations and 6 AM stations may be preset (in the LSI memory) by pressing any channel after pressing the memory button, while the MEMORY indicator is on (approx. 2 seconds). The preset station may then be "one-touch" tuned by simply pressing the relevant push-button switch. The corresponding Preset Channel indicator will light up, and the tuned frequency will be shown in the digital frequency display.

PRESET INDICATOR LAMPS

These green LEDs will light up when the corresponding Preset Channel push-button switch is pressed, either when presetting a station, or when recalling that station for listening.

SIGNAL LEVEL INDICATOR

This indicator corresponds to the conventional signal strength meter. The relative strengths of the input signals received by the antenna are shown by the indicators lighting up in order (and intensity) from left to right. All 5 LEDs will light up for strong stations, the optimum tuning position being adjusted accurately by the Auto Scan mechanism.

PEAK READING POWER METERS

These meters indicate the peak (or instantaneous) power output levels when using 8 ohm speakers. (For 4 ohm speakers, multiply the indicated readings by 2 to obtain approximate values). Note that these meters are designed to indicate instantaneous output levels, not the average or continuous levels.

UP AND DOWN PUSH-BUTTON SWITCHES

To move up or down the frequency band one step at a time (100 kHz steps in the FM band and 1 kHz steps in the AM band), press either of these push-button switches, releasing the switch after each step. For rapid movement up or down the band, press the relevant push-button switch continuously (until the desired frequency is reached).

AUTO SCAN PUSH-BUTTON SWITCH

Press this push-button switch, and then either the UP or DOWN push-button switch, for automatic scanning up or down the frequency band. The frequency shown in the digital frequency display will change rapidly for a while, and then suddenly stop at a particular station.

AUTO SCAN INDICATOR LAMP

This red LED lamp lights up whenever the AUTO SCAN push-button switch is pressed, but will turn off again once the automatic scanning stops at a particular station.

Figure 5.

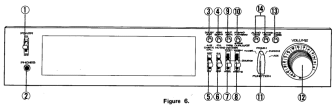


Figure 6.

①POWER SWITCH

When this switch is turned on, the meter lamps light up immediately to indicate that the power is ON.

②PHONES JACK

Used for connecting stereo headphones. We strongly recommend that you audition Toshiba's unique complementary back-elected headphones.

③DOLBY*FM PUSH-BUTTON

Press this button when listening to a Dolby*FM broadcast. The Dolby*type-B noise reduction circuit will reduce noise by 8 to 10 dB more than that of ordinary FM. Return the push-button to the extended position when listening to ordinary FM broadcasts.

④HIGH BLEND PUSH-BUTTON

Turn this switch on when receiving a noisy FM stereo broadcast. Noise will be reduced with only a slight loss of high-range response and stereo separation.

⑤AIR CHECK CALIBRATION SWITCH

The FM 50% modulation level (for tape recording of an FM broadcast) is obtained by pressing this push-button. Adjust the tape deck's recording controls accordingly.

⑥FM MUTING SWITCH

Set this switch to ON when listening to FM broadcasts. It will suppress irritating inter-station noise. For distant FM broadcasting stations, however, switch to the OFF position in order to prevent the weaker FM signals from being muted out along with the noise elements.

⑦TAPE MONITOR (1 & 2) SWITCH

This switch allows the monitoring of sound being recorded in a tape deck. It is also used when listening to tapes (playback).

TAPE 1: For use when a tape deck connected to TAPE 1 (REC & PLAY) jacks is being used to play back, or monitor a recording in progress.

TAPE 2: For use with a tape deck connected to TAPE 2 jacks (REC & PLAY or REC/PLAY DIN connector) to play back, or monitor a recording in progress.

Leave the TAPE MONITOR in the SOURCE position when switching to another program source.

⑧DUPLICATE SWITCH

This switch is used for tape duplication in either direction, from tape deck 2 to 1 or from tape deck 1 to 2.

⑨MULTIPATH PUSH-BUTTON

When selecting the best direction for the FM antenna, depress this button so that multipath sound is heard from the speaker systems. For details see page 3.

⑩NARROW/WIDE IF BAND PUSH-BUTTON

Although the SA-7150 features outstanding sensitivity and selectivity may be further improved in very crowded conditions by switching over to the NARROW IF BAND position. In less congested areas, leave in the WIDE position for better stereo separation, lower distortion, and improved frequency response.

⑪FUNCTION SELECTOR

TUNER: For reception of FM and AM broadcasts. An FM or AM frequency will be shown in the digital frequency display.

PHONO-1: For turntables equipped with MM or IM cartridges.

PHONO-2: Also for turntables equipped with MM or IM cartridges. 3-way load capacitance switching available.

AUX: For other audio components connected vig the rear panel AUX terminals.

⑫VOLUME CONTROL

Adjusts the sound level of both speakers and headphones

⑬LOUDNESS

This switch compensates for the frequency response of the human ear at low volumes. In the ON position, low and high frequencies are enhanced when listening at low volume levels.

⑭AUDIO MUTING PUSH-BUTTONS

Volume levels may be attenuated by −10 dB, −20 dB, or even −30 dB (both push-buttons depressed) in order to eliminate temporary noises such as those caused when the stylus lands on the record surface.

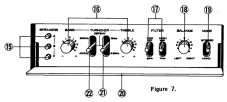


Figure 7.

⑮ SPEAKERS SELECTOR PUSH-BUTTONS

These push-buttons correspond to the speaker terminals on the rear panel. Select according to the speaker system arrangement being used.

1. When any pair of push-buttons (A+B, B+C, or A+C) are pressed, the corresponding SPEAKERS indicators will light up, and the corresponding speaker systems activated. However, if a third push-button is then depressed, the 2 indicators, and the corresponding speaker systems will turn off automatically. In this case, simply reset the push-buttons to reactivate the speaker systems.

⑯ BASS AND TREBLE CONTROLS

Adjust the bass and treble. Flat response is obtained when these controls are centered. Turning the controls clockwise or counterclockwise from the center will boost or diminish the tones as desired.

⑰ FILTER SWITCHES

LOW: Set this switch to 20 Hz when low-pitch rumble occurs (caused by turntable motor or other sources).

HIGH: Set this switch to 7 kHz when high-frequency noise occurs (caused by scratches on worn records, or other sources).

Keep these switches in the OFF position for normal listening.

⑱ BALANCE CONTROL

Adjusts the balance of sound level between left and right speakers. Clockwise rotation emphasizes the right channel and counterclockwise rotation emphasizes the left channel.

⑲ MODE SWITCH

Selects either stereo or mono mode.

STEREO: Keep this switch in the STEREO position for normal operation.

MONO: Left and right channel signals will produce monophonic sound which will be blended together and heard through both speakers.

⑳ HINGED PANEL

Press the bottom of the panel to unlock and open. To close, push the top edge of the panel up and in until it locks shut.

㉑ TREBLE TURNOVER DEFEAT SWITCH

Treble tone control is also available in two different ranges, one from 5 kHz, and the other from 2.5 kHz. Switch to the DEFEAT position for direct comparison of the treble tone setting with the flat frequency response.

㉒ BASS TURNOVER DEFEAT SWITCH

Bass tone control is available in two different ranges, one up to 200 Hz, and the other up to 400 Hz. By switching to the DEFEAT position, the tone setting may be compared directly with the flat frequency response.

FEATURES

The Quartz Frequency Synthesizer Tuner Section

Frankly, there are several different quartz crystal FM tuning systems now being used by others— quartz-lock tuning and quartz-sampling tuning systems— you'll know these by the fact that they still use a tuning knob and a tuning dial!! But here, in the SA-7150, there's no dial and no knob; the fully automatic quartz frequency synthesizer system does away with these because there's simply no more accurate nor any more stable way of tuning than this. And, the precision and quality start at the very beginning with the selection of the quartz crystal itself.

VCO Phase-Locked-Loop (PLL) Uses Three Toshiba ICs

Specially developed expressly for use in the SA-7150, these three ICs form the heart of the frequency synthesizer section. The VCO (Voltage Controlled Oscillator) itself is running at the L.O. (Local Oscillator) frequency ranging between 98.2 and 118.7 MHz, too high for ordinary logic ICs, so a special pre-scaler IC (Toshiba's TD-6102P) using ECL (Emitter Coupled Logic) divides this frequency by 8 bringing it reliably down into the normal working range of 12 to 15 MHz. As you can see from the block diagram, the separate AM VCO's output is also provided to the pre-scaler but is not reduced by division.

Accurate/Stable Reference Frequencies

The 6.4 MHz crystal is attached to a second specially manufactured IC (Toshiba's TC-9123AP) which generates the 6.4 MHz master reference frequency and, by use of fixed dividers, two sub-reference frequencies of 12.50 kHz for FM and 1.00 kHz for AM. This IC also contains a programmable divider to count-down the output from the pre-scaler and a frequency/phase (F/) comparator to compare this counted-down frequency to either the FM or AM sub-reference frequencies.

Precision/Automatic Control

The programmable divider receives its instructions from a third specially manufactured IC (Toshiba's TC-9124AP) which also provides the drive to the LED frequency display based on the currently selected frequency or mode of tuning. These instructions to the programmable divider cause the pre-scaler's output to be divided by from 982 to 1187 for FM giving a range of about 10 to 15 kHz at the F/ (frequency/phase) comparator, for comparison against the 12.50 kHz sub-reference frequency.

Microprocessor Tuning Control

The IC (Toshiba's TC-9124P), which provides instructions to the programmable divider, is in reality a microprocessor— the "guts" of a computer, plus memory and output circuits making it the most sophisticated IC ever incorporated into a stereo receiver. It is internally programmed specially to handle the SA-7150's requirements for preset memory tuning (6 stations each for FM and AM), manual tuning in 0.10 MHz increments for FM or 1.0 kHz increments for AM and for automatic scanning tuning in these same respective increments for either FM or AM!! Quite a heavy job for just a single IC and that's why so much care has gone into its production.

And setting the preset channel frequencies is so easy— just pressing two buttons locks in the code for the channel to which you are currently tuned and, it can be changed over and over again. Plus, even with power off or even when the line cord is removed, this memory of preset channel frequencies is retained.

Narrow/Wide Bandwidth Selection Option

Most reception areas don't have much adjacent channel interference so— with the SA-7150, you can select WIDE IF bandwidth reception. This way, you'll get less stereo distortion, better frequency response and more L/R separation because the IF pass-band phase characteristics become more linear for the same carrier deviation.

Newly Improved Quadrature-phase Detector

Another level of improvement thanks to advancing IC technology. With this new circuit, detection becomes more precise for reduced stereo distortion and, it also provides the accurate signal-strength outputs to drive the 5-level display on the panel. What's more, its design permits fast and accurate auto-scan stop logic eliminating "hunting" so common with other systems. Multipath output is also obtained and worked into the system so you need only press a button on the panel to listen to multipath effects as you finely tune your FM antenna.

PLL Multiplex IC with Auto Pilot-canceller

An improvement has been achieved in this area too with greather 19 KHz pilot tone suppression for reduced intermodulation distortion. This feature also means less passive filtering is required for improved audio frequency and phase response. Low stereo distortion and good separation are inherent.

Super Power Torroidal Transformer Dedicated to Output Power

There's been absolutely no corners cut in providing the very best possible power supply design for the SA-7150. As you can imagine, at 150 Watts per channel rms, total power requirements can get pretty heavy, so— the more efficient answer, for linear amplification, is the torroidal (doughnut-shaped) power transformer core which contains the magnetic flux-field, keeping it from creeping into low level circuits, and providing the most superior regulation characteristics under all diverse loading conditions. More, the torroidal transformer has no mechanical vibration even at full load and, because of its efficiency, it runs cooler. Coupled with super-sized (15,000 mFd X 4) computer-type filter capacitors, the isolated power sections provided for each channel have the capability to handle any expected long-period transient music waveform without "collapse" and resulting "clipping". What's more, unique and new non-inductive V-type (vertical) metallized polyester film capacitors are placed in parallel with each 15,000 mFd capacitor unit for absolutely no device effect on high frequency response characteristics.

Separate Power Transformer for Preamp and Tuner Circuits

For total isolation from the OCL power amplifier supplies, a separate line transformer is provided with separated filter sections for the preamp and tuner circuits. In this way, also, separation of common ground circuits prevents the high output currents from introducing parasitic effects back into these low level stages.

Direct Common Connections and Double-thickness Copper PC Boards

Every precaution has been taken to keep the high OCL output power from affecting in any way the low level circuits. And, in so doing, by using heavy-gauge wire for direct common connections and double-thickness copper on the printed circuit (PC) boards, not only has isolation been achieved, but also output efficiency has been improved.

Brute Force OCL Power Stages

To deliver 150 Watts of rms power per channel isn't child's-play and Toshiba's engineers aren't children— that's why only the very best high-frequency power transistors are used. Each OCL amplifier section, both left and right, use paralleled transistor pairs with 2-stage Darlington, beta-multiplication, input drivers for excellent current gain across the entire band and for essentially zero phase-error in the feedback frequency band.

Cascodes and Emitter-followers Driving Current-mirror Stages

Prior to the Darlington drivers, an ideal series of stages provides high-gain/sensitivity plus plenty of feedback margin for the lowest distortion ever at these power levels. The amplifier inputs are almost totally resistive for best matching with whatever source is used, be it the internal preamp or some external device. Flat frequency response is assured and, by using unique current-mirror stages prior to the Darlington drivers, full direct-coupled stability is obtained at no sacrifice in performance in any way. Finally, at full output, clipping occurs first at the final OCL output drivers assuring there is no hidden distortion prior to reaching full output.

Fully Protected with Double-contact Relays

Speakers remain disconnected until power has stabilized at which time they're relay-connected to the output. But, this is no ordinary relay— rather, it's been specially designed just for this application with double sets of contacts. One set of contacts are silver to handle any inrush current while maintaining relatively low resistance and anti-freezing properties throughout their life. The other set of contacts are gold and close later to provide the absolute minimum full-time contact resistance for full power efficiency and consistent performance. And, a newly developed IC acts as a power and overload sensor for faster relay operation giving added speaker safety.

Built-in Dolby*FM Reception Circuit Sections

Twin left/right Dolby*FM expandor circuits are available at the touch of a button to deliver the corrected signals to the amplifier. Lower-noise FM reception is now becoming a reality as more and more broadcast stations shift to the Dolby* system. Accurate expansion with minimum distortion is provided by these precisely designed and manufactured circuits.

TECHNICAL POINTS

The Synthesizer Unit Featured in the SA-7150

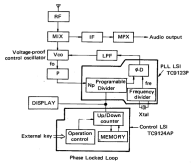
The SA-7150 synthesizer unit consists of the following three ICs.

1. **TD6102P** This pre-scaler IC divides the high oscillator frequency into more easily handled frequencies.
2. **TC9123P** This synthesizer CMOS LSI contains the reference frequency oscillator, the phase comparator, and the programmable divider all on a single chip.
3. **TC9124AP** This controller IC produces all the control signals. It is also controls all automatic tuning, manual tuning, preset tuning, and memory functions.

In addition to these three ICs, there is also an IC (TC9022P) used to drive the frequency display LEDs (TLG324 × 2), and an IC (M51903L) used to drive the SIGNAL LEDs (GL-8M22 × 5).
For detailed technical data on TD6102P, TC9123P, and TC9124, refer to the other supplement. These ICs are used as basic ICs in other synthesizer tuners and receivers, and not just in the SA-7150.
The overall block diagram for the tuner stage is shown in Fig. 8, and will used to outline the operational principles of the synthesizer.

FM Reception

The basic section of the synthesizer unit in the above mentioned block diagram may be simplified as shown in Fig. 8.



Phase Locked Loop

Figure 8.

Since the local oscillator frequencies 98.2 ~ 118.7 MHz (10.7 MHz added to the reception frequencies of 87.5 ~ 108 MHz) are too high, they are divided by the prescaler into 1/8 so as to obtain more readily handled frequencies.
The reference frequency is obtained by dividing the 6.4 MHz generated by the crystal oscillator into 12.5 kHz, this then being used as the reference frequency for the phase comparator. (The 1:8 pre-scaler provides 12.5 kHz x 8 = 100 kHz for use as channel space frequency).
Therefore, by varying Np for 982 ~ 1187 (98.2 MHz/100 kHz ~ 118.7 MHz/100 kHz), the desired frequency may be received.

AM Reception

For AM reception, on the other hand, an AM/FM switching signal is produced by the controller IC, resulting in the pre-scaler being set to 1 (no frequency division is required since the local oscillator frequency is much lower than in FM). The phase comparator reference frequency also becomes 1 kHz.

In this case, Np varies between 985 and 2065 (460 kHz added to reception frequencies of 525 ~ 1605 kHz = 985 ~ 2065 kHz, with channel space of 1 kHz).

- **Low-Pass Filter**

The phase comparator output is passed through a low-pass filter, and forms a VCO control loop. If the time constants of the low-pass filter CR are too high, too much time may be taken to lock, and in some case the system may fail to lock; if, on the other hand, the time constants are too low, the SN ratio will deteriorate.

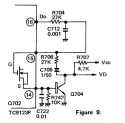


Figure 9.

- **Time Constant Setting for Lock-Out Detection**

The CL terminal determines the time constant for setting the relocking time after the lock has been once released.

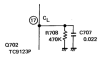


Figure 10.

Control Functions Performed by the Controller IC (TC9124AP)

(a) Control Functions when Coupled to the TC9123P PLL Synthesizer IC

The TC9124AP is involved in a large number of operations with almost all inputs and outputs synchronized to T1 ~ T4 timing. Together with the TC9123P, T1 ~ T4 and A ~ D connections result in 4-digit frequency data outputs according to T1 ~ T4 timing. (For BCD data transmission, decimal figures are converted into binary form, and sent as 0 and 1 values). The following table outlines how these parameters are related to one another.

Symbol	Function	T1	T2	T3	T4
A B C D	Data output to TC9123P for programming frequency indicator	Receiving frequency x 1 column 1 2 4 8	Receiving frequency x 10 column 10 20 40 80	Receiving frequency x 100 column 100 200 400 800	Receiving frequency x 1000 column Output (applied to TC-9123P) designating receiving mode*

* Receiving mode is designated by B = 1, C = 1, and D = 1 for FM reception, and B = 0, C = 1, and D = 0 for AM reception (10K separation).

Supplementary note: the T1 ~ T4 frequency is determined by the time constants of C708 and R709 connected to OSC-1 (pin No. 9 and terminal CK1).

(b) Control Functions when Coupled to the TD6102P Pre-scaler IC

By connecting pin 13 of TC9124AP to pin 7 of TD6102P, an output signal generated in response to the FM/AM switching action is used to control the pre-scaler frequency divider.

(c) Control Functions due to Key Operation

The various push-button control keys are arranged along the top of the front panel of the SA-7150. These include control keys for FM/AM selection, auto scan tuning, manual tuning, pre-set tuning, memory and up/down operations.

These designations are synchronized with the T1 ~ T4 timing, and implemented by the following matrix arrangements.

	Function	T1	T2	T3	T4
K1	Operated key Input signal		Auto scan command Memory command	1 CH 3	2 CH 4
K2				5	6
K3				DOWN	UP
K4					
K5		AM mode designation	FM mode designation		

Sections not employed in the SA-7150 have been omitted.
The circuitry for this matrix may be shown in the following manner.

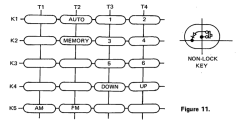


Figure 11.

Remarks: Memory and FM/AM switching

TC9124AP has been designed with a 12-station memory capacity. The SA-7150 can memorize 6 stations in the FM band, and 6 in the AM band. In terms of circuitry, the AM band is connected to channels 1 ~ 6, and the FM band to channels 7 ~ 12 (by adding +6 to the internal memory).

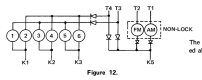


Figure 12.

FM/AM switching in the SA-7150 is performed by non-lock keys. So unless data is preset (written in) in each memory channel in advance, the reception band will switch over if the memory channel is recalled (read out) when that memory FM/AM data is designated for the other band. (When a vacant channel is recalled during FM mode in the SA-7150, the AM band edge will appear).
However, once the memory channels have been preset, only channels containing FM data will be recalled during FM mode. The problem described above will not occur. (Nor would there be any problem if the FM and AM keys were lock type keys.)

(d) TC9124AP Terminal Functions

d-1 Reception frequency display (Connection to the BCD 7-segment input display decoder/driver IC TC5022P)

The BCD code data from the A ~ D output terminals of TC9124AP is applied to TC9123P in accordance to the T1 ~ T4 timing. And with TC9123P connected to TC5022P, the TC5022P outputs will drive the D744, 745 TLG324 LEDs directly.
The Q707 ~ Q710 transistors are turned on and off in accordance to T1 ~ T4 timing, resulting in a dynamic dispaly as shown by the table described above in section (a).

Remarks

1) Since the BCD data within the T4 timing is the operational mode designation code applied to the PLL LSI TC9123P, it is necessary to stop the display. This is achieved by connecting D715 ~ D717 to the x1000 display column.
2) Suppression of 0 in the left hand column
For frequencies below 100 MHz in the FM band, and frequencies below 1000 kHz in the AM band, the left hand column digit would naturally become "0". In order to prevent the display of this 0, however, the T4 signal is applied to pin No. 2 of TC5022P (the RBI zero-suppression terminal), resulting in the absence of any display in this column during T4 timing for "0" inputs.
3) Decimal point display during FM mode
During FM mode, the second column from the right must show the decimal point. Consequently, a decimal point drive signal is supplied from pin No. 21 (DO_8 terminal) of TC9124AP in accordance to timing T2. (See later for further details).
4) BI (blanking) terminal function
TC9124AP is capable of adjusting display brightness to 2 different levels. In the SA-7150, the brighter level has been chosen, this being achieved by connecting pin No. 23 (BI terminal) to pin No. 3 (BI terminal) of TC5022P.

The TC9124AP reception frequency display circuit described above is outlined below in the following block diagram.

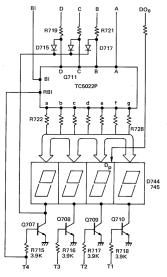


Figure 13.

(e) Display Functions Accompanying Key Operations

The output signals appearing at the four $DO_0 \sim DO_3$ terminals of TC9124AP in accordance to the T1 ~ T4 timing, are employed in the direct drive of LED lamps. These are outlined in the following table.

Function	T1	T2	T3	T4
DO_0 Operational mode DO_1 Memory read out, DO_2 display output DO_3	Memory 1 CH 5 7	Decimal point during FM mode Memory 2 CH 6 8	Auto-scan Memory 3 CH 11 9	Memory Memory 4 CH 12 10

For channels 7 to 12 in the above table, it is necessary to complete the connections shown in the circuit diagram.

• Scanning Speed Control and Memory Timing

When the broadcast signal is received, a direct current component is generated at pin No. 13 output of IF circuit Q103. This results in Q706 being turned on, and the time constant of the CR connected to pin No. 10 of Q703 (TC9124AP) being increased.
The C707/R710 time constant determines the memory write in time for scanning speed. This CR hence serves as a timing clock oscillator terminal.
The reason for increasing the time constant is to slow down the scanning speed automatically when the frequency of a broadcast signal is approached, thereby ensuring accurate tuning at that frequency.

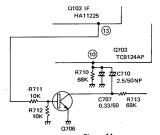


Figure 14.

• Auto-stop Signal Generator Circuit

During auto-scan mode, it is necessary to apply an auto-stop signal to the controller IC TC9124AP when a broadcast signal is received. When the auto-stop signal generator circuit shown here is activated, 0,1 mode stop signals are generated by Q106 muting the Q103 (HA11225) IF.

MODE		Q105	Q107	Q108	D107	D106
FM	No signal	ON	ON	OFF	OFF	OFF
	Signal	OFF	OFF	OFF	ON	OFF
AM	No signal	ON	ON	OFF	OFF	OFF
	Signal	OFF	OFF	ON	OFF	ON

NOTE: MODE { ON → 0 / OFF → 1

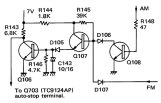


Figure 15.

D718 TO D722 LIGHTING MODE

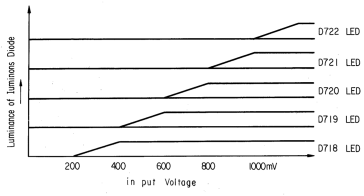


Figure 16.

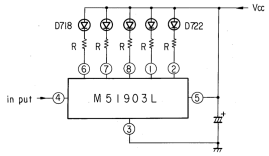


Figure 17.

DISASSEMBLY INSTRUCTION

CABINET REMOVAL

AMP COVER REMOVAL

1. Remove 4 screws ① (Side).
2. Remove 4 screws ② (Rear).
3. Remove the amplifier cover by pulling and raising it as illustrated by arrow ③ .

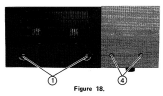


Figure 18.

Figure 20.

TUNER CABINET REMOVAL

1. Remove 4 screws ④ (Side).
2. Remove the cabinet by pulling it slightly and raising it as illustrated by arrow ⑤ .

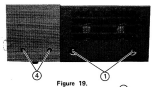


Figure 19.

Figure 21.

BOTTOM PLATE REMOVAL

1. Remove 14 screws ⑥ (Bottom).

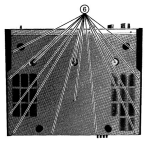


Figure 22.

FRONT PANEL REMOVAL

1. Remove cabinet.
2. Remove 10 knobs ⑦ (Front).
3. Remove 2 screws ⑧ (Top).
4. Remove 3 screws ⑨ (Bottom).
5. Remove the front panel by drawing it to the direction as illustrated by arrow ⑮ .

Figure 23.

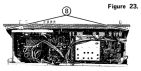


Figure 24.

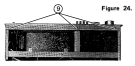
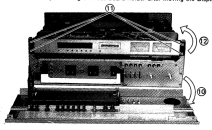


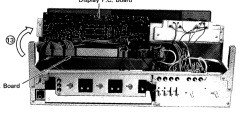
Figure 25.

DIGITAL TUNER AND DISPLAY P.C. BOARD REMOVAL

1. Inspect the Display P.C. Board by removing 4 screws and moving it as illustrated by arrow ⑫ .
2. Inspect the Digital Tuner P.C. Board by removing the P.C. Board holder after moving the Display P.C. Board.



Display P.C. Board



Digital Tuner P.C. Board

Figure 26.

PARTS LOCATION

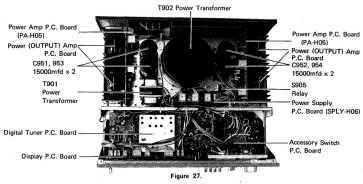


Figure 27.

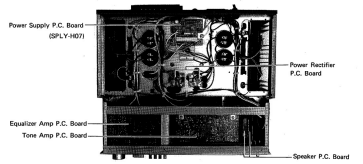
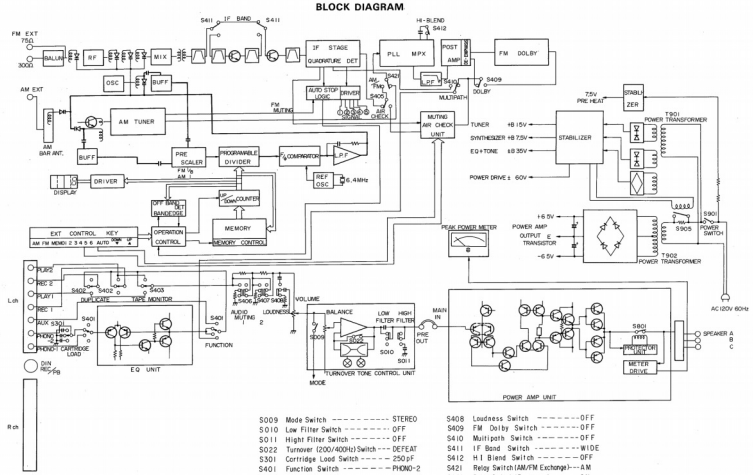


Figure 28.

BLOCK DIAGRAM



S009	Mode Switch ---------- STEREO	S408	Loudness Switch ---------OFF
S010	Low Filter Switch --------- OFF	S409	FM Dolby Switch ---------OFF
S011	Hight Filter Switch -------- OFF	S410	Multipath Switch ---------OFF
S022	Turnover (200/400Hz) Switch --- DEFEAT	S411	IF Band Switch ---------WIDE
S301	Cortridge Load Switch ------ 250pF	S412	HI Blend Switch ---------OFF
S401	Function Switch ---------PHOND-2	S421	Relay Switch (AM/FM Exchange) ---AM
S402	Duplicate Switch --------- SOURCE	S801	Relay Switch (Protector) ------ ON
S403	Monitor Switch --------- SOURCE	S901	Power Switch ---------OFF
S405	Air Check Switch --------- OFF	S905	Relay Switch (Push Current Protector) ---- ON
S406	Audio Muting (-20dB) Switch -- OFF		
S407	Audio Muting (-10dB) Switch -- OFF		

Figure 29.

LEVEL DIAGRAM

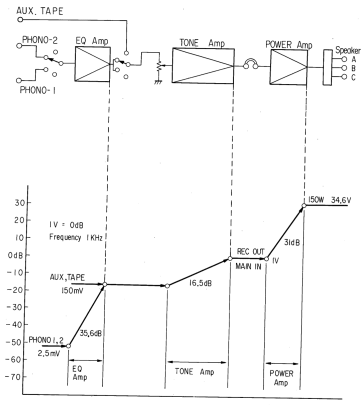


Figure 30.

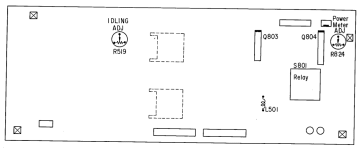


Figure 31. ACCESSORY SWITCH TOP VIEW (DOLBY)

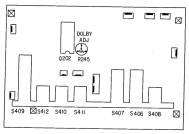


Figure 32. POWER AMP TOP VIEW

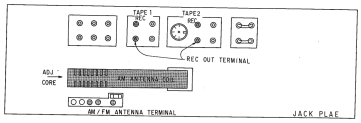


Figure 33. TERMINAL (JACK PLATE)

AM ADJUSTMENT

Test equipments/Tools required

1. Signal generator (with frequency counter)
2. Sweep generator
3. Test loop antenna
4. Adjusting screwdriver
5. Oscilloscope
6. Dummy load resister

IF ADJUSTMENT

Step	Adjustment	Remarks
IF Response	T103	Adjust for scope pattean with specified marker (460 kHz) as illustrated in Fig. 35.

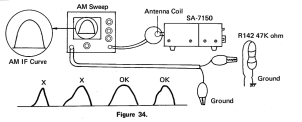


Figure 34.

VD ADJUSTMENT (Variable Capacitor Diode Voltage)

Band	Step	Signal Generator Frequency	Connection		Display Frequency	Adjustment	Remarks
			Input	Output			
AM	1	530 kHz	Connect signal generator to test loop.	Connect VTVM to T.P (VD)	530 kHz	T102	Adjustment 1.5 V
	2	1600 kHz			1600 kHz	C007	Adjustment 10 V
	3	Repeat steps 1 and 2.					
FM	4	88.000 MHz	Connect FM Signal Generator to FM Antenna terminal.	Connect VTVM to T.P (VD)	88 MHz	L006	Adjustment 4 V
	5	108.000 MHz			108 MHz	C005	Adjustment 10 V
	6	Repeat steps 1 and 2.					

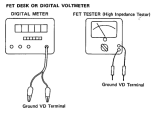


Figure 35.

TRAKING ADJUSTMENT

Test equipments/Tools required

1. Distortion
2. Signal generator
3. Oscilloscope
4. VTVM
5. FM dummy antenna (300 ohm)
6. Network
7. Adjusting screwdriver
8. Adjusting bar
9. Dummy load resistor

Input (AM Signal Generator) 400 Hz 30% Modulation
Input (FM Signal Generator) 1 kHz 75 kHz 100% Modulation
Antenna (300 ohm Balance Antenna)
Output REC-out (TAPE 1, 2) Terminal
FM Muting, Dolby, High Blend ---- OFF Position
IF Band ---- WIDE Position

Band	Step	Signal Generator Frequency	Connection		Display Frequency	Adjustment	Remarks
			Input	Output			
AM	1	600 kHz	Connect signal generator to test loop.	Connect VTVM to REC out (TAPE 1, 2) Terminal.	600 kHz	ANT Coil L902	Adjust for maximum
	2	1400 kHz			1400 kHz	C006	Adjust for maximum
	3	Repeat steps 1 and 2.					
FM	4	88.000 MHz	Connect signal generator to FM Antenna Terminal.	Connect VTVM to REC out (TAPE 1, 2) Terminal.	88 MHz	C001, 002 003, 004	Adjust for maximum
	5	108.000 MHz			108 MHz	L001, 002 003, 004	Adjust for maximum
	6	Repeat steps 1 and 2.					
	7	98.000 MHz	Connect signal generator to FM Antenna Terminal.	Connect VTVM to REC out (TAPE 1, 2) Terminal.	98 MHz	T001	Adjust for minimum distortion and best waveform

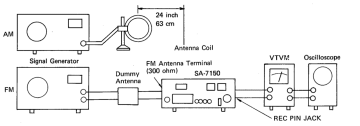


Figure 36.

FM DISTORTION ADJUSTMENT

Band	Step	Signal Generator Frequency	Connection		Display Frequency	Adjustment	Remarks
			Input	Output			
FM	1	98.000 MHz 66 dB	Connect FM Signal generator to FM Antenna Terminal. Connect the modulator to signal generator	Connect VTVM to Diode D107 Cathode.	98 MHz	T101 PNK	Adjust for D107 cathode Voltage minimum
	2					T101 BLU	Adjust for minimum distortion
	3	Repeat steps 1 and 2.					

Note: Make certain that sound is heard when setting the Muting switch to ON position with the cathode voltage of D107 adjusting to minimum.

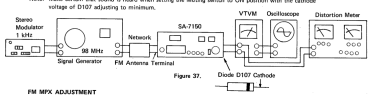


Figure 37.

FM MPX ADJUSTMENT

1. Frequency counter
2. Signal generator
3. Stereo Modulator
4. VTVM
5. 300 ohm FM dummy antenna
6. Oscilloscope

Free-running Frequency Adjustment	Connect a frequency to the Test Point (VCO) and Adjust the R206 for 76 kHz reading counter with no-signal input. (or adjust the sub-signal to maximum.) Set the modulation of stereo modulator to R or L and adjust R222 so that the separation is maximum.

FM DETECT OUTPUT ADJUSTMENT

Connection		Signal Generator Frequency	Adjustment	Remarks
Input	Output			
Connect FM Signal to FM antenna terminal.	Connect VTVM to REC-Out (TAPE 1, 2) terminal.	1K 100% Modulation	R118	Adjust the R118 for 400 mV ~ 450 mV reading.

SIGNAL LEVEL ADJUSTMENT

Connection		Signal Generator Frequency	Adjustment	Remarks
Input	Output			
Connect FM Signal to FM antenna terminal.	Connect VTVM ro REC-Out (TAPE 1, 2) terminal.	1K 100% Modulation 80dBf	R149	Adjust so all the SIGNAL LEDs from D718 to D722 light up.

DOLBY FREQUENCY CHARACTERISTIC ADJUSTMENT

Step	Connection		Signal Generator Frequency	Display Frequency	Adjustment	Remarks
	Input	Output				
1	Connect Signal generator to FM antenna terminal (300 ohm) 50% Modulation 60 dB 400 Hz/2 kHz	Connect VTVM to REC OUT (TAPE 1, 2) terminal.	98.000 MHz	Tuner to 98.00 MHz	R245	Tune in 98 MHz and set the output to 0 dB (400 Hz 50% Modulation).
2						Lower signal generators Modulation degree and set output to −15.7 dB. (400 Hz)
3						Shift Modulation Frequency of signal generator from 400 Hz to 2 kHz and adjust R245 to set output to −20 dB.

IDLING ADJUSTMENT

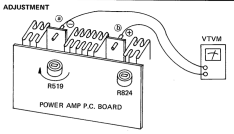


Figure 38.

Turn the semi-solid resistor R519 fully to the arrow before turning the power switch ON. (idle current to zero). Turn the power switch on and after 60 seconds, connect VTVM between a and b as illustrated and adjust R519 to obtain 5 mV.

POWER METER ADJUSTMENT (LEFT & RIGHT)

Step	Connection		Signal Generator Frequency	Volume Control	Adjustment	Remarks
	Input	Output				
1	Connect signal generator to AUX JACK	Connect 8 ohm and VTVM to Speaker Terminal	1 kHz	Maximum	R824	Increase input to get 4 V at 8 ohm load.
2						Adjust so the Power Meter indicates 2 W at 4 V of output voltage.

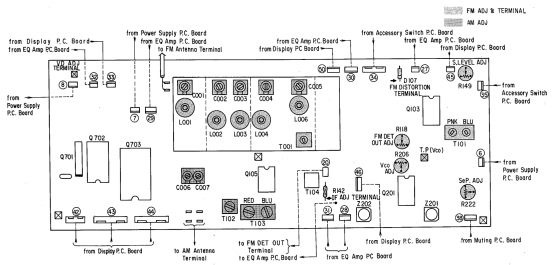
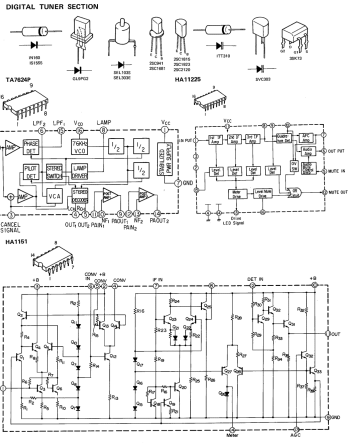


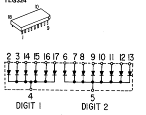
Figure 39. DIGITAL TUNER TOP VIEW

EXTERNAL APPEARANCE OF TRANSISTOR IC S AND DIODES

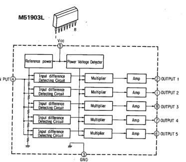
DIGITAL TUNER SECTION



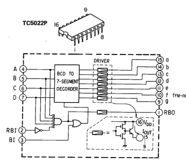
TLG324



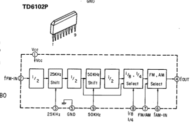
M51903L



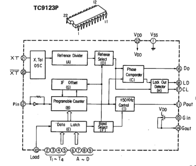
TC5022P



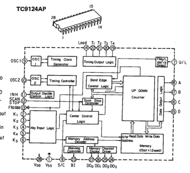
TD6102P



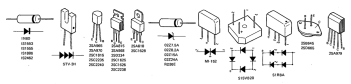
TC9123P

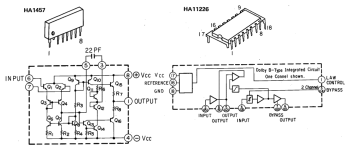


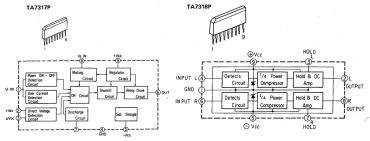
TC9124AP



AUDIO SECTION







P.C. BOARD VIEW

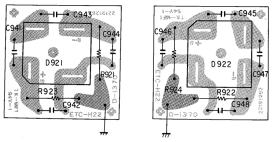


Figure 40. POWER SUPPLY P.C. BOARD (ETC-H22)

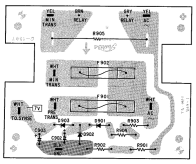


Figure 41. POWER SUPPLY P.C. BOARD (SPLY-H07) (PRIMARY)

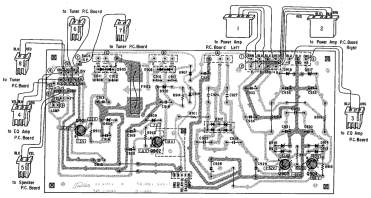


Figure 42. POWER SUPPLY P.C. BOARD (SPLY-H06)

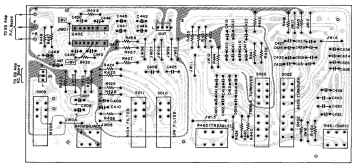


Figure 43. TONE AMP P.C. BOARD (AF-H02)

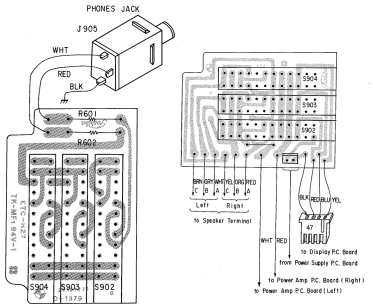


Figure 44. SPEAKER P.C. BOARD (ETC-H27)

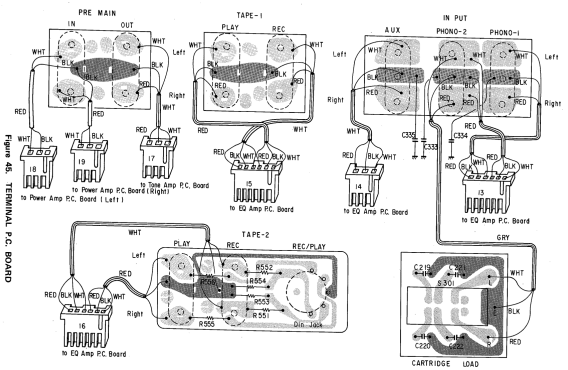


Figure 45. TERMINAL P.C. BOARD

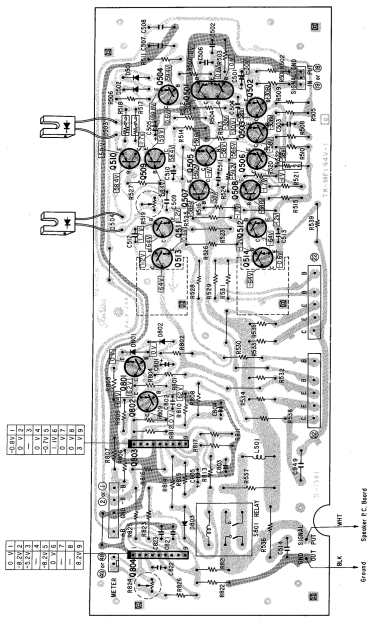


Figure 46. POWER AMP P.C. BOARD (PA-H05)(LEFT & RIGHT)

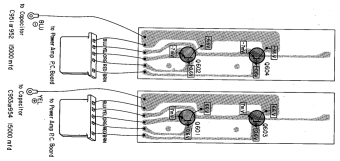


Figure 47. POWER AMP (OUTPUT) P.C. BOARD (ETC-H23)

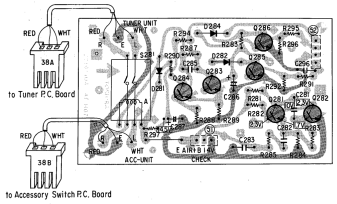


Figure 48. AIR CHECK & MUTING P.C. BOARD (AF-H07)

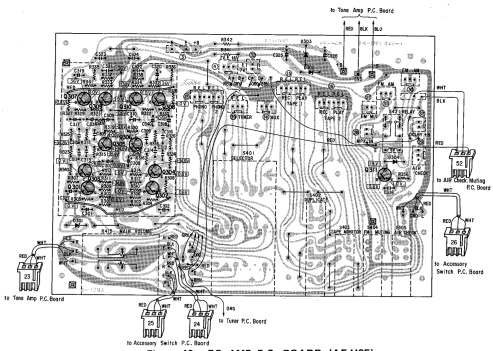
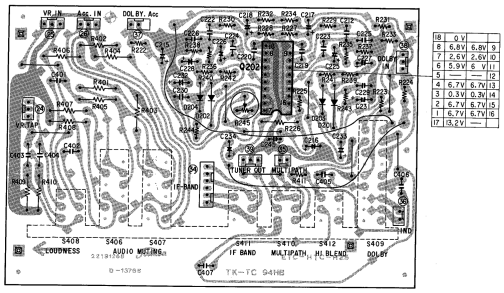


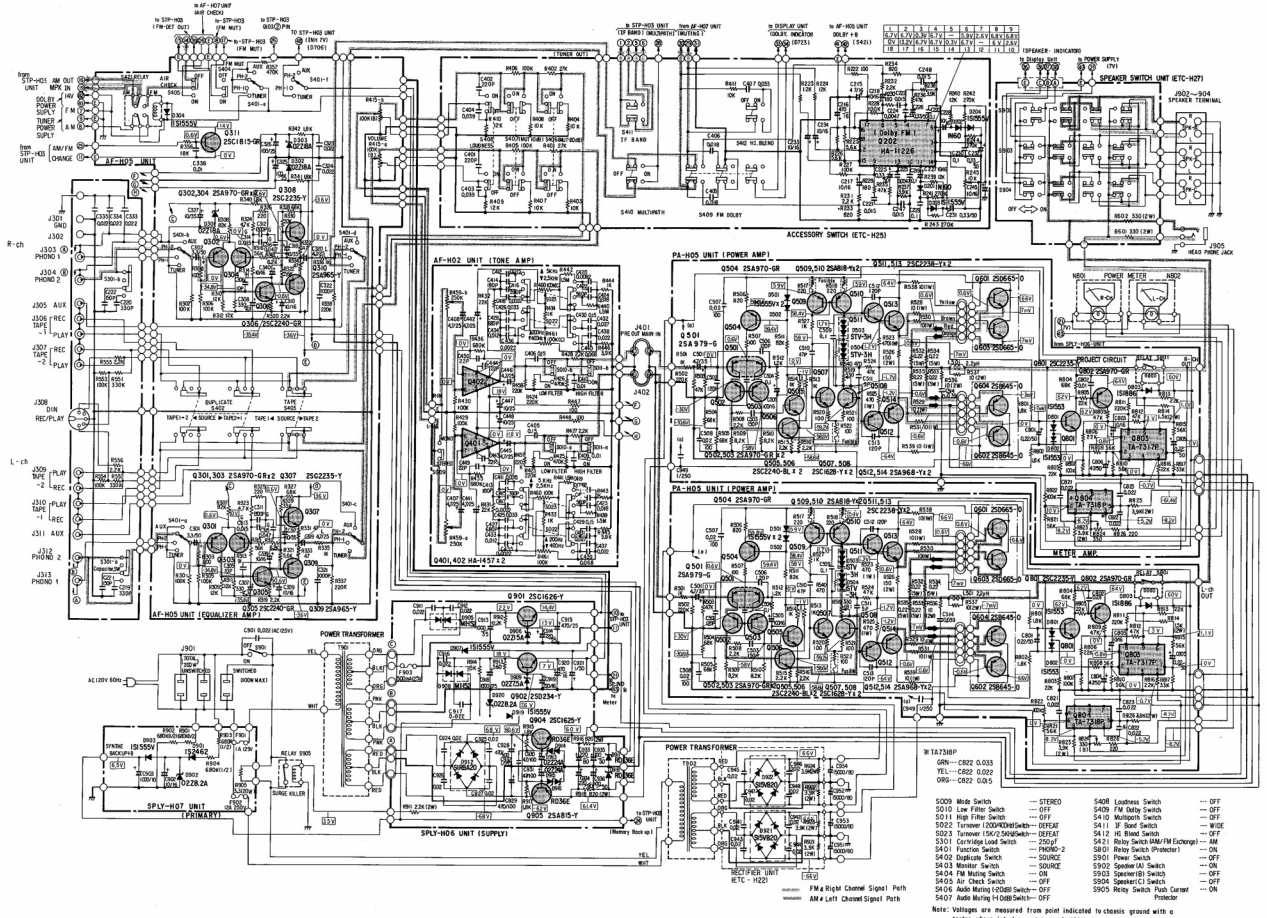
Figure 49. EQ AMP P.C. BOARD (AF-H05)



18	0 V		
8	6.8V	6.8V	9
7	2.6V	2.6V	10
6	5.9V	6 V	11
5	—	—	12
4	6.7V	6.7V	13
3	0.3V	0.3V	14
2	6.7V	6.7V	15
1	6.7V	6.7V	16
17	13.2V	—	

Figure 50. ACCESSORY SWITCH P.C. BOARD (ETC-H25)
(DOLBY P.C. BOARD)

AUDIO SCHEMATIC DIAGRAM



S009 Mode Switch --- STEREO
S010 Low Filter Switch --- OFF
S011 High Filter Switch --- OFF
S022 Turnover (200/400Hz) Switch--- DEFEAT
S023 Turnover (5K/2.5K) Switch--- DEFEAT
S301 Cartridge Load Switch --- 250pF
S401 Function Switch --- PHONO-2
S402 Duplicate Switch --- SOURCE
S403 Monitor Switch --- SOURCE
S404 FM Muting Switch --- ON
S405 Air Check Switch --- OFF
S406 Audio Muting (-20dB) Switch--- OFF
S407 Audio Muting (-10dB) Switch--- OFF
S408 Loudness Switch --- OFF
S409 FM Dolby Switch --- OFF
S410 Multipath Switch --- OFF
S411 IF Band Switch --- WIDE
S412 Hi Blend Switch --- OFF
S421 Relay Switch (AM/FM Exchange) --- AM
S801 Relay Switch (Protector) --- ON
S901 Power Switch --- OFF
S902 Speaker (A) Switch --- ON
S903 Speaker (B) Switch --- OFF
S904 Speaker (C) Switch --- OFF
S905 Relay Switch Push Current Protector --- ON

Note: Voltages are measured from point indicated to chassis ground with a tester whose interior resistance is 100K ohm.

Figure 54.

CABINET EXPLODED VIEW

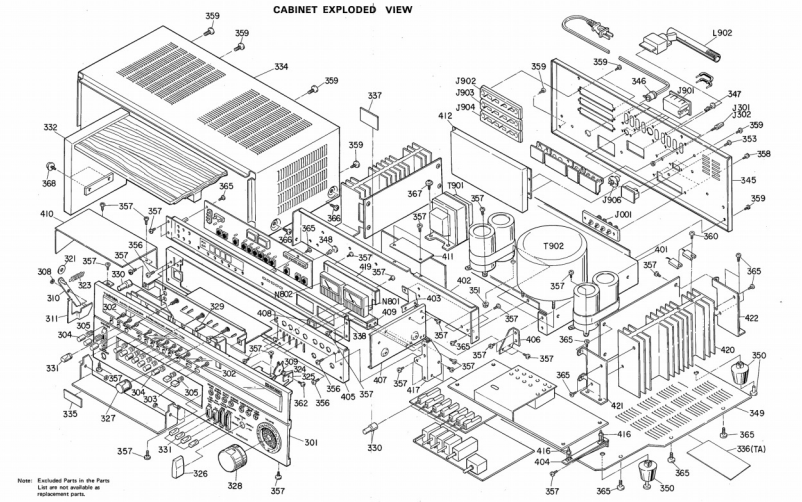


Figure 55.

SEVERAL PARTS CONNECTIONS

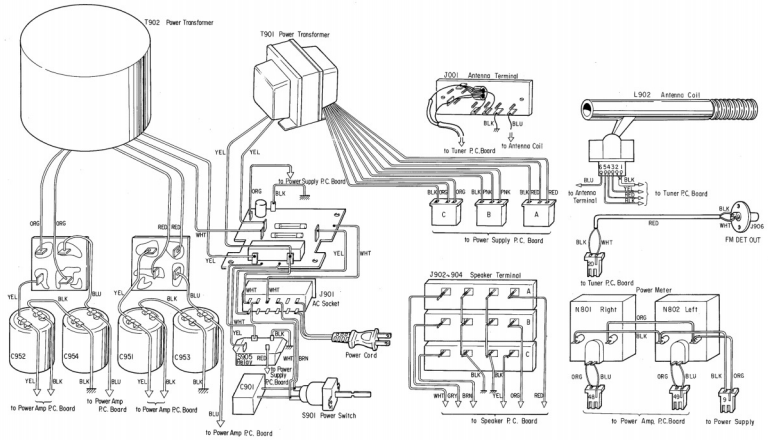


Figure 56.

CABINET EXPLODED VIEW

Note: Excluded Parts in the Parts List are not available as replacement parts.

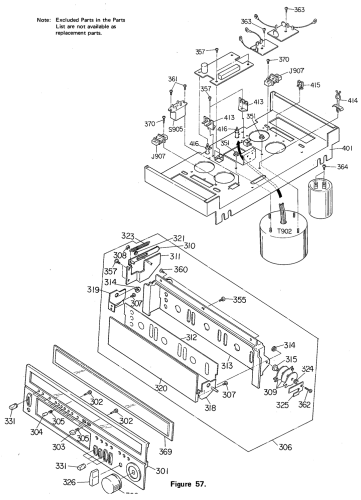


Figure 57.

PARTS LIST

Symbol No.	Part No.	Description
CABINET PARTS		
301	20017128	Panel Ass'y
302	22845269	Shaft, Knob
303	22845270	Knob, Push
304	22845271	Button, Push, AM/FM Channel
305	25772483	Spring, Knob
306	22719120	Pocket Ass'y
307	70432605	Screw, 2.6ϕ x 6mm, BID
308	74060030	E Ring, 3ϕ
309	29022181	Damper
312	20836102	Plate, Decoration
313	20846058	Pocket
320	22843574	Door, Sub Panel
321	25764402	Washer, 4ϕ
323	25771907	Spring, Door
324	25772452	Spring, Damper
325	25774545	Spring, Pocket
326	22834851	Knob, Function
327	22824237	Knob, Bass/Treble/Balance
328	22826177	Knob, Volume
329	22826205	Knob, Lever, Turnover/Filter/ Mode
330	22826206	Knob, Push, Accessories Switch (Muting, Dolby, etc)
331	22834984	Knob, Lever, Power/Air Check/ Muting/Mono/Dupl
332	20815179	Cabinet Ass'y, Tuner Section
334	22841883	Amp Cover
335	22950752	Caution Label, Door
336	22950885	Caution Label, Rear Panel (TA)
337	22950827	Caution Label, Fuse (TA)
	22950834	Caution Label, Fuse (TC)
338	22823090	Dial Grille Ass'y
345	20015155	Jack Plate (TA)
	20015162	Jack Plate (TC)
346	26844017	Cord Bush, Power Cord
347	22705022	Rivet, Plastic, 3ϕ x 5.5mm
348	22705033	Rivet, Plastic, 3.5ϕ x 7mm
350	22828064	Foot
351	22702157	Nut, 6ϕ, Transformer
353	22701327	Screw, 2.6ϕ x 4mm, BLK, BID
355	70433606	Screw, 2.6ϕ x 6mm, BID
356	70433008	Screw, 3ϕ x 8mm, BID
357	71233008	Screw, 3ϕ x 8mm, Tapping
358	22701325	Screw, 3ϕ x 8mm, BLK, BID
359	22701326	Screw, 3ϕ x 8mm, BLK, Tapping
360	70433010	Screw, 3ϕ x 10mm, BID
361	71233012	Screw, 3ϕ x 12mm, Tapping
362	70433016	Screw, 3ϕ x 16mm, BID
363	71233020	Screw, 3ϕ x 20mm, Tapping
364	70434006	Screw, 4ϕ x 6mm, BID
365	71234006	Screw, 4ϕ x 6mm, Tapping

Symbol No.	Part No.	Description
366	22707185	Screw, 4ϕ x 8mm, BLK, BID
367	22707196	Screw, 4ϕ x 8mm, BLK, PAN
368	22707184	Screw, 4ϕ x 25mm, BLK, PAN
369	20033098	Dial Cover
370	71236016	Screw, 4ϕ x 16mm, Tapping

Symbol No.	Part No.	Description
DIGITAL TUNER SECTION TUNER AND SYNTHESISZER P.C. BOARD (STP-H03)		
		IC'S, TRANSISTORS & DIODES
Q001		Transistor, 3SK73-GR
Q002, 003		Transistor, 2SC1923-O
004, 101		
102, 104		
Q103	22114688	IC, HA11225
Q105	22114472	IC, HA1151
Q106, 107		Transistor, 2SC2120-Y
108, 707		
708, 709		
710		
Q109		Transistor, 2SC941-O
Q201		IC, TA7624P
Q701		IC, TD6102P
Q702	A0411232	IC, TC9123P
Q703		IC, TC9134AP
Q704		Transistor, 2SC1681-BL
Q706		Transistor, 2SC1815-GR
D001 ~ 005	22115304	Diode, 1TT310
D101, 104		Diode, 1S1555V
105 ~ 107		
111, 112		
114, 115		
701, 702		
706, 707		
746 ~ 749		
D102, 103	22116505	Diode, SVC303 (Par)
D108, 110		Diode, 1N60-FD1
113		
		COILS & TRANSFORMERS
L001	22294384	Coil, FM, RT6124294
L002	22294339	Coil, FM, RT6154339
L003	22294338	Coil, FM, RT6154338
004		
L005, 102	22291082	Coil, 2.2μH, LH3003
701		
L006	22294371	Coil, FM Oscillator, RT7154371
L101	22341044	Coil, FM IF, LH0851044
T001	22265719	Transformer, IF, IT1625719
T101	22261365	Transformer, IF, IT1057365
T102	22246288	Coil, AM, RT7265288
T103	22266353	Transformer, IF, IT15D6353
T104	22264789	Transformer, IF, IT15D4789
		ELECTRICAL PARTS
Z101, 102	22153063	Filter, Ceramic, 10.7 MHz
103, 104		
Z201, 202	22135025	Filter, Low Pass
Z701	22153069	Crystal, HC-43/U-6400, 6.4 MHz

Symbol No.	Part No.	Description
		CAPACITORS **D = ±0.5pF, J = ±5%, K = ±10%, M = ±20%, Z = $^{+80\%}_{-20}$**
C001	22309125	Trimmer Con
C002	22309125	Trimmer Con
C003	22309125	Trimmer Con
C004	22309125	Trimmer Con
C005	22309125	Trimmer Con
C006	22309149	Trimmer Con 2R
C007	22309149	Trimmer Con 2R
C008	22362221	Ceramic, 220pF, 50V, K
C009	22342103	Ceramic, 0.01mfd, 50V, Z
C010	22361470	Ceramic, 47pF, 50V, J
C012	22342103	Ceramic, 0.01mfd, 50V, Z
C013	22362221	Ceramic, 220pF, 50V, K
C014	22361508	Ceramic, 0.5pF, 50V, D
C015	22362221	Ceramic, 220pF, 50V, K
C016	22362221	Ceramic, 220pF, 50V, K
C017	22361209	Ceramic, 2pF, 50V, D
C018	22361109	Ceramic, 1pF, 50V, D
C019	22362101	Ceramic, 100pF, 50V, K
C020	22343102	Ceramic, 0.001mfd, 50V, M
C021	22342103	Ceramic, 0.01mfd, 50V, Z
C022	22361908	Ceramic, 0.5pF, 50V, D
C023	22362221	Ceramic, 220pF, 50V, K
C024	22361709	Ceramic, 7pF, 50V, K
C025	22362390	Ceramic, 39pF, 50V, K
C026	22342103	Ceramic, 0.01mfd, 50V, Z
C027	22342103	Ceramic, 0.01mfd, 50V, Z
C028	22342103	Ceramic, 0.01mfd, 50V, Z
C029	22342103	Ceramic, 0.01mfd, 50V, Z
C031	22342103	Ceramic, 0.01mfd, 50V, Z
C032	22342103	Ceramic, 0.01mfd, 50V, Z
C033	22448339	Electrolytic, 3.3mfd, 50V
C101	22342103	Ceramic, 0.01mfd, 50V, Z
C102	22342223	Ceramic, 0.022mfd, 50V, Z
C103	22342103	Ceramic, 0.01mfd, 50V, Z
C104	22342223	Ceramic, 0.022mfd, 50V, Z
C105	22343473	Ceramic, 0.047mfd, 50V, Z
C106	22342223	Ceramic, 0.022mfd, 50V, Z
C107	22342223	Ceramic, 0.022mfd, 50V, Z
C108	22342223	Ceramic, 0.022mfd, 50V, Z
C109	22343473	Ceramic, 0.047mfd, 50V, Z
C110	22321029	Polypropylene, 330pF, 50V, K
C111	22342223	Ceramic, 0.022mfd, 50V, Z
C112	22342223	Ceramic, 0.022mfd, 50V, Z
C114	22342223	Ceramic, 0.022mfd, 50V, Z
C116	22342223	Ceramic, 0.022mfd, 50V, Z
C116	22448479	Electrolytic, 4.7mfd, 50V
C117	22342223	Ceramic, 0.022mfd, 50V, Z
C118	22445330	Electrolytic, 33mfd, 16V
C119	22342223	Ceramic, 0.022mfd, 50V, Z
C120	22343102	Ceramic, 0.001mfd, 50V, M

Symbol No.	Part No.	Description
C121	22448338	Electrolytic, 0.33mfd, 50V
C122	22361209	Ceramic, 2pF, 50V, D
C123	22361100	Ceramic, 10pF, 50V, D
C124	22321050	Polypropylene, 360pF, 50V, J
C126	22342103	Ceramic, 0.01mfd, 50V, Z
C129	22448109	Electrolytic, 1mfd, 50V
C130	22448339	Electrolytic, 3.3mfd, 50V
C131	22343102	Ceramic, 0.001mfd, 50V, M
C132	22342103	Ceramic, 0.01mfd, 50V, Z
C133	22371103	Mylar, 0.01mfd, 50V, J
C134	22445100	Electrolytic, 10mfd, 16V
C135	22445101	Electrolytic, 100mfd, 16V
C136	22445100	Electrolytic, 10mfd, 16V
C137	22443101	Electrolytic, 100mfd, 10V
C138	22448478	Electrolytic, 0.47mfd, 50V
C140	22371103	Mylar, 0.01mfd, 50V, J
C141	22371103	Mylar, 0.01mfd, 50V, J
C143	22445100	Electrolytic, 10mfd, 16V
C144	22342473	Ceramic, 0.047mfd, 50V, Z
C145	22448478	Electrolytic, 0.47mfd, 50V
C146	22342223	Ceramic, 0.022mfd, 50V, Z
C147	22342223	Ceramic, 0.022mfd, 50V, Z
C201	22445102	Electrolytic, 1000mfd, 16V
C202	22448479	Electrolytic, 4.7mfd, 25V
C203	22371333	Mylar, 0.033mfd, 50V, J
C204	22342103	Ceramic, 0.01mfd, 50V, Z
C205	22321028	Polypropylene, 470pF, 50V, K
C206	22448229	Electrolytic, 2.2mfd, 50V
C207	22445100	Electrolytic, 10mfd, 16V
C208	22371472	Mylar, 0.0047mfd, 50V, J
C209	22445100	Electrolytic, 10mfd, 16V
C210	22445100	Electrolytic, 10mfd, 16V
C211	22445100	Electrolytic, 10mfd, 16V
C212	22445100	Electrolytic, 10mfd, 16V
C213	22445100	Electrolytic, 10mfd, 16V
C214	22445100	Electrolytic, 10mfd, 16V
C215	22371682	Mylar, 0.0068mfd, 50V, J
C216	22371682	Mylar, 0.0068mfd, 50V, J
C701	22342223	Ceramic, 0.022mfd, 50V, Z
C702	22371103	Mylar, 0.01mfd, 50V, J
C703	22362820	Ceramic, 82pF, 50V, K
C704	22360136	Ceramic, 33pF, 50V, J, CH
C705	22342103	Mylar, 0.01mfd, 50V, J
C706	22448109	Electrolytic, 1mfd, 50V
C707	22342223	Ceramic, 0.022mfd, 50V
C708	22349332	Ceramic, 0.0033mfd, 50V, K
C709	22448339	Electrolytic, 3.3mfd, 50V
C710	22476229	Electrolytic, 2.2mfd, 50V, NP
C711	22443671	Electrolytic, 470mfd, 10V
C712	22343102	Ceramic, 0.001mfd, 50V, M
C713	22342223	Ceramic, 0.022mfd, 50V, Z
C714	22443101	Electrolytic, 100mfd, 10V
C715	22342223	Ceramic, 0.022mfd, 50V, Z
C717	22342223	Ceramic, 0.022mfd, 50V, Z

Symbol No.	Part No.	Description
C721	22443101	Electrolytic, 100mfd, 10V
C722	22342103	Ceramic, 0.01mfd, 50V, Z

RESISTORS

All resistors are carbon film 1/4W, ±5%, unless otherwise noted. K = 1000

R001	22555104	100K ohm
R002	22555104	100K ohm
R003	22555104	100K ohm
R004	22555104	100K ohm
R005	22555104	100K ohm
R006	22555104	100K ohm
R007	22555104	100K ohm
R008	22555224	220K ohm
R009	22555104	100K ohm
R010	22555470	47 ohm
R012	22555153	15K ohm
R013	22555104	100K ohm
R014	22545102	1K ohm
R017	22555152	1.5K ohm
R018	22545273	27K ohm
R019	22555683	68K ohm
R020	22545561	560 ohm
R021	22555102	1K ohm
R022	22545103	10K ohm
R023	22545103	10K ohm
R024	22545222	2.2K ohm
R025	22545101	100 ohm
R026	22545101	100 ohm
R027	22545102	1K ohm
R101	22545331	330 ohm
R102	22555182	1.8K ohm
R103	22555331	330 ohm
R104	22555102	1K ohm
R106	22555331	330 ohm
R107	22555101	100 ohm
R108	22555182	1.8K ohm
R109	22555331	330 ohm
R110	22555102	1K ohm
R111	22555331	330 ohm
R112	22555221	220 ohm
R113	22555680	68 ohm
R114	22555103	10K ohm
R115	22545273	27K ohm
R117	22555222	2.2K ohm
R118	22558394	100K ohm, B, Semi-fixed Variable
R120	22555331	330 ohm
R122	22555103	10K ohm
R123	22555470	47 ohm
R124	22555222	2.2K ohm
R127	22545152	1.5K ohm
R128	22545273	27K ohm
R129	22555683	68K ohm
R130	22555563	56K ohm

Symbol No.	Part No.	Description
R132	22555124	120K ohm
R133	22545221	220 ohm
R134	22555474	470K ohm
R135	22555151	150 ohm
R136	22555103	10K ohm
R137	22555470	470 ohm
R138	22555274	270K ohm
R139	22555103	10K ohm
R140	22555272	2.7K ohm
R142	22555473	47K ohm
R143	22555682	6.8K ohm
R144	22555183	18K ohm
R145	22553393	39K ohm
R146	22555472	4.7K ohm
R148	22555682	6.8K ohm
R149	22558394	100K ohm, B, Semi-fixed, Variable
R150	22555683	68K ohm
R151	22555153	15K ohm
R152	22555563	56K ohm
R153	22555823	82K ohm
R154	22555103	10K ohm
R156	22555102	1K ohm
R157	22555272	2.7K ohm
R158	22555682	6.8K ohm
R159	22555104	100K ohm
R160	22555104	100K ohm
R161	22555104	100K ohm
R201	22555151	150 ohm
R202	22555682	6.8K ohm
R203	22545123	12K ohm
R204	22555473	47K ohm
R205	22555183	18K ohm
R206	22558318	4.7K ohm, B, Semi-fixed, Variable
R207	22555104	100K ohm
R208	22555684	680K ohm
	22555334	330K ohm
	22555224	220K ohm
R209	22555102	1K ohm
R210	22545332	3.3K ohm
R211	22545332	3.3K ohm
R212	22555682	6.8K ohm
R213	22555682	6.8K ohm
R214	22555682	6.8K ohm
R215	22555682	6.8K ohm
R216	22555152	1.5K ohm
R217	22555152	1.5K ohm
R218	22555153	15K ohm
R219	22555153	15K ohm
R220	22555562	5.6K ohm
R221	22555562	5.6K ohm
R222	22558441	47K ohm, B, Semi-fixed, Variable
R223	22545332	3.3K ohm
R224	22555332	3.3K ohm
R225	22555224	220K ohm

Symbol No.	Part No.	Description
R226	22555224	220K ohm
R127	22555563	56K ohm
R704	22556273	27K ohm
R706	22555473	47K ohm
R707	22555472	4.7K ohm
R708	22555474	470K ohm
R709	22555473	47K ohm
R710	22556683	68K ohm
R711	22555103	10K ohm
R712	22555103	10K ohm
R713	22556683	68K ohm
R715	22545392	3.9K ohm
R716	22545392	3.9K ohm
R717	22545392	3.9K ohm
R718	22545392	3.9K ohm
R742	22555103	10K ohm
R743	22556223	22K ohm

Symbol No.	Part No.	Description
AIR CHECK & MUTING P.C. BOARD (AF-H07)		
TRANSISTORS & DIODE		
Q281, 282		Transistor, 2SC1815-GR
283, 284		
285, 286		
D281, 282		Diode, 1S1555V
284		
ELECTRICAL PARTS		
S281	22148647	Relay Switch, Muting
CAPACITORS		
J = ±5%, K = ±10%		
C281	22371683	Mylar, 0.068mfd, 50V, J
C282	22371153	Mylar, 0.015mfd, 50V, J
C283	22371473	Mylar, 0.047mfd, 50V, J
C285	22349101	Ceramic, 100pF, 50V, K
C286	22445330	Electrolytic, 33mfd, 16V
C287	22445470	Electrolytic, 47mfd, 16V
C289	22342223	Ceramic, 0.022mfd, 50V, Z
RESISTORS		
R281	22555822	8.2K ohm
R282	22555822	8.2K ohm
R283	22555682	6.8K ohm
R284	22555662	5.6K ohm
R285	22555104	100K ohm
R287	22555682	6.8K ohm
R288	22555272	2.7K ohm
R289	22555101	100 ohm
R290	22555561	560 ohm
R291	22555103	10K ohm
R292	22555104	100K ohm
R293	22555473	47K ohm
R294	22555683	68K ohm
R295	22555154	150K ohm
R296	22555124	120K ohm
R297	22555103	10K ohm

Symbol No.	Part No.	Description
DISPLAY P.C. BOARD (ETC-H24)		
IC'S & DIODES		
Q711		IC, TC5022P
Q712	22114634	IC, MS1903L
D701 ~ 717		Diode, 1S1555V
738 ~ 743		
750, 751		
D718 ~ 722	22115434	Diode, GL-8PG2
D723 ~ 732	22115429	Diode, SEL303E
735, 736		
D733, 734	22115383	Diode, SEL103S
737		
D744, 745		Diode, TLG324
ELECTRICAL PARTS		
S701 ~ 712	22185145	Switch, Key, Channel
CAPACITORS		
Z = $^{+80\%}_{-20}$		
C719	22443101	Electrolytic, 100mfd, 10V
C720	22342223	Ceramic, 0.022mfd, 50V, Z
RESISTORS		
All resistors are carbon film ¼W, ±5%, unless otherwise noted. K = 1000		
R719	22545103	10K ohm
R720	22545103	10K ohm
R721	22545103	10K ohm
R722	22545101	100 ohm
R723	22545101	100 ohm
R724	22545101	100 ohm
R725	22545101	100 ohm
R726	22545101	100 ohm
R727	22545101	100 ohm
R728	22545101	100 ohm
R729	22545151	150 ohm
R730	22545151	150 ohm
R731	22545101	100 ohm
R732	22545561	560 ohm
R733	22545561	560 ohm
R734	22545561	560 ohm
R735	22545561	560 ohm
R736	22545561	560 ohm
R737	22545152	1.5K ohm
R738	22545681	680 ohm
R739	22545680	680 ohm
R740	22545680	680 ohm
R741	22545152	1.5K ohm
R742	22545471	470 ohm

Symbol No.	Part No.	Description
AUDIO SECTION **EQUALIZER AMP P.C. BOARD (AF-H05)**		
TRANSISTORS & DIODES		
Q301 ~ 304		Transistor, 2SA970-GR
Q305, 306		Transistor, 2SC2240-GR
Q307, 308		Transistor, 2SC2235-Y
Q309, 310		Transistor, 2SA965-Y
Q311		Transistor, 2SC1815-GR
D301 ~ 303		Diode, 02Z18A
D304		Diode, 1S1588V
ELECTRICAL PARTS		
S401	22195205	Switch, Rotary, Function
S402	22195056	Switch, Lever, Tape Duplicate
S403	22195055	Switch, Lever, Tape Monitor
S404, 405	22195057	Switch, Lever, Muting/Air Chec
S421	22148650	Relay, AM/FM Change
CAPACITORS **D = ±0.5pF, G = ±2%, J = ±5% L = Low Noise**		
C301	22468339	Electrolytic, 3.3mfd, 50V, L
C302	22468339	Electrolytic, 3.3mfd, 50V, L
C305	22361100	Ceramic, 10pF, 50V, D
C306	22361100	Ceramic, 10pF, 50V, D
C307	22442331	Electrolytic, 330mfd, 6.3V
C308	22442331	Electrolytic, 330mfd, 6.3V
C309	22445100	Electrolytic, 10mfd, 16V
C310	22445100	Electrolytic, 10mfd, 16V
C311	22321076	Polypropylene, 1300pF, 100V, G
C312	22321076	Polypropylene, 1300pF, 100V, G
C313	22321160	Polypropylene, 0.015mfd, 100V, G
C314	22321160	Polypropylene, 0.015mfd, 100V, G
C315	22321178	Polypropylene, 0.047mfd, 100V, G
C316	22321178	Polypropylene, 0.047mfd, 100V, G
C317	22447100	Electrolytic, 10mfd, 35V
C318	22447100	Electrolytic, 10mfd, 35V
C319	22469479	Electrolytic, 4.7mfd, 25V, L
C320	22469479	Electrolytic, 4.7mfd, 25V, L
C321	22371102	Mylar, 1000pF, 50V, J
C322	22371102	Mylar, 1000pF, 50V, J
C323	22342223	Ceramic, 0.022mfd, 50V, Z
C324	22342223	Ceramic, 0.022mfd, 50V, Z
C325	22446101	Electrolytic, 100mfd, 25V
C326	22446101	Electrolytic, 100mfd, 25V
C327	22447100	Electrolytic, 10mfd, 35V
C338	22371103	Mylar, 0.01mfd, 50V, J
C339	22445100	Electrolytic, 10mfd, 16V
C340	22445100	Electrolytic, 10mfd, 16V
RESISTORS **All resistors carbon film ¼W, ±5%, unless otherwise noted. K = 1000**		
R301	22555104	100K ohm
R302	22555104	100K ohm
R303	22555101	100 ohm
R304	22555101	100 ohm
R305	22555104	100K ohm
R306	22555104	100K ohm
R307	22555823	82K ohm
R308	22555823	82K ohm
R309	22555123	12K ohm
R310	22555123	12K ohm
R311	22555123	12K ohm
R312	22555123	12K ohm
R313	22559910	91 ohm
R314	22559910	91 ohm
R315	22555563	56K ohm
R316	22555563	56K ohm
R317	22556822	8.2K ohm
R318	22556822	8.2K ohm
R319	22555222	2.2K ohm
R320	22555222	2.2K ohm
R321	22555562	5.6K ohm
R322	22555562	5.6K ohm
R323	22555472	4.7K ohm
R324	22555472	4.7K ohm
R325	22555221	220 ohm
R326	22555221	220 ohm
R327	22556683	68K ohm
R328	22556683	68K ohm
R329	22556333	33K ohm
R330	22556333	33K ohm
R331	22559470	47 ohm
R332	22559470	47 ohm
R333	22559470	47 ohm
R334	22559470	47 ohm
R335	22555102	1K ohm
R336	22555102	1K ohm
R337	22555224	220K ohm
R338	22555224	220K ohm
R340	22555182	1.8K ohm
R341	22545182	1.8K ohm
R342	22545182	1.8K ohm
R356	22555183	18K ohm
R357	22555474	470K ohm,
R415	22650488	100K ohm, x 2, B, Variable Detent Volume

Symbol No.	Part No.	Description
C440	22371683	Mylar, 0.068mfd, 50V, J
C441	22466479	Electrolytic, 4.7mfd, 25V
C442	22466479	Electrolytic, 4.7mfd, 25V
C443	22362220	Ceramic, 22pF, 50V, K
C444	22362220	Ceramic, 22pF, 50V, K
C445	22466479	Electrolytic, 4.7mfd, 25V
C446	22466479	Electrolytic, 4.7mfd, 25V
C447	22446100	Electrolytic, 10mfd, 25V
C448	22446100	Electrolytic, 10mfd, 25V
C449	22362220	Ceramic, 22pF, 50V, K
C450	22362220	Ceramic, 22pF, 50V, K
		RESISTORS
		All resistors carbon film ¼W, ±5%, unless otherwise noted. K = 1000, M = 1000000
R423	22545224	220K ohm
R424	22545224	220K ohm
R425	22545474	470K ohm
R426	22545474	470K ohm
R427	22545222	2.2K ohm
R428	22545222	2.2K ohm
R429	22545104	100K ohm
R430	22545104	100K ohm
R431	22545223	22K ohm
R432	22545223	22K ohm
R433	22545102	1K ohm
R434	22545102	1K ohm
R435	22545684	680K ohm
R436	22545684	680K ohm
R439	22545185	1.8M ohm
R440	22545155	1.5M ohm
R441	22545155	1.5M ohm
R442	22545185	1.8M ohm
R443	22545102	1K ohm
R444	22545102	1K ohm
R445	22545392	3.9K ohm
R446	22545392	3.9K ohm
R447	22545101	100 ohm
R448	22545101	100 ohm
R457	22545224	220K ohm
R458	22545224	220K ohm
R459	22651433	250K ohm, MN, Variable Balance
R460	22651470	100K ohm, Variable Treble
R461	22651470	100K ohm, Variable Bass

Symbol No.	Part No.	Description
		POWER AMP P.C. BOARD (PA-H05) (LEFT & RIGHT)
		IC'S, TRANSISTORS & DIODES
Q501	22114688	Transistor, 2SA979-G
Q502, 503		Transistor, 2SA970-GR
504, 802		
Q506, 506		Transistor, 2SC2240-BL
Q507, 508		Transistor, 2SC1628-Y
Q509, 510		Transistor, 2SA818-Y
Q511, 513		Transistor, 2SC2238-Y
Q512, 514		Transistor, 2SA968-Y
Q801		Transistor, 2SC2235-Y
Q803		IC, TA7317P
Q804		IC, TA7318P
D501, 502		Diode, 1S1555V
D503, 504	22115481	Diode, STV-3H
D801, 802		Diode, 1S1553
D803		Diode, 1S1886
		COIL
L501	22210107	Coil, 2.2mH
		ELECTRICAL PARTS
S801	22148644	Relay, Muting/Protector
		CAPACITORS
		D = ±0.5pF, J = ±5%, K = ±10%, Z = $^{+80\%}_{-20\%}$
C501	22447475	Electrolytic, 4.7mfd, 35V
C502	22362121	Ceramic, 120pF, 50V, K
C503	22362151	Ceramic, 150pF, 50V, K
C504	22371104	Mylar, 0.1mfd, 50V, J
C505	22445101	Electrolytic, 100mfd, 16V
C506	22362121	Ceramic, 120pF, 50V, K
C507	22340032	Ceramic, 0.02mfd, 500V, Z
C508	22340032	Ceramic, 0.02mfd, 500V, Z
C509	22371104	Mylar, 0.1mfd, 50V, J
C510	22362470	Ceramic, 47pF, 50V, K
C511	22361509	Ceramic, 5pF, 50V, D
C512	22362121	Ceramic, 120pF, 50V, K
C513	22362121	Ceramic, 120pF, 50V, K
C514	22371393	Mylar, 0.039mfd, 50V, J
C801	22445105	Electrolytic, 0.22mfd, 50V
C802	22371103	Mylar, 0.01mfd, 50V, J
C803	22445100	Electrolytic, 10mfd, 16V
C804	22448470	Electrolytic, 47mfd, 50V
C805	22448228	Electrolytic, 0.22mfd, 50V
C821	22342223	Ceramic, 0.022mfd, 50V, Z
C822	22371223	Mylar, 0.022mfd, 50V, J
C823	22342223	Ceramic, 0.022mfd, 50V, Z

Symbol No.	Part No.	Description
C949	22370208	Polyester Film, 1mfd, 250V, K
		RESISTORS
		All resistors carbon film ¼W, ±5%, unless otherwise noted. K = 1000
R501	22545102	1K ohm
R502	22545224	220K ohm
R503	22545473	47K ohm
R504	22545683	68K ohm
R505	22545683	68K ohm
R506	22545821	820 ohm
R507	22545101	100 ohm
R508	22545222	2.2K ohm
R509	22545822	8.2K ohm
R510	22545822	8.2K ohm
R511	22545823	82K ohm
R512	22545122	1.2K ohm
R513	22545102	1K ohm
R514	22545102	1K ohm
R515	22545222	2.2K ohm
R516	22545222	2.2K ohm
R517	22500117	220 ohm, ½W, Fusible
R518	22500117	220 ohm, ½W, Fusible
R519	22658460	330 ohm, B, Semi-fixed Variable
R520	22545101	100 ohm
R521	22545101	100 ohm
R522	22500122	100 ohm, ½W, Fusible
R523	22570270	470 ohm, 1W, Metal Oxided Film
R524	22545473	47K ohm
R525	22570270	470 ohm, 1W, Metal Oxided Film
R526	22570309	150 ohm, 2W, Metal Oxided Film
R528	22570250	10 ohm, 1W, Metal Film
R527	22545102	1K ohm
R529	22570250	10 ohm, 1W, Metal Film
R530	22570250	10 ohm, 1W, Metal Film
R531	22570250	10 ohm, 1W, Metal Film
R532	22500186	0.22 ohm, 2W, Wire Wound
R533	22500186	0.22 ohm, 2W, Wire Wound
R534	22500186	0.22 ohm, 2W, Wire Wound
R535	22500186	0.22 ohm, 2W, Wire Wound
R536	22570269	10 ohm, 2W, Metal Film
R537	22570269	10 ohm, 2W, Metal Film
R538	22570250	10 ohm, 1W, Metal Film
R539	22570250	10 ohm, 1W, Metal Film
R540	22545471	470 ohm
R801	22545182	1.8K ohm
R802	22545182	1.8K ohm
R803	22545223	22K ohm
R804	22545683	68K ohm
R805	22545223	22K ohm
R806	22545223	22K ohm
R807	22545104	100K ohm
R808	22545683	68K ohm
R809	22545473	47K ohm

Symbol No.	Part No.	Description
R810	22545683	68K ohm
R811	22545224	220K ohm
R812	22545473	47K ohm
R813	22545223	22K ohm
R814	22570321	1.5K ohm, 2W, Metal Oxided Film
R815	22545683	68K ohm
R816	22545223	22K ohm
R817	22545333	33K ohm
R821	22545563	56K ohm
R822	22545104	100K ohm
R823	22570326	3.9K ohm, 2W, Metal Oxided Film
R824	22658480	330 ohm, B, Semi-fixed Variable
R825	22570326	3.9K ohm, 2W, Metal Oxided Film
R826	22545221	220 ohm

POWER AMP (OUTPUT) P.C. BOARD (ETC-H23) (LEFT & RIGHT)

TRANSISTORS

Q601, 603		Transistor, 2SD665-O
Q602, 604		Transistor, 2SB645-O

SPEAKER SWITCH P.C. BOARD (ETC-H27)

ELECTRICAL PARTS

S902	22195061	Switch, Push, Speaker A
903		Speaker B
904		Speaker C

RESISTOR

R601, 602	22570313	330 ohm, 2W, Metal Oxided Film

Symbol No.	Part No.	Description
POWER SUPPLY P.C. BOARD (SPLY-H07) (PRIMARY)		
		DIODES
D901		Diode, 1S2462
D902		Diode, 02Z8.2A
D903		Diode, 1S1555V
		ELECTRICAL PARTS
F901	22144379	Fuse, 1A, 125V
F902	22144402	Fuse, 12A, 250V
		CAPACITORS
C902	22445100	Electrolytic, 10mfd, 16V
C903	22443102	Electrolytic, 1000mfd, 10V
		RESISTORS
R901	22547684	680K ohm, ½W, Fixed Carbon
R902	22547684	680K ohm, ½W, Fixed Carbon
R903	22547684	680K ohm, ½W, Fixed Carbon
R904	22547684	680K ohm, ½W, Fixed Carbon
R905	22500238	3.3 ohm, 20W, Wire Wound
POWER SUPPLY P.C. BOARD (SPLY-H06)		
		TRANSISTORS & DIODES
Q901		Transistor, 2SC1626-Y
Q902		Transistor, 2SD234-Y
Q904		Transistor, 2SC1625-Y
Q905		Transistor, 2SA815-Y
D905, 908	22115427	Diode, MI-152
D906		Diode, 02Z15A
D907, 919		Diode, 1S1555V
D909		Diode, 02Z7.5A
D912	22115484	Diode, S1VB A20
D913, 915		Diode, 02Z24A
D914, 916 917, 918	22115375	Diode, RD36E
D920		Diode, 02Z8.2A
		ELECTRICAL PARTS
F903	22144390	Fuse, 500mA, 125V
	22165036	Holder, Fuse
		CAPACITORS
K = ±10%, Z = $^{+80\%}_{-20\%}$		
C911	22342223	Ceramic, 0.022mfd, 50V, Z
C912	22342223	Ceramic, 0.022mfd, 50V, Z
C913	22447102	Electrolytic, 1000mfd, 35V
C914	22446221	Electrolytic, 220mfd, 25V
C915	22446471	Electrolytic, 470mfd, 25V
C916	22342223	Ceramic, 0.022mfd, 50V, Z
C917	22342223	Ceramic, 0.022mfd, 50V, Z

Symbol No.	Part No.	Description
C918	22446102	Electrolytic, 1000mfd, 25V
C919	22445221	Electrolytic, 220mfd, 16V
C920	22445471	Electrolytic, 470mfd, 16V
C921	22448109	Electrolytic, 1mfd, 50V
C924	22340032	Ceramic, 0.02mfd, 500V, Z
C925	22340032	Ceramic, 0.02mfd, 500V, Z
C926	22340032	Ceramic, 0.02mfd, 500V, Z
C927	22340032	Ceramic, 0.02mfd, 500V, Z
C928	22440213	Electrolytic, 470mfd, 100V
C929	22440213	Electrolytic, 470mfd, 100V
C930	22440036	Electrolytic, 47mfd, 100V
C931	22440036	Electrolytic, 47mfd, 100V
C932	22370208	Polyester Film, 1mfd, 250V, K
C933	22440110	Electrolytic, 220mfd, 80V
C934	22440110	Electrolytic, 220mfd, 80V
C935	22448101	Electrolytic, 100mfd, 50V
C936	22448101	Electrolytic, 100mfd, 50V
		RESISTORS
All resistors carbon film ½W, ±5%, unless otherwise noted. K = 1000		
R911	22570323	2.2K ohm, 2W, Metal Oxided Film
R912	22545222	2.2K ohm
R913	22545561	560 ohm
R914	22545152	1.5K ohm
R915	22545182	1.8K ohm
R916	22570318	820 ohm, 2W, Metal Oxided Film
R917	22545182	1.8K ohm
R918	22570318	820 ohm, 2W, Metal Oxided Film
POWER SUPPLY P.C. BOARD (ETC-H22) (RECTFIER)		
		DIODES
D921	22115425	Diode, S15VB20
D922	22115425	Diode, S15VB20
		CAPACITORS
Z = $^{+80\%}_{-20\%}$		
C941	22340032	Ceramic, 0.02mfd, 500V, Z
C942	22340032	Ceramic, 0.02mfd, 500V, Z
C943	22340032	Ceramic, 0.02mfd, 500V, Z
C944	22340032	Ceramic, 0.02mfd, 500V, Z
C945	22340032	Ceramic, 0.02mfd, 500V, Z
C946	22340032	Ceramic, 0.02mfd, 500V, Z
C947	22340032	Ceramic, 0.02mfd, 500V, Z
C948	22340032	Ceramic, 0.02mfd, 500V, Z
		RESISTORS
R921	22570326	3.9K ohm, 2W, Metal Oxided Film
R922	22570326	3.9K ohm, 2W, Metal Oxided Film
R923	22570326	3.9K ohm, 2W, Metal Oxided Film
R924	22570326	3.9K ohm, 2W, Metal Oxided Film

Symbol No.	Part No.	Description
OTHERS SECTION		
		COIL & TRANSFORMERS
L901	22290002	Coil, Balun, LH9050
L902	22242720	Coil, Ferrite Antenna FA32-2720A
T901	22223219	Transformer, Power
T902	22223218	Transformer, Power
		ELECTRICAL PARTS
S901	22195039	Switch, Lever, Power (TA)
S901	22195201	Switch, Lever, Power UL (TC)
S905	22148851	Relay, Surge Killer
J001	22162402	Terminal, Antenna
J001	22167847	AC Socket, 3P
J902 ~ 904	22162412	Terminal, 4P, Speaker
J905	22163649	Jack, 6D, Headphone
J906	22163361	Jack, US1P, FM DET OUT
J907	22161617	Terminal, 1P
N801, 802	22104477	Meter, Power
	22178577	Power Cord, EPUC
	22164392	Short Plug, 2P
		CAPACITORS M = ±20%, Z = +80% −20%
C901	22321206	Polypropylene, 0.022mfd, AC 125V, M
C951	22430080	Electrolytic, 15000mfd, 80V, M
C952	22430080	Electrolytic, 15000mfd, 80V, M
C953	22430080	Electrolytic, 15000mfd, 80V, M
C954	22430080	Electrolytic, 15000mfd, 80V, M

Symbol No.	Part No.	Description
ACCESSORIES		
	22124452	Feeder Ass'y, Antenna
	22902183	Owner's Manual (TA)
	22902185	Owner's Manual (TC)

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PRINTED IN JAPAN 2295545 Oct., 1978 Ⓑ

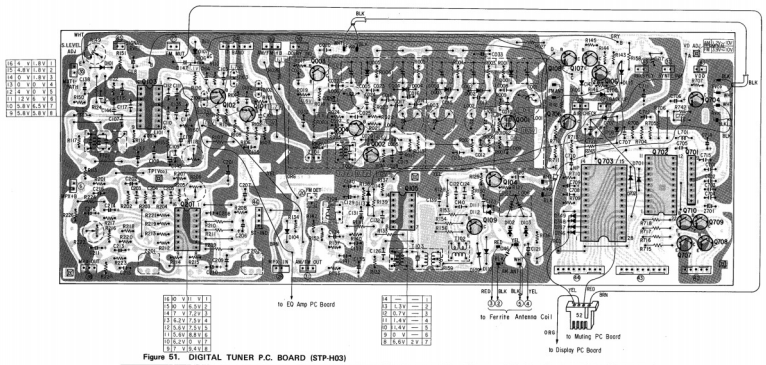

Figure 51. DIGITAL TUNER P.C. BOARD (STP-H03)

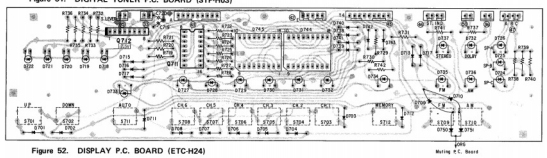

Figure 52. DISPLAY P.C. BOARD (ETC-H24)

DIGITAL TUNER SCHEMATIC DIAGRAM

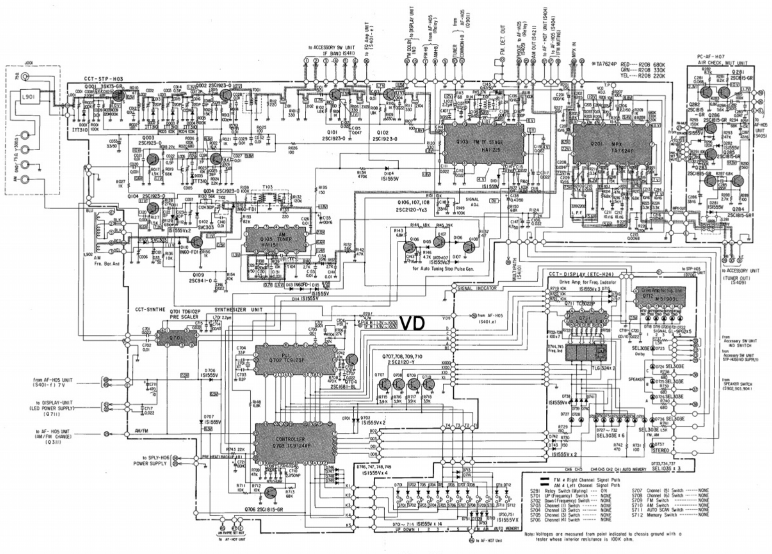

Figure 53.

CORRECT

DIGITAL TUNER SCHEMATIC DIAGRAM

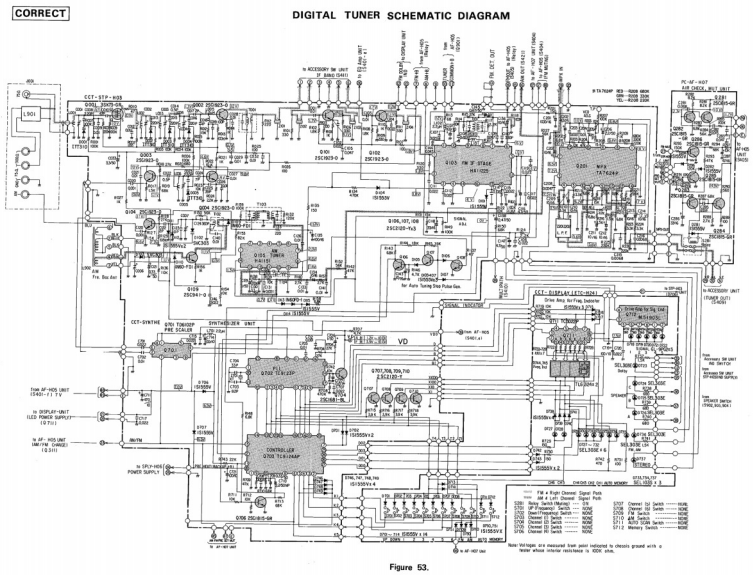

Figure 53.