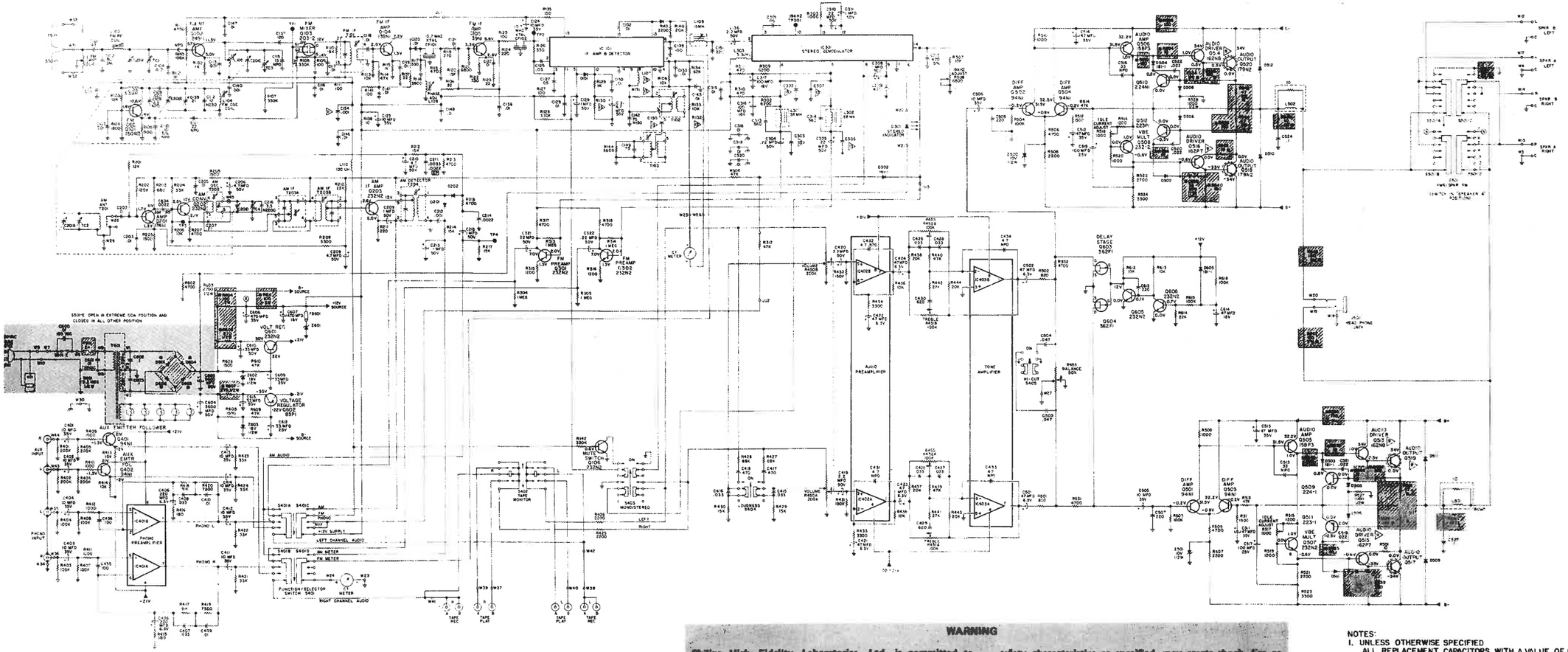
SCHEMATIC DIAGRAM



All IC voltages taken with Function/Selector Switch in FM position and Speaker Switch in Speaker-A position (unless otherwise specified).

IC101 VOLTAGE CHART

PIN	VOLTAGE	NOTE
1	1.7V	----
2	1.7V	----
3	1.7V	----
4	0 (Ground)	----
5	2.5V	1
6	5.3V	2
7	5.3V	----
8	5.3V	----
9	5.3V	----
10	5.3V	----
11	10.0V	----
12	2.5V	----
13	.5V	----
14	0 (Ground)	----
15	5.7V	----
16	0V	----

IC301 VOLTAGE CHART

PIN	VOLTAGE	NOTE
1	12.0V	----
2	3.0V	----
3	5.0V	----
4	7.5V	----
5	7.5V	----
6	20.0V	----
7	0V (Ground)	----
8	2.3V	1
9	2.3V	----
10	1.5V	3
11	2.3V	----
12	2.3V	----
13	2.3V	----
14	3.0V	1

NOTES:
1. Goes to 0V when Mono Switch placed in "ON" position.
2. Goes to 6V when Mono Switch placed in "ON" position.
3. Goes to 3V when Mono Switch placed in "ON" position.

COMPONENT VERSION CHART

Chassis Version	R130	R131	R132	L107	C302	C307	C303	C306	C150
AA	18K	3.9K	22K	22 uH	1800 pf.	1800 pf.	.015 mfd.	.015 mfd	3.9 pf. ± .25 pf.,500V,NPO
BA/CA	36K	6.8K	39K	27 uH	1500 pf.	1500 pf.	.012 mfd.	.012 mfd	3 pf. ± .25 pf.,500V,NPO

WARNING

Philips High Fidelity Laboratories, Ltd. is committed to marketing safe products which meet or exceed applicable safety standards of industry, government agencies and independent laboratories. It therefore uses parts in its products designed for maximum safety, reliability and performance.

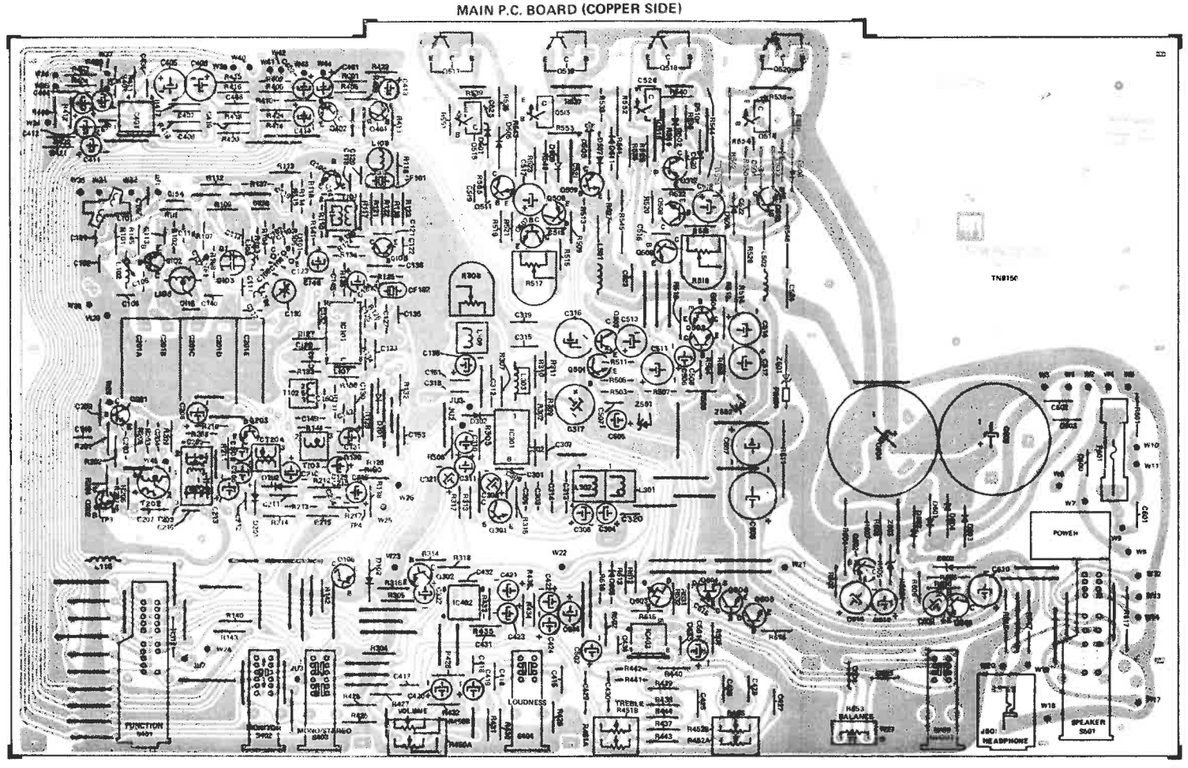
For continued safety of this product, parts shown in the shaded areas of this schematic must be replaced with only those identified in the Parts List of this manual. Use of substitute replacement parts which do not have the same safety characteristics as specified, may create shock, fire or other hazards.

For maximum reliability and performance, all other parts must be replaced by those having identical specifications.

Under no circumstances may the original design be modified or altered without permission from Philips High Fidelity Laboratories, Ltd., otherwise the consumer may be exposed to fire and/or shock hazards.

NOTES:
1. UNLESS OTHERWISE SPECIFIED
   ALL REPLACEMENT CAPACITORS WITH A VALUE OF 1 OR GREATER ARE IN PICOFARADS, 10%, 100V.
   ALL REPLACEMENT CAPACITORS WITH A VALUE OF LESS THAN 1 ARE IN MICROFARADS, 10%, 100V.
   ALL RESISTORS ARE CARBON FILM, 5%, 1/4 WATT.
2. ■ COMPONENT MUST BE ELEVATED 1/4 INCH ABOVE P.C. BOARD.
3. ALL VOLTAGES MEASURED WITH A DVM WITH NO SIGNAL APPLIED, SELECTOR SW IN FM POSITION, SPEAKER SWITCH IN PHONES POSITION.
4. * VOLTAGES MEASURED WITH SELECTOR SWITCH IN AM POSITION AND NO SIGNAL APPLIED.
5. → ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION.
8. TRANSISTOR SURROUNDED WITH A DOTTED LINE INDICATE TRANSISTOR IS MOUNTED TO A HEAT SINK.
9. IF THIS TRANSISTOR IS REPLACED, IDLE CURRENT MUST BE READJUSTED.
10. ⏚ INDICATES POWER SUPPLY GROUND.
    ⏚ INDICATES CHASSIS GROUND.
11. COMPONENT MOUNTED ON COPPER SIDE OF P.C. BOARD IN EARLY PRODUCTION UNITS.
12. EP = EARLY PRODUCTION.
    LP = LATE PRODUCTION.
13. SEE COMPONENT VERSION CHART

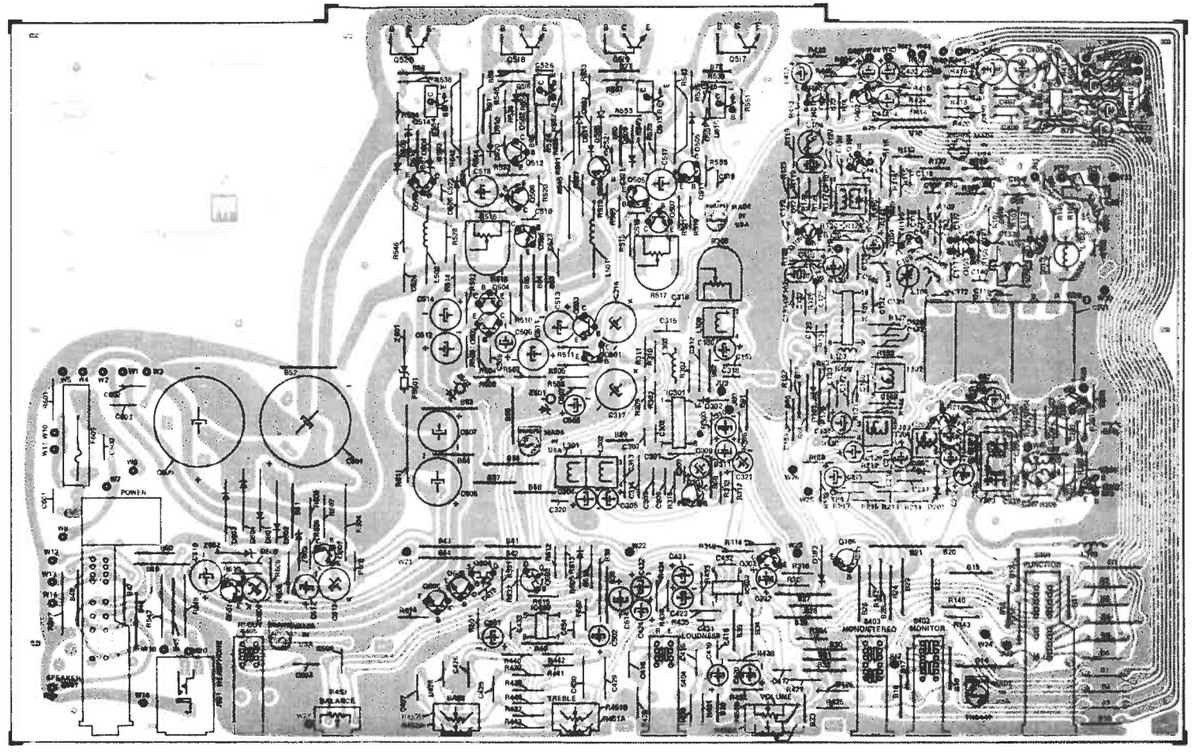
MAIN P.C. BOARD (COPPER SIDE)



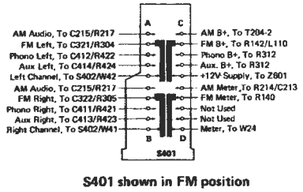
NOTES:
Component screening as shown above is correct, however, on some units:

1. R547 was incorrectly screened as R549.
2. R303 was incorrectly screened as R503.
3. R306 was incorrectly screened as R506.
4. C322 was incorrectly screened with it's polarity reversed.
5. C154 may not be screened on board, component may be mounted raised from board.
6. C145 not used, but screening may be present.

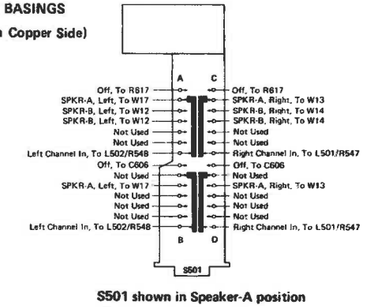
MAIN P.C. BOARD (COMPONENT SIDE)



SWITCH BASINGS
(Shown from Copper Side)



S401 shown in FM position



S501 shown in Speaker-A position

NOTES:
Component screening as shown above is correct, however, on some units:

1. C150 was incorrectly screened as C151.
2. C433 was incorrectly screened as C443.
3. R547 was incorrectly screened as R549.
4. R303 was incorrectly screened as R503.
5. R306 was incorrectly screened as R506.
6. D503 was incorrectly screened as D502.
7. C128 was incorrectly screened with it's location wrong.
8. Q102 basing was incorrectly screened.
9. Q201 basing was incorrectly screened.
10. C322 was incorrectly screened with it's polarity reversed.
11. C154 may not be screened on board, component may be mounted on copper side.
12. C145 not used, but screening may be present.
13. W14 was not screened.
14. C320 was not screened.

AH7851 Stereo Receiver

Service
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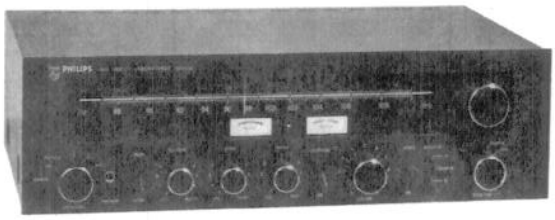
Service



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For Service Information on the AH7851-BK01 (Black Version) refer to the 22AH785-44 (Silver Version) Service Manual. The AH7851-BK01 is electrically identical to the 22AH785-44, therefore, only cosmetic differences are listed in this parts list. When ordering replacement parts for the AH7851-BK01 please use the part number as shown in this list, including Description, Chassis, and Model Number. Complete information will help expedite the order.

For electrical replacement parts refer to 22AH785-44 (Silver Version) Service Manual. Replacement parts may occasionally differ in part number or value from the Factory installed part. In either event the replacement part has been chosen to provide equal or improved performance.

Major changes to this radio will be identified by change in the last two digits (e.g., AH7851-BK02)

REPLACEMENT PARTS LIST *

REF.	DESCRIPTION	PART NO.
	Backplate	733377-0004
	Metal Cabinet	733373-0002
	Bezel	733310-0003
	Foot (4 used)	120822-0001
	Dial Scale Inlay	151620-0010

REF.	DESCRIPTION	PART NO.
	Control Knob - Bass, Treble, Balance	143730-0018
	Control Knob - Selector, Speaker, Vol.	143730-0019
	Tuning Knob	143730-0020
	Knob f/Lever Switch (4 used)	144010-0002
	Dial Point (White)	733446-0002

*NOTE: This parts list only identifies the differences between the 22AH785-44 (Silver Version) and the AH7851-BK01 (Black Version).

22AH785-44 Stereo Receiver

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CHASSIS IDENTIFICATION

The number on the label affixed tothe inside of the back panel (e.g., R352-01-AA), identifies the chassis. The first three numbers (352) identifies the basic chassis series. The next two numbers (01) are used to identify the chassis version within the series. The last two letters are used to indicate production change codes, (AA being the original production). A change in the first letter will identify an important electrical change and a change in the second letter will identify a major mechanical change. Minor changes may not be identified within these letters, however, they will be called out on the schematic as Early and Late production. These minor changes will not necessarily affect the performance of the chassis.

SPECIFICATIONS *

Amplifier Section

Continuous Power	30 watts/Channel
Band	20-20 KHz
Total Harmonic Distortion	0.1%
Load	8 ohms
IM Distortion, @ Rated Power	0.07%
Distortion, @ 2 watts	
THD	0.05%
IM (SMPTE 4:1)	0.05%
Continuous Power	
at 1 KHz, 0.1% THD	36 watts/Channel
Damping Factor	30
Frequency Response	
Phono ± 0.5 dB	RIAA
Aux, ±0.5 dB	20-20 KHz
Input Sensitivity	
Phono	2.5mv
Aux. Tape	150 mv
Signal to Noise	
Phono	70 dB (A weighting)
Aux, Tape	90 dB (A weighting)
Phono Overload	
(ref. 2.5 mv Input)	200 mv
Impedance	
Phono Input	50K ohms
Aux, Tape Input	100K ohms
Tape Record Outputs	1K ohms
Control Range	
Base @ 50 Hz	±12 dB
Treble @ 10 KHz	±12 dB
High Filter @ 10 KHz	-8 dB
Loudness Action @ -30 dB	
@ 50 Hz	+10 dB
@ 10 KHz	+4 dB
Separation, Aux 1 KHz	45 dB

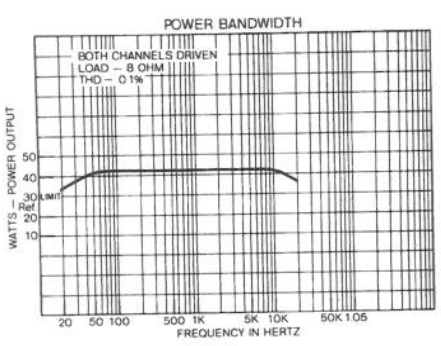
FM Section

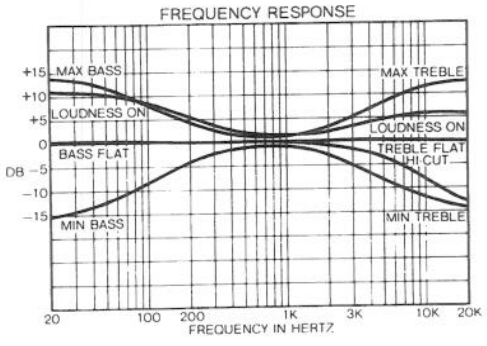
Tuning Range	87.5-108 MHz
Usable Sensitivity	
Mono	2.0 µv
Stereo	5.0 µv
50 dB Quieting Sensitivity	
Mono	3.5 µv
Stereo	42 µv
Total Harmonic Distortion @ 1 KHz	
Mono	0.15%
Stereo	0.3%
Signal to Noise Ratio @ 65 dBf	
Mono	65 dB
Stereo	60 dB
Capture Ratio	1.7 dB
Selectivity	
(Single Generator)	82 dB
(Dual Generator)	62 dB
Stereo Separation @ 1 KHz	45 dB
IF Rejection	90 dB
Image Rejection	70 dB
Spurious Rejection	75 dB
AM Rejection	40 dB
Muting Threshold	3 µv

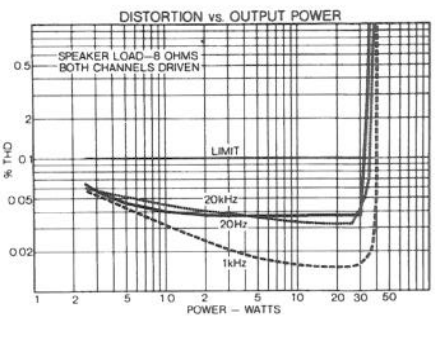
AM Section

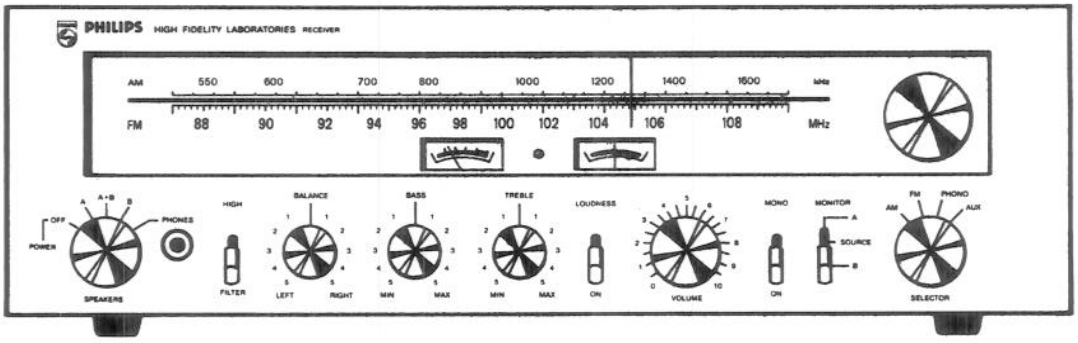
Tuning Range	540-1605 KHz
Usable Sensitivity	350 µv/m
Selectivity	20 dB
Signal to Noise Ratio (100% Mod.)	45 dB
Image Rejection	50 dB
IF Rejection	45 dB

*Subject to Modification









FRONT PANEL FUNCTIONS

POWER/SPEAKERS SWITCH — Rotating the Power/Speaker switch clockwise applies AC power to the receiver while also activating the desired Speaker System. The Power/Speaker switch permits the selection of Speaker System A only, Speaker System B only, or both A and B systems simultaneously (if both systems are connected to the unit). Rotating the Power/Speaker switch to the Phones position activates the stereo headphone jack for use. Rotating the switch counterclockwise to Off, turns the unit Off.

NOTE: Do not activate any of the Speaker Systems with the Volume control rotated to a high level setting.

NOTE: If only one set of speakers is connected no sound will be heard in the A + B mode.

BALANCE CONTROL - Rotating the Balance control will accentuate the volume of one channel by decreasing the volume in the other channel. The Balance control is used to compensate for volume differences between channels, either in presentation or caused by acoustical situations.

BASS CONTROL - Rotating this control in a clockwise direction will increase the bass response; counterclockwise will decrease the bass response. The lower the frequency, the more the effect. Placing the control at the "12 o'clock" setting provides a flat response for the low frequencies.

TREBLE CONTROL - Rotating this control in a clockwise direction will increase the treble response; counterclockwise will decrease the treble response. The higher the frequency, the more the effect. Placing the control at the "12 o'clock" setting provides a flat response for the higher frequencies.

LOUDNESS SWITCH — The Loudness switch is used to boost the low and high frequencies at low volume settings. This is necessary to compensate for the human ear's tendency to hear mid-range frequencies as being louder than low and high frequency sounds at low volume levels.

VOLUME CONTROL — The volume control varies the volume of both channels equally and simultaneously.

MONO SWITCH — Placing the Mono switch in the On position combines the two stereo channels into one and provides monaural output to the speakers. The Mono switch may also be employed during excessively noisy stereo FM broadcasts. The program will no longer be reproduced in stereo but the noise level will be reduced. In the Mono On position the mute mechanism, which eliminates the hissing noise between stations is disabled.

MONITOR SWITCH - Placing the Monitor switch in "A" or "B" position applies the signal present at the associated Tape Play jacks to the amplifier sections of the receiver for playing back a tape or while monitoring a recording in progress with a 3-Head tape deck. The Monitor switch may be in Source or the associated "A" or "B" position during recording.

HIGH FILTER — The High Filter switch is used to reduce the hiss from FM and the noise from scratchy records and tapes.

SELECTOR SWITCH — The Selector switch is used to select the function as follows:

AM — for reception of AM Radio broadcasts.
FM — for reception of FM radio broadcasts.
PHONO — Permits the receiver to amplify signals applied to the Phono jacks from a magnetic phono cartridge.
AUX — Allows the receiver to amplify signals applied to the Aux jacks from a tape unit or other suitable source.

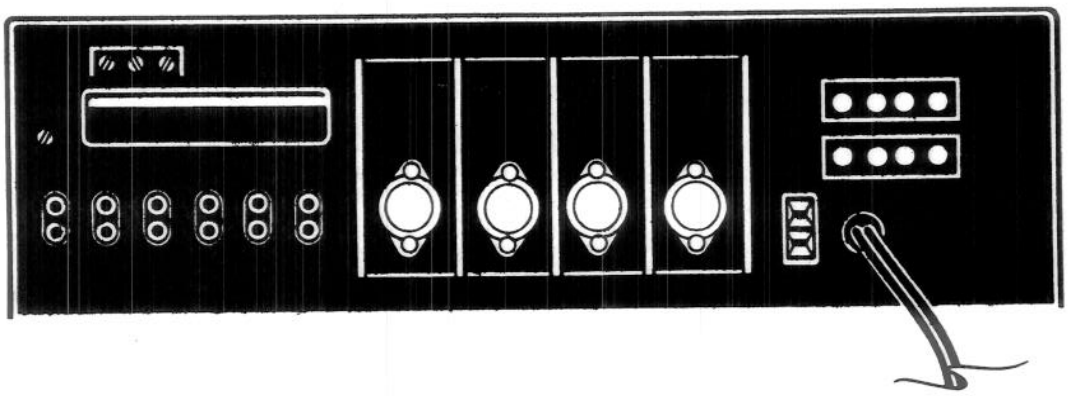
TUNING KNOB — The Tuning Knob is used to tune in the desired AM or FM station.

SIGNAL STRENGTH METER — The Signal Strength Meter indicates the strength of the signal being received for both AM and FM, optimum reception being at maximum deflection.

CENTER TUNING METER — The Center Tuning Meter is used for accurately tuning FM boradcasts, optimum FM reception being center deflection.

STEREO INDICATOR — The FM Stereo light will illuminate if the Selector Switch is in the FM position, and an FM stereo broadcast is being received. The Mono switch must be in the Off position for the Indicator to light.

HEADPHONES — The Phones jack makes it possible to connect a pair of stereo headphones via a standard ¼" stereo plug for private listening. Be certain that the Volume control is at a low setting when the plug is inserted and that the Power/Speakers switch is in the Phones position. In the Phones position, the speakers are disconnected.



REAR PANEL FUNCTIONS

PHONO INPUTS – The left and right channel signals from a record changer or turntable with a magnetic cartridge may be connected to the Phono Inputs. If the record player has a separate ground wire, it should be connected to the ground terminal on the rear panel.

AUX JACKS – The Aux inputs can be used to connect the left and right channel signals from the higher level pre-amp or line outputs of an additional source (such as a stereo tape deck or other component capable of providing 150 MV at approximately 100K ohms) to the input circuits of the amplifier section.

AM ANTENNA – The AM antenna is used to receive AM broadcasts when the Selector switch is in the AM position. The 3-dimensional mounting allows you to position the antenna to eliminate interference and increase signal strength.

FM ANTENNA TERMINALS – A folded dipole FM antenna has been provided with this receiver. Connect this antenna to the 300 ohm terminals. Terminals have been provided for the connection of a 75 ohm coaxial type lead-in from the antenna.

TAPE RECORD OUTPUTS A & B – These jacks are used to supply left and right channel signals from the receiver to the line in or high level inputs of a tape recorder. The signal present at the Tape Record outputs is unaffected by the Volume, Bass, Treble and Balance controls.

TAPE PLAY INPUTS A & B – These jacks are used to connect the play preamplifiers of a 3-Head tape recorder to the input circuits of the amplifier section for tape monitoring. The inputs can also be used for other tape recorders, reverberation units, tape equalizers, ect.

SPEAKER SYSTEM A & B – These terminals are used to supply left and right output signals to a pair of 8 ohm speakers. The A Speakers are considered the primary speakers.

NOTE: To avoid possible damage to the receiver, the bare wire or connector inserted into a black or red terminal must not make a contact to a bare wire or connector inserted into a black terminal or to any adjacent metal chassis surface.

UNSWITCHED AC RECEPTACLE – The Unswitched AC Receptacle is a source of 120 VAC which may be used to power another component such as a turntable or tape deck that does not exceed the wattage rating stamped above the receptacle. This receptacle has power at any time the AC line cord of this tuner is connected to an AC source.

CIRCUIT DESCRIPTION

Power Supply and Audio Delay Circuitry

The power supply circuitry develops the DC voltages necessary for the operation of the receiver as well as the AC voltage needed to light the five dial lamps. There are six sources available from the power supply circuitry, +34 VDC, -34 VDC, +21 VDC, -21 VDC, +12 VDC and 6 VAC.

The following is a description of how these source voltages are obtained. When the receiver is plugged in and the Power/ Speaker Switch (S501-E) is closed, 120 VAC is applied to the primary of the power transformer T601. The stepped down AC voltage at the secondary of T601 is used to develop the sources. The main secondary winding,with its center-tap being grounded, is connected to a full-wave bridge rectifier. The positive output of this rectifier is filtered by C605 and becomes the +34V source. The negative output of this rectifier is filtered by C604, and becomes the -34V source. Both of these filtered outputs are also used to develop the regulated +21V and -21V sources. The +21V source is derived from the +34V source via dropping resistor R605 and series regulator Q601. The -21V source is derived from the -34V source via dropping

resistor R607 and series regulator Q602. The +34V output of the bridge rectifier is also used to develop the +12V supply. This is accomplished by dropping the +34V source through R604 and a low pass filter network, R604, C606, R611 and C607 to a voltage Regulator Z601.

The +34V and -34V sources supply power to the audio amplifier sections of the receiver, with the +34V source also applied through R603 to forward bias the Stereo Indicator Diode, D301, when the unit is tuned to a FM Stereo station. The +21V and -21V sources are developed to supply power to the Dual Operational Amplifiers IC401, 402, and 403, as well as Aux Input Amplifiers Q401 and Q402.

The +12V source supplies unswitched power to the FM IF section, the Stereo Demodulator IC301, the Delay circuitry, Q603 and Q604, and the FM Audio Amplifiers, Q301 and Q302. This same source is also connected through Selector Switch S401 to provide a switch source to either the AM section or the remaining FM areas. With S401 in the AM position, +12V is applied to the AM section of the receiver and through R306 and D302 to pin 14 of IC301 for muting. With S401 in the FM position, +12V is applied to the FM RF and the Mixer-Oscillator sections as well as being applied through R142 to the base of the Mute Switching Transistor, Q106. With S401 in either Phono or Aux position, +12V is applied through R312 and D302 to pin 14 of IC301 for muting.

The +12V source also provides an unswitched source to supply the audio output delay circuitry which contains P channel FETS, Q603 and Q604 also switching transistors Q605 and Q606. This circuit is connected to the outputs of the left and right channels of the Pre-Amp section. The purpose of the circuit is to delay, for a brief period, any signal from reaching the speakers when the unit is first turned on. This is necessary due to the transient voltages that are present in the circuit immediately after power is applied. If the audio signal were allowed to pass immediately through to the amplifier section and then to the speakers, the transient voltages may be amplified and cause objectionable noise from the speaker, or damage them.

The following is a description of how the Delay Stage circuitry performs its function. When power is first applied (S501-E closed) to the unit, +12V is dropped through R613 to the base of switching transistor Q605, turning the transistor On. With Q605 on, the collector will drop to near ground. The collector of Q605 is connected to the gates of P-channel FETS, Q603 and Q604, so that a drop to near ground on the collector of Q605 will cause a no bias state to exist from gate to source of both Q603 and Q604. P-channel FETS in a no bias state will act as low resistance values. Therefore, when the unit is first turned on, Q603 and Q604 exhibit low resistance and passes an audio signal from the left or right channel to ground. Since supply voltage is now applied to the Delay Circuitry, capacitor C614 begins to charge through R616 at a rate determined by the RC time constant. When C614 reaches a positive potential that becomes sufficient to forward bias the switching transistor Q606, the voltage on the collector of Q606 will drop to near ground potential. The collector of Q606 is connected directly to the base of Q605 so that the drop in collector voltage on Q606 will remove bias from Q605 and turn the transistor off. With Q605 off, the supply voltage will be applied through R612 to the gates of the P-channel FETS, Q603 and Q604. This positive voltage on the gates of Q603 and Q604 will cause the FETS to become very high in resistance, similar to an open switch. The audio signal from the preamp circuits is no longer passed through the FETS to ground, but passes directly through the audio amplifier stage to the speakers. Diode D605 is placed in the delay circuit to shorten the discharge time of C614.

AM Section

With the Function/Selector Switch in the AM position, supply voltage from the +12V switched source is applied to the AM section of the receiver (for a discussion of the +12V switched and unswitched source, see the Power Supply and Audio Delay Circuit Description). With +12V applied, the AM RF amplifier, Q201, becomes forward biased. When an AM station is selected, the input signal from the AM antenna, T201, is coupled through C202 to the base of Q201. The gain of Q201 is controlled by an AM RF AGC voltage applied to its base from the anode of the detector diode D202. Detector Diode, D202, rectifies the signal from AM IF transformer, T204, and developes a negative voltage which is proportional to the signal strength. This negative voltage is applied through the filter components, R213, C211, and R212 to C210 where it is filtered and also subtracts from the positive potential present at C210. This lower positive potential is applied through R201 to the base of Q201 and is used for RF AGC. As the signal strength increases, the positive potential on the base of Q201 will decrease causing a reduction in gain. Under a no signal condition the voltage at the anode of D202 will become the slightly positive voltage drop of the diode itself. This voltage will no longer subtract from the positive potential present at C210 and the voltage on the base of Q201 will become more positive, allowing the RF amplifier to operate at maximum amplification. When the bias voltage on the base of Q201 is varied, it will cause the emitter voltage to vary also (emitter voltage follows base voltage). The voltage change on the emitter will be felt through the filter network R209, C208 and T203B to the base of the AM IF amplifier, Q203, affecting its gain. Therefore, the AGC voltage affecting the gain of Q201 will affect the gain of Q203 which provides less distortion.

The amplified signal at the collector of Q201 is applied to the base of Q202, the AM Converter, through C204. The AM Converter combines the RF signal from the AM antenna with the AM oscillator signal of T202 to produce the 455 KHz IF signal. The frequency of the AM oscillator is varied by the variable tuning capacitor C201, to operate 455 KHz above the incoming RF signal's frequency. The output of the AM converter is coupled from the center-tap of T202 through C207 to the emitter of the AM Converter Q202, where it is mixed with the incoming RF signal. The output present at the collector of Q202 consists of the sum and difference frequencies as well as both of the original input signals. The difference frequency (455 KHz) is passed through the tuned IF transformer T203A,B. From the center-tap of T203B the 455 KHz IF signal is direct coupled to the base of the AM IF amplifier Q203. From the collector of Q203, the amplified 455 KHz signal is applied directly to the AM Detector circuitry, consisting of IF transformer T204 and detector diodes D201 and D202. The detected audio signal is coupled through R215 and C215 to the Function/Selector Switch S401. The signal from the anode of D202 is also used for RF AGC as mentioned earlier. The detected audio signal from D201 is filtered by R214 and C213 resulting in a positive potential proportional to the signal strength. This potential is applied to the positive side of the Signal Meter through S401 when the Function/Selector Switch is in the AM position. The negative side of the Signal Meter is placed to ground. The potential connected across the Signal Meter causes the needle to deflect to the right by a distance directly proportional to the signal strength.

FM Section

With the Function/Selector Switch in the FM position supply voltage from the +12V switched source is applied to the FM RF Amplifier, the FM oscillator and the FM Mixer. For a discussion of the +12V switched and unswitched sources, see the Power Supply and Audio Delay Circuit Description.

When an FM station is selected, the input signal from the FM antenna is coupled to the base of the RF amplifier, Q102. This stage is tuned to the frequency of the incoming RF signal by the tuned circuits in the base and collector of Q102. Bias is supplied to the base of Q102 through a voltage divider network formed by R145, R101, R135 and the circuitry at pin 15 within IC101. The gain of Q102 is controlled by the RF AGC voltage applied to its base. Under a no signal condition, the AGC circuitry within IC101 establishes a positive voltage of approximately 5.7 volts at pin 15. Due to the divider action of R135, R101 and R145, the base bias of Q102 is set to provide maximum gain. When a strong signal is received, the AGC circuitry within IC101 establishes a less positive voltage at pin 15 of IC101. Due to the divider action under these conditions the base bias of Q102 is reduced, which will in turn reduce the gain of the stage. The amplified signal present at the collector of Q102 is coupled through C137 to G1 of the FM Mixer Q103. Q103 is a N-channel, Dual-Gate, MOS Field Effect transistor with gate to source diode protection. A MOSFET combines a high input impedance and a very high signal-to-noise ratio with relatively high power gain. The output of the FM oscillator Q101 is coupled through C111 to G2 of the Mixer Q103. The FM osillator runs 10.7 MHz above the incoming RF frequency. The Mixer circuit combines this oscillator signal with the selected RF signal to produce a 10.7 MHz IF signal. The 10.7 MHz IF signal present at the drain of the Mixer Q103 is coupled through an FM IF transformer, T101 and is amplified by the FM IF amplifier Q104. The output of Q104 is coupled from its collector to CF101, the first of a matched pair of ceramic IF filters. From CF101 the signal is coupled through R119 and C121 to the Second IF amplifier Q105 base. The IF signal present at Q105's collector is then passed through the second ceramic IF filter CF102 via R125 to the IF inputs of IC-101. The use of ceramic filters in place of a tuned inductance increases the selectivity of the IF section.

Further IF amplification and FM detection are the primary functions of IC101. However, pins on IC101 also provide outputs for the FM Center-Tune Meter and Mute control. The audio output of IC101 is applied to the Stereo Demodulator IC301.

The following is a brief pin by pin summary of IC101. Pins 1,2, and 3 are the IF inputs. The 10.7 MHz IF signal is coupled from CF102 directly to pin 1 through R126 to pin 3 and from there through Bypass Capacitor C125 to pin 2. Pin 4 is ground. Pin 5 is the Mute control output and is directly connected to the Mono Switch S403. When S403 is placed in the "ON" position and the Function/Selector Switch S401 is placed in the "FM" position, the output voltage at pin 5 of IC101 is placed to near ground potential through the Mute Switch Transistor Q106. This action disables the mute circuitry within IC101 allowing low level monaural as well as stereo signals to be amplified. Pin 6 is the audio output of IC101. From Pin 6 the composite audio signal from IC101 is coupled through compensating coil L109 and C136 to the Stereo Demodulator IC301 Pin 2. Pins 7 and 10 of IC101 are connected across the Center Tuning Meter to allow for FM center tuning. Pin 10 is a reference voltage established by the circuits within IC101. When the positive DC voltage at pin 7 equals the positive DC voltage of pin 10 the meter needle will be in center position. As the receiver is tuned off station, the voltage at pin 7 will vary more positive or less positive depending upon the direction that the receiver dial is tuned. When the DC voltage between pin 7 and pin 10 varies, the meter will deflect off center. Pin 8 is the IF output of IC101. The IF signal from pin 8 is shifted 90 degrees by L107 and the quadrature coils T102 and T103 to develope the input for pin 9 of IC101. Quadrature detection is performed by circuitry within IC101 and pin 9 is the input to the detector circuits. Pin 11 is the B+ input for IC101. Pin 12 is the mute logic output which sets the mute level for an incoming signal. Pin 13 is used for the Signal Meter. When the Function/Selector Switch is placed to the "FM" position the Signal Meter will receive a positive potential from pin 13 through D102, voltage divider network R140 and R143 causing a deflection. The amount of deflection is proportional to the strength of the incoming signal. Pin 14 is connected to ground. Pin 15 is the RF AGC output as mentioned earlier.

The Stereo Demodulator IC301 performs several functions. The output signals are determined by the presence or absence of voltages at various pins on the chip.

The following is a brief pin by pin summary of the Stereo Demodulator IC301. Pin 1 is used for connection of the B+ voltage. Pin 2 is the input terminal. The composite audio signal from pin 6 of IC101 is coupled to pin 2 through the filter network C135, L109 and C151. Capacitor C136 keeps any DC potential on this line from affecting pin 2 of IC301. Pin 3 and pin 11 are used for phase compensation. Capacitor C301 between pin 3 and pin 11 causes a phase shift in the regenerated 38 KHz subcarrier so that it is reproduced in phase with the suppressed carrier. Pin 6 is connected to the cathode of the Stereo Indicator, LED, D301. The anode of D301 is connected to a positive voltage developed by the voltage divider network of R602 and R603. The internal circuitry of IC301 which connects to pin 6, functions as an electronic switch. During non-stereo operation, this internal switch acts as an open circuit and the Stereo Indicator does not light. When a stereo signal is present, the internal circuitry connected to pin 6 acts like a closed switch, connecting pin 6 to ground and forward biasing D301. In this condition, the stereo indicator will light, indicating that a stereo signal is being received. Pin 7 is ground. Pins 8 and 9 are used for external Monaural/Stereo Switch with C308 as the switch filter capacitor. When the Mono Switch S403 is placed in the "ON" position, a ground is applied to pin 8 of IC301. With this ground potential on pin 8, all input signals will be reproduced monaurally at pins 4 and 5.

At pin 10 of IC301 is the 19 KHz output signal. A frequency counter may be connected to this point to measure the oscillator free-running frequency for alignment. Pins 12 and 13 contain the phase-lock loop filter components R303, C310 and C311. Pin 14 is the oscillator timing network, C312, R307 and the 19 KHz oscillator adjust R308. When the Mono Switch S403 is placed in the "ON" position pin 14 is grounded disabling the 19 KHz oscillator.

Audio is available from the Stereo Demodulator IC301 at pins 4 and 5. For monaural operation, the same information is present at both outputs. During stereo operation, right channel information is present at pin 5 and left channel information is present at pin 4. From pins 4 and 5 of IC301, the audio is passed through identical but separate audio channels. Because the channels are identical, only the right channel circuits will be discussed.

From Pin 5, the right channel output signal is coupled through the 19 KHz and 38 KHz filter network L302 and C314. From L302, the signal is coupled via C305 to the base of FM Preamplifier Q302. FM preamplifier Q302 and its associated circuitry, boosts the FM audio signal to insure fullpower output in the FM mode. The output signal from the collector of Q302 is coupled through C322 to the Function/Selector Switch S401.

Auxiliary/Phono Input Circuitry

The Auxiliary and Phono input circuitry is designed with a high input impedance and a low output impedance. This prevents loading of the source and also ehlps eliminate hum and noise.

Since the input circuitry for the left and right Aux. input jacks is identical, only the right channel will be discussed. The input impedance (approximately 100K ohms) of the emitter follower, Q401, is determined by R401 and R405. An emitter follower exhibits the high input and low output impedance that is desired for impedance matching. The Aux. input signal applied to the right input jack is coupled through C401 and R409 to the base of Q401. The output of the emitter follower is applied to the Function/Selector switch, S401, through C413.

The input circuits for the left and right channel Phono jacks are also identical, therefore, the right channel will be discussed. The input signal from the right Phono jack is coupled through C403 and R411 to pin 5 of IC401A. Phono preamplifier, IC401 (a Dual Operational Amplifier), provides a high input impedance and a low output impedance as did the emitter follower mentioned above. Since the input impedance of the IC alone is in the meg ohm range, R403 and R407 are incorporated to bring the input impedance down to approximately 50K ohms, which is an acceptable input impedance for magnetic cartridges. The operational amplifier, IC401 is used in the Phono input circuitry because the signal level at the Phono jacks is extremely low. Operational amplifier IC401A employs RIAA compensation which is formed by the feedback network consisting of R417, R419, C407, C409, C405 and R415. The amplified signal is coupled from pin D of IC401 through C411 to the Function/Selector switch (S401).

From the Function/Selector Switch, the right audio signal is passed to the two right Tape Record jacks and the Tape Monitor Switch S402. The Tape Monitor Switch can accommodate two tape recorders through jacks "A" and "B". With the Tape Monitor Switch in the "Source" position, the right channel signal is passed directly through the Monitor Switch and R425 to the Volume Control R450A. The Tape Monitor Switch allows the operator to monitor the audio signal while recording it with an externally connected three-head tape recorder. By connecting the inputs of the tape recorder to the Tape Record jacks of the receiver and connecting the output of the recorder to the same letter Tape Play jacks ("A" or "B"), the receiver is set to monitor the recording of the audio signal. Placing the Monitor Switch S402, in either "A" or "B" position causes the audio signal to be directed through the respective Tape Record jacks, "A" or "B", into the recorder. Also, due to the action of Tape Monitor Switch S402, the volume controls and output stages are no longer connected to the audio signals present at the Tape Record jacks, but are now connected to the Tape Play jacks. From the recorder, the signal is passed through the Tape Play jacks to the audio circuitry within the receiver and from there to the speakers. The Monitor Switch S402, may be in either the "A", "B" or Source position during recording and there will be no affect on the recorded signal. However, the Tape Monitor Switch S402, must be in either position "A" or "B" while playing back a tape. When the Mono Switch is placed in the "ON" position, the right channel signal is combined with the left channel signal through the switching action of S403. The right channel audio signal is also applied to the filter network of R427 and C417. This network is connected to the Loudness Switch S404.

When the Loudness Switch is placed in the "ON" position the filter network in conjunction with C415 and R429 will provide Bass and Treble boosting at low volume setting. This is necessary because at low volume levels, the human ear has a tendency to hear midrange signals as being louder than high and low frequency signals. With the Loudness Switch in the "OFF" position, the filter network of R427 and C417 is disconnected from the circuit and the right channel audio signal is passed on to the Volume Control R450A. A tap on the Volume control R450A, is connected to another filter network consisting of C415 and R429. When the Loudness switch is in the "Off" position C415 is shunted by a switch contact. This action places R429 in parallel with the resistance of R450A (below the center tap), effectively lowering the resistance of this portion of the Volume control. Volume control, R450A, being purely resistive, now attenuates the low, midrange and high frequencies equally at any setting of the Volume control. When the Loudness switch is placed in the "On" position, C415 is no longer shunted, but is placed in series with R429. The other filter network consisting of R427 and C417 is placed in parallel with the top half of the Volume control. The Volume Control/Loudness Circuit is now resistive and capacitive. Because of the component values used, the Volume control above the center-tap is relatively unaffected, while the portion of the Volume control below the center-tap now contains boosted high and low frequencies.

Tone Control and Audio Output Circuitry

The Tone control circuitry is used to vary the frequency content of the signal being amplified. The Bass and Treble controls change the level of the low and high frequencies that are present in the signal applied to dual operational amplifier, IC403. With the Bass and Treble controls set at the flat (center) position, the signal at each input of IC403 will consist of low, midrange and high frequencies at approximately the same relative level. Varying the Bass control can raise or lower the level of the low frequencies in the signal present at it's wiper. This is done by attenuating the low frequencies more or less than the mid-range frequencies. The Treble control works basically the same as the Bass control except that it varies the level of the high frequencies in the signal. The Op Amp, IC403, provides the gain necessary to offset any attenuation caused by the Bass and Treble controls.

Since the left and right channels of the Tone circuitry are identical, only the right will be discussed. From the wiper arm of the Volume control, R450A, the signal is coupled through C419 to pin 3 of operational amplifier, IC402A. From pin 1 of IC402A, the amplified signal is coupled through C423 to the Tone control circuitry. A portion of the signal at pin 1 is fed back to pin 2 via R435, R433 and C421. This feed back network determines the gain and frequency characteristics of Op Amp, IC402A. From C423 the signal is applied to Treble control R451A and through R437 to the Bass control, R452A. From the junction of R439 and R441, the signal is then coupled directly to pin 6 of operational amplifier, IC403A. The frequency content of the signal at the junction of R439 and R441 is determined by the settings of the Bass and Treble controls. This is accomplished by changing the RC

networks contained in the Bass and Treble circuits as the wipers are moved from one end of the controls to the other. The tone compensated signal applied to pin 6 of Op Amp IC403A is amplified, inverted and then coupled from pin 7 through C501 and R501 to the Balance control (R453) and the audio output stage. The Balance control determines the amount of audio signal that will be present in the output stage of each channel. By varying the Balance control to the right or left of center, the operator can decrease the volume of one channel without affecting the volume of the other channel.

Hi-Cut Filter Switch S405, is used to reduce the noise from scratchy records, tapes and FM hiss. This is accomplished by C503 filter being placed to ground when the Hi-Cut Filter is placed in the "FILTER" position allowing the high frequencies to be reduced.

From pin 7 of IC403A, the right channel audio signal is coupled through C501, R501, R531 and C505 to the base of Q501. Transistors, Q501 and Q503, form a differential amplifier whose gain and frequency response are determined by the feedback network in the base circuit of Q503. The degenerative feedback from this network results in less distortion and an improved frequency response in the output stage. This differential amplifier configuration also allows for a near zero volt DC feedback line from the speakers, through L501 and R513 to the base of Q503. Dropping resistors, R513 and R511, form a voltage divider network whose ratio determines the audio gain of the differential amplifier. Capacitor C511 is placed in series with R511 to maintain 100% DC feedback and stabilize the output while allowing R513 and R511 to divide the AC feedback proportionally. The output of the differential amplifier is direct coupled from the collector of Q501 to the base of Q505, a common emitter configuration that amplifies and inverts the signal. The output from the collector of Q505 is applied to the base of Q513 (via R549) and the VBE Multiplier circuitry containing Q507. The VBE Multiplier provides temperature compensated bias to the output stage to prevent thermal overload of the output circuits. The VBE multiplier acts as a low resistance to AC signals and will pass the signal from the Q505's collector directly to the base of Q515. The VBE multiplier also establishes the DC bias required by the output circuits, so the AC signal on the base of Q515 will be offset from the AC signal on the base of Q513 by the DC voltage from collector to emitter of Q507. Transistors, Q513 and Q515, are arranged in conjunction with the audio output transistors (Q517 and Q519) to form a quasi-complementary symmetry configuration. The audio output is taken from the junction of emitter resistors, R541 and R543. The signal is then coupled through L501 to the Power/Speaker Switch (S501) and through L501 and R547 to the Headphone jack.

Diodes, D509 and D511 are safety devices that protect the output stage from any inductive kick that may result from an open in the speaker circuitry. Capacitor C517 (called a bootstrap capacitor) is employed to prevent distortion of the right channel audio output signal during high level negative peaks. It essentially tracks the audio output line and becomes a temporary negative source during the high level negative peaks by adding it's negative charge to the peaks. This temporary source voltage is applied through R521 to the base of Q515. The charge on C517 provides enough bias on Q515 to allow sufficient base current to flow at all times. Therefore, Q515 never shuts completely off on the high negative peaks of the audio signal. Zener diode, Z501 is used as a filter to eliminate the normal charge time associated with capacitors which could cause objectionable noise or popping in the output circuits.

Protection Circuit

Since both channels of the audio driver circuits are the same, only the right channel will be covered. The output protection circuit consists of Current Limiting resistors R541 (top half) and R543 (Bottom half), Drive Current Clamps Q509 and Q511, Voltage Divider resistors R533, R535 and R527, Opening resistors R553 and R555, Neutralizing capacitors C521 and C519, and finally D501, D503, D505 and D507.

Resistors R553 and R555 are intended to open circuit under certain failure modes and removes DC voltage from the output, thereby, preventing fire in the speakers. Diodes D503 and D501 prevent Back Bias breakdown of Current Clamps Q509 and Q511 during normal operation. Capacitors C521 and C519 prevent Q509 and Q511 from oscillation during current limiting.

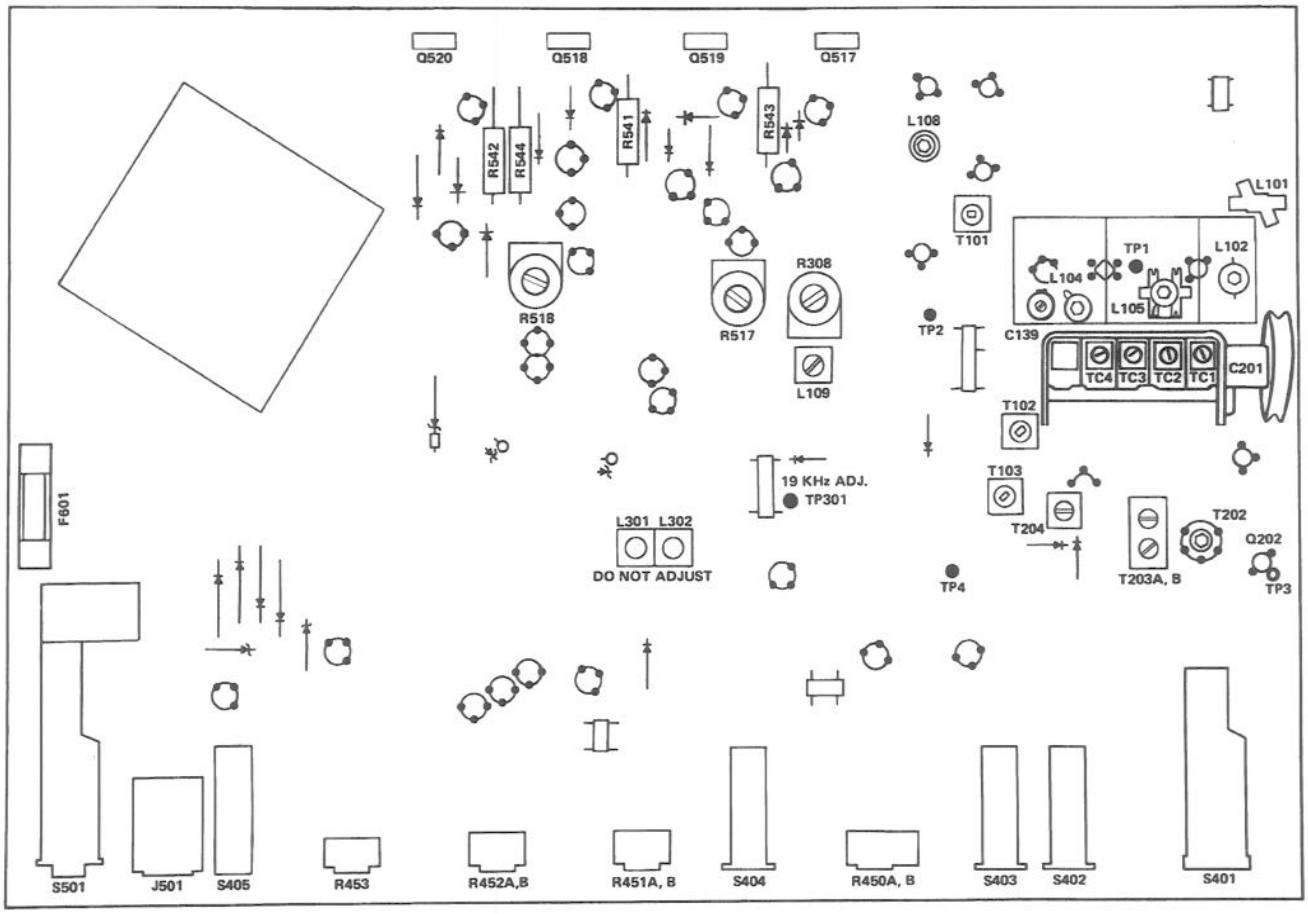
The top and bottom halves operate in a similar manner and only the top half will be described. Load current through R541 causes a voltage to be developed across this resistor and applied to the base-emitter junction of Q509 through the voltage divider R533, D507 and R527. With normal load impedance of 8 ohms there is insufficient current through R541 to bias Q509 on. The output is then voltage limited by the power supply voltage to slightly more than the rated output.

If the load impedance is changed to 4 ohms the current limiting circuit begins to operate on the peaks and then the amplifier is current limited. This type of circuit limiting is known as "Load Line Limiting". The output power into 4 ohms will be at least as great as into 8 ohms but will be current limited instead of voltage limited.

If the load is reduced further, the current will be limited to even lower values. The extreme case is to have the output short circuited to ground. In this case the output voltage is of course held at zero and the current is limited to its lowest value. This is so because when the output voltage is zero none of the current through R533 will be bled through D507 and R527, instead the current will turn Q509 on at a lower output current. When Q509 is turned on the drive current from the base of Q513 is shunted to the output, limiting the emitter current of Q513 to just enough to drive the base of Q519 until its emitter current is enough to turn Q509 on.

At other loads, such as 2 ohms, some output voltage will be present when current limiting takes place causing current to flow in R533, D507 and R527. This will allow the load current to increase to more than the short circuit condition.

ALIGNMENT REFERENCE GUIDE



ALIGNMENT AND ADJUSTMENTS

CAUTION: BEFORE ATTEMPTING TO ALIGN THIS RADIO CHASSIS, READ THE PROCEDURE TO ASSURE THAT ALL TEST EQUIPMENT IS AVAILABLE.

Test Equipment Required:

AC VTVM, DC VTVM
Frequency Counter
AM Sweep Generator
19 KHz/38 KHz Filter
Oscilloscope (with Detector Probe)
Distortion Analyzer
50 ohm-300 ohm Matching Transformer with 1:1 voltage ratio.
Sound Technology - Model 1000A (or equivalent) FM Alignment Generator

Note: The RF shields should not be removed during alignment.
Note: When tuning the receiver to a specific frequency, set the dial pointer at the center of the desired number. For example, when tuning to 106 MHz, set the dial pointer at the center of the "0".

FM IF ALIGNMENT

1. Place the Function/Selector Switch in the FM position and tune the receiver to an unused frequency near 98 MHz.
2. Connect a 10.7 MHz sweep input at 60 mv to TP1 and preset L108 to maximum inductance. (**Note:** To preset L108 to maximum inductance, screw it's core into the winding so that the top of the core is even with the top of the winding.)
3. Connect an oscilloscope with detector probe to TP2.
4. Tune T101 for maximum output and symmetry.

FM DETECTOR ALIGNMENT

1. Tune the radio to an unused frequency near 98 MHz.
2. Set the slug of T103 flush with the top of it's can.
3. Adjust T102 to center the tuning meter.

FM DISTORTION ALIGNMENT

1. Connect an FM signal generator with a 98 MHz mono signal at 1000 uV, modulated with 1 KHz at ± 75 KHz deviation, through a 50 to 300 ohm matching transformer to the 300 ohm FM antenna terminals.
2. Tune the receiver to 98 MHz and place the Mono switch in the "On" position. Make sure that the center tune meter is indicating center.
3. Connect a distortion analyzer to the A speaker system right channel terminals.
4. Tune T103 for minimum mono distortion in the right channel.
5. Modulate the FM generator with a right stereo signal and connect a 19 KHz/38 KHz filter in series with the distortion analyzer. Place the Mono switch in the "Off" position.
6. Tune L108 counterclockwise for minimum stereo distortion.
7. Monitor the Speaker System A left channel output with an AC VTVM while modulating the right stereo signal.
8. Tune L109 for minimum output in the left channel.

FM RF ALIGNMENT

1. Connect an FM signal generator of 106 MHz with 1 KHz modulation, 75 KHz deviation through a 50-300 ohm matching transformer to the 300 ohm FM antenna terminals.
2. Connect an oscilloscope to the Speaker System A right channel terminals, place the Mono switch in the "On" position and tune the receiver dial to 106 MHz. Set the output of the FM signal generator to below limiting as indicated on the oscilloscope.
3. Adjust C139 and the two FM trimmer capacitors (TC1 and TC3) for maximum output as indicated on the oscilloscope.
4. Reset the FM signal generator for 90 MHz with 1 KHz modulation and 75 KHz deviation.
5. Tune the receiver dial to 90 MHz and adjust the FM RF and oscillator coils (L102, L104 and L105) for maximum output as indicated on the oscilloscope.
6. Repeat steps 1 through 5 until no further improvement can be obtained.

FM STEREO ALIGNMENT

1. Tune the receiver to an unused frequency near 98 MHz and be sure that the Mono switch is in the "Off" position.
2. Connect a frequency counter through a 10K ohm resistor to the 19 KHz Test Point, TP301, (pin 10 of IC301) and adjust R308 for 19 KHz ± 50 Hz.

AM IF ALIGNMENT

1. Place the Function/Selector switch in the AM position and tune the receiver to a point of non interference at the extreme low end of the band.
2. Using the AM Sweep Generator, inject a 455 KHz RF signal at 30 mV, through a 100K ohm resistor to TP3 on the base of the AM Converter, Q202.
3. Connect an oscilloscope to TP4.
4. Align T203 and T204 for maximum output and symmetry.

AM RF ALIGNMENT

1. Short the AM antenna primary to ground with a clip lead.
2. Connect an oscilloscope to the Speaker System A right channel terminals (for peak tuning, an AC VTVM may also be connected to the speaker terminals.). Tune the receiver to 1400 KHz on the dial.
3. Using an RF signal generator, radiate a 1400 KHz signal using a standard AM loop antenna. (The output of the generator should be as low as possible while maintaining a usable indication on the oscilloscope.)
4. Adjust the AM oscillator trimmer capacitor, TC4, for maximum output.
5. Tune the receiver to 600 KHz on the dial and reset the generator for 600 KHz.
6. Adjust the AM oscillator coil, T202, for maximum output.
7. Repeat steps 2 through 6 until no further improvement can be obtained.
8. Remove the clip lead from the AM antenna.
9. Tune the receiver to 1400 KHz and radiate a 1400 KHz signal from the RF generator.
10. Adjust the AM antenna trimmer capacitor, TC2, for maximum output.
11. Tune the receiver to 600 KHz on the dial and adjust the RF generator to 600 KHz.
12. Adjust the AM rod antenna for maximum output.
13. Repeat steps 9 through 12 until no further improvement can be obtained.

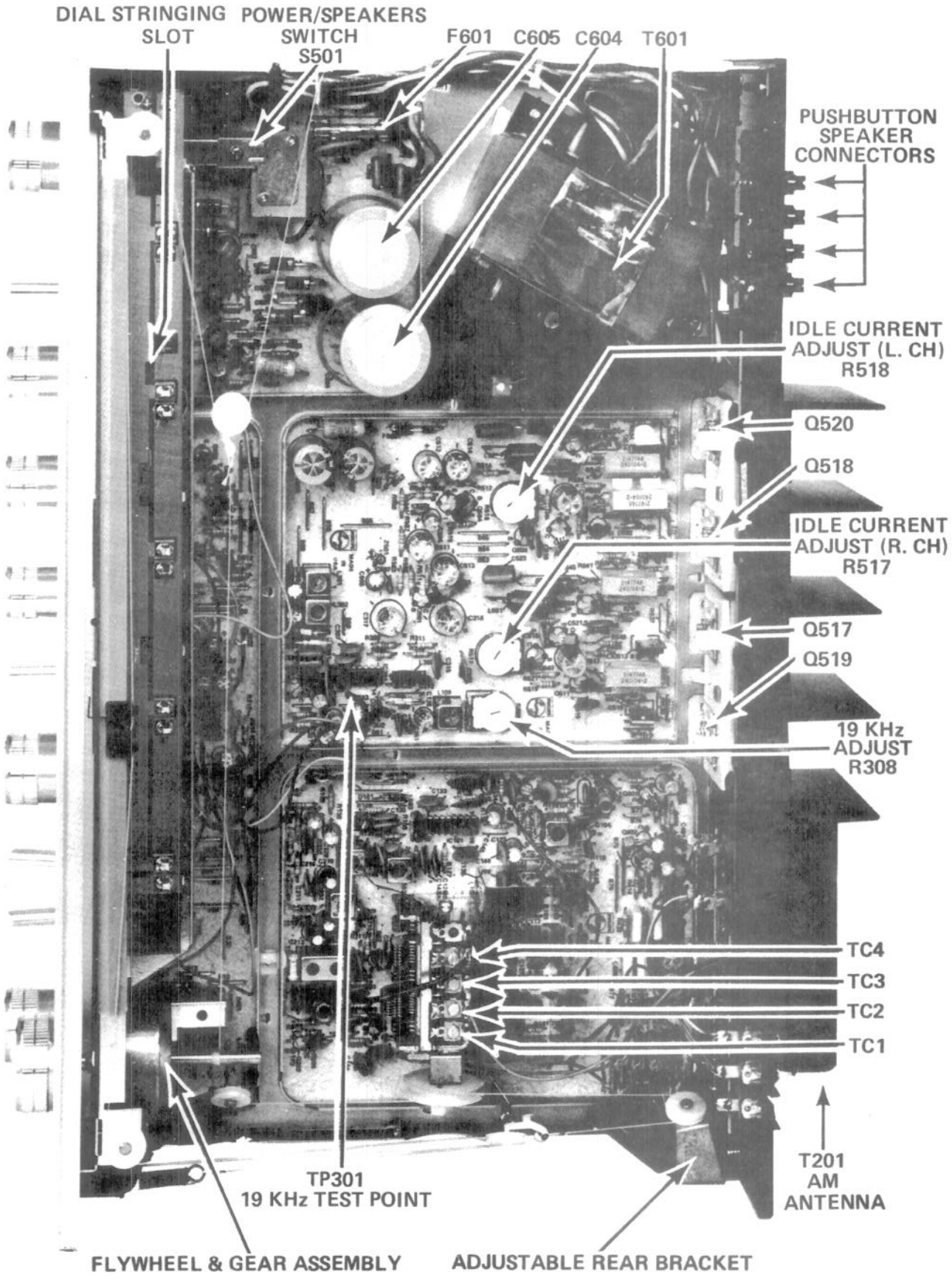
IDLE CURRENT ADJUSTMENT

Note: This adjustment must be performed while the unit is cold, therefore, the unit must have been turned off for at least one hour before this adjustment is attempted.

1. With no signal applied, connect a DC VTVM across R541 and R543 in the right channel output stage.
2. Adjust R517 until a reading of 20 mv ± 5 mv is obtained.
3. With no signal applied, connect a DC VTVM across R542 and R544 in the left channel output stage.
4. Adjust R518 until a reading of 20 mv ± 5 mv is obtained.

Note: This adjustment must be performed in the affected channel when any of the output transistors covered by note 9 on the schematic are replaced. Misadjustment may cause crossover distortion or premature failure of the output transistor(s).

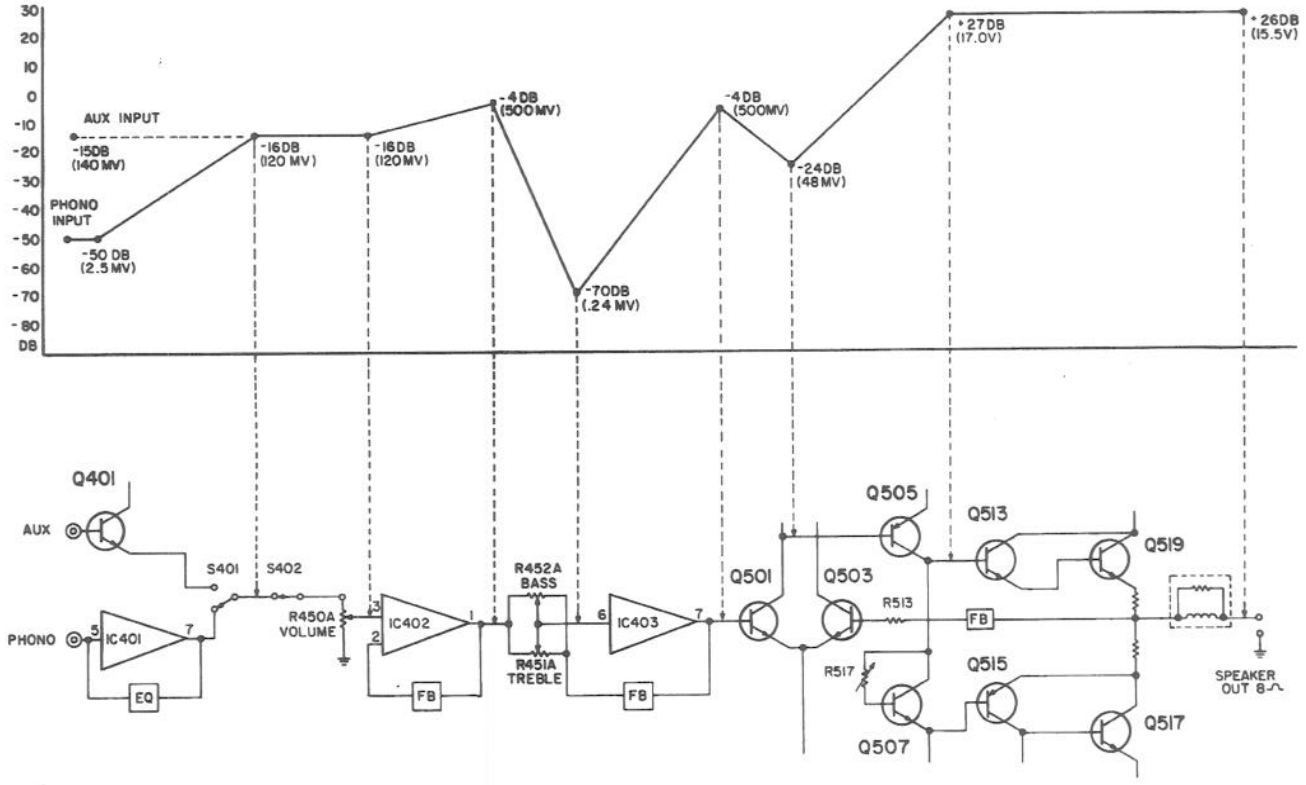
CHASSIS (TOP VIEW)



GAIN DIAGRAM

Test Equipment Required:

Audio generator with variable output
AC VTVM
8 ohm, 100 Watt load resistors - 2 used
Shielded test cables.



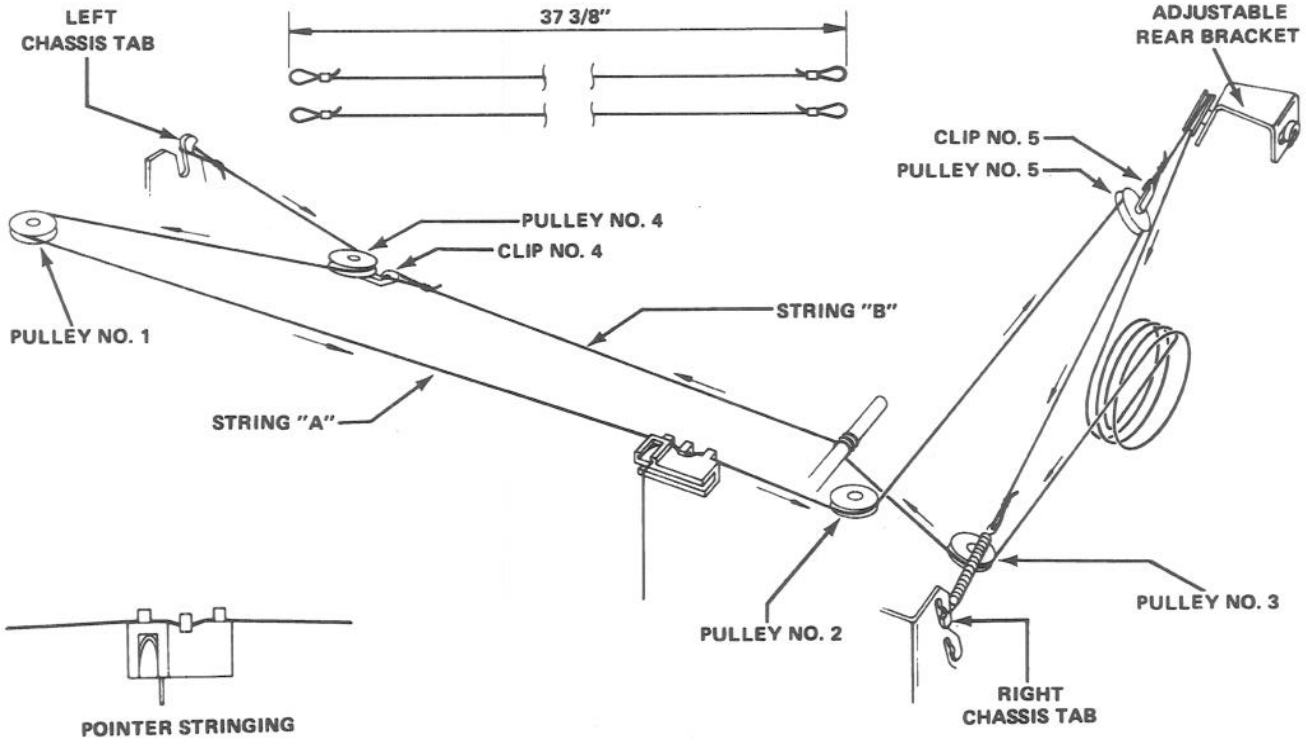
NOTES:

1. 8 ohm, 100 watt load resistors connected to left and right speaker-A outputs.
2. Tone Controls set for flat response (12 o'clock setting).
3. Balance control set to middle position.
4. Volume control fully clockwise (max.)
5. Power/Speakers switch to speaker-A position.
6. Selector Switch in PHONO or AUX position, depending upon test being performed.
7. High filter, Loudness, Mono switches off, and Monitor switch to SOURCE position.
8. 1000 Hz tone at 2.5 mV (-50 dB), applied to the Phono Input jacks for phono gain test.
9. 1000 Hz tone at 140 mV (-15 dB), applied to the Aux Input jacks for Aux gain test.
10. 0 dB is equal to .775 VRMS, each 6 dB change indicates a doubling or halving of the signal level.
11. All measurements are made with respect to ground.

DIAL STRINGING PROCEDURE

1. Slide the rear pulley bracket as far forward as possible and secure it to the chassis.
2. Rotate the tuning gang to the open (minimum capacitance) position.
3. Hook the tension spring to the lower right hand chassis tab.
4. Place Pulley No. 4 (with Clip No. 4 inserted) in the stringing slot located on the light P.C. board near the second dial lamp from the left.
5. Hook Pulley No. 5 (with Clip No. 5) to one end of string "B" and set both aside until called for.
6. Hook one end of string "A" to the left hand chassis tab and loop the string around Pulley No. 4 (which is to remain mounted in the light P.C. board).
7. From Pulley No. 4, loop string "A" around Pulley No. 1; around Pulley No. 2 and hook it's end loop to the free end of the tension spring.
8. Hold string "A" tight at the position of Pulley No. 5 (shown in diagram) and place Pulley No. 5 in the resulting loop.
9. Take string "B" (attached to Clip No. 5) and loop it over and around the pulley on the adjustable rear bracket.
10. From the rear pulley, loop string "B" over and around the gang pulley counterclockwise for 2¼ turns; then slip the string through the slots in the rim of the gang pulley and loop the string counterclockwise again for 1¼ more turns.
11. From the gang pulley, loop string "B" around Pulley No. 3 to the flywheel shaft.
12. Loop string "B" under and around the flywheel shaft (approximately 3-4 turns) until the end loop of string "B" just reaches Clip No. 4 of Pulley No. 4 (located on light P.C. board). Leave Pulley No. 4 (with Clip No. 4) mounted in the stringing slot on the light P.C. board and hook the end loop of string "B" to Clip No. 4.
13. Loosen the screw on the adjustable rear bracket. Remove Pulley No. 4 (with Clip No. 4) from the slot in the light P.C. board and take up any dial string slack by moving the rear bracket backward. When the desired tension is achieved, tighten the rear bracket screw.
14. Turn the tuning gang from one end of the dial to the other and observe the 3½ turns of string looped around the gang pulley. Make sure that the dial string does not overlap and cause entanglement.

DIAL STRINGING DIAGRAM



REPLACEMENT PARTS LIST

Note: When ordering replacement parts please specify the part number as shown in this list including Description, Chassis, and Model Number. Complete information will help expedite the order. Replacement parts may occasionally differ in part number or value from the Factory installed part. In either event the replacement part has been chosen to provide equal or improved performance.

REF.	DESCRIPTION	PART NO.
	COILS & TRANSFORMERS	
CF101,102	10.7 MHz IF Filter*	361479-0009
L101	FM Antenna	361108-0001
L102	FM RF Coil	361080-0006
L103	Choke, 3.3 uh	361425-0339
L104	FM Oscillator Coil	361101-0001
L105	FM RF Coil Adjustable	361536-0001
L107	Coil, 22 uh (AA,BA Versions Only)	361475-0220
L107	Coil, 27 uh (CA Version Only)	361475-0270
L108	FM Phasing Coil	361515-0002
L109	FM Compensation Coil	361546-0004
L110	Coil, 100 uh	361324-0101
L301	Fixed Inductor, 58 mh	361546-0003
L302	Fixed Inductor, 58 mh	361546-0003
L303	Choke, 3.3 uh	361425-0339
L501	Audio Choke	361091-0020
L502	Audio Choke	361091-0020
T101	FM IF Coil, 10.7 MHz	361433-0001
T102	Quadrature Coil, 10.7 MHz	361433-0005
T103	Quadrature Coil, 10.7 MHz	361433-0005
T201	AM Antenna	361314-0001
T202	AM Oscillator Coil	361031-0003
T203	AM IF Transformer	361357-0001
T204	AM Transformer	361315-0004
T601	Power Transformer	300361-0001
	CAPACITORS	
C101	Ceramic, 47 pf., 10%, 500V	250551-4709
C102	Mica, 82 pf., 10%, 100V	250607-1947
C104	Ceramic, 8.2 pf.,10%,500V,NPO	250546-8299
C105	Ceramic, 5.6 pf., 5%, 500V,NPO	250546-5695
C106	Ceramic, 1000 pf.,10%,500V	250551-1029
C107	Ceramic, 1000 pf.,10%,500V	250551-1029
C108	Ceramic, 6.8 pf.,5%,500V,NPO	250546-6895
C109	Ceramic, 1000 pf.,10%,500V	250551-1029
C110	Ceramic, 10 pf.,5%,500V,NPO	250546-1005
C111	Ceramic, 22 pf.,10%,500V,NPO	250546-2209
C112	Ceramic, 12 pf.,10%,500V,N220	250666-1209
C113	Ceramic, 1000 pf.,10%,500V	250551-1029
C115	Ceramic, 15 pf.,10%,500V,NPO	250546-1509
C116	Ceramic, .01 mfd., 20%, 100V	250660-1002
C117	Ceramic, .01 mfd., 20%, 100V	250660-1002
C118	Ceramic, .01 mfd., 20%, 100V	250660-1002
C119	Ceramic, .01 mfd., 20%, 100V	250660-1002
C120	Ceramic, .01 mfd., 20%, 100V	250660-1002
C121	Ceramic, .01 mfd., 20%, 100V	250660-1002
C122	Ceramic, .01 mfd., 20%, 100V	250660-1002
C123	Electrolytic, 10 mfd., 35V	270109-1135
C124	Electrolytic, 10 mfd., 35V	270109-1135
C125	Ceramic, .05 mfd., +80-20%,100V	250660-1012
C127	Ceramic, .05 mfd., +80-20%, 100V	250660-1012
C128	Ceramic, .01 mfd., 20%	250554-1030
C129	Electrolytic, 1 mfd., 50V	270109-1050
C130	Ceramic, .01 mfd., 20%	250554-1030
C132	Ceramic, .01 mfd., 20%	250554-1030
C133	Electrolytic, 4.7 mfd., 50V	270109-5050
C135	Ceramic, 100 pf.,10%,500V	250551-1019
C136	Electrolytic, 2.2 mfd., 50V	270109-2050
C137	Ceramic, 120 pf.,10%,500V	250551-1219
C138	Ceramic, .01 mfd., 20%	250554-1030
C139	Trimmer, 21 pf.	360220-0005
C140	Ceramic, 1000 pf.,10%,500V	250551-1029
C141	Ceramic, .01 mfd., 20%, 100V	250660-1002
C142	Ceramic, 75 pf.,10%,500V,N150	250527-7505
C143	Ceramic, .01 mfd., 20%	250554-1030
C146	Ceramic, .01 mfd., 20%, 100V	250660-1002
C147	Ceramic, .01 mfd., 20%, 100V	250660-1002
C148	Ceramic, .01 mfd., 20%, 100V	250660-1002
C149	Ceramic, 75 pf.,500V, N150	250527-7505
C150	Ceramic, 3.9 pf.,± .25 pf. (AA & BA Versions Only)	250546-3997
C150	Ceramic, 3 pf.,± .25 pf. (CA Version Only)	250546-3097
C151	Ceramic, 220 pf.,10%	250551-2219
C154	Ceramic, 1000 pf.,10%,500V	250551-1029

REF.	DESCRIPTION	PART NO.
C201	Variable Tuning	260213-0002
C202	Ceramic, .01 mfd., 20%	250554-1030
C203	Ceramic, .01 mfd., 20%	250554-1030
C204	Polystyrene, .0022 mfd.	250551-2229
C205	Ceramic, .01 mfd., 20%	250554-1030
C206	Electrolytic, 4.7 mfd., 50V	270109-5050
C207	Ceramic, .01 mfd., 20%	250554-1030
C208	Electrolytic, 4.7 mfd., 50V	270109-5050
C209	Electrolytic, 1 mfd., 50V	270109-1050
C210	Electrolytic, 4.7 mfd., 50V	270109-5050
C211	Ceramic, 2200 pf.,10% (E.P. only)	250553-2229
C211	Ceramic, 3300 pf.,10%	250553-3329
C212	Ceramic, 1000 pf.,10%,500V	250551-1029
C213	Electrolytic, 4.7 mfd.,50V	270109-5050
C214	Ceramic, 2200 pf.,10%	250553-2229
C215	Electrolytic, 1 mfd., 50V	270109-1050
C216	Ceramic, 3.3 pf.,500V, N2200	250584-3396
C301	Ceramic, .05 mfd., +80-20%,100V	250660-1012
C302	Ceramic, 1800 pf.,10% (AA & BA Versions Only)	250551-1829
C302	Ceramic, 1500 pf.,10% (CA Version Only)	250551-1529
C303	Polyester, .015 mfd.,10% (AA & BA Versions only)	250581-1543
C303	Polyester, .012 mfd.,10% (CA Version Only)	250581-1243
C304	Electrolytic, .22 mfd.,50V	270134-2240
C305	Electrolytic, .22 mfd., 50V	270134-2240
C306	Polyester, .015 mfd.,10% (AA & BA Versions only)	250581-1543
C306	Polyester, .012 mfd.,10% (CA Version Only)	250581-1243
C307	Ceramic, 1800 pf.,10% (AA & BA Versions Only)	250551-1829
C307	Ceramic, 1500 pf.,10% (CA Version Only)	250551-1529
C308	Electrolytic, 1 mfd., 50V	270109-1050
C309	Ceramic, 470 pf.,10%,500V	250551-4719
C310	Electrolytic, .22 mfd., 50V	270134-2240
C311	Electrolytic, 1 mfd., 50V	270111-1050
C312	Polystyrene,470 pf.,5%	250637-4715
C313	Polystyrene,560 pf.,5%,60V	250637-5615
C314	Polystyrene,560 pf.,5%,60V	250637-5615
C315	Ceramic, .01 mfd., 20%	250554-1030
C316	Electrolytic, 100 mfd., 16V	270109-1215
C317	Electrolytic, 100 mfd., 16V	270109-1215
C318	Ceramic, .01 mfd., 20%, 100V	250660-1002
C319	Ceramic, .01 mfd., 20%	250554-1030
C320	Ceramic, .01 mfd., 20%, 100V	250660-1022
C321	Electric, .22 mfd., 50V	270134-2240
C322	Electrolytic, .22 mfd., 50V	270134-2240
C401	Electrolytic, 10 mfd., 35V	270109-1135
C402	Electrolytic, 10 mfd., 35V	270109-1135
C403	Electrolytic, 10 mfd., 35V	270109-1135
C404	Electrolytic, 10 mfd., 35V	270109-1135
C405	Electrolytic, 220 mfd., 6.3V	270109-2206
C406	Electrolytic, 220 mfd., 6.3V	270109-2206
C407	Metallized Polyester, .033 mfd., 10%, 250V	250655-3339
C408	Metallized Polyester, .033 mfd., 10%, 250V	250655-3339
C409	Metallized Polyester, .01 uf., 10%, 250V	250655-1039
C410	Metallized Polyester, .01 uf., 10% , 250V	250655-1039
C411	Electrolytic, 10 mfd., 35V	270109-1135
C412	Electrolytic, 10 mfd., 35V	270109-1135
C413	Electrolytic, 10 mfd., 35V	270109-1135
C414	Electrolytic, 10 mfd., 35V	270109-1135
C415	Metallized Polyester, .033 mfd., 10%, 250V	250655-3339
C416	Metallized Polyester, .033 mfd., 10%, 250V	250655-3339
C417	Ceramic, 470 pf.,10%,500V	250551-4719
C418	Ceramic, 470 pf.,10%,500V	250551-4719
C419	Electrolytic, 2.2 mfd., 50V	270109-2050
C420	Electrolytic, 2.2 mfd., 50V	270109-2050
C421	Electrolytic, 47 mfd., 6.3V	270109-5160
C422	Electrolytic, 47 mfd., 6.3V	270109-5160
C423	Electrolytic, 47 mfd., 6.3V	270109-5160

WARNING

For continued safety of this product, parts shown in the shaded areas of this Parts List must be used as replacements for those identified in the shaded areas of the schematic diagrams of this service manual. Use of substitute replacement parts which do not have the same safety characteristics as specified, may create shock, fire or other hazards.

For maximum reliability and performance, all other parts must be replaced by those having identical specifications.

Under no circumstances may the original design be modified or altered without permission from Philips High Fidelity Laboratories, Ltd.

REPLACEMENT PARTS LIST (CONTINUED)

Note: When ordering replacement parts please specify the part number as shown in this list including Description, Chassis, and Model Number. Complete information will help expedite the order. Replacement parts may occasionally differ in part number or value from the Factory installed part. In either event the replacement part has been chosen to provide equal or improved performance.

REF.	DESCRIPTION	PART NO.
C424	Electrolytic, 47 mfd., 6.3V	270109-5160
C425	Metallized Polyester, .033 mfd.,10%, 250V	250655-3335
C426	Metallized Polyester, .033 mfd.,10%, 250V	250655-3335
C427	Metallized Polyester, .033 mfd.,10%, 250V	250655-3335
C428	Metallized Polyester, .033 mfd.,10%, 250V	250655-3335
C429	Polystyrene, 620 pf.,5%, 60V	250637-6215
C430	Polystyrene, 620 pf.,5%,60V	250637-6215
C431	Ceramic, 4.7 pf.,10%,500V,NPO	250546-4799
C432	Ceramic, 4.7 pf.,10%,500V,NPO	250546-4799
C433	Ceramic, 4.7 pf.,10%,500V,NPO	250546-4799
C434	Ceramic, 4.7 pf.,10%,500V,NPO	250546-4799
C435	Ceramic, 100 pf.,10%,500V	250551-1019
C436	Ceramic, 100 pf.,10%,500V	250551-1019
C501	Electrolytic, 47 mfd.,6.3V	270109-5106
C502	Electrolytic, 47 mfd.,6.3V	270109-5106
C503	Metallized Polyester, .047 mfd.,10%	250655-4739
C504	Metallized Polyester, .047 mfd.,10%	250655-4739
C505	Electrolytic, 10 mfd., 35V	270109-1135
C506	Electrolytic, 10 mfd., 35V	270109-1135
C507	Ceramic, 220 pf.,10%	250551-2219
C508	Ceramic, 220 pf.,10%	250551-2219
C511	Electrolytic, 47 mfd., 35V	270109-5135
C512	Electrolytic, 47 mfd., 35V	270109-5135
C513	Electrolytic, 47 mfd., 35V	270109-5135
C514	Electrolytic, 47 mfd., 35V	270109-5135
C515	Ceramic, 33 pf.,5%,500V,NPO	250546-3305
C516	Ceramic, 33 pf.,5%,500V,NPO	250546-3305
C517	Electrolytic, 100 mfd.,25V	270109-1225
C518	Electrolytic, 100 mfd., 25V	270109-1225
C519	Ceramic, .022 mfd.,20%,100V	250660-2003
C520	Ceramic, .022 mfd.,20%,100V	250660-2003
C521	Ceramic, .022 mfd.,20%,100V	250660-2003
C522	Ceramic, .022 mfd.,20%,100V	250660-2003
C523	Polyester, .1 mfd.,20%,100V DC (63V AC)	250555-0184
C524	Polyester, .1 mfd.,20%,100V DC (63V AC)	250555-0184
C525	Ceramic, 33 pf., 5%, 500V, NPO	250546-3305
C526	Ceramic, 33 pf., 5%, 500V, NPO	250546-3305
C600	Bypass, .01 mfd., +80-20%,1400V	250626-0010
C601	Bypass, .01 mfd., +80-20%,1400V	250626-0010
C602	Polyester, .1 mfd.,20%,100V DC (63V AC)	250555-0184
C603	Polyester, .1 mfd.,20%,100V DC (63V AC)	250555-0184
C604	Electrolytic, 5600 mfd.,50V	270099-0045
C605	Electrolytic, 5600 mfd.,50V	270099-0045
C606	Electrolytic, 470 mfd.,35V	270109-5235
C607	Electrolytic, 470 mfd.,16V	270109-5215
C609	Electrolytic, 33 mfd.,25V	270109-3125
C610	Electrolytic, 33 mfd.,50V	270109-3150
C612	Electrolytic, 33 mfd., 25V	270109-3125
C613	Electrolytic, 33 mfd., 50V	270109-3150
C614	Electrolytic, 47 mfd., 16V	270111-5115
C615	Ceramic, 220 pf.,10%	250551-2219
	RESISTORS	
R101	Carbon Film,4700 ohm,5%,.25W	230214-4725
R102	Carbon Film,1000 ohm,5%,.25W	230214-1025
R103	Carbon Film, 12K ohm,5%,.25W	230214-1235
R104	Carbon Film,1800 ohm,5%,.25W	230214-1825
R105	Carbon Film,1500 ohm,5%,.25W	230214-1525
R105	Carbon Film,10K ohm,5%,.25W	230214-1035
R107	Carbon Film,330K ohm,5%,.25W	230214-3345
R108	Carbon Film,330K ohm,5%,.25W	230214-3345
R109	Carbon Film,100 ohm,5%,.25W	230214-1015
R110	Carbon Film,18K ohm,5%,.25W	230214-1835
R111	Carbon Film,100 ohm,5%,.25W	230214-1015
R112	Carbon Film,1000 ohm,5%,.25W	230214-1025
R113	Carbon Film,10K ohm,5%,.25W	230214-1035
R114	Carbon Fim.,47K ohm,5%,.25W	230214-4735
R115	Carbon Film,1000 ohm,5%,.25W	230214-1025
R116	Carbon Film,3600 ohm,5%,.25W	230214-3625
R117	Carbon Film,330 ohm,5%,.25W	230214-3315
R118	Carbon Film,470 ohm,5%,.25W	230214-4715
R119	Carbon Film,270 ohm,5%,.25W	230214-2715
R120	Carbon Film,15K ohm,5%,.25W	230214-1535
R121	Carbon Film,6800 ohm,5%,.25W	230214-6825
R122	Carbon Film,330 ohm,5%,.25W	230214-3315
R123	Carbon Film,22 ohm,5%,.25W	230214-2205
R124	Carbon Film,220 ohm,5%,.25W	230214-2215
R125	Carbon Film,100 ohm,5%,.25W	230214-1015
R126	Carbon Film,330 ohm,5%,.25W	230214-3315
R127	Carbon Film,100 ohm,5%,.25W	230214-1015
R128	Carbon Film,330K ohm,5%,.25W	230214-3345
R129	Carbon Film,1000 ohm.5%..25W	230214-1025

REF.	DESCRIPTION	PART NO.
R130	Carbon Film, 18K ohm,5%,.25W (AA & AB Versions Only)	230214-1835
R130	Carbon Film,36K ohm,5%,.25W (CA Version Only)	230214-3635
R131	Carbon Film,3900 ohm,5%, .25W (AA & AB Versions only)	230214-3925
R131	Carbon Film,6800 ohm,5%, .25W (CA Version Only)	230214-6825
R132	Carbon Film, 22K ohm,5%, .25W (AA & BA Versions Only)	230214-2235
R132	Carbon Film, 39K ohm,5%,.25W (CA Version Only)	230214-3935
R133	Carbon Film,10K ohm,5%,.25W	230214-1035
R134	Carbon Film,62K ohm,5%,.25W	230214-6235
R135	Carbon Film,100 ohm,5%,.25W	230214-1015
R136	Carbon Film,82 ohm,5%,.25W	230214-8205
R137	Carbon Film,22 ohm,5%,.25W	230214-2205
R138	Carbon Film,10 ohm,5%,.25W	230214-1005
R140	Carbon Film,20K ohm,5%,.25W	230214-2035
R141	Carbon Film,100 ohm,5%,.25W	230214-1015
R142	Carbon Film,330K ohm,5%,.25W	230214-3345
R143	Carbon Film,2200 ohm,5%,.25W	230214-2225
R144	Carbon Film,5600 ohm,5%,.25W	230214-5625
R145	Carbon Film,100K ohm,5%,.25W	230214-1045
R201	Carbon Film,12K ohm,5%,.25W	230214-1235
R202	Carbon Film,120K ohm,5%,.25W	230214-1245
R203	Carbon Film, 680 ohm,5%,.25W	230214-6815
R204	Carbon Film,33K ohm,5%,.25W	230214-3335
R205	Carbon Film,1500 ohm,5%,.25W	230214-1525
R206	Carbon Film,10K ohm,5%,.25W	230214-1035
R207	Carbon Film,4700 ohm,5%,.25W	230214-4725
R208	Carbon Film,1500 ohm,5%,.25W	230214-1525
R209	Carbon Film,3300 ohm,5%,.25W	230214-3325
R210	Carbon Film,22K ohm,5%,.25W	230214-2235
R211	Carbon Film,220 ohm,5%,.25W	230214-2215
R212	Carbon Film,15K ohm,5%,.25W	230214-1535
R213	Carbon Film,4700 ohm,5%,.25W	230214-4725
R214	Carbon Film,6.8 ohm,5%,.25W	230214-6825
R215	Carbon Film,4700 ohm,5%,.25W	230214-4725
R217	Carbon Film,15K ohm,5%,.25W	230214-1535
R302	Carbon Film,6200 ohm,5%,.25W	230214-6225
R303	Carbon Film,1000 ohm,5%,.25W	230214-1025
R304	Carbon Film, 1 meg.ohm,5%,.25W	230214-1055
R305	Carbon Film,1 meg. ohm,5%,.25W	230214-1055
R306	Carbon Film,47K ohm,5%,.25W	230214-4735
R307	Carbon Film,15K ohm,5%,.25W	230214-1535
R309	Carbon Film,6200 ohm,5%,.25W	230214-6225
R310	Carbon Film,470 ohm,5%,.25W	230214-4715
R311	Carbon Film,470 ohm,5%,.25W	230214-4715
R312	Carbon Film,47K ohm,5%,.25W	230214-4735
R313	Carbon Film,1 meg. ohm,5%,.25W	230214-1055
R314	Carbon Film, 1 meg. ohm, 5%, .25W	230214-1055
R315	Carbon Film,1200 ohm,5%,.25W	230214-1225
R316	Carbon Film,1200 ohm,5%,.25W	230214-1225
R317	Carbon Film,4700 ohm,5%,.25W	230214-4725
R318	Carbon Film,4700 ohm,5%,.25W	230214-4725
R401	Carbon Film,200K ohm,5%,.25W	230214-2045
R402	Carbon Film,200K ohm,5%,.25W	230214-2045
R403	Carbon Film,100K ohm,5%,.25W	230214-1045
R404	Carbon Film,100K ohm,5%,.25W	230214-1045
R405	Carbon Film,200K ohm,5%,.25W	230214-2045
R406	Carbon Film,200K ohm,5%,.25W	230214-2045
R407	Carbon Film,100K ohm,5%,.25W	230214-1045
R408	Carbon Film,100K ohm,5%,.25W	230214-1045
R409	Carbon Film,1000 ohm,5%,.25W	230214-1025
R410	Carbon Film,1000 ohm,5%,.25W	230214-1025
R411	Carbon Film,1000 ohm,5%,.25W	230214-1025
R412	Carbon Film,1000 ohm,5%,.25W	230214-1025
R413	Carbon Film,10K ohm,5%,.25W	230214-1035
R414	Carbon Film,10K ohm,5%,.25W	230214-1035
R415	Carbon Film,180 ohm,5%,.25W	230214-1815
R416	Carbon Film,180 ohm,5%,.25W	230214-1815
R417	Carbon Film,91K ohm,5%,.25W	230214-9135
R418	Carbon Film,91K ohm,5%,.25W	230214-9135
R419	Carbon Film,7500 ohm,5%,.25W	230214-7525
R420	Carbon Film,7500 ohm,5%,.25W	230214-7525
R421	Carbon Film, 33K ohm,5%, .25W	230214-3335
R422	Carbon Film,33K ohm,5%,.25W	230214-3335
R423	Carbon Film,33K ohm,5%,.25W	230214-3335
R424	Carbon Film,33K ohm,5%,.25W	230214-3335
R425	Carbon Film,2200 ohm,5%,.25W	230214-2225
R426	Carbon Film,2200 ohm,5%,.25W	230214-2225
R427	Carbon Film,68K ohm,5%,.25W	230214-6835
R428	Carbon Film,68K ohm,5%,.25W	230214-6835
R429	Carbon Film,15K ohm,5%,.25W	230214-1535
R430	Carbon Film,15K ohm,5%,.25W	230214-1535
R431	Carbon Film,150K ohm,5%,.25W	230214-1545
R432	Carbon Film,150K ohm,5%,.25W	230214-1545
R433	Carbon Film,3300 ohm,5%,.25W	230214-3325
R434	Carbon Film,3300 ohm,5%,.25W	230214-3325
R435	Carbon Film,10K ohm,5%,.25W	230214-1035
R436	Carbon Film,10K ohm,5%,.25W	230214-1035

REPLACEMENT PARTS (CONTINUED)

Note: When ordering replacement parts please specify the part number as shown in this list including Description, Chassis, and Model Number. Complete information will help expedite the order. Replacement parts may occasionally differ in part number or value from the Factory installed part. In either event the replacement part has been chosen to provide equal or improved performance.

REF.	DESCRIPTION	PART NO.
R437	Carbon Film,20K ohm,5%,.25W	230214-2035
R438	Carbon Film,20K ohm,5%,.25W	230214-2035
R439	Carbon Film,47K ohm,5%,.25W	230214-4735
R440	Carbon Film,47K ohm,5%,.25W	230214-4735
R441	Carbon Film,27K ohm,5%,.25W	230214-2735
R442	Carbon Film,27K ohm,5%,.25W	230214-2735
R443	Carbon Film,20K ohm,5%,.25W	230214-2035
R444	Carbon Film,20K ohm,5%,.25W	230214-2035
R501	Carbon Film,820 ohm,5%,.25W	230214-8215
R502	Carbon Film,820 ohm,5%,.25W	230214-8215
R503	Carbon Film,100K ohm,5%,.25W	230214-1045
R504	Carbon Film,100K ohm,5%,.25W	230214-1045
R505	Carbon Film,4700 ohm,5%,.25W	230214-4725
R506	Carbon Film,4700 ohm,5%,.25W	230214-4725
R507	Carbon Film,2200 ohm,5%,.25W	230214-2225
R508	Carbon Film,2200 ohm,5%,.25W	230214-2225
R509	Carbon Film,1000 ohm,5%,.25W	230214-1025
R510	Carbon Film,1000 ohm,5%,.25W	230214-1025
R511	Carbon Film,1500 ohm,5%,.25W	230214-1525
R512	Carbon Film,1500 ohm,5%,.25W	230214-1525
R513	Carbon Film,47K ohm,5%,.25W	230214-4735
R514	Carbon Film,47K ohm,5%,.25W	230214-4735
R515	Carbon Film,1200 ohm,5%,.25W	230214-1225
R516	Carbon Film,1200 ohm,5%,.25W	230214-1225
R519	Carbon Film,1000 ohm,5%,.25W	230214-1025
R520	Carbon Film,1000 ohm,5%, .25W	230214-1025
R521	Carbon Film,2700 ohm,5%,.25W	230214-2725
R522	Carbon Film,2700 ohm,5%,.25W	230214-2725
R523	Carbon Film, 3300 ohm,5%,.25W	230214-3325
R524	Carbon Film,3300 ohm,5%,.25W	230214-3325
R525	Carbon Film,150 ohm,5%,.25W	230218-1515
R526	Carbon Film,150 ohm,5%,.25W	230218-1515
R527	Carbon Film,1000 ohm,5%,.5W	230214-1025
R528	Carbon Film,1000 ohm,5%,.5W	230214-1025
R531	Carbon Film,4700 ohm,5%,.25W	230214-4725
R532	Carbon Film,4700 ohm,5%,.25W	230214-4725
R533	Carbon Film,180 ohm,5%,.25W	230218-1815
R534	Carbon Film,180 ohm,5%,.25W	230218-1815
R535	Carbon Film,180 ohm,5%,.25W	230218-1815
R536	Carbon Film,180 ohm,5%,.25W	230218-1815
R537	Carbon Film,150 ohm,5%,.25W	230218-1515
R538	Carbon Film,150 ohm,5%,.25W	230218-1515
R539	Carbon Film,150 ohm,5%,.25W	230218-1515
R540	Carbon Film,150 ohm,5%,.25W	230218-1515
R541	Wire Wound, .47 ohm,10%,3W	240104-0002
R542	Wire Wound, .47 ohm,10%,3W	240104-0002
R543	Wire Wound, .47 ohm,10%,3W	240104-0002
R544	Wire Wound, .47 ohm,10%,3W	240104-0002
R545	Wire Wound, 10 ohm,10%,2W	230164-0062
R546	Wire Wound, 10 ohm,10%,2W	230164-0062
R547	Wire Wound, 150 ohm,10%,2W	230164-0076
R548	Wire Wound, 150 ohm,10%,2W	230164-0076
R549	Carbon Film,100 ohm,5%, .25W	230218-1015
R550	Carbon Film,100 ohm,5%,.25W	230218-1015
R551	Carbon Film,10 ohm,5%, .25W	230218-1005
R552	Carbon Film,10 ohm,5%,.25W	230218-1005
R553	Carbon Film,10 ohm,5%,.25W	230218-1005
R554	Carbon Film,10 ohm,5%,.25W	230218-1005
R555	Carbon Film,10 ohm,5%,.25W	230218-1005
R556	Carbon Film,10 ohm,5%,.25W	230218-1005
R601	Carbon Film,2.2 meg. ohm,5%,.5W	230212-2255
R602	Carbon Film,4700 ohm,5%,.25W	230214-4725
R603	Carbon Film,2700 ohm,5%,.5W	230212-2725
R604	Metal Film,100 ohm,10%,2W	230192-1019
R605	Carbon Film,270 ohm,5%,.5W	230223-2715
R606	Carbon Film,1500 ohm,5%,.25W	230214-1525
R607	Carbon Film,270 ohm,5%,.5W	230223-2715
R608	Carbon Film,1500 ohm,5%,.25W	230214-1525
R609	Carbon Film,15K ohm,5%,.25W	230214-1535
R610	Carbon Film,15K ohm,5%,.25W	230214-1535
R611	Metal Film,100 ohm,10%,2W	230192-1019
R612	Carbon Film,10K ohm,5%,.25W	230214-1035
R613	Carbon Film,10K ohm,5%,.25W	230214-1035
R614	Carbon Film,22K ohm,5%,.25W	230214-2235
R615	Carbon Film,100K ohm,5%,.25W	230214-1045
R616	Carbon Film,100K ohm,5%,.25W	230214-1045
R617	Wire Wound, 22 ohm,10%,2W	230164-0066
	CONTROLS & SWITCHES	
R308	6800 ohm,19 KHz Oscillator Adjust	220300-6822
R450A/B	200K ohm, Volume Control	220372-0001
R451A/B	100K ohm, Treble Control	220369-0002
R452A/B	100K ohm,Bass Control	220369-0002
R453	50K ohm,Balance Control	220369-0005
R517	1000 ohm, Idle Current Adjust	220300-1022
R518	1000 ohm, Idle Current Adjust	220300-1022
S401	Rotary Slide Switch f/Function Selector	160595-0001
S402	2P3T Switch f/Tape Monitor	160606-0001
S403	4P2T Switch f/Mono-Stereo	160600-0002
S404	2P2T Switch f/Loudness	160600-0001
S405	2P2T Switch f/Hi Cut	160600-0001
S501	Rotary Slide Switch f/Power,Speaker	160594-0002
	SEMICONDUCTORS	
D101	Germanium Diode	530092-1001
D102	Silicon Diode	530181-1001
D201	Germanium Diode	530092-1001
D202	Germanium Diode	530092-1001
D301	Light Emitting Diode	530189-0001
D302	Silicon Diode	530181-1001
D501	Silicon Diode	530181-1001
D502	Silicon Diode	530181-1001
D503	Silicon Diode	530181-1001
D504	Silicon Diode	530181-1001
D505	Silicon Diode	530181-1001
D506	Silicon Diode	530181-1001
D507	Silicon Diode	530181-1001
D508	Silicon Diode	530181-1001
D509	Silicon Diode	530181-1002
D510	Silicon Diode	530181-1002
D511	Silicon Diode	530181-1002
D512	Silicon Diode	530181-1002
D601	Silicon Diode, 3A, 380V	530180-0001
D602	Silicon Diode, 3A, 380V	530180-0001
D603	Silicon Diode, 3A, 380V	530180-0001
D604	Silicon Diode, 3A, 380V	530180-0001
D605	Silicon Diode	53D181-1001
IC101	FM IF Detector	612077-0002
IC301	FM Stereo Demodulator	612075-0003
IC401	Dual Operational Amp	612143-0002
IC402	Dual Operational Amp	612143-0002
IC403	Dual Operational Amp	612143-0002
Q101	NPN Silicon	610150-0003
Q102	NPN Silicon	610249-0002
Q103	Dual Gate-N Channel FET	610203-0002
Q104	NPN Silicon	610139-0001
Q105	NPN Silicon	610139-0001
Q106	NPN Silicon	610232-0002
Q201	NPN Silicon	610174-0001
Q202	NPN Silicon	610232-0002
Q203	NPN Silicon	610232-0002
Q301	NPN Silicon	610232-0002
Q302	NPN Silicon	610232-0002
Q401	NPN Silicon	610094-0001
Q402	NPN Silicon	610094-0001
Q501	NPN Silicon	610094-0001
Q502	NPN Silicon	610094-0001
Q503	NPN Silicon	610094-0001
Q504	NPN Silicon	610094-0001
Q505	PNP Silicon	610158-0003
Q506	PNP Silicon	610158-0003
Q507	NPN Silicon**	610232-0002
Q508	NPN Silicon**	610232-0002
Q509	NPN Silicon	610224-0001
Q510	NPN Silicon	610224-0001
Q511	PNP Silicon	610223-0001
Q512	PNP Silicon	610223-0001
Q513	NPN Silicon**	610162-0008
Q514	NPN Silicon**	610162-0008
Q515	PNP Silicon**	610162-0007
Q516	PNP Silicon**	610162-0007
Q517/519	NPN Silicon	171465-0001
Q518/520	NPN Silicon**	171465-0001
Q601	NPN Silicon	610232-0002
Q602	PNP Silicon	610083-0001
Q603	P Channel FET	610362-0001
Q604	P Channel FET	610362-0001
Q605	NPN Silicon	610232-0002
Q606	NPN Silicon	610232-0002
Z501	10V Zener Diode, .5W	530157-0100
Z502	10V Zener Diode,.5W	530157-0100
Z601	12V Zener Diode, 1W	530192-0120
Z602	22V Zener Diode,.5 W	530157-3220
Z603	22V Zener Diode, .5W	530157-3220
	MISCELLANEOUS	
F601	Fuse, 2A, 125V, Slow-Blow	181021-5200
FB601	Ferrite Bead, f/530192	364005-0003
J501	Head Phone Jack	181218-0001
	Fuse Clip	181007-0004
	AC Receptacle	181054-0014
	AC Line Cord	461276-0012
	Pilot Lamp (5 used)	180931-0002
	White Nylon Support Bushing f/ 530189	143991-0001
	Rubber Bushing, f/530189	642954-0003
	Shoulder Rivet, f/Pulley Shaft (4 used)	102011-0036
	Idler Pulley (6 used)	141028-0005
	White Pulley Hook (2 used)	144036-0001
	Gang Pulley	143708-0001

REPLACEMENT PARTS CONTINUED

Note: When ordering replacement parts please specify the part number as shown in this list including Description, Chassis, and Model Number. Complete information will help expedite the order. Replacement parts may occasionally differ in part number or value from the Factory installed part. In either event the replacement part has been chosen to provide equal or improved performance.

REF.	DESCRIPTION	PART NO.
	AC Line Cord Strain Release Bushing	102454-0012
	Antenna Strain Release Bushing	102454-0013
	Nut, 9M f/Control Mounting	103269-0109
	Pushbutton Speaker Connector Assembly (2 used)	181286-0001
	AM Antenna Cover	142209-0003
	Mtg. Bracket f/142209	733387-0001
	Heat Sink	733385-0002
	Mica Insulator f/Q517,518,519, 520 (4 used)	180701-0006
	FM Antenna Assembly	703939-0001
	FM Antenna Terminal Block	144001-0002
	FM Antenna Terminal w/Screw	200488-0009
	Center Tuning Meter	702594-0001
	Signal Strength Meter	702594-0002
	Fly Wheel and Gear	733115-0004
	Backplate	733377-0002
	Tension Spring	733383-0001
	Metal Cabinet	733373-0001
	Bezel	733310-0001
	Foot (4 used)	120822-0006
	Carriage f/Dial Pointer	143863-0001
	Dial Pointer	733446-0001

REF.	DESCRIPTION	PART NO.
	Dial Scale Inlay	151620-0008
	Jack Board Assembly	180978-0014
	Insulator f/180978	644053-0001
	Socket Clip f/180931 (10 used)	181009-0003
	Dial Window	644054-0001
	Transistor Cover, f/Q517,518,519, 520 (4 used)	144035-0001
	Transistor Socket (2 used)	181258-0001
	Phono Connection Bracket	733384-0001
	Control Knob-Bass,Treble,Balance	143730-0014
	Control Knob-Selector,Speaker, Volume	143730-0015
	Tuning Knob	143730-0016
	Knob f/Lever Switch (4 used)	144010-0001
	Screw, 8 x 2 f/142209	103130-1814
	Screw, 4-40 x ¼ Set, f/143708	103250-0603
	Screw, 8 x 3/8, PHST (Torx,Black)	103267-1810
	Screw, M4 x 10 THST, (f/Mtg. Metal Cabinet to Chassis, Black-2 used)	103270-1810
	Screw, 6 x 3/8 PHST, f/610179, 181286	103272-1805
	Screw, M3 x 8 PHTC f/702676	103273-1808

* These filters can only be purchased in pairs and must be replaced as a set. The location of the color coded dot on the replacement filter must match the original filter.

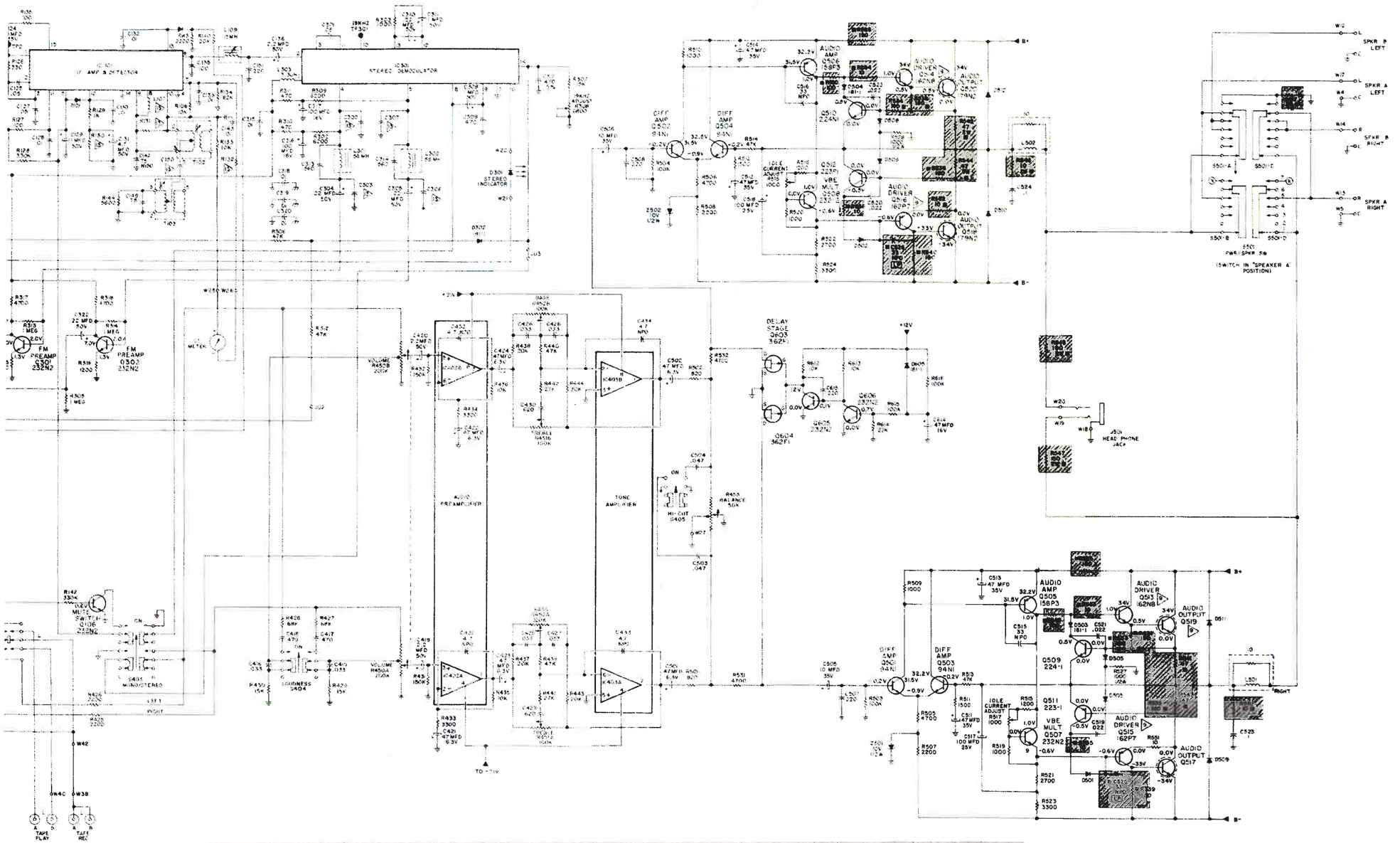
** When this transistor is replaced, Idler Current must be readjusted.

OUTPUT TRANSISTOR REPLACEMENT

Since transformerless quasi complementary output circuitry is utilized in this chassis, extreme care should be exercised when servicing or replacing the transistors. It is imperative that the transistors be isolated from the heat sink by means of a mica insulator coated on both sides with Dow-Corning DC4 silicon grease or equivalent.

When replacing an output transistor, make certain the replacement transistor has the same beta range (i.e., Orange or Blue) as the defective transistor. The beta range of the transistor is indicated by a Orange or Blue dot (or Lettering) on the top of the case. Failure to replace a defective driver or output transistor with one having the same beta characteristics could be detrimented to the performance of the power amplifier.

After servicing or replacing one or more of the output transistors, the Idle Current Adjustment must be performed in the affected channel. Misadjustment of the output transistor will cause crossover distortion and possible premature failure of the output transistors.



All IC voltages taken with Function/Selector Switch in FM position and Speaker Switch in Speaker-A position (unless otherwise specified).

IC101 VOLTAGE CHART		
PIN	**VOLTAGE**	**NOTE**
1	1.7V	-----
2	1.7V	-----
3	1.7V	-----
4	0 (Ground)	-----
5	2.5V	1
6	5.3V	2
7	5.3V	-----
8	5.3V	-----
9	5.3V	-----
10	5.3V	-----
11	10.0V	-----
12	2.5V	-----
13	.5V	-----
14	0 (Ground)	-----
15	5.7V	-----
16	0V	-----

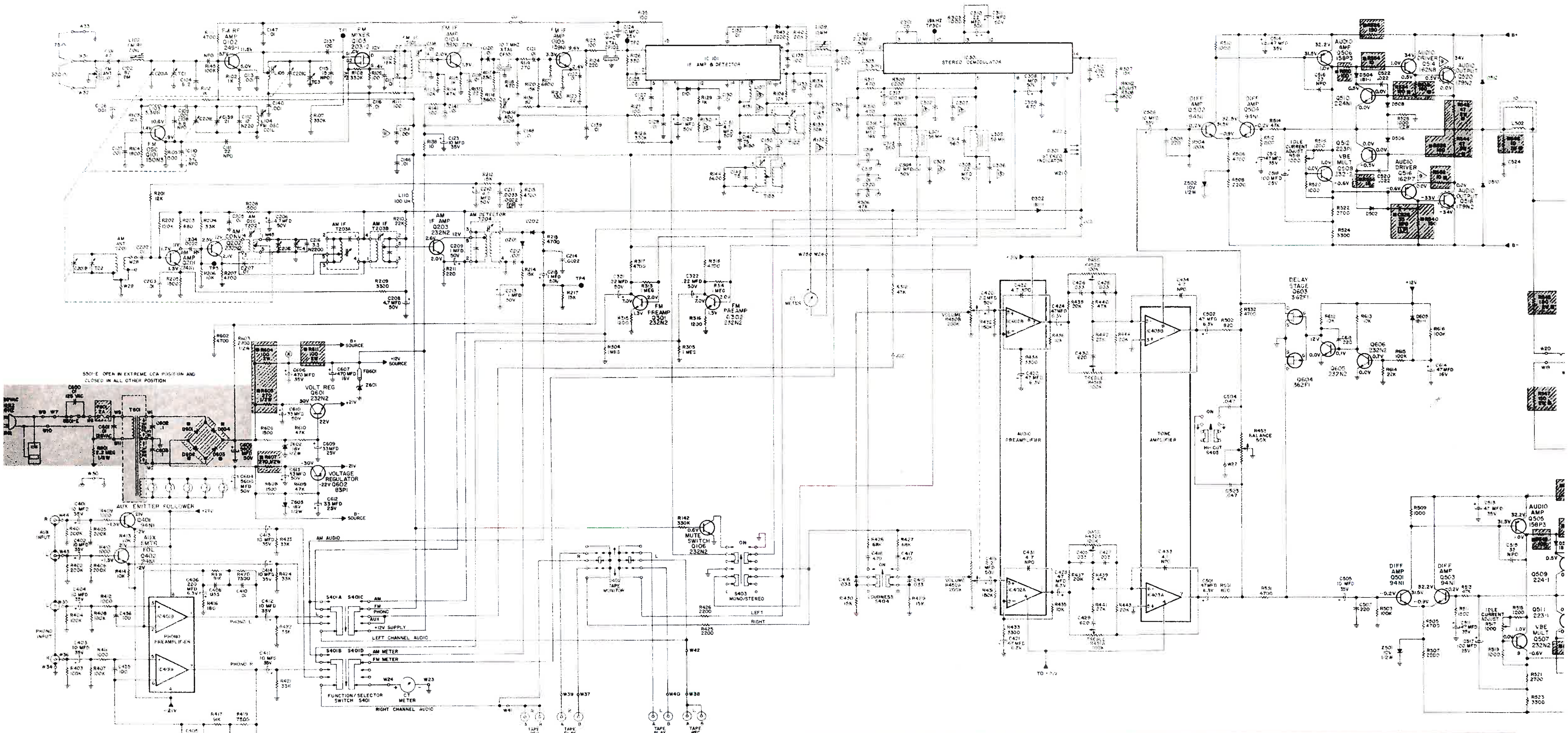
IC301 VOLTAGE CHART		
PIN	**VOLTAGE**	**NOTE**
1	12.0V	-----
2	3.0V	-----
3	5.0V	-----
4	7.5V	-----
5	7.5V	-----
6	20.0V	-----
7	0V (Ground)	-----
8	2.3V	1
9	2.3V	-----
10	1.5V	3
11	2.3V	-----
12	2.3V	-----
13	2.3V	-----
14	3.0V	1

NOTES:
1. Goes to 0V when Mono Switch placed in "ON" position.
2. Goes to 6V when Mono Switch placed in "ON" position.
3. Goes to 3V when Mono Switch placed in "ON" position.

WARNING

NOTES:
1. UNLESS OTHERWISE SPECIFIED
ALL REPLACEMENT CAPACITORS WITH A VALUE OF I

8. TRANSISTOR SURROUNDED WITH A DOTTED LINE INDICATE TRANSISTOR IS MOUNTED TO A HEAT



IC 101 IF AMP & DETECTOR
IC 301 STEREO DEMODULATOR
FM RF AMP Q102 249-1
FM MIXER Q103
FM OSC Q101 150N3
AM IF AMP Q203 232N2
AM DETECTOR
FM PREAMP Q301 232N2
FM PREAMP Q302 232N2
VOLT REG Q601 232N2
VOLTAGE REGULATOR Q602 83P1
S501E OPEN IN EXTREME CCA POSITION AND CLOSED IN ALL OTHER POSITION
AUX EMITTER FOLLOWER
PHONO PREAMPLIFIER
FUNCTION/SELECTOR SWITCH S401
MUTE SWITCH Q106 232N2
TAPE MONITOR
MONO/STEREO
AUDIO PREAMPLIFIER
TONE AMPLIFIER
DELAY STAGE Q603 562F1
BALANCE
LOUDNESS S404
LEFT CHANNEL AUDIO
RIGHT CHANNEL AUDIO
TAPE REC
TAPE PLAY

WARNING