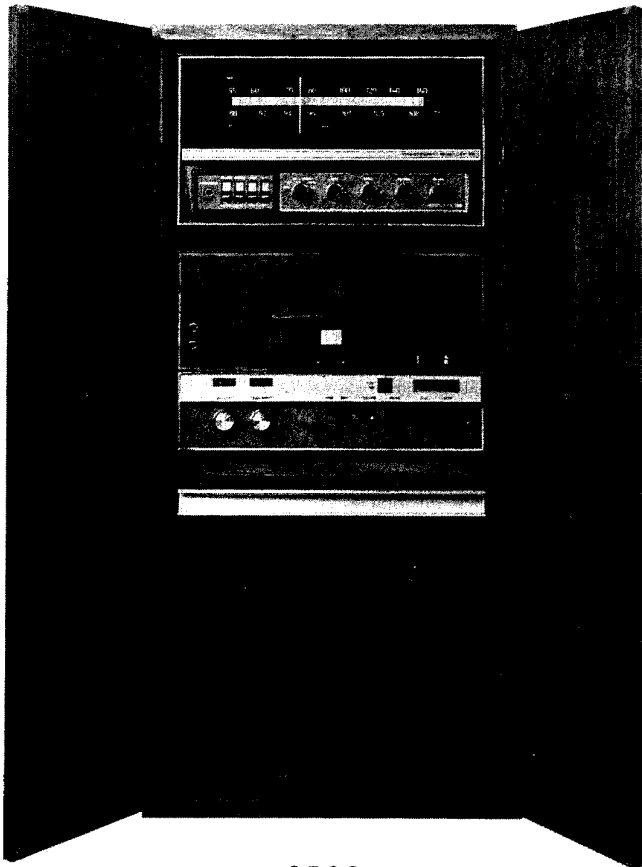


SERVICE MANUAL

MUSICOM™ MASTER RECEIVER (Tuner/Amplifier/Power Supply)



2502

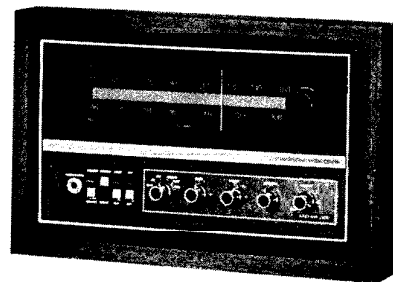
For Models:

2500

2501

2502

2600



2600

NuTone Housing Products

Scovill

MADISON & RED BANK ROADS - CINCINNATI, OHIO 45227 - U.S.A.

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SERVICE MANUAL

MUSICOM MASTER UNIT RECEIVER

THIS MANUAL COVERS THE SERVICING OF THE RECEIVER (TUNER/AMPLIFIER & POWER SUPPLY FOR THE ENTIRE MUSICOM SYSTEM) USED IN BOTH THE 2500 AND 2600 MODELS. BECAUSE OF THE INTERRELATIONSHIP BETWEEN THE MUSICOM MASTER UNIT AND

THE MUSICOM INTERCOM CONTROL UNIT (MODEL 2510), THERE WILL BE SOME DUPLICATION OF THE INFORMATION CONTAINED IN THE 2510 SERVICE MANUAL. IT IS RECOMMENDED THAT BOTH MANUALS BE AVAILABLE TO THE SERVICING TECHNICIAN.

RECEIVER SPECIFICATIONS

Power Input:	Nominal: 0.6 Amps @ 120 V, 60 Hz.
Power Output:	20 watts RMS at less than 0.5% THD each channel with full volume
Audio Amplifier Sensitivity:	At full volume for rated output: TAPE and AUXILIARY INPUTS: 60 millivolts PHONO INPUT: 120 millivolts
FM Sensitivity:	Average 5 microvolts for 20 db signal/noise 25 microvolts for 100 millivolts peak-to-peak at notch filter output.
FM Image Rejection:	Better than 50 db
FM Multiplex (MPLX) Separation:	Minimum 30 db @ 1 KHz.
AM Sensitivity:	Average 40 microvolts for 50 millivolts RMS at AM 2nd. Detector output

GENERAL

1. The MUSICOM Master Unit is supplied in the following models:

Model 2500: Includes the solid-state high fidelity stereo receiver; 4-speed automatic record player; associate "A" Frame and housing with mounting hardware and FM/AM antenna.

Model 2501: Same as Model 2500 and includes the Model 2505 8-Track Stereo Tape Cartridge Player.

Model 2502: Same as Model 2500 and includes the Model 2506 Stereo Tape Cassette Player/Recorder.

NOTE: The Model 2505 or 2506 may be purchased separately and installed in the Model 2500 "B" Box Assembly.

Model 2600: Includes the solid-state high fidelity stereo receiver; associated "A" frame and housing with mounting hardware and AM/FM Antenna.

2. Service Manuals for the individual MUSICOM components are available from NuTone's Field Engineering Department:

Model 2500/2600 Receiver, NuTone Part No. 45880-1

Model 2500 4-Speed Record Player, Part No. 45880-2

Model 2505 8-Track Stereo Tape Cartridge Player, Part No. 45880-4

Model 2506 Stereo Tape Cassette Player/Recorder, Part No. 45880-5

Model 2605 8-Track Stereo Tape Cartridge Player (use with 2600) Part No. 46186.

Model 2510 Intercom Master Control, Part No. 45880-3

3. Either the 2500 or 2600 MUSICOM Master Unit can be used in "MUSIC ONLY" systems with one or more sets of stereo speakers (Fig. 1.1). Note that in systems using two or more sets of speakers, each set of speakers is controlled by the Model 2519 Stereo Level Control.

Model 2603 Fold-Away Record Player (use with 2600), Part No. 46179

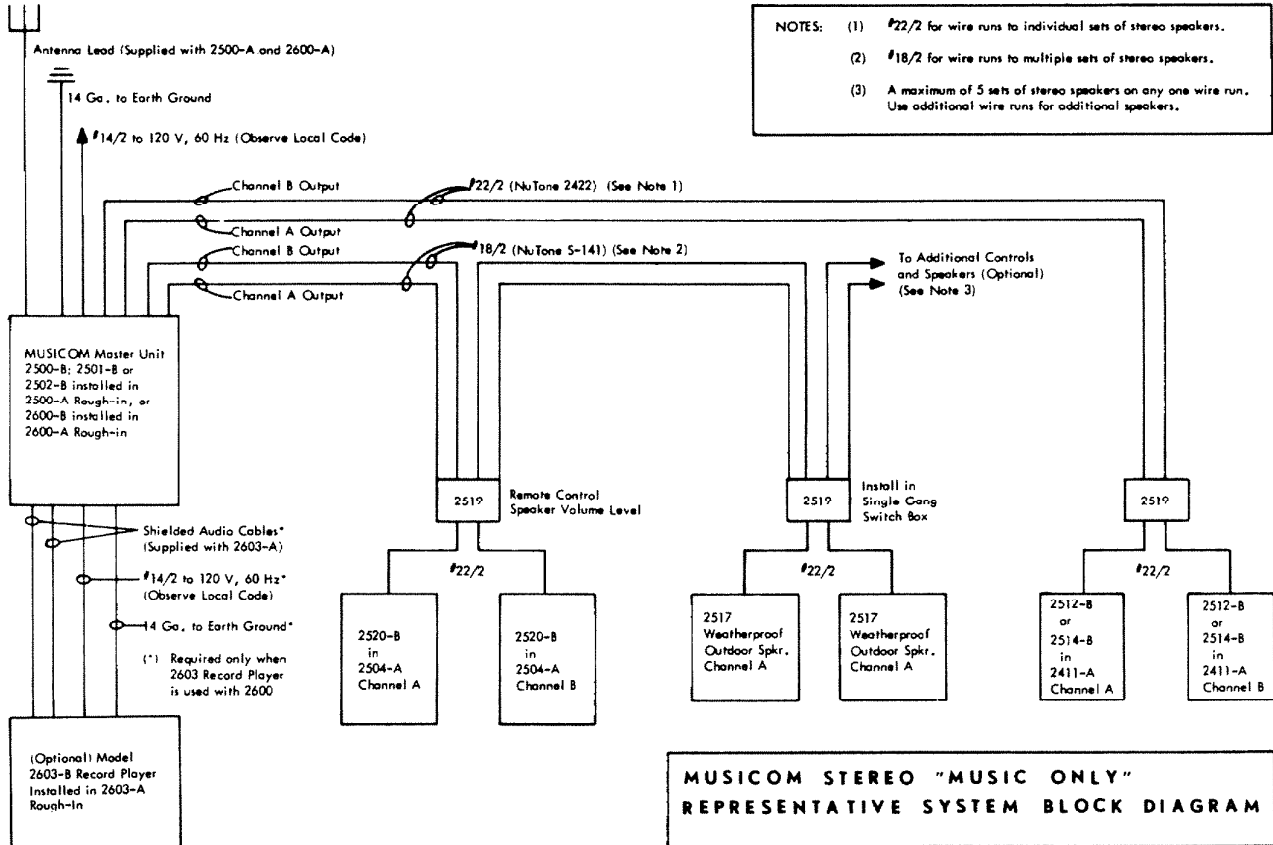
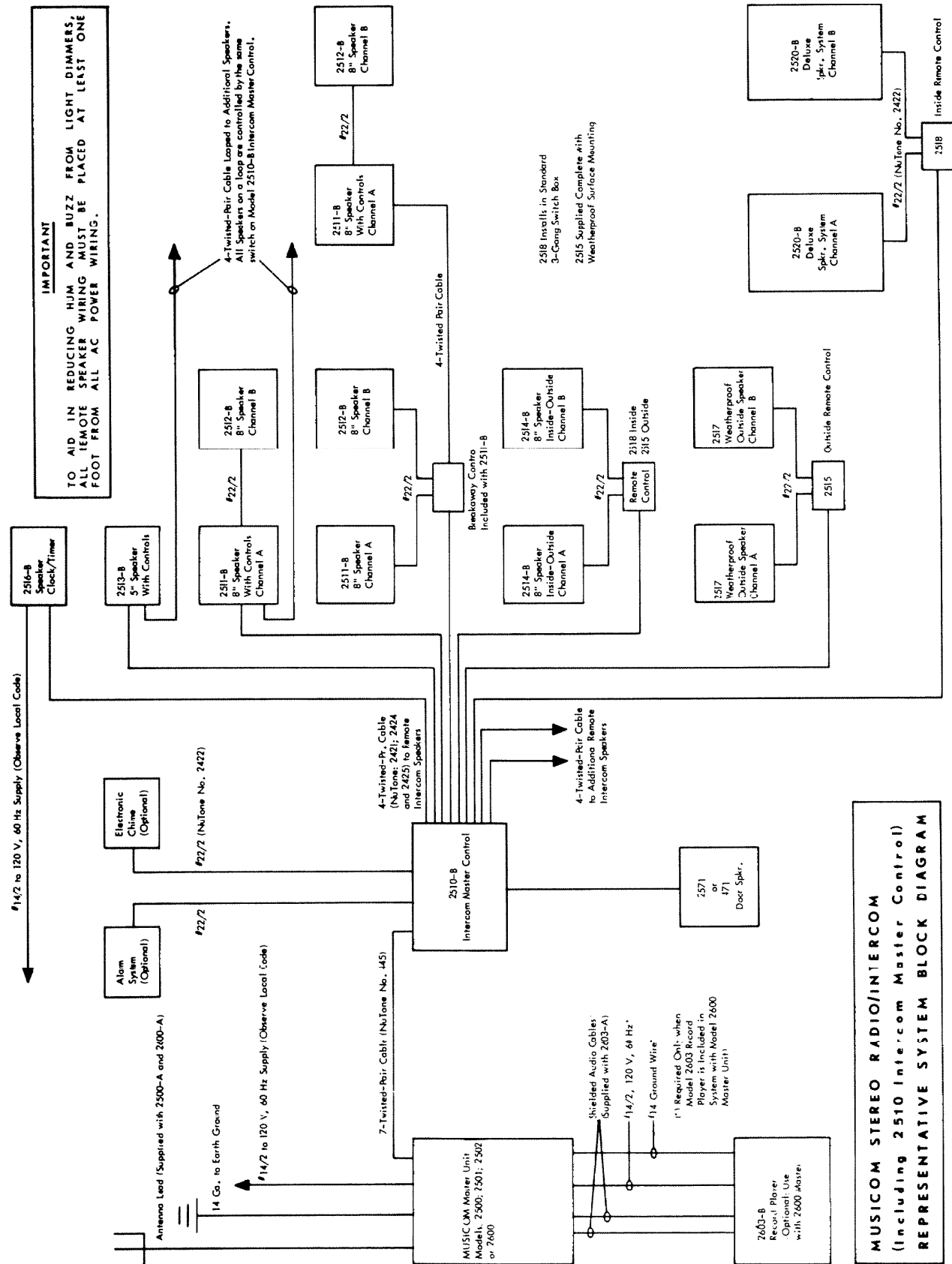


Fig. 1.1

4. When the intercom capability of the MUSICOM system is desired. **THE MODEL 2510 INTERCOM MASTER CONTROL MUST BE**

INCLUDED IN THE SYSTEM. (Fig. 1.2)

5. Operating and control voltages for the 2510 Intercom Master Control are supplied by the



MUSICOM STEREO RADIO/INTERCOM
(Including 2510 Intercom Master Control)
REPRESENTATIVE SYSTEM BLOCK DIAGRAM

Fig. 1.2

MUSICOM Master Unit, and are fed to the 2510 by the 7-twisted-pair cable (NuTone 445) connected between the 2500-A (or 2600-A) and the 2510-A rough-in housings. (Fig. 1.2 & 1.3)

6. In this manual, printed circuit board terminal connections are indicated by circled lower case letter. Example: (a) (d) (p)

7. Unless otherwise noted, all voltage measurements are made in respect to common chassis ground.

When possible a VTVM should be used. (although approximate indications may be made with a standard 20 Kohm/volt multi-meter.

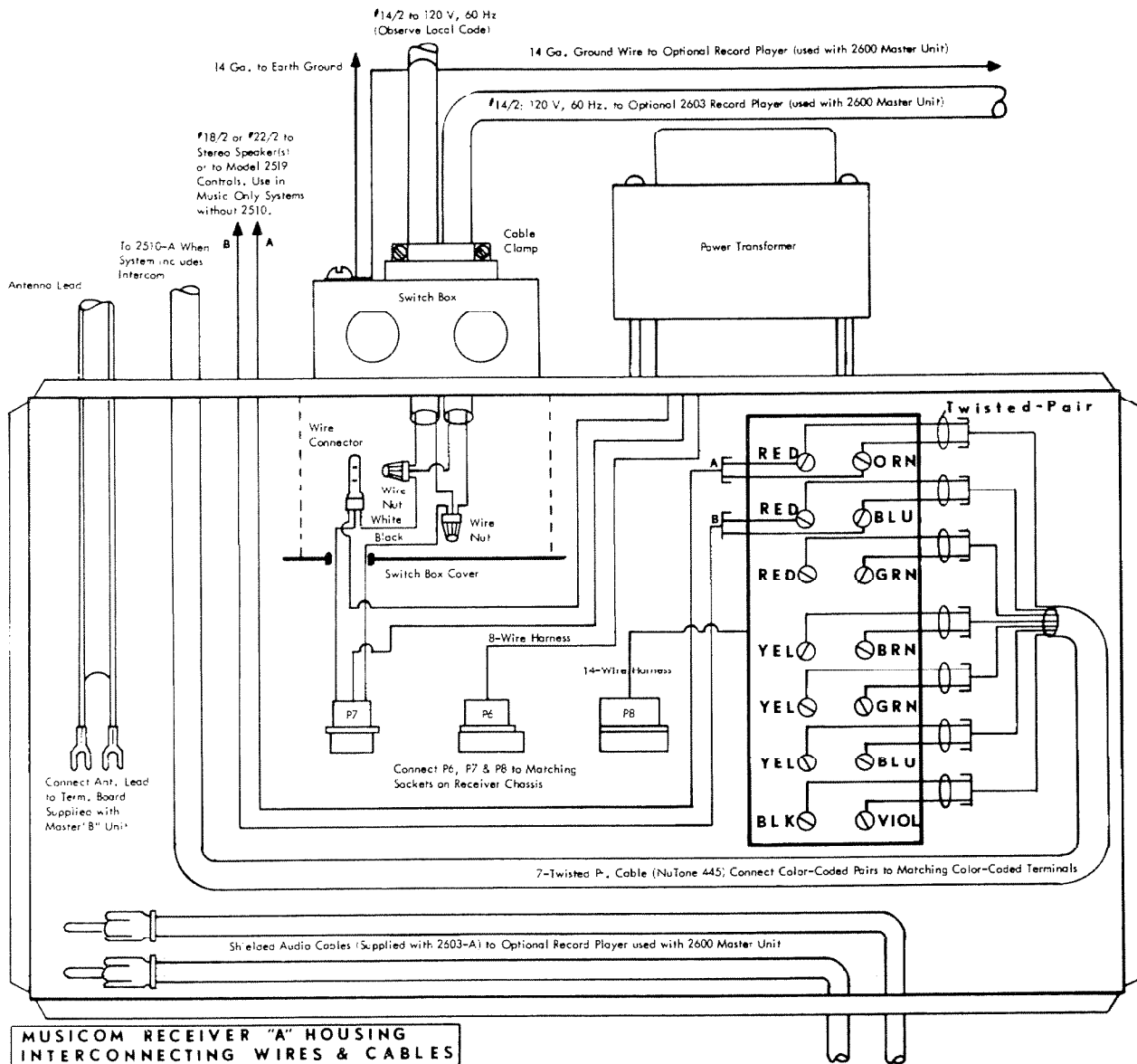


Fig. 1.3

(See Fig. 1.6, pg. 11)

INSTALLATION

1. All NuTone Musicom products are supplied with complete installation instructions which should be followed when installing the various components.

Model 2500-A Rough-in Frame and Housing, NuTone Part No. 46133

Model 2500-B; 2501-B and 2502-B MUSICOM Master Unit, Part No. 46058 (for production units prior to July, 1971 use Part No. 45896)

Model 2600-A Rough-in Housing, Part No. 46142

Model 2600-B MUSICOM Master Unit, Part No. 46145

2. Special attention should be made to the installation and connection of inter-connecting wires and cables. USE RECOMMENDED NUTONE WIRING.

CHECK OUT PROCEDURE

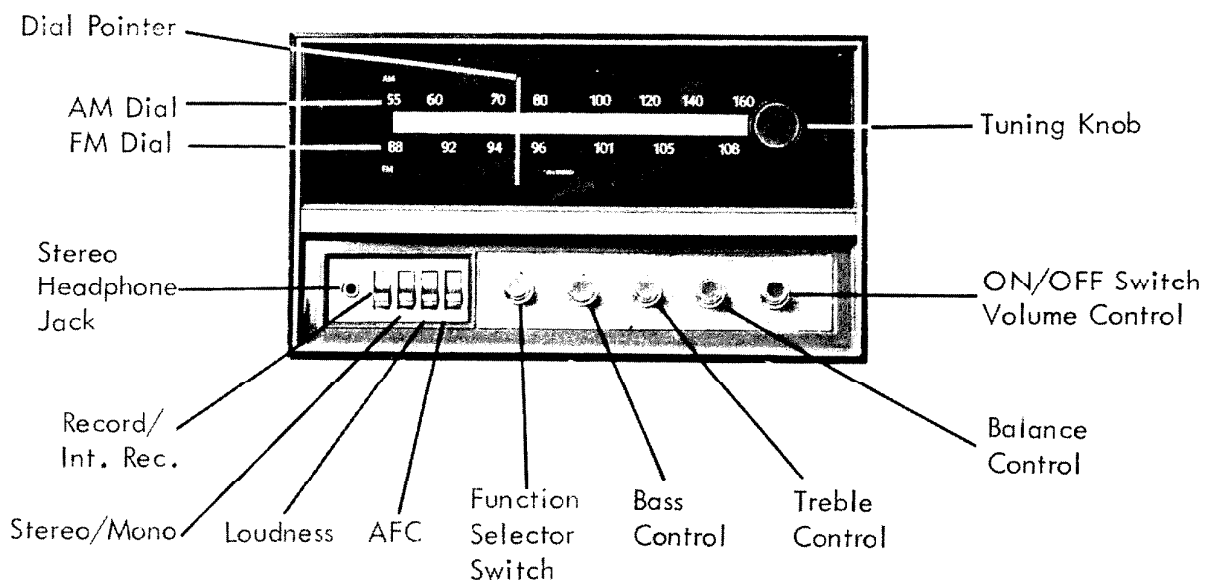


Fig. 1.4 — MODEL 2500/2600 RECEIVER FRONT PANEL

MUSIC ONLY SYSTEMS (Fig. 1.4)

1. **ON/OFF VOLUME CONTROL:** Turn set on — rotate control clockwise until “Click” is heard. Pilot lamps behind dial panel should come ON. Set control to approximate 10 o’clock position.
2. **PROGRAM SELECTOR SWITCH:** Set to AM.
3. **TUNING KNOB:** Rotate to tune set to desired AM station (top scale of tuning dial) — adjust for best sound.
4. **VOLUME CONTROL:** Adjust for desired level.
5. **BALANCE CONTROL:** While listening to a

set of stereo speakers (one speaker connected to channel A and one speaker to channel B) adjust the control so that the sound appears to emanate from a point mid-way between the speakers.

Turning the control counter-clockwise increases the volume of the channel A speaker and decreases the volume of the channel B speaker. When the dual control is full counter-clockwise, the channel B speaker should be silent.

Turning the control clockwise increases the volume of the channel B speaker and decreases the volume of the channel A speaker. When the control is in the full clockwise position, the channel A speaker should be silent.

6. TREBLE CONTROL: Nominal flat response in center position. Clockwise rotation increases and counter-clockwise rotation decreases the high frequency response of both channels.

7. BASS CONTROL: Nominal flat response in center position. Clockwise rotation increases and counter-clockwise rotation decreases the low frequency response of both channels.

8. LOUDNESS CONTROL: With the VOLUME CONTROL set for low audio level, switching the LOUDNESS CONTROL ON should result in greater bass response. This control compensates for the human ear's loss of bass perception at low levels.

9. PROGRAM SELECTOR SWITCH: Set to FM.

10. STEREO/MONO SWITCH: Set to STEREO.

11. AFC SWITCH: Set to Off.

12. TUNING KNOB: Rotate to select FM station (bottom scale of tuning dial) — tune for best sound.

13. FM STEREO INDICATOR LIGHT: Will come ON when receiver is tuned to an FM station that is broadcasting MPLX stereo.

If the STEREO/MONO SWITCH is in the MONO position, the light can not come ON — even though the receiver is tuned to an FM station that is broadcasting FM MPLX stereo.

14. AFC SWITCH: Set to ON. Station tuning should not drift — even with slight variations of the ambient temperature and/or minor changes of the applied voltages to the FM RF and IF stages.

When the FM band is tuned with the AFC on, the station will come in very sharply and remain locked in.

When tuning to a weak or distant station operating on a band adjacent to that of a strong local station, the AFC SWITCH should be in the OFF position. This will prevent the

tuner locking in on the stronger station and prohibiting the tuning in of the weaker station. After the weak station is tuned in, the AFC SWITCH can be moved to the ON position, keeping the weak station tuned in.

15. STEREO/MONO SWITCH: Set in MONO position — the sound should be the same from both speakers, regardless of whether the audio source is stereo or mono.

Set to STEREO position — if program source is MONO the sound from both speakers will be identical and, if sound source is STEREO, the sound will have aural spaciousness and depth depending on the program source.

16. PROGRAM SELECTOR SWITCH: Set in PHONO position — play a record on automatic record player and check through steps 4 through 8 and step 15 above.

Any standard record player using a ceramic phono cartridge may be played through the MUSICOM receiver. (Cartridge output should not exceed 250 millivolts.)

A record player using a magnetic or variable reluctance cartridge must be fed through a phono preamplifier and the output of the preamplifier fed into the AUXILIARY inputs of the MUSICOM receiver.

17. PROGRAM SELECTOR SWITCH: Set in TAPE position — play tape through system and check through steps 4 through 8 and step 15 above.

Any standard tape player with a preamplified output (not a speaker power output) will operate through the MUSICOM receiver. The nominal output of the tape preamplifier should not exceed 300 to 400 millivolts. (See: THEORY OF OPERATION, EXTERNAL AUDIO SOURCES AND FUNCTION SELECTOR SWITCH, para. 2 DUAL TAPE INPUT.)

18. HEADPHONE JACK: Insert stereo headset (low impedance) and check through above using headset in lieu of speakers. (Speakers will be on.)

MUSIC/INTERCOM SYSTEMS (Fig. 1.4 & 1.5).

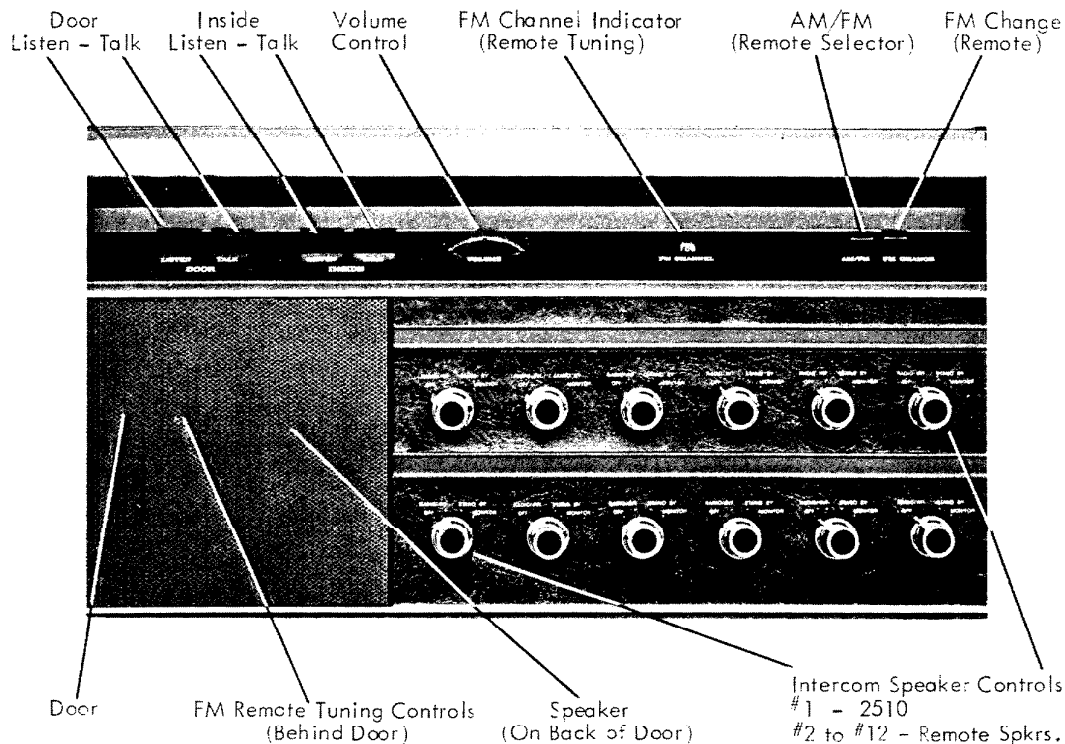


Fig. 1.5 — MODEL 2510 INTERCOM MASTER CONTROL FRONT PANEL

NOTE: THE MODEL 2510 INTERCOM MASTER CONTROL MUST BE USED WITH EITHER THE MODEL 2500 or 2600 MUSICOM MASTER WHEN THE SYSTEM IS BEING USED FOR INTERCOM.

1. MUSICOM MASTER UNIT (2500 or 2600): Turn power On (see step 1, MUSIC ONLY SYSTEMS above).
2. Set MUSICOM MASTER UNIT for AM, FM, PHONO or TAPE program.
3. INTERCOM MASTER CONTROL (Model 2510-B): Set all INTERCOM SPEAKER CONTROLS in RADIO/INT position.

No. 1 FUNCTION CONTROL SWITCH controls the mode of operation of the speaker in the 2510-B. For stereo listening in the same room that the 2510-B is installed in, see 2510-A Installation Instructions, NuTone Part No. 46108.

No. 2 through No. 12 FUNCTION CONTROL SWITCHES control the mode of operation of the remote intercom speakers.

4. TO SET THE AUDIO VOLUME FOR THE COMPLETE SYSTEM:

(4.1) The VOLUME CONTROL on the 2510-B and the VOLUME CONTROLS on all other remote intercom speakers should be set at maximum, i.e. full clockwise.

(4.2) The VOLUME CONTROL on the 2500-B (or 2600-B) should be set so that there is sufficient volume in the area or room requiring the greatest sound level.

(4.3) Adjust the VOLUME CONTROL of the 2510-B speaker and the VOLUME CONTROLS at each remote intercom speaker for the desired level in that area.

5. INTERCOM OPERATION:

THE CHANNEL A AUDIO AMPLIFIER AND THE SPEAKERS CONNECTED TO IT, ARE USED FOR INTERCOM OPERATION.

WHEN ANY "INSIDE TALK," "INSIDE LISTEN," "DOOR TALK," OR "DOOR LISTEN" SWITCH IS ACTIVATED FOR INTERCOM OPERATION, THE MUSIC PROGRAM WILL

BE SILENCED IN BOTH CHANNELS A AND B.

(5.1) On the 2510-B (or any remote intercom speaker control), depress the INSIDE TALK SWITCH and speak through the channel A speaker — the message should be heard through all other channel A speakers.

(5.2) Depress the INSIDE LISTEN SWITCH to receive answer from any other inside intercom speaker. The party answering from any inside intercom speaker, does so, without touching any control, i.e. "Hands free."

NOTE: "INSIDE" speakers include model 2514 patio and Model 2517 weatherproof speakers that are controlled by either the Model 2515 or 2518 Remote Controls.

(5.3) Depress the DOOR TALK SWITCH to speak to door speaker(s). The message will be heard at all speakers connected to the DOOR terminals on the printed circuit terminal board in the 2510-A.

(5.4) Depress the DOOR LISTEN SWITCH and a person at any door speaker area can answer.

NOTE: When any LISTEN or TALK switch is activated at any of the intercom speaker controls, there will be an audible "Click" heard at all intercom speakers. This is normal, see: THEORY OF OPERATION, MUTING AND KEY CLICK SUPPRESSION.

6. REMOTE AM/FM SWITCHING:

(6.1) On MUSICOM Master Unit, set PROGRAM SELECTOR SWITCH to AM position and tune to an AM station.

(6.2) On MUSICOM Master Unit set PROGRAM SELECTOR SWITCH to REMOTE position

If the AM/FM remote selector circuit (flip-flop multivibrator in 2510) is in the AM mode, the AM station tuned above will be heard through all of the music/intercom speakers (not door speakers).

If the AM/FM remote selector circuit is in the FM mode, an FM station (or background noise) will be heard.

NOTE: When the MUSICOM Master Unit is

turned ON, the FM/AM remote selection circuit will start in the same mode (AM or FM) every time — regardless of the mode of operation when the set was turned OFF. See: THEORY OF OPERATION, REMOTE AM/FM SELECTION.

(6.3) On the 2510-B (or any remote intercom speaker control) depress the AM/FM REMOTE SELECTOR SWITCH. The mode of operation should change from AM to FM, or vice versa.

7. REMOTE FM TUNING CONTROLS: (Located in 2510-A behind speaker door in 2510-B).

(7.1) On the MUSICOM Master Unit set the FUNCTION SELECTOR SWITCH TO REMOTE and the AFC SWITCH TO OFF.

(7.2) Set the system in remote FM mode as directed in steps 6.2 and 6.3 above.

With the MUSICOM system in the remote FM mode of operation, it may be set to receive six FM stations.

The selective tuning of these stations is accomplished by adjusting the FM REMOTE TUNING CONTROLS (slide potentiometers located behind the door of the 2510-B). These controls are numbered "1" through "6" from top to bottom respectively.

The control that is being used is indicated by the number appearing at the FM CHANNEL INDICATOR.

When the FM CHANGE SWITCH is depressed, the step-relay in the 2510-B is moved one position; changing the number appearing at the FM CHANNEL INDICATOR and, switching the next FM REMOTE TUNING CONTROL (slide pot) into the circuit.

The FM CHANGE SWITCH must be depressed for each change. Changing of FM stations DOES NOT continue if the FM CHANGE SWITCH is kept depressed.

(7.3) Open door on the 2510-B and slide all FM REMOTE TUNING CONTROLS to the left.

(7.4) Depress the FM CHANGE SWITCH until the number "1" control is in the circuit.

(7.5) SLOWLY — slide the No. 1 (top) FM REMOTE TUNING CONTROL to the right until an FM station is heard — adjust for best sound.

(7.6) Depress the FM CHANGE SWITCH: the number "2" will appear at the FM CHANNEL INDICATOR and the No. 2 slide pot is in the circuit.

(7.7) SLOWLY — slide the No. 2 FM REMOTE TUNING CONTROL to the right, past the station tuned in step 7.5 above, to the next FM station and adjust for best sound.

(7.8) Repeat steps 7.6 and 7.7 for channels 3 through 6.

(7.9) On the MUSICOM Master Unit set the AFC SWITCH to ON.

REMOTE INTERCOM SPEAKERS

1. The remote intercom speakers' mode of operation is determined by the setting of the controls #2 through #12. The speaker in 2510-B is controlled by #1.
2. OFF position, speaker can not receive music nor intercom signals.
3. RADIO/INT position, speaker can receive music program; receive calls originated by other

inside intercom speakers, and answer "Hands Free"; originate calls to and receive "Hands Free" answer from all other intercom speakers, both INSIDE and DOOR.

The speaker can also receive signals from electronic chimes and/or security/fire alarm systems when these optional units are used with the MUSICOM system.

Will receive intercom signals from inside speaker(s) that are in MONITOR.

4. STANDBY position, speaker can originate call and can answer incoming calls "Hands Free." It can not receive: calls from speakers that are in MONITOR; music programs nor signals from electronic chimes or alarm systems.
5. MONITOR position: Speaker will transmit sounds in its immediate vicinity to all other inside speakers that are in the RADIO/INT mode.
6. "NIGHT WATCHMAN" — with a speaker in RADIO/INT position, set all other intercom speaker controls in MONITOR, the one speaker will hear sounds in the vicinity of the other speakers.

"A" HOUSING

1. The 2500-A is used with Models 2500-B; 2501-B and 2502-B. The 2600-A is used with 2600-B.
2. The "A" units include: power transformer; 7-twisted-pair-cable terminal board; antenna; and interconnecting plug and wire assemblies. (Fig. 1.6)
3. THE "A" HOUSING MUST BE GROUNDED TO AN EARTH GROUND (WATER PIPE, ETC).
4. The terminal board in the "A" Housing is a convenient place for measuring the control and operating voltages between the MUSI-

COM Master Unit and the 2510 Intercom Master Control.

5. The power transformer secondary voltages (ac) may be measured at P6 as shown in Fig. 1.6.

NOTE: WHEN MAKING DC VOLTAGE MEASUREMENTS AT THE 7-PAIR TERMINAL BOARD: THE YELLOW TERMINAL OF THE YELLOW/BROWN PAIR IS SYSTEM COMMON GROUND, AND ALL DC VOLTAGES SHOULD BE MEASURED IN RESPECT TO THIS TERMINAL.

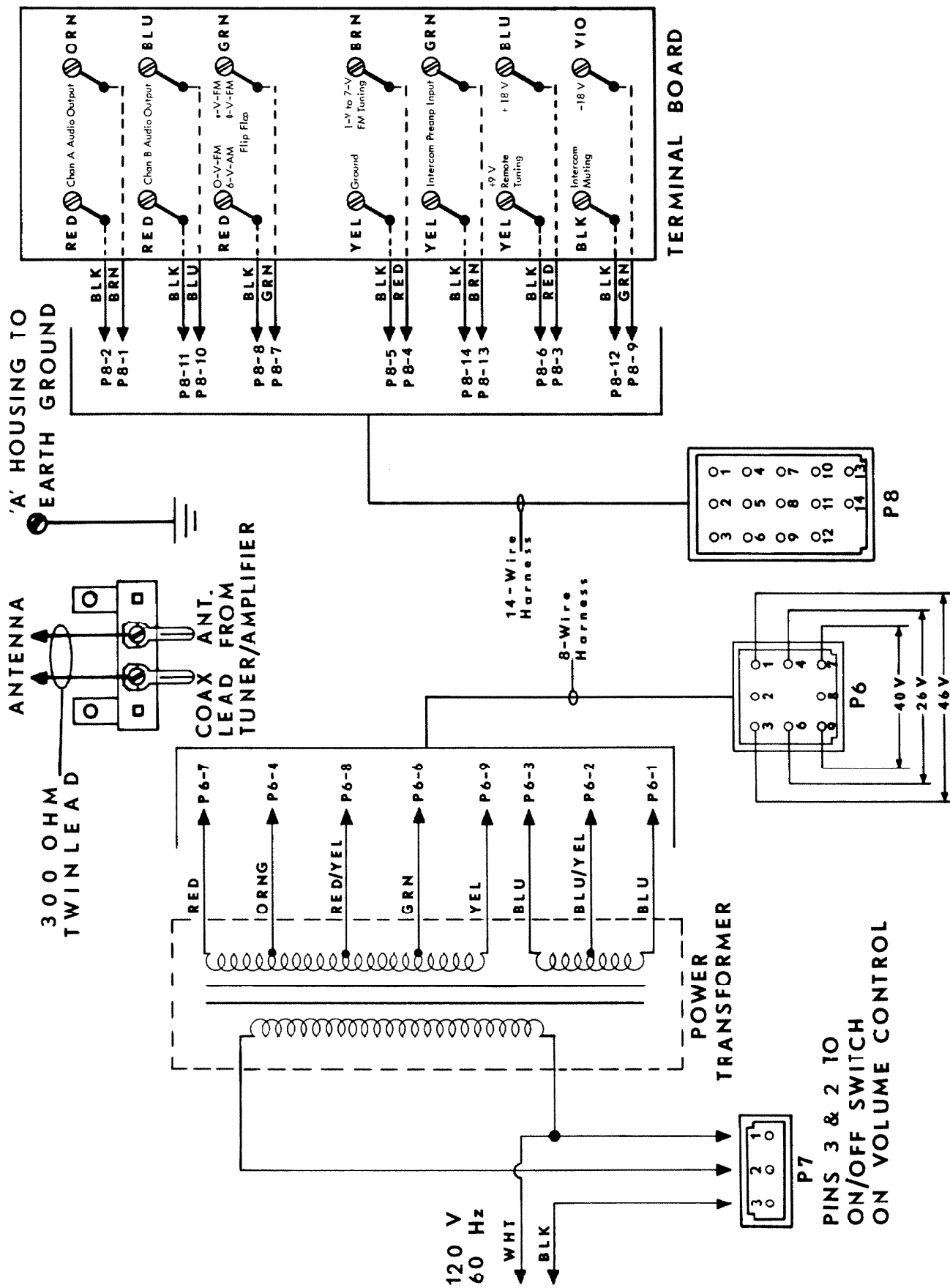


Fig. 1.6 — 2500-A/2600-A SCHEMATIC DIAGRAM

THEORY OF OPERATION

POWER SUPPLY

1. All DC voltages for operating the MUSICOM Master Unit; the Intercom Master Control and the remote switching and tuning are supplied by the receiver's DC Power Supply.
2. The power transformer is located on top of the "A" housing. Its primary voltage (120 Vac) is controlled by the ON/OFF switch on the volume control.

The power transformer has two low-voltage secondary windings: one winding of 40 Vac and one winding of 46 Vac with taps for 26 Vac.

These secondary voltages may be measured at P6 of the "A" Housing. (Fig. 1.6)

3. The DC Power Supply includes three full-wave bridge rectifiers:

(3.1) Bridge of D501; D502; D503 and D504 is driven by the 40 Vac transformer winding and supplies the +26 Vdc and -26 Vdc to the audio voltage amplifier/inverter/driver PC assy. and to the audio amplifier power output transistors on the Heat Sink Assy.

(3.2) Bridge of D505; D506; D507 and D508 is driven by the 26 Vac winding and supplies +18 Vdc and -18 Vdc for operation of the Model 2510 Intercom Master Control.

(3.3) Bridge of D509; D510; D511 and D512 is driven by the 46 Vac winding and in conjunction with voltage dividing network of R501; R502; R503 and R505 supplies the following DC voltages:

(3.3.1) Regulated +9 Vdc to the FM RF varicap diodes for FM tuning, and through S8-6 to the FM remote tuning slide potentiometers in the 2510. (See Interstage Wiring Diagram.)

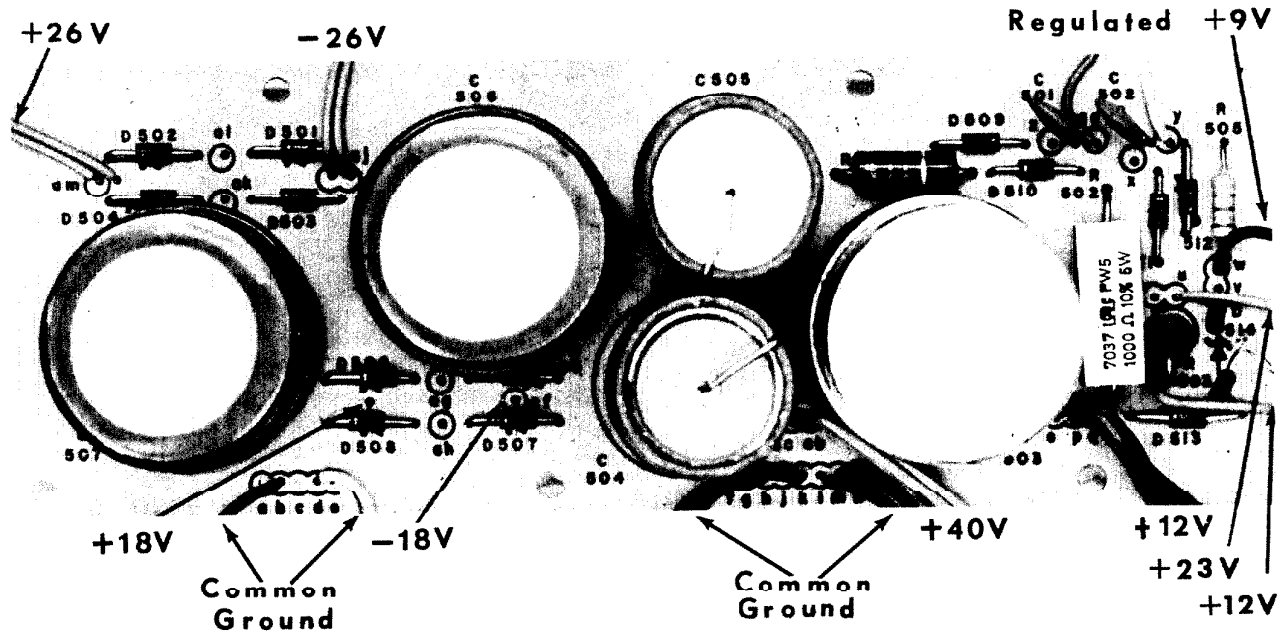


Fig. 1.7 — TOP VIEW OF POWER SUPPLY PC ASSEMBLY

The voltage at the Regulated 9 Vdc outputs (y) & (w) may measure from 8.5 to 11 Vdc —this variation is caused by permissible tolerances in the components. So long as this voltage remains constant, the FM tuning will remain stable.

If one or both of the Zener diodes (D514 or D515) opens, the voltage will rise to an un-

acceptable value, and will vary with changes in load and temperature.

If D514 shorts, the voltage will read approximately +6.2 Vdc, and tuning of FM stations will be changed in that, the low frequency stations can be tuned only at the upper end of the tuning band, and the high frequency stations can not be tuned.

If D515 shorts, the voltage will read approximately 3.9 Vdc, and no station can be tuned with the possible exception of the lowest

frequency FM station being tuned at the very top of the FM dial.

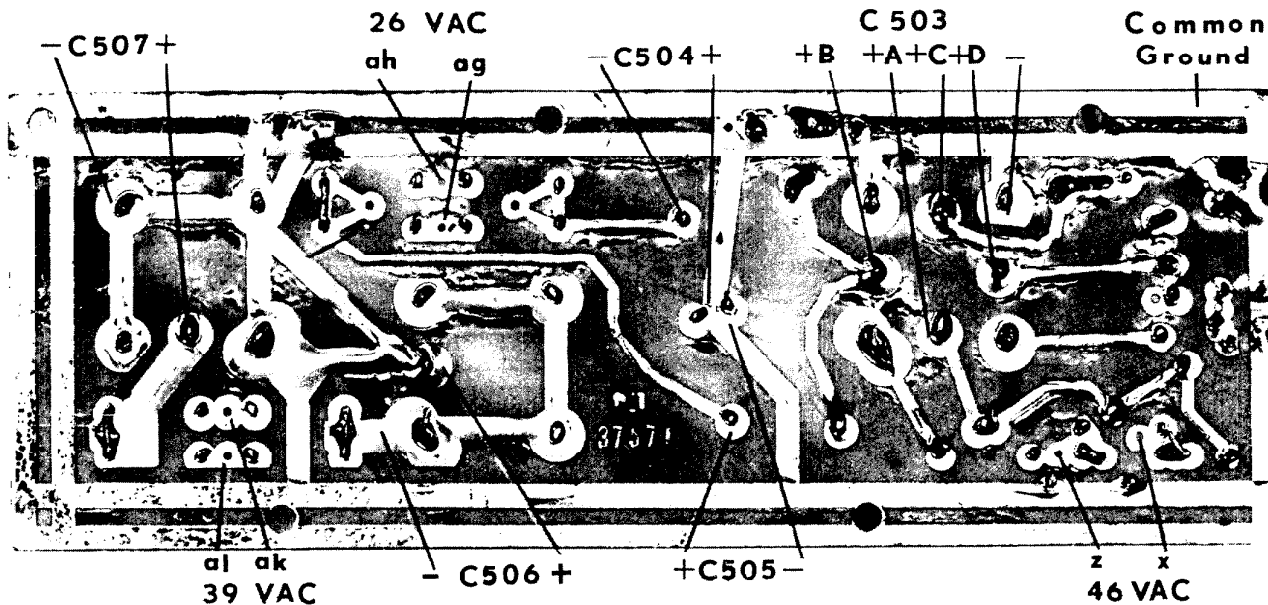


Fig. 1.8 — BOTTOM VIEW POWER SUPPLY PC ASSEMBLY

(3.3.2) Regulated +12 Vdc (controlled by Zener Diode D513) to: FM RF and IF stages; AF RF/IF assembly and to MPLX and Switching circuits. Use of regulated 12 volts increase stability of the RF and IF stages and of the MPLX stereo operation.

This 12 volts is also fed to S9-2 for use in powering the preamps in the original Model 2505 8-track tape player. Later 8-track tape players contain their own DC supply.

(3.3.3) Positive 23 Vdc to S9.1 for powering solenoids in original Model 2505,s. Later 8-track players contain their own DC supply. The 23 volts is also used to power the STEREO INDICATOR LIGHT.

In original MUSICOM Master production, the voltage on the low side of R503 drops to 12 Vdc when indicator light is turned ON. In current production units, 12 V Zener Diode D516 has been added between the low side of R503 and ground — cathode to R503 and anode to ground. This Zener was added to remove hum frequency voltage spikes from the indicator light wire. This spike was coupled to channel A input through capacitive pickup at the STEREO/MONO SWITCH. The Zener maintains 12 Volts

at low side of R503 whether indicator light is ON or OFF.

(3.3.4) Positive 40 Vdc supply to the Dual Audio Preamps; the Dual Volume and Tone Control and to the Intercom Preamp.

FM RF TUNER/AMPLIFIER

1. The FM RF Tuner includes the Tuner RF Amplifier (FET, TR101); Mixer/First Detector (TR102) and Oscillator TR103. The tuner is powered by the regulated +12 Vdc fed from terminal (a) on the FM IF PC Board.
2. The tuning of this unit is unique in that there are no tuning capacitors nor tuning inductances. Tuning is accomplished by varying the reverse bias voltage on Varicap Diodes D101; D102 and D104. This voltage is supplied by the regulated +9 Vdc supply.
3. The resonant frequency of the tuned circuits increases as the reverse bias voltage increases. (The capacity of the Varicaps varies inversely as the square of the applied reverse bias voltage.) In actual operation, this voltage will measure between one and seven volts at the point of insertion into the tuner section (junction of RED/W wire and 1 Meg resistor R109). Use VTVM.

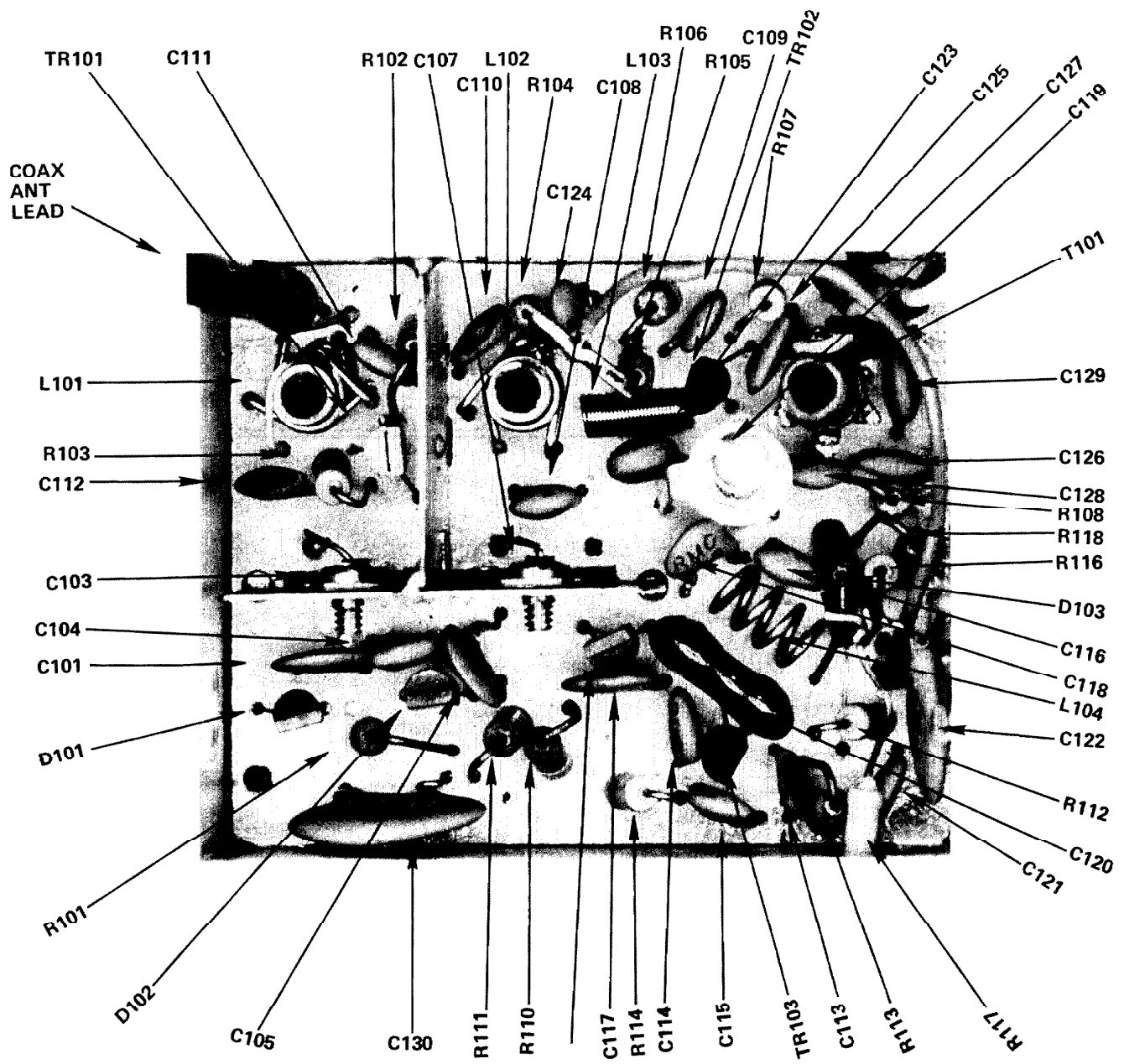


Fig. 1.9 — TOP VIEW FM RF TUNER PC ASSEMBLY

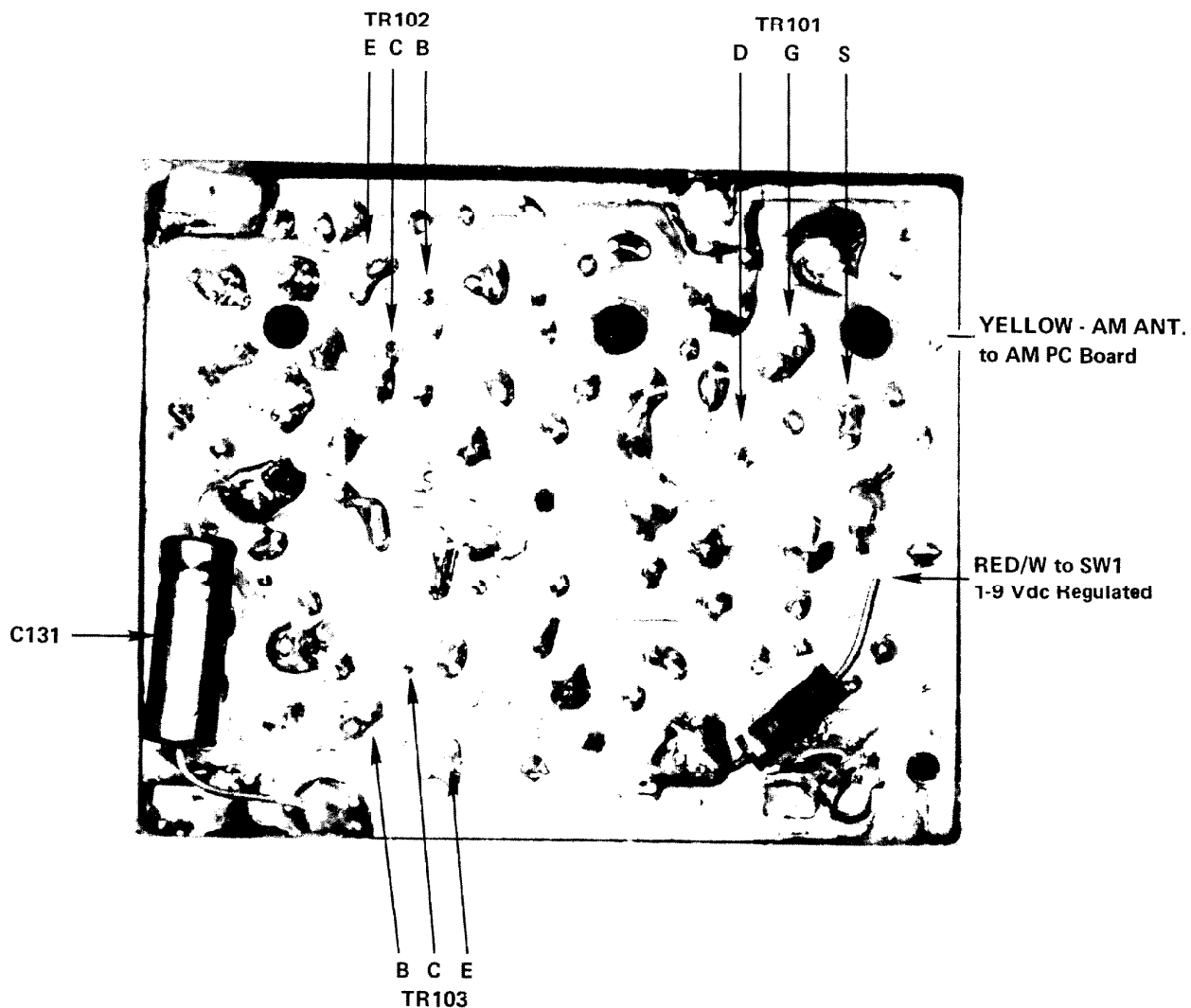


Fig. 1.10 — BOTTOM VIEW FM RF PC ASSEMBLY

FM STATION SELECTION, LOCAL TUNING

1. When the FUNCTION SELECTOR SWITCH is in position #2 through #6, adjusting the TUNING KNOB changes the Master Tuning Potentiometer R521 which, in turn varies the reverse bias voltage to the Varicap Diodes.

NOTE. Trim Pot. R170: located on the FM IF PC Board is set when aligning the high frequency end of the FM band. (See ALIGNMENT INSTRUCTIONS)

Trim Pot. R283: located on the MPLX PC Board is set when aligning the low frequency end of the FM band.

FM STATION SELECTION, REMOTE TUNING

1. Remote FM station selection is possible only

when the Model 2510 Intercom Master Control is included in system.

2. When the MUSICOM Master Unit's FUNCTION SELECTOR SWITCH is in the REMOTE (#1) position, the voltage to D101; D102 and D104 is supplied through one of the slide pots. in the 2510 Remote FM tuning circuit and is fed through terminal #1 (section 2, rear) of the FUNCTION SELECTOR SWITCH.
3. The slide pots. are connected between the regulated +9 Vdc supply and system ground. Moving the slide control changes the voltage through the slide pot. center tap and the step relay switch contacts, that is applied to the Varicaps in the FM RF Tuner. When this slide pot. is connected to the circuit, the station to which it had previously been tuned will be received.

4. The FM CHANNEL INDICATOR in the 2510-B shows which slide pot. is in the circuit.
5. Depressing the FM Change Switch in the 2510-B or in one of the remote speaker controls causes the FM CHANNEL INDICATOR to move to the next number and to connect the corresponding slide switch into the circuit.
6. Selection of the slide pot. is accomplished with the step relay in the 2510-B in the following manner. (Fig. 1.11)

(6.1) Depressing the FM CHANGE SWITCH in the 2510-B or in one of the remote speaker controls, connects the floating end of R626 to floating end of R601 on the Intercom Control PC Board in the 2510-B and connects the BLACK buss to the BLACK/W buss.

(6.2) Completing the circuit as above, applies a negative going voltage through D604 to the base of TR604, turning TR604 ON; this causes a negative going voltage to the base of TR605, turning TR605 ON — which connects the collector of TR605 to +18 Vdc.

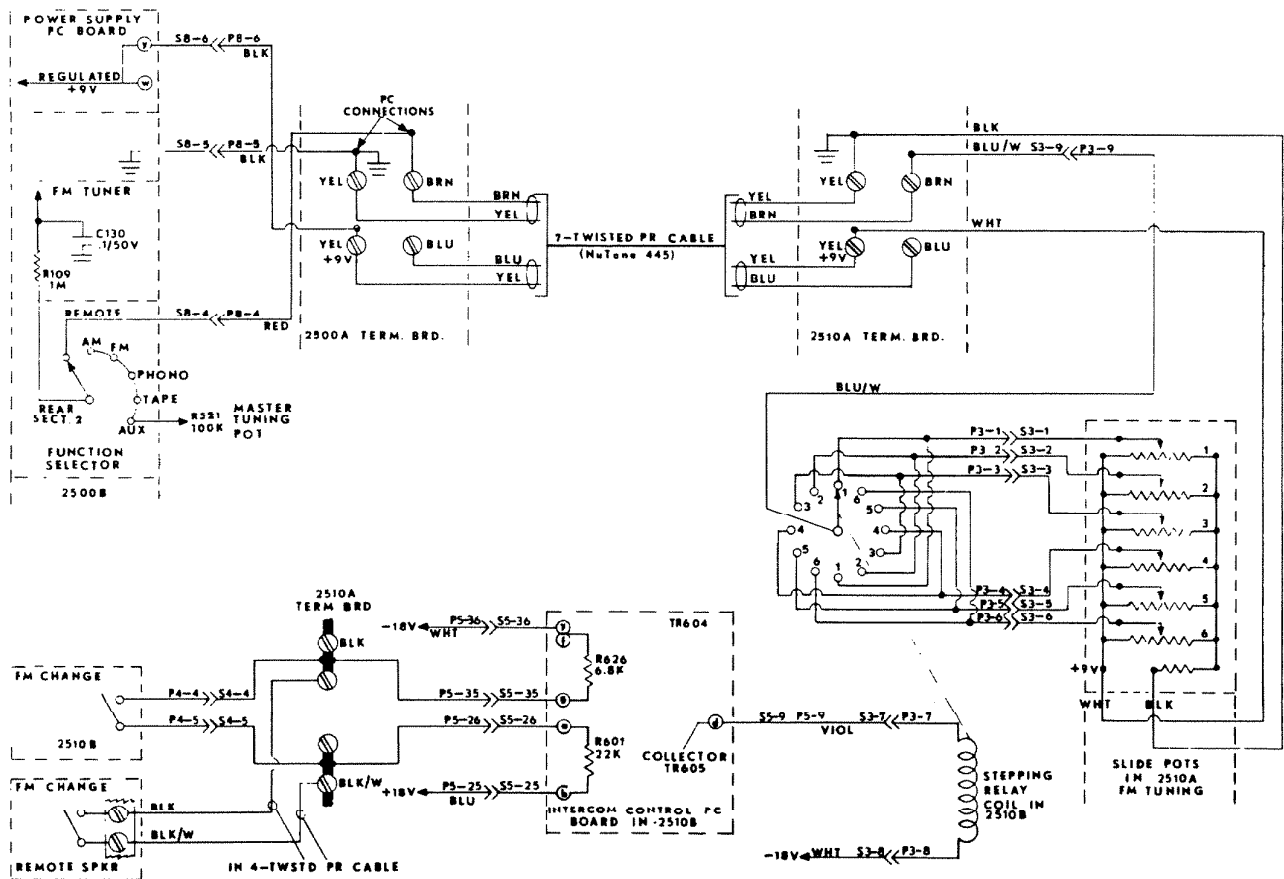


Fig. 1.11 — REMOTE FM STATION SELECTION WIRING DIAGRAM

(6.3) The collector of TR605 is connected to the stepping relay coil and the other end of the coil is connected to -18 Vdc.

(6.4) Completing the circuit from -18 Vdc to +18 Vdc causes the stepping relay armature to be activated, moving the slide pot. selector switch and the FM INDICATOR one position.

7. The FM remote tuning voltages may be meas-

ured at the terminal board in the 2510-A or in the MUSICOM Master Unit "A" Housing.

USE VACUUM TUBE VOLT METER. (Approximate voltages may be read with a standard multi-meter, but because of their low input impedance they will load down the circuit — detuning the tuned circuits in the RF Tuner Section.

Place ground (neutral) probe of meter on YELLOW terminal of the YELLOW BROWN pair.

Measure regulated +9 Vdc at YELLOW terminal of the YELLOW/BLUE pair.

Measure tuning voltage at BROWN terminal of YELLOW/BROWN pair. This voltage should read between 1 Vdc and 7 Vdc (approximate).

The tuning voltage on the BROWN terminal will change with adjustment of the slide pot. that is in the circuit.

FM IF AMPLIFIER

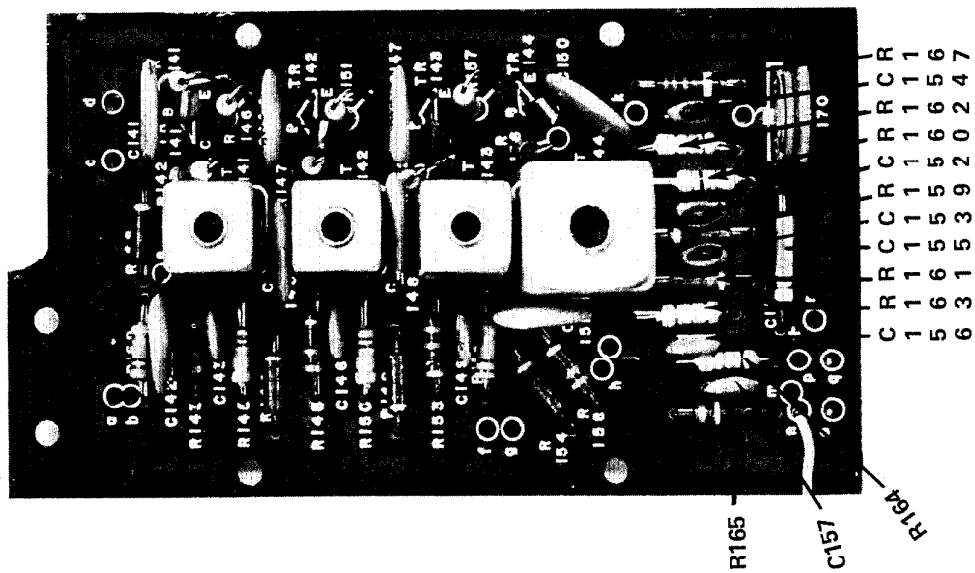
1. The FM IF frequency is 10.7 MHz.
2. The FM IF is powered by the regulated +12 Vdc supply, fed to terminal (h) on the PC board. (Fig. 1.12)
3. The IF signal is fed from T101 on the FM RF Tuner Assy. through WHITE wire to terminal (d) of the IF PC Assy.
4. The IF signal is amplified through the four 10.7 MHz. IF amplifiers — TR141; TR142; TR-

143 and TR144.

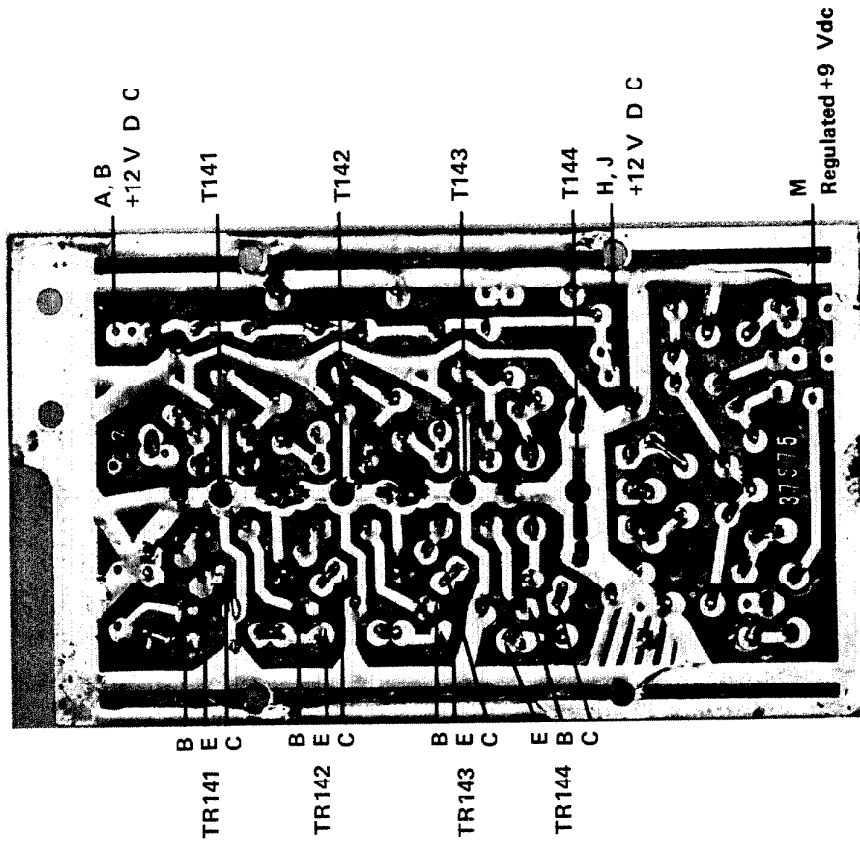
5. The output of TR144 is fed through Ratio Discriminator Transformer T144 to the discriminator network.
6. The audio signal (no deemphasis on IF PC Board) is coupled through R154 and C156 to (p), and then through coax cable to MPLX & SWITCHING ASSY.
7. AFC (Automatic Frequency Control): When the IF frequency through the ratio discriminator transformer varies due to oscillator drift or to detuning of the FM RF stage, there will be a DC voltage change at the junction of R165 and C157. This is the AFC control voltage and is fed from terminal (n) through the WHITE wire to RF Tuner Assy, and then through R117 and R116 to the anode of varicap Diode D103.

The reverse biased D103 is across the oscillator tuned circuit. Changes in the AFC voltage varies this reverse bias, resulting in a change of the oscillator frequency so that it tends to maintain a 10.7 MHz difference between the oscillator frequency and the carrier frequency of the FM station being received.

The AFC voltage is defeated by shorting to ground, i.e. closing AFC/OFF SWITCH (OFF position).



TOP VIEW



BOTTOM VIEW

Fig. 1.12 FM IF AMPLIFIER PC ASSEMBLY

AM RF/IF TUNER

1. The AM RF/IF Tuner is powered by the regulated +12 Vdc fed to terminal **(h)** on the PC board.
2. The AM antenna is fed through the shielded outer conductor of the coax antenna lead between the antenna terminal strip in "A" Housing and the FM RF Tuner, then through the YELLOW wire from the FM tuner to terminal **(f)** on the AM Tuner PC assembly.

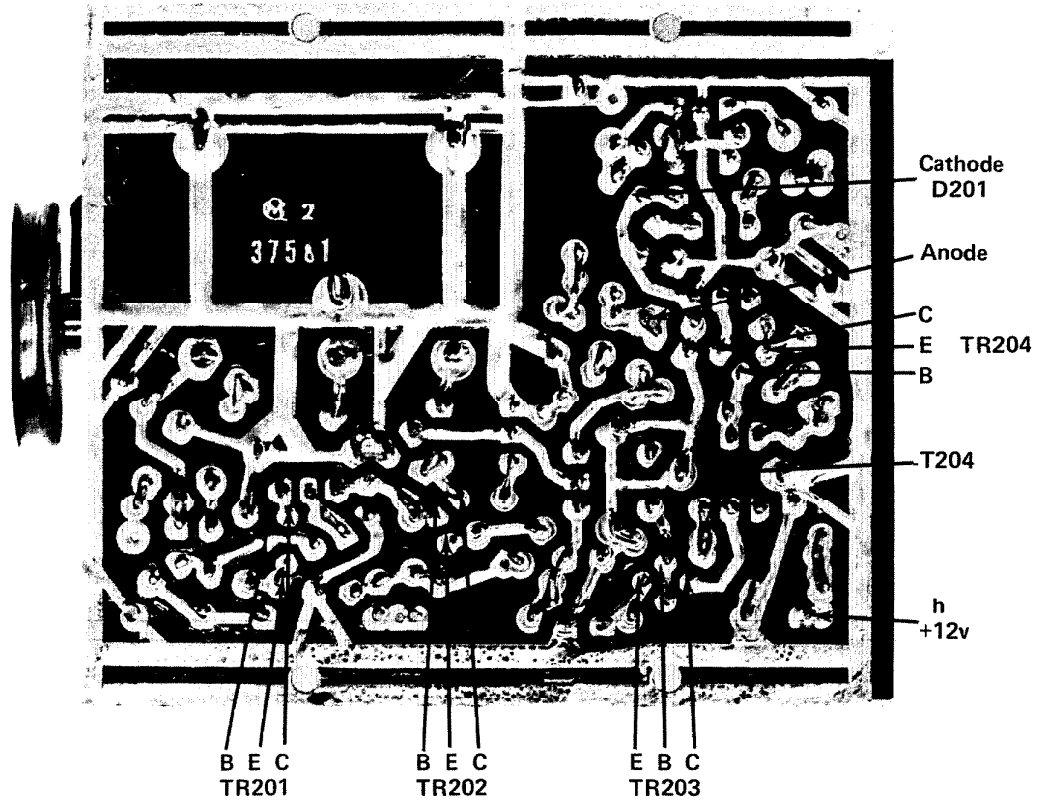
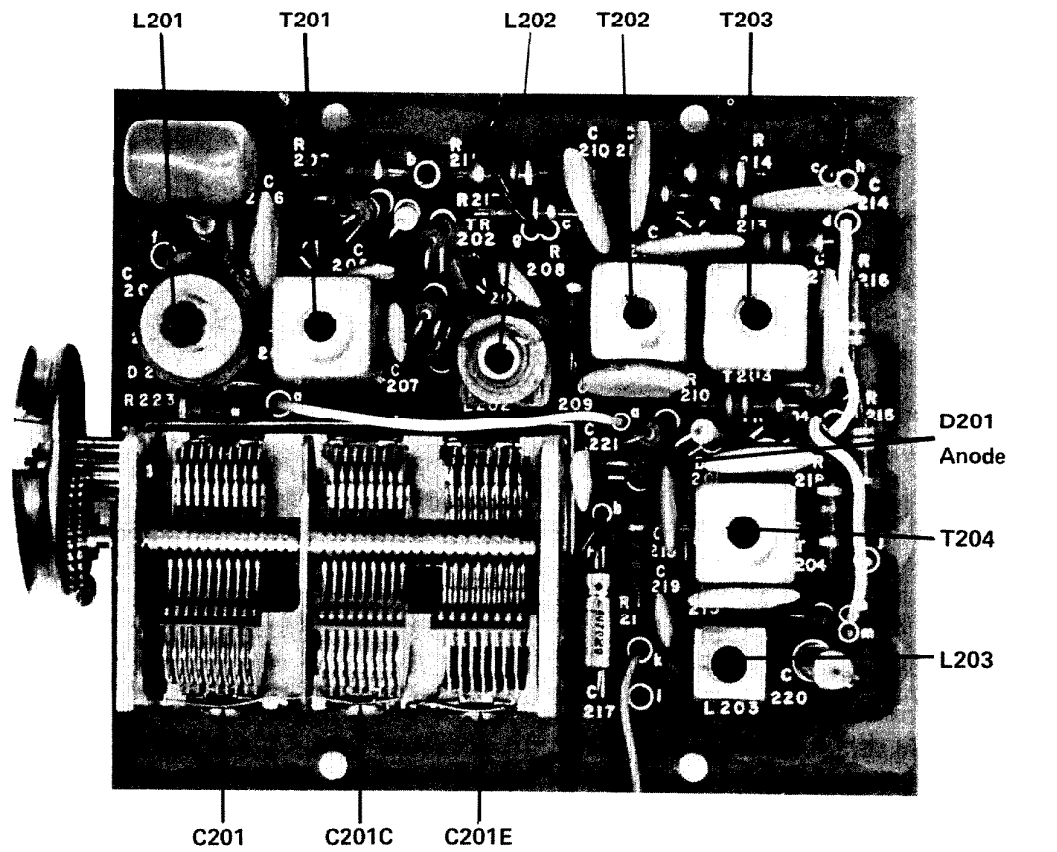
THE SHIELDED OUTER CONDUCTOR OF THE COAX MUST NOT BE GROUNDED

3. The output of the tuned RF Amplifier TR201 is fed to the Base of the Oscillator Converter TR202.
4. The output of TR202 is fed to the 455 KHz. IF Transformer T202.
5. The 455 KHz. IF is amplified through the two IF stages, TR203 and TR204.
6. The AM tuner uses Diode Detection, D201, of the audio signal.
7. The audio signal is fed from terminal **(k)** through the GREEN wire to the MPLX & SWITCHING ASSEMBLY.
8. The AM tuner has excellent high-frequency (wide band pass) characteristics.

The 10 KHz. "Whistle Filter, series circuit consisting of variable inductance L203; and C220, connected between terminal point **(k)** and ground, should be tuned to attenuate 10 KHz. heterodyne between adjacent stations.

MULTIPLEX & SWITCHING

1. The MPLX & SWITCHING circuit is powered by the regulated -12 Vdc fed through RED wire to 180 ohm Resistor R285. (Fig. 1.14)
2. The FM signal is coupled through C261 to the Input (Pin #3 of the MPLX Decoder and Amplifier Matrix (Integrated Circuit Board, IC-261).
3. When a monaural FM program is Fed to Pin #3, the identical amplified audio output appears at Pins #11 and #12.
4. When a stereo FM program is fed to Pin #3, the channel A (left) amplified audio output is fed out through Pin #11; and the channel B (right) amplified audio output is fed out through Pin #12.
5. High-frequency deemphasis is accomplished through C266 and R264 for the output at Pin #11; and through C267 and R265 for the output at Pin #12.
6. P1 and P2 are 38 KHz. notch filters. These integrated passive networks attenuate to ground any 38 KHz. signal that may escape the high-frequency deemphasis network. This keeps the 38 KHz. out of the audio amplifier (protecting the speaker system tweeters that may be used) and prevents harmonics beating with the bias oscillator of tape recorders when program is being tape recorded from the TAPE OUTPUT JACKS of the amplifier.



BOTTOM VIEW

Fig. 1.13 AM RF/IF TUNER PC ASSEMBLY

7. Pin #11's deemphasized audio output (stereo channel A) is fed through C271 and P1 to the base of audio amplifier TR262.

The output of TR262 is coupled from its collector through C280 to terminal #3 of the FUNCTION SELECTOR SWITCH, section 1 front and rear.

This output is also fed from TR262's collector through C272 to the base of emitter follower TR263.

8. Pin #12's deemphasized audio output (stereo channel B) is fed through C269 and P2 to the base of audio amplifier TR261.

The output of TR261 is coupled from its collector through C279 to terminal #3 of the FUNCTION SELECTOR SWITCH, section 3 front and rear.

This output is also fed from TR261's collector through C273 to the base of emitter follower TR264.

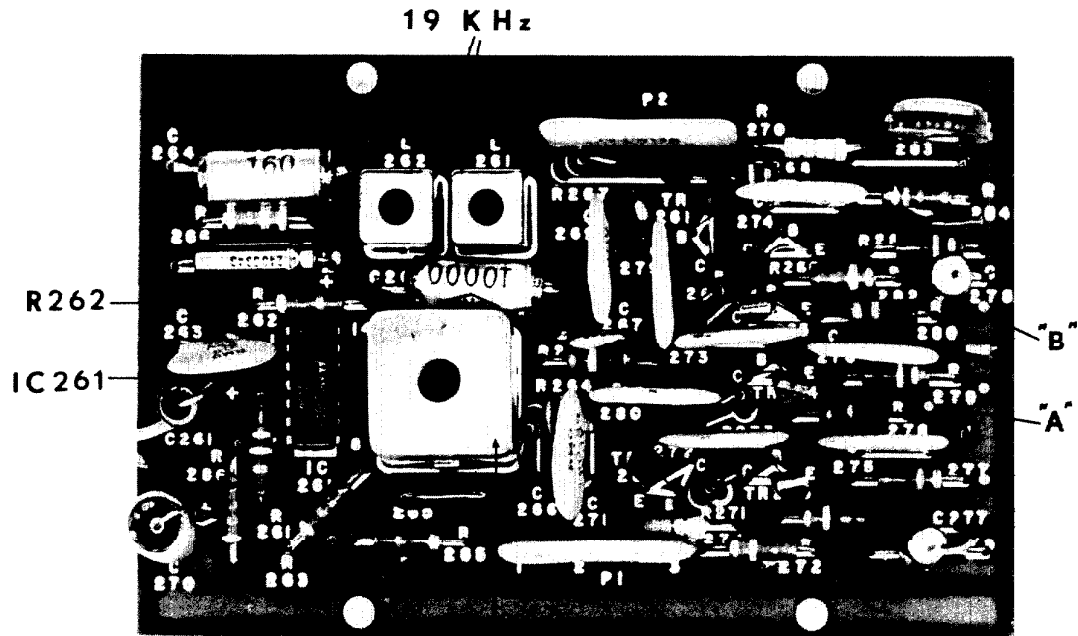
9. The AM audio signal is fed through R284 to terminal #2 of the FUNCTION SELECTOR SWITCH, section 1 front and rear and section 3 front and rear.
10. When point "A" (see Schematic Diagram and Fig. 1.14 and 1.15) is at 6 Vdc, the base bias on TR263 and TR264 will be approximately 1.8 Vdc. This will turn the transistors on as class A emitter follower amplifiers.
11. With the FUNCTION SELECTOR SWITCH in No. 1 (REMOTE) position and TR263 and TR264 turned ON, FM audio channel A will be fed from the emitter of TR263 through C275 to terminal #1 of the switch, section 1 front and rear; and FM audio Channel B will be fed from

the emitter of TR264 through C276 to terminal #1 of the switch, section 3 front and rear.

12. In operation, when point "A" is at 6 Vdc, point "B" should be at 0.6 Vdc and transistors TR265 and TR266 are turned OFF.
13. When point "A" is switched to 0.6 Vdc, TR263 and TR264 will be turned OFF; and, at the same time point "B" should be switched to 6 Vdc-causing the bias on TR265 and TR266 to be approximately 1.8 Vdc. This will turn TR265 and TR266 ON, and they will operate as class A emitter follower amplifiers.
14. With the FUNCTION SELECTOR SWITCH in No. 1 (REMOTE) position and TR265 and TR266 turned ON, the AM audio program will be fed from the emitter of TR266 through C275 to terminal No. 1 of the switch, section 1 front and rear; and the AM audio program will be fed from the emitter of TR265 through C276 to terminal No. 1 of the switch, section 3 front and rear.

REMOTE AM/FM SWITCHING

1. Determining the voltage (6 Vdc or 0.6 Vdc) at points "A" and "B" and whether the AM or FM program is being played through the system when operating in the remote mode is a function of the Flip-Flop (TR608 and TR609) circuit in the 2510 Intercom Master Control. (Fig. 1.15)
2. When the MUSICOM master Unit is turned ON, one of the transistors (TR608 **OR** TR609) will be turned ON — and this same transistor will be turned ON every time, regardless of the mode of operation the system was in at the time it was turned OFF.



IC261: Motorola 1304, R262=100 Ohm
 Motorola 1307, =180 Ohm
 TexInstr 7611ON, = 68 Ohm

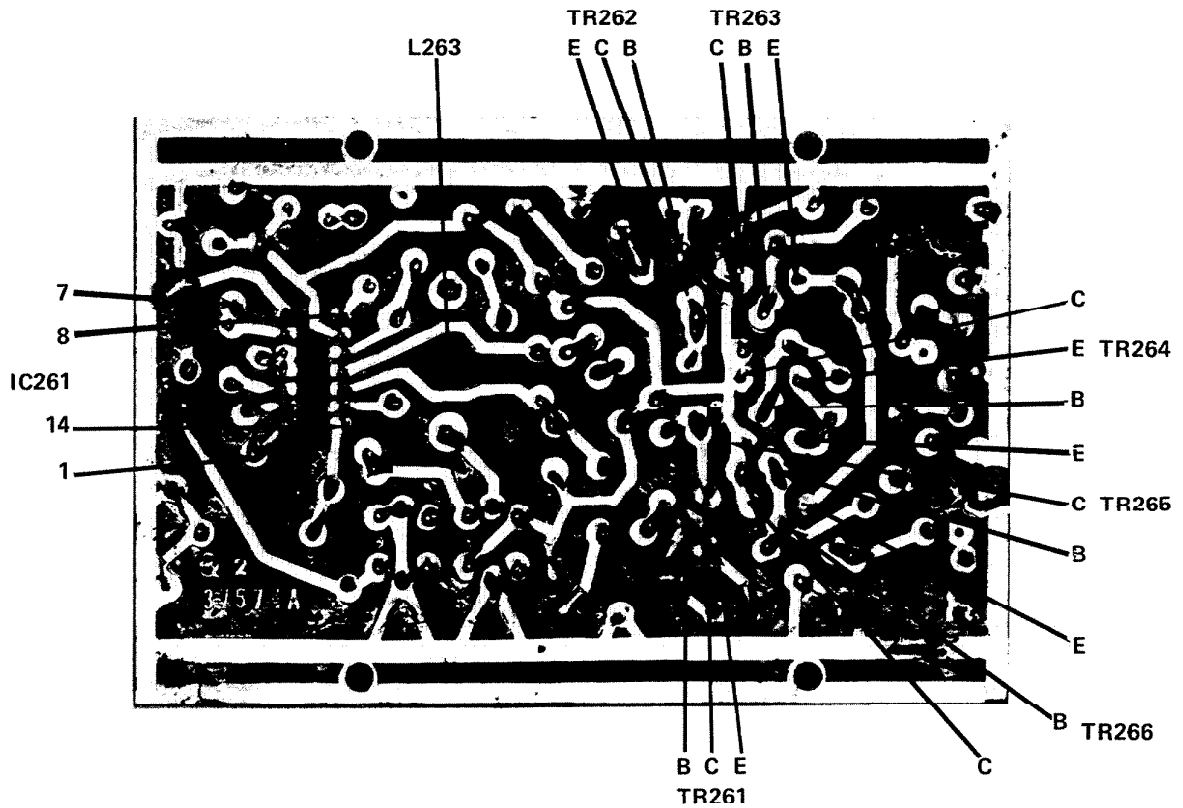


Fig. 1.14 MULTIPLEX & SWITCHING PC ASSEMBLY

- The two sections of the Flip-Flop circuit are symmetrical, but because of permissible manufacturing tolerances, the components will vary slightly. There will be a slight difference in the voltages applied to the transistor elements and with the highly regenerative nature of these circuits, the voltage difference will cause one transistor to be turned ON and the other transistor to be turned OFF, and the

same transistor will be turned ON every time that the MUSICOM Master unit is turned ON. NOTE: If a transistor or other component in the Flip-Flop circuit is replaced, it may change which transistor (TR608 **OR** TR609) is turned ON when the system is turned ON and, therefore, whether the set is operating in the AM or FM mode.

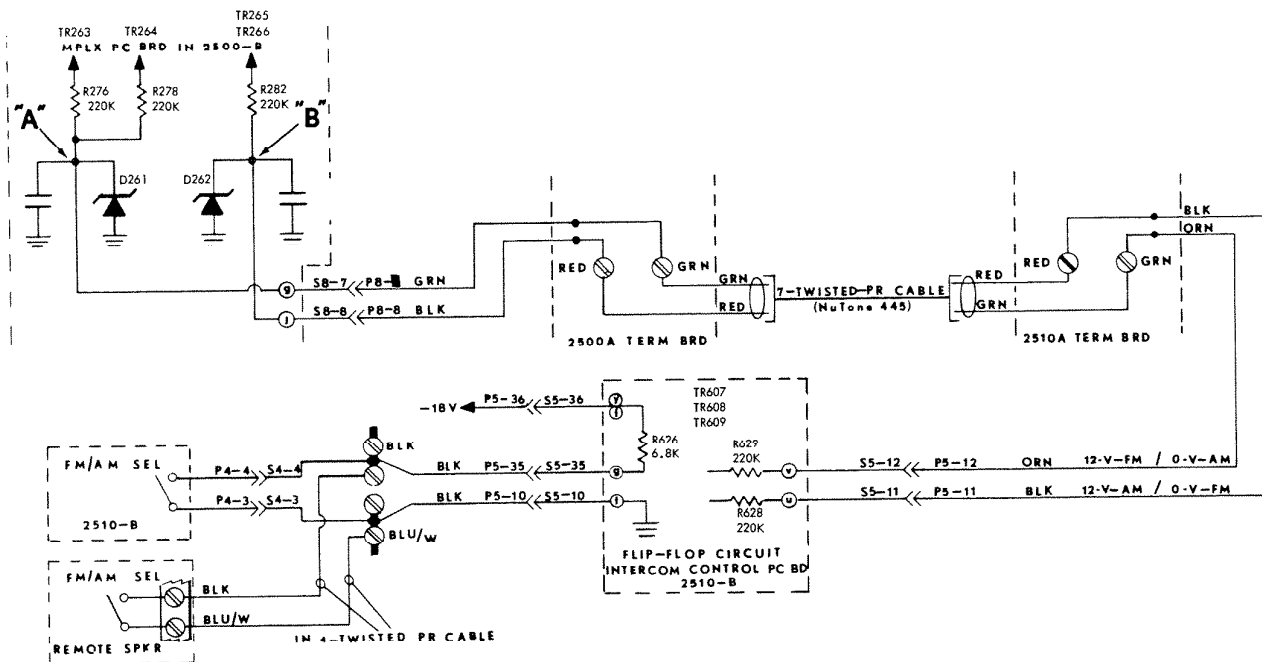


Fig. 1.15 — REMOTE FM/AM SELECTION WIRING DIAGRAM

- If TR608 is turned ON, the collector will be at approximately 1 Vdc and 0.6 Vdc will be present at: (see Intercom Master Control Service Manual)

point (u) on 2510-B's Relay Control PC Board,

RED terminal of RED/GREEN pair on terminal board in 2500-A or 2600-A and in 2510-A,

at point "B" on the MPLX & SWITCHING PC BOARD, resulting in transistors TR265 and TR266 being turned OFF.

- If TR608 is turned ON, TR609 will be turned OFF and TR609's collector will be at near Vcc (Approximately +18 Vdc) and 6 Vdc will be present at:

Point (v) on 2510-B's Relay Control PC Board,

GREEN terminal on RED/GREEN pair on terminal board in 2500-A or 2600-A and in 2510-A,

at point "A" on the MPLX & SWITCHING PC BOARD, resulting in transistors TR263 and TR264 being turned ON.

(5.1) If, in the MPLX & SWITCHING circuit, TR263 and TR264 are turned ON, and the FUNCTION SELECTOR SWITCH is in No. 1 (REMOTE) position, the FM program will be fed to the audio amplifier.

- Depressing the AM/FM REMOTE SELECTOR SWITCH on the 2510-B (or in a remote intercom speaker control) will ground point (g) of the 2510-B's Relay Control PC Board. This causes Zener Diode D609 to conduct, resulting in the base bias of TR607 changing to approximately -3 Vdc. This turns TR607 ON with its collector voltage changing to -18 Vdc and

the voltage at the junction of R620 and R619 going to approximately -6 Vdc.

A -6 Vdc pulse is transmitted through C603 and D606 to the base of TR608—turning it OFF. At the same time the -6 Vdc pulse is transmitted through C604 and D607 to the base of TR609 but, because TR609 is already turned OFF, it will have no effect on collector current.

TR608 being turned OFF results in its collector voltage rising toward Vcc ($+18$ Vdc) this positive going voltage is coupled through R612 to the base of TR609 causing collector current and the collector voltage changing to approximately 1 Vdc. and the voltage at (v) switching to -0.6 Vdc. This $+0.6$ Vdc is applied to point "A" on the MPLX & SWITCHING PC ASSY., turning TR263 and TR264 OFF.

At the same time, the collector voltage of TR608 rises to approximately $+18$ Vdc., and the voltage at (u) switches to $+6$ Vdc. This $+6$ Vdc. is connected to point "B" on the MPLX & SWITCH ASSY., turning TR 265 and TR266 ON.

OPERATION OF PARA. 6 ABOVE RESULTS IN A CHANGE OF MODE FROM FM TO AM

7. If, in step 4 and 5 above, TR609 had been ON (and TR608, OFF) depressing the AM FM REMOTE SELECTOR SWITCH would have turned TR607 ON, TR609 would have been turned OFF and TR608 turned ON, the voltages at points "A" and "B" of the MPLX & SWITCHING ASSY. would be switched:
RESULTING IN A CHANGE OF MODE FROM AM TO FM.
8. In early production units there was a delay of a second or two when changing mode of operation. C277 and C278 were 15 microfarads @ 15 WVDC electrolytics and D261 and D262 were not used. For instantaneous switching of these earlier units, replace C277 and C278 and add D261 and D262 to comply with present production as shown in MPLX & SWITCHING schematic diagram (center fold this manual).
9. Early production units of the 2510-B used R628 and R629 values of 220K ohm. This high resistance helped limit the voltage at "A" and "B" on the MPLX & SWITCHING ASSY. With the use of Zener Diodes D261 and D262 (6.2 V) and the changing of C277 and C278 to .05 microfarads @ 50 WVDC electrolytics, on the MPLX board (para. 8 above), the Resistors

R628 and R629 should be changed to 10K ohms, further increasing the speed of the AM-FM switching.

NOTE: For the instant that the AM FM REMOTE SELECTOR SWITCH is held depressed, the radio program will be heard at the door speaker(s).

If the FUNCTION SELECTOR SWITCH is in No. 1 (REMOTE) position, changed mode of operation will be heard at all inside speakers. When the FUNCTION SELECTOR SWITCH is in No. 2 (AM) or No. 3 (FM) position, changing mode of operation with the AM FM REMOTE SELECTOR SWITCH will have no effect on the program being heard at the inside speakers even though, the voltages applied to points "A" and "B" on the MPLX & SWITCHING PC ASSY. is being switched.

EXTERNAL AUDIO SOURCES AND OPERATING SWITCHES

1. PHONO INPUTS: A relatively high-output stereo phono cartridge (ceramic) must be used with the MUSICOM receiver.

Channel A's Phono signal is connected to shielded phono jack J1 and then through R1 and C1 to terminal No. 4 section 1 front and rear of the FUNCTION SELECTOR SWITCH. (see Schematic Diagram and Interstage Wiring Diagram)

Channel B's Phono signal is connected to shielded phono jack J2 and then through R2 and C2 to terminal No. 4 section 3 front and rear of the FUNCTION SELECTOR SWITCH.

Channel A's R1 and C1; and channel B's R2 and C2 provide a high impedance load for the ceramic cartridge. This load is necessary to maintain proper high-frequency response. Also, since many ceramic cartridges have outputs in the order of 300 to 400 millivolts, these networks attenuate the signal to values approximating 124 to 200 millivolts, preventing the overloading of the audio preamp input stage.

2. TAPE INPUT: the preamplified tape player output is fed through J3 (channel A) to terminal No. 5 section 1 front and rear, and through J4 (channel B) to terminal No. 5 section 3 front and rear respectively of the FUNCTION SELECTOR SWITCH. Do not use a

tape signal from an audio power amplifier such as that used to drive a loud speaker.

Some tape players have preamplifiers with very high output levels with no provisions for attenuating the signal. The output of these recorders should be fed through volume control potentiometers (order of 500K ohm) to the TAPE input jacks. These pots. should be adjusted so that the tape signal does not overload the audio preamp input (125-200 millivolts).

R3 (channel A) and R4 (channel B) attenuate the tape signal. The value (22K ohm) was selected for matching the output of NuTone Models: 2505 and 2605 8-Track Tape Cartridge Players and Model 2506 Tape Cassette Player/Recorder.

3. AUXILIARY INPUT: a preamplified audio source (tape player; tuner; preamplifier such as used with magnetic or variable reluctance cartridge; etc.) may be fed through J5 (channel A) to terminal No. 6 section 1 front and rear and through J6 (channel B) to terminal No. 6 section 3 front and rear of the FUNCTION SELECTOR SWITCH. This signal should not exceed 125-200 millivolts.

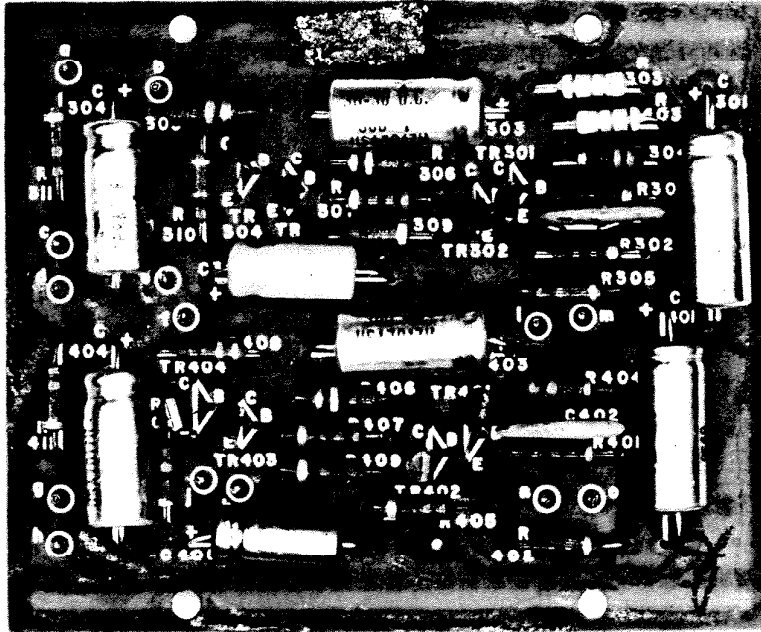
If the audio output of the auxiliary source exceeds 125 to 200 millivolts, it should be attenuated as directed in TAPE INPUT, above.

4. FUNCTION SELECTOR SWITCH: The channel A audio signal is fed from the common wiper of section 1 front to the STEREO/MONO SWITCH (one side of the DPDT toggle switch common terminal) and then to terminal **(m)** of the audio preamplifier PC board.

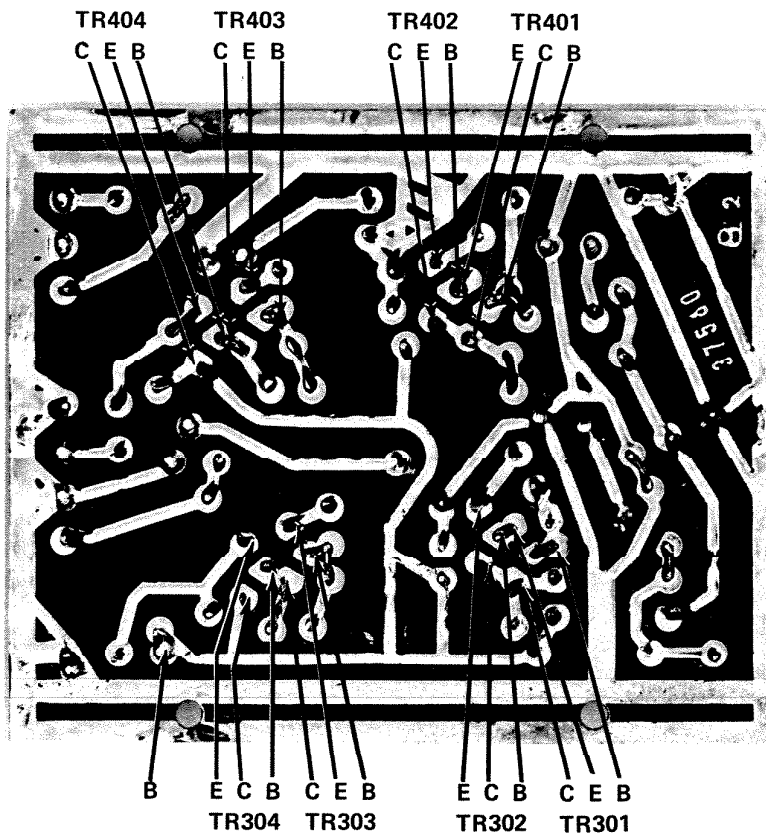
Channel B's audio signal is fed from common wiper of section 3 rear to one side of the STEREO MONO SWITCH and then to terminal **(o)** of the preamp PC board.

CHANNEL A: Rear section 1's wiper shorts the audio signal at terminal 1, 2 and 3 (REMOTE, FM AND AM respectively) when the switch is in position 4, 5 or 6 (PHONO, TAPE or AUX respectively).

CHANNEL B: Front section 3's wiper shorts the audio signal at terminals 1, 2 and 3 when the FUNCTION SELECTOR SWITCH is in position 4, 5 or 6.



TOP VIEW



BOTTOM VIEW

Fig. 1.16 — DUAL PREAMPLIFIERS

The shorting to ground of the AM and FM signals when the SWITCH is in position 4, 5 or 6 assures that there will be no leak through, due to capacitive coupling across the switch contacts, of these signals when listening to phonograph, tape or auxiliary.

5. FUNCTION SELECTOR SWITCH section 2 rear controls the voltage to the FM tuning Varicap Diodes. (see Schematic and Interstage Wiring diagrams)

In position No. 1 the remote FM tuning voltage is fed from the slide pots. in the 2510 Intercom Master Control.

In positions No. 2 through No. 6 the tuning voltage is fed from and controlled by the FM tuning potentiometer R170.

6. Section 2 front switches the DC voltage to the FM STEREO INDICATOR LIGHT. The wiper is connected to contact of one section of the DPDT STEREO/MONO SWITCH and #1 (REMOTE) and #3 (FM) contacts are connected by a BROWN wire to the MPLX & SWITCHING ASSY.
7. STEREO MONO SWITCH: One section used to common connect both audio channels resulting in mono reproduction regardless of whether stereo or mono source is being reproduced.

Other side of SWITCH is used to control voltage to FM STEREO INDICATOR LIGHT. LIGHT can not be turned ON when this section of SWITCH is open.

DUAL AUDIO PREAMPLIFIER

1. Channel A and channel B Class A audio preamplifiers are constructed on one PC Board Assy. The preamps are powered by the +40 Vdc supply connected to terminal (b) on the PC board. (Fig. 1.16)
2. TR301 (channel A) and TR401 (channel B) are high impedance input stages. To prevent over-driving the preamps, the audio input signal strength should not exceed 300-400 millivolts RMS.
3. Channel A: TR301 and TR302 are Darlington connected for hi-input-impedance and for very high voltage gain. The audio output of TR302 is coupled through C403 to base of TR303 for

further amplification. TR303 is direct coupled to Emitter Follower TR304. The Emitter Follower has two outputs: one from the high side of R310 is coupled through C304 to point (d) and then via shielded audio cable to input terminal (v) on the Dual Volume and Tone Control PC Board. (see Interstage Wiring Diagram)

The other Emitter Follower audio output is coupled from high side of R311 through C305 to one side of the RECORD INT REC SWITCH. This is a flat output, i.e. it is not effected by the volume and tone controls. This audio signal is fed to the channel A TAPE OUTPUT jack when switch is in the RECORD position. (When switch is in INT REC position, the intercom signal is fed to channel A TAPE OUTPUT jack.)

4. Channel B: Operation is the same as for channel A— substituting 400 component numbers in lieu of 300 numbers of para. 3 above. Channel B Tape Output is coupled through C405 direct to channel B TAPE OUTPUT jack.

Emitter Follower TR404 audio output is coupled from the high side of R410 through C404 to point (h) and then via shielded audio cable to input terminal (w) on the Dual Volume and Tone Control PC Board.

DUAL VOLUME AND TONE CONTROL

1. Control circuits for both channels are on one PC Board, except the LEVEL SET CONTROL, which is chassis mounted behind the front panel.
2. The Control Circuit Assy. is powered by +40 Vdc supply connected to terminal (u) on the PC board. (Fig. 1.17)
3. Channel A preamplified audio signal is fed to terminal (v) and then through BASS and TREBLE control to the base of TR321.

Channel B preamplified audio signal is fed to terminal (w) and then through BASS and TREBLE control to the base of TR421.

4. The dual Bass and Treble controls are nominally flat in the center position. Clockwise rotation increases and counter-clockwise rotation decreases the Bass and/or Treble drive to the transistor amplifying their output.

MODEL 2500 MUSICOM MASTER TUNER/AMPLIFIER PARTS LIST

CAPACITORS: Ceramic; Value in micro Farads; 50 WVDC, unless otherwise noted.

RESISTORS: Carbon Composition; Value in Ohms; ½ Watt unless otherwise noted.

K (Kilo) = 1,000

M (Mega) = 1,000,000

Schematic Symbol No.	NuTone Part No.	Description
FM RF ASSEMBLY		
	41175	Complete Assy.
	41176	PC Board Assy.
	37576	PC Board
CAPACITORS		
C101, C105 C117	33101-104	470 pfd. @ 500 WVDC
C102		Not Used
C103, C107	39144	Variable Trimmer, RF Tuning
C104	35101-127	2.2 pfd.
C106		Not Used
C108, C116	35101-134	3.3 pfd.
C109, C111	35101-130	15 pfd.
C110, C112 C113	35100-120	.001 ϕ 500 WVDC
C114, C118	35101-129	4.7 pfd.
C115	35101-132	12 pfd.
C119	35078	1 to 5 pfd. @ 500 WVDC, Oscillator Trimmer
C120	35110-106	.002 Mica @ 100 WVDC
C121, C125 C126, C127	35100-139	.01
C122	35100-141	.05
C123	35101-126	1.2 pfd. @ 500 WVDC
C124	35100-124	270 pfd.
C128, C129	35100-144	56 pfd. @ 500 WVDC
C130	35100-127	.1 @ 100 WVDC
C131	35068-109	15 @ 15 WVDC, Electrolytic
DIODES		
D101, D102 D104	36568	VariCap-RF and Oscil- lator Tuning-Motorola MV2106 (Capacitance varies inversely with amplitude of REVERSE BIAS voltage) Matched to \pm 3%. Supplied by NuTone in sets of 3 ONLY. All 3 diodes must be replaced if any one diode is defective.
D103	35069	Silicon VariCap, AFC. T.I.-TIV-308, Gen. Inst. Corp. CSO-88, Motorola SMV-288

Schematic Symbol No.	NuTone Part No.	Description
COILS		
L101	30073 31935 31915 30068 30070 30080	Ant. Transformer Assy. Coil Form Spacer Tuning Core Ant. Primary Ant. Trap FM Ant. Secondary
L102	30073 31935 31915 30042 30072	Coil and Form Assy. Coil Form Spacer Tuning Core Mixer Neutralizer
L103	30062	RF Trap
L104	30082	Oscillator
RESISTORS		
R101, R110 R111	33101-104	100 K
R102	33101-681	680
R103	33101-271	270
R104, R108		
R115, R118	33101-331	330
R105, R112 R117	33101-333	33 K
R106, R113	33101-392	3.9 K
R107, R114	33101-102	1,000
R109	33101-105	1 Meg
R116	33101-224	220 K
TRANSFORMERS		
T101	30525	1st. I.F. 10.7 MHz.
TRANSISTORS		
TR101	36582	RF Amplifier, Silicon FET, N-Channel Epitax- ial Planar. T.I. SKA-4229
TR102	36578	F.M. Mixer and 1st. De- tector, Silicon NPN, Epi- taxial Planar. T.I. SKA- 4231. Motorola SPS-4484
TR103	36581	Oscillator, Silicon NPN Planar, Low Noise, T.I. SKA-4230.
MISCELLANEOUS		
	41265 38283	Coax Cable Assy. RF Shield
FM I.F. ASSEMBLY		
	41174 37575	Complete Assembly PC Board

MODEL 2500 MUSICOM MASTER TUNER/AMPLIFIER PARTS LIST (Cont.)

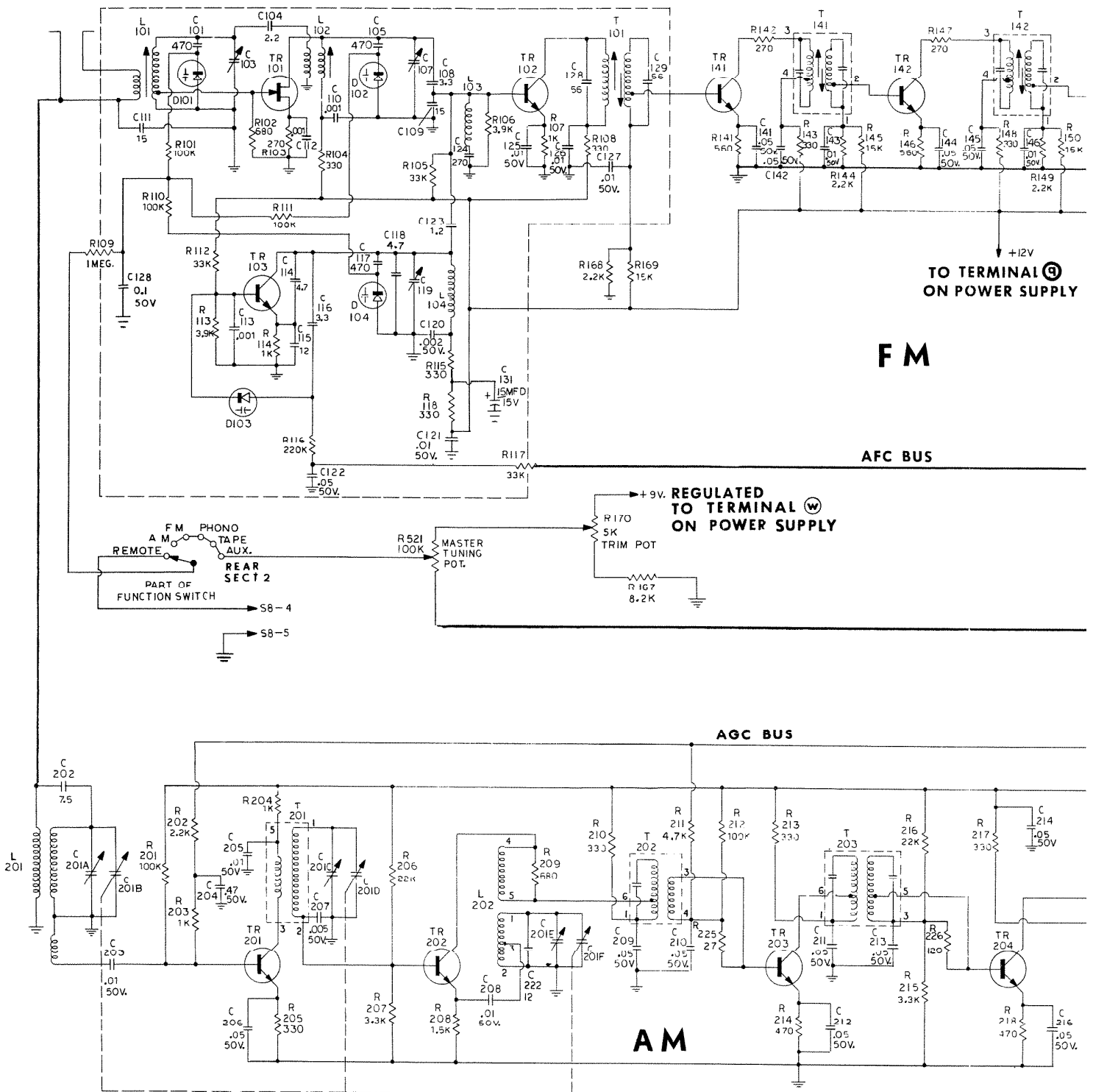
Schematic Symbol No.	NuTone Part No.	Description
CAPACITORS		
C141, C142 C144, C145 C147, C148 C150, C151 C143, C146 C149, C157 C152, C153 C154 C155	33100-141 33100-139 35100-142 35068-108	.05 .01 330 pfd. 10 @ 6 WVDC, Electrolytic
C156	35100-138	.005
RESISTORS		
R141, R146 R151, R157 R142, R147 R152 R143, R148 R153, R158 R144, R149 R154, R156 R145, R150 R155, R169 R156 R157 R160 R161 R165 R166 R167 R170	35101-561 33101-271 33101-331 33101-222 33101-153 33101-471 33101-680 33101-102 33101-102 33101-104 33103-822 34050	560 270 330 2.2 K 15 K 470 68 1,000 1.5 K 100 K Not Used 8.2 K \pm 5%, Carbon Film 5 K Potentiometer, FM RF Tuning Trimmer (High End — 108 MHz)
TRANSFORMERS		
T141 T142, T143 T144	30583 30582 30574	1st. FM IF, 10.7 MHz. 3 rd. & 4th. FM IF, 10.7 MHz. FM Radio Discriminator, 10.7 MHz.
TRANSISTORS		
TR141, TR142 TR143, TR144	36578	IF Amplifier, Silicon NPN, Epitaxial Planar, T.I. SKA-4231. Motorola SPS-4484
FM MULTIPLEX & SWITCHING ASSEMBLY		
	41160 37574	Complete PC Assembly PC Assembly
CAPACITORS		
C261, C268 C262, C267 C263, C277 C278 C277, C278	35068-106 35100-139 35100-146 35068-109	2 @ 50 WVDC, Electrolytic .01 .05 15 @ 15 WVDC, Electro- lytic (Used in production models prior to April 7, 1971)

Schematic Symbol No.	NuTone Part No.	Description
C264, C266 C265 C269, C271 C272, C273 C274, C275 C276, C279 C280 C270	35087-101 35110-107 35100-127 35068-104	.01 @ 50 V, Polystyrene, \pm 10% 1200 pfd. @ 100 WVDC, Silver Mica .1 30 @ 30 WVDC, Electrolytic
DIODES		
D261, D262	36594	Zener 6.2 V, Motorola 1N5234A (Used in pro- duction models after April 7, 1971)
INTEGRATED CIRCUIT		
IC261	36607	Motorola MC-1307-P
COILS		
L261, L262 L263	30075 30076	Stereo Peaking Doubler
LAMPS		
M261	31813 31815	Stereo Indicator, Syl- vania 12ESB (Mounted on Front Panel) Socket, Lamp-12ESB
PRINTED CIRCUIT BOARDS		
P1, P2	37582	Notch Filter 38 KHz.
RESISTORS		
R261 R262, R285 R263, R286 R264, R265 R266 R267, R271 R268, R272 R276, R278 R282 R269, R270 R273, R274 R275, R279 R281, R284 R284	33101-183 33101-181 33101-152 33101-392 33101-472 33101-474 33101-224 33101-332 33101-104 33101-683	18 K 180 1.5 K 3.9 K 4.7 K 470 K 220 K 3.3 K 100 K 6.8 K (Used in produc- tion models prior to March 30, 1971)
R277, R280 R283	33101-103 34041	10 K 50 K Potentiometer, FM RF Tuning Trimmer (Low End, 88 MHz.)
TRANSISTORS		
TR261, TR262 TR263, TR264 TR265, TR266	36580	Silicon, NPN Planar, Low Noise, T.I. SKA- 4220. Motorola SPS-1216
MISCELLANEOUS		
	8167	Shielded Cable Assy.

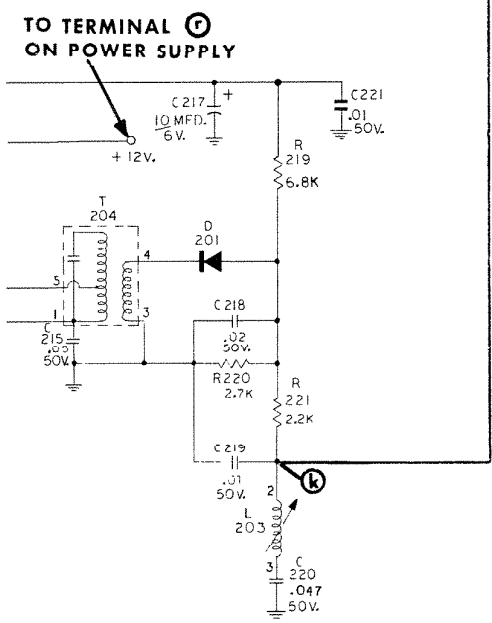
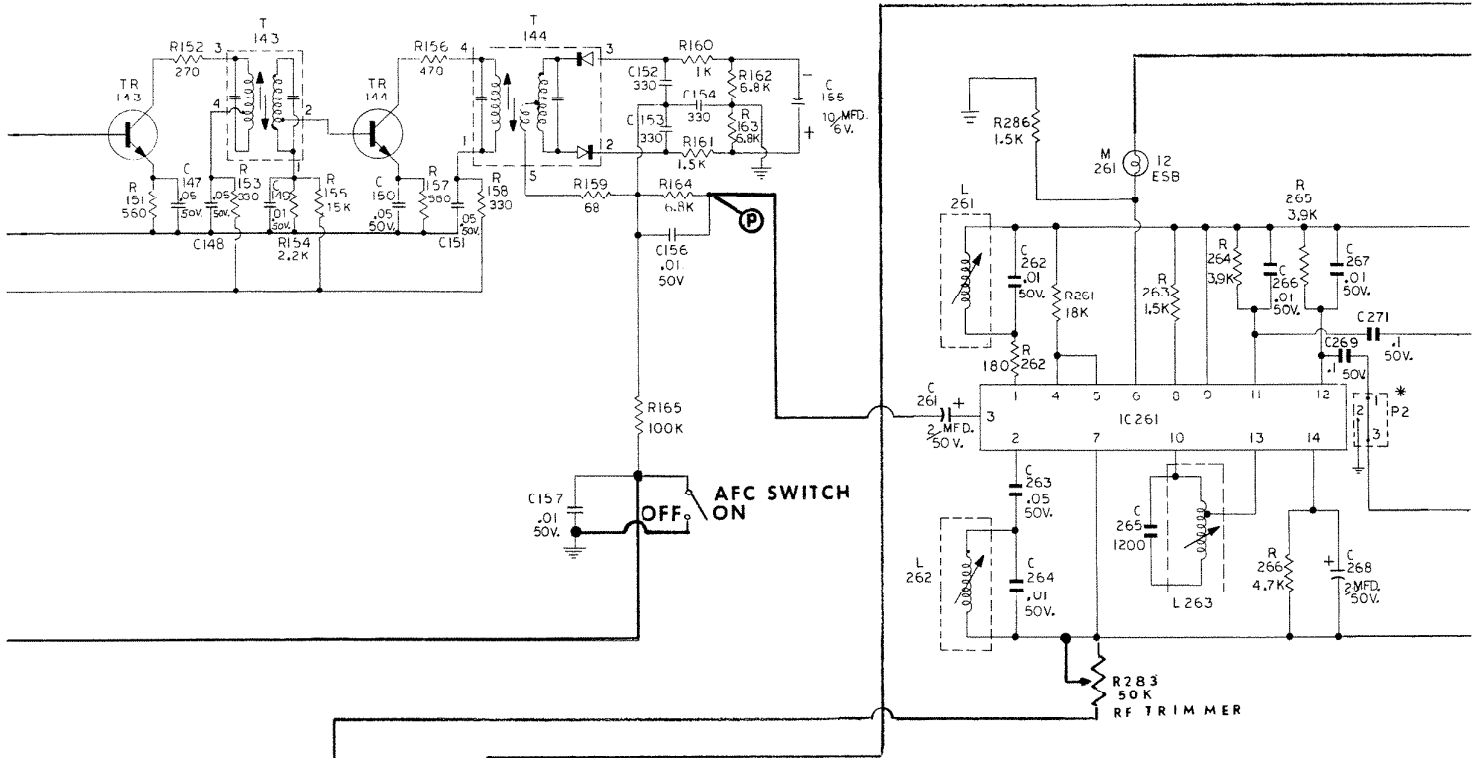
MODEL 2500 MUSICOM MASTER TUNER/AMPLIFIER PARTS LIST (Cont.)

Schematic Symbol No.	NuTone Part No.	Description
AM RF & IF ASSEMBLY		
	41164	Complete PC Assembly
	37581	PC Board
C201	35088	Tuning, 3-Gang
C202	35101-135	7.5 pfd. @ 500 WVDC
C203, C205 C208, C219		
C221	35100-139	.01
C204	35024-101	.47 @ 75 WVDC Polyester Film
C206, C209 C210, C211 C212, C213	35100-141	.05
C216 C207	35100-108	.005
C217	35068-108	10 @ 6 WVDC Electrolytic
C218	35100-140	.02
C220	35066-104	.047 @ 150 WVDC, Mylar Dielectric Film Wrap
C222	35101-133	10 pfd. @ 500 WVDC (Used in production models after March 30, 1971)
DIODES		
D1	36508	Semi-Conductor, 1N295A, 1N270A
D2	36580	(Used in production prior to March 30, 1971)
COILS		
L201		Included as part of Antenna Transformer — Part No. 30578.
L202	30078	Oscillator
L203	30075	10 KHz. Whistle Filter (Used with C220)
RESISTORS		
R201, R212	33101-104	100 K
R202, R221	33101-222	2.2 K
R203, R204	33101-102	1,000
R205, R210 R213, R217	33101-331	330
R206, R216	33101-223	22 K
R207, R215	33101-332	3.3 K
R208	33101-152	1.5 K
R209	33101-681	680
R211	33101-472	4.7 K
R214, R218	33101-471	470
R219	33101-682	6.8 K
R220	33101-272	2.7 K
R222		Not Used
R223, R224	33101-472	4.7 K (Both used in production models prior to March 30, 1971)

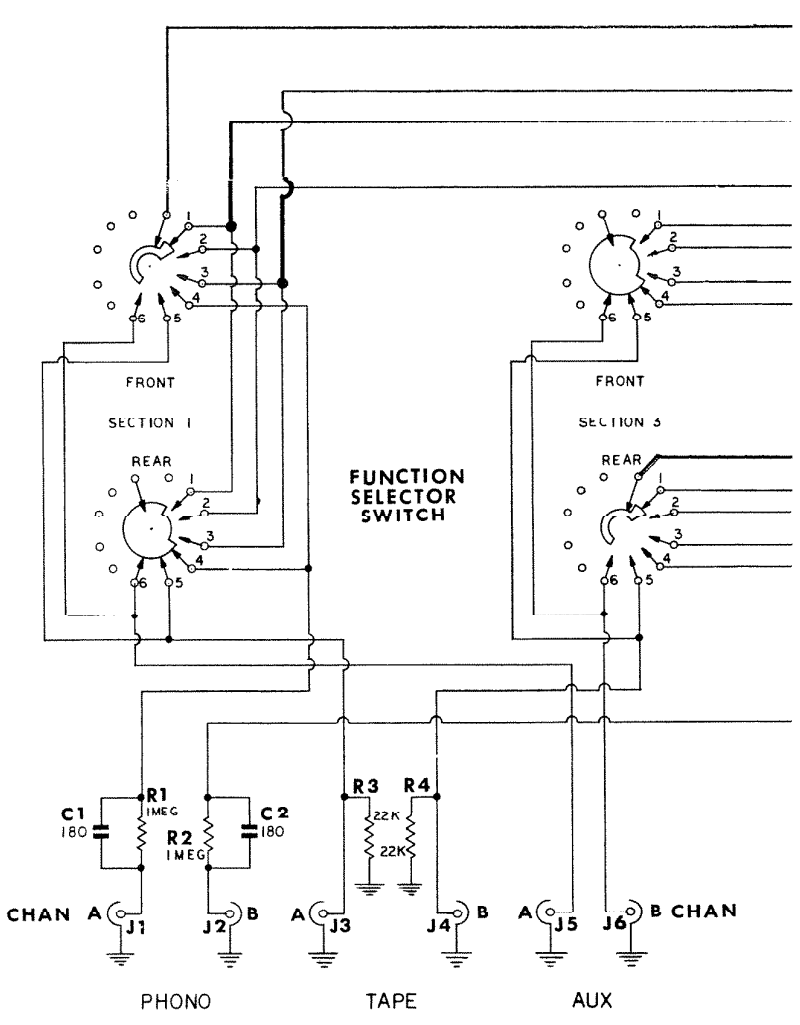
Schematic Symbol No.	NuTone Part No.	Description
R225	33101-270	27
R226	33101-121	120
TRANSFORMERS		
	30578	Antenna, Input (Includes L201 Antenna Coil)
T201	30077	Mixer
T202	30580	1st. IF, 455 KHz.
T203	30579	2nd. IF, 455 KHz.
T204	30581	3rd. IF, 455 KHz.
TRANSISTORS		
TR201, TR202	36580	Silicon, NPN Planar, Low Noise, T.I. SKA-4220. Motorola SPS-1216
TR203, TR204		
DUAL PREAMPLIFIER ASSEMBLY		
	41182	Complete PC Assembly
	37580	PC Board
	NOTE:	Components in 300 series are channel A (left) Components in 400 series are channel B (right)
CAPACITORS		
C301, C401	35068-113	50 @ 50 WVDC Electrolytic
C302, C402	35100-147	.1
C303, C304 C403, C404	35068-104	30 @ 30 WVDC Electrolytic
C305, C405	35068-105	50 @ 10 WVDC Electrolytic
RESISTORS		
R301, R401	33101-685	6.8 M
R302, R402	33101-125	1.2 M
R303, R403	33101-682	6.8 K
R304, R404	33101-332	3.3 K
R305, R311 R405, R411	33101-681	680
R306, R406	33101-154	150 K
R307, R407	33101-822	8.2 K
R308, R408	33101-103	10 K
R309, R409	33101-102	1,000
R310, R410	33101-272	2.7 K
TRANSISTORS		
TR301, TR302	36580	Silicon, NPN Planar, Low Noise, T.I. SKA-4220. Motorola SPS-1216
TR303, TR304 TR401, TR402 TR403, TR404		
DUAL VOLUME & TONE CONTROL ASSEMBLY		
	41158	Complete PC Assembly
	37573	PC Board
CAPACITORS		
C321, C421	35100-146	.05
C322, C422	35068-107	100 @ 3 WVDC Electrolytic
C323, C423	35100-156	.0022



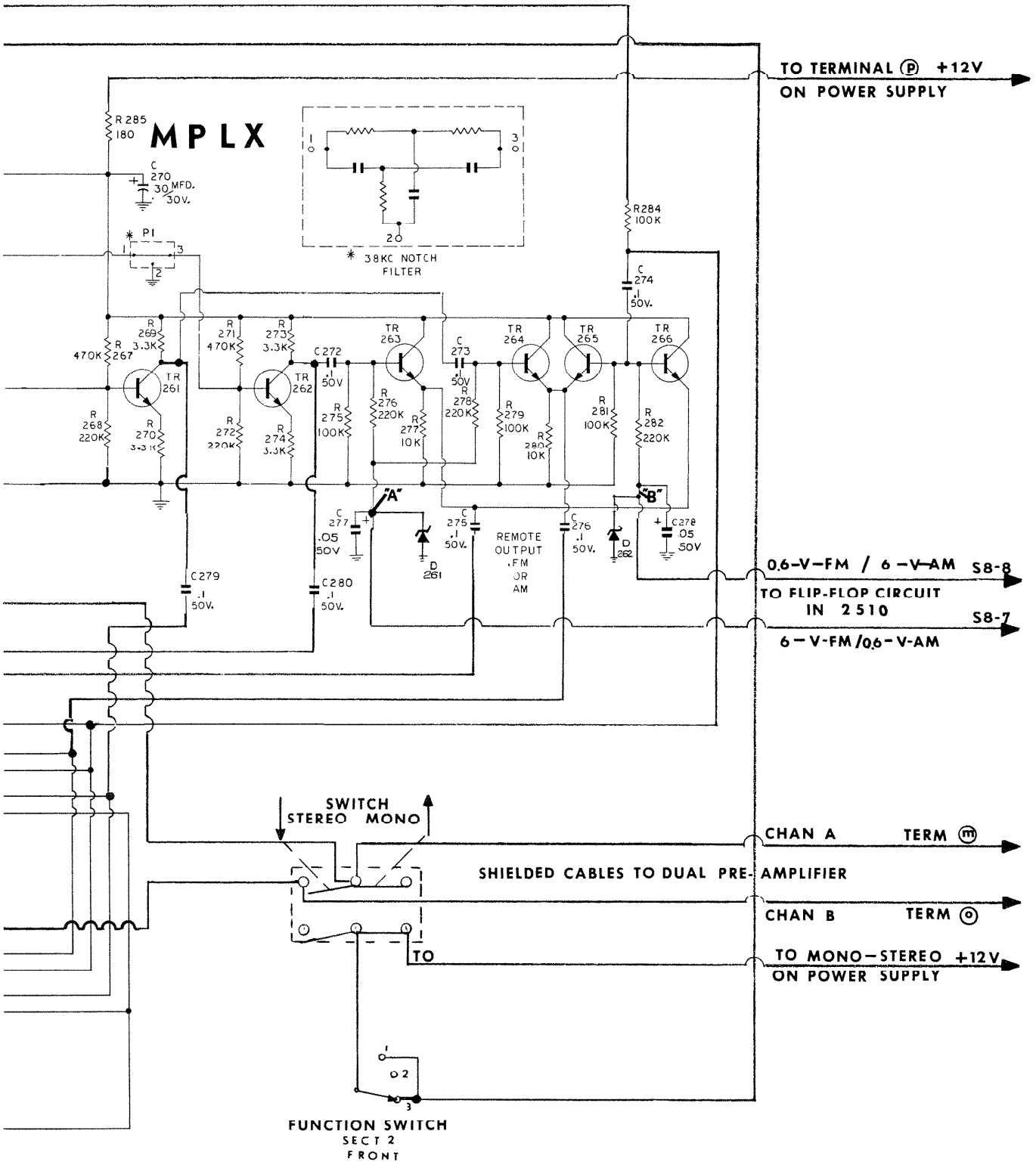
MODEL 2500 MUSICOM MASTER UNIT TUNER-AMPLIFIER SCHEMATIC DIAGRAM (AM, FM, MPLX AND SWITCHING)



- 1 - REMOTE
- 2 - AM
- 3 - FM
- 4 - PHONO
- 5 - TAPE
- 6 - AUX



SEE OTHER SIDE FOR PARTS LIST



MODEL 2500 MUSICOM MASTER TUNER/AMPLIFIER PARTS LIST (Cont.)

Schematic Symbol No.	NuTone Part No.	Description
R355, R359 R455, R459	33101-680	68
R356, R358 R456, R458	33101-102	1,000
R357, R457	33101-472	4.7 K
R362, R364 R462, R464	33030-108	.47, 5 Watt, Wire Wound
R363, R365 R463, R465	33101-220	22
R467	33101-105	1 Meg (Use resistor mounted on bottom PC Board)
TRANSISTORS		
TR341, TR342 TR347, TR441 36577 TR442, TR447		Silicon PNP, Epitaxial Planar T.I. SKA-4223
TR343, TR345 36605 TR443, TR445		Silicon NPN, Power Motorola MPS-U05
TR344, TR444 36580		Silicon NPN, Low Noise T.I. 4220, Motorola SPS-1216
TR348, TR448 36603		Silicon PNP, Power Motorola MPS-U55
TR346, TR349 36566 TR446, TR449		Silicon NPN, Single Dif-fused, Power Output (on Heat Sink Assy.) RCA-40633
	36616	2N3055
MISCELLANEOUS		
	38105	Mtg. Bracket, Heat Sink Type for Power Transistors on PC Board
	31449	Socket, Output Transistor (on Heat Sink Assy.)
	39145	Terminal Strip (on Heat Sink Assy.)
INTERCOM PREAMPLIFIER		
CAPACITOR		
C381	35100-140	.02
C382, C385	35100-127	.1
C383, C388	35024-101	.47
C384, C391	35068-116	15 @ 50 WVDC, Electrolytic
C387	35068-110	20 @ 6 WVDC, Electrolytic
C389, C390	35100-134	470 pfd.
DIODES		
D381, D382, D383	36549	Silicon Rectifier, 1N4002 Motorola MR-2065 (D383 used in late production ONLY)
COIL		
L381	39154	Relay Reed Switch. (Used in Early Production ONLY)

Schematic Symbol No.	NuTone Part No.	Description
RESISTORS		
R381	33101-470	47
R382	33101-562	5.6 K (Early Production used 10 K)
R383	33101-124	120 K
	33101-184	180 K
R384, R385	33101-224	(220 K used in late production)
R386	33101-333	33 K
	33101-103	10 K
R387	33101-333	(33 K used in late production)
R388	33101-101	100
R389, R393	33101-332	3.3 K
R390	33101-224	220 K
R391, R397	33101-472	4.7 K (R397 used in late production only)
R392, R396 R398	33101-104	100 K (R396 & R398 used in late production only)
R394	33101-473	47 K
R395	33101-221	220
TRANSISTORS		
TR381, TR382 36580 TR383, TR384		Silicon NPN, Low Noise T.I.-4220, Motorola SPS-1226 (TR384 used in late production only)
DC POWER SUPPLY		
	41180	Complete PC Assy.
	37578	PC Board
CAPACITORS		
C501, C502	35100-139	.01
C503 A	35089	500 @ 80 WVDC Electrolytic, Can Negative
	B	500 @ 80 WVDC Electrolytic, Can Negative
	C	500 @ 50 WVDC Electrolytic, Can Negative
	D	200 @ 50 WVDC Electrolytic, Can Negative
C504, C505	35047	500 @ 50 WVDC, Electrolytic, Paper
C506, C507	35006	1500 @ 50 WVDC, Electrolytic, Can Negative
DIODES		
D501, D502 D503, D504 D505, D506 D507, D508	36549	Silicon Rectifier, 1N4002 Motorola MR-2065
D509, D510 D511, D512	36608	Silicon Rectifier (PIV 200 V, 3 Amps)
D513	36539	Zener, 12 V., Motorola 1N4742A, International Rectifier 1ZM12T5
D514	36601	Zener 3.9 V., Motorola 1N5228

MODEL 2500 MUSICOM MASTER TUNER/AMPLIFIER PARTS LIST (Cont.)

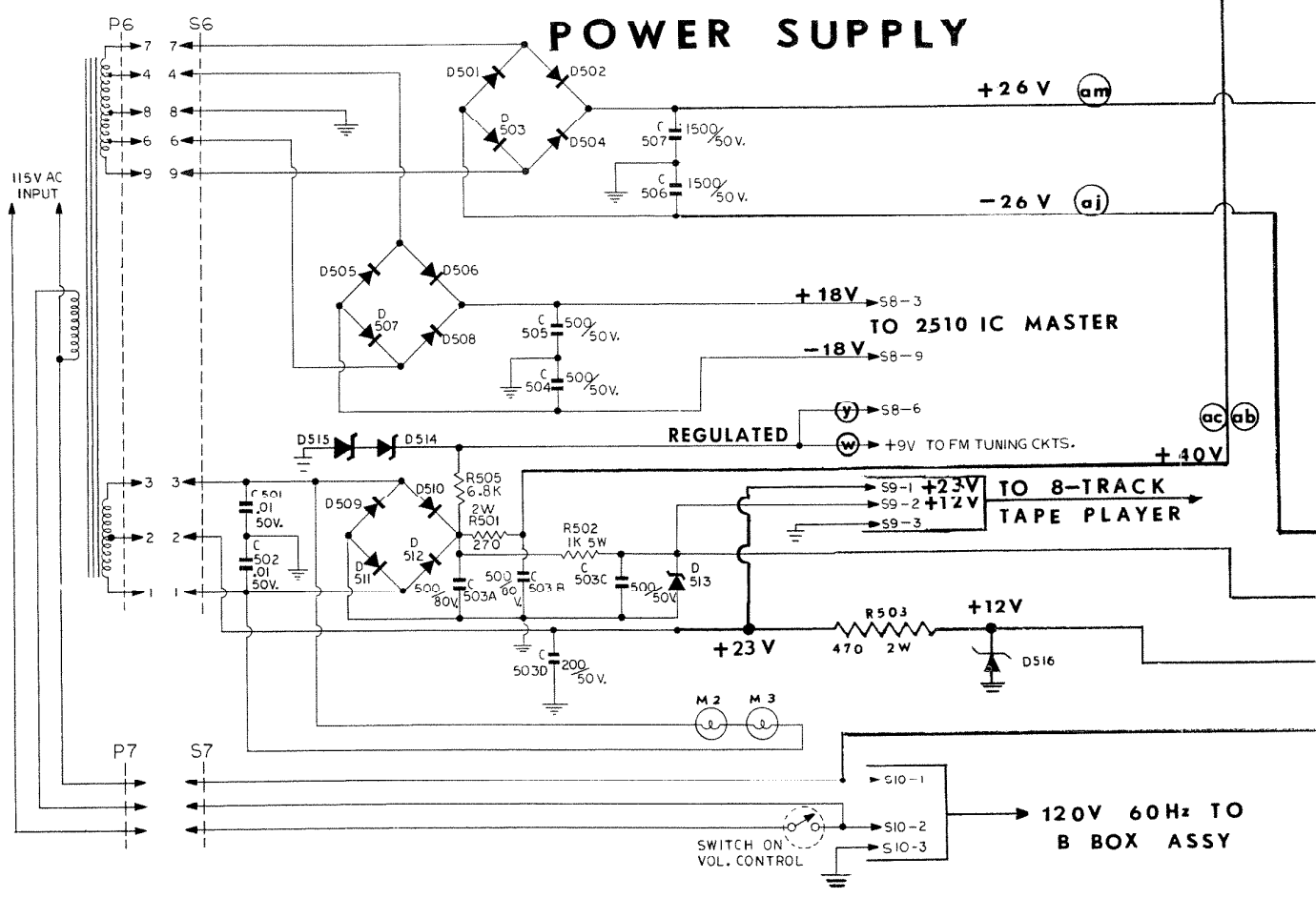
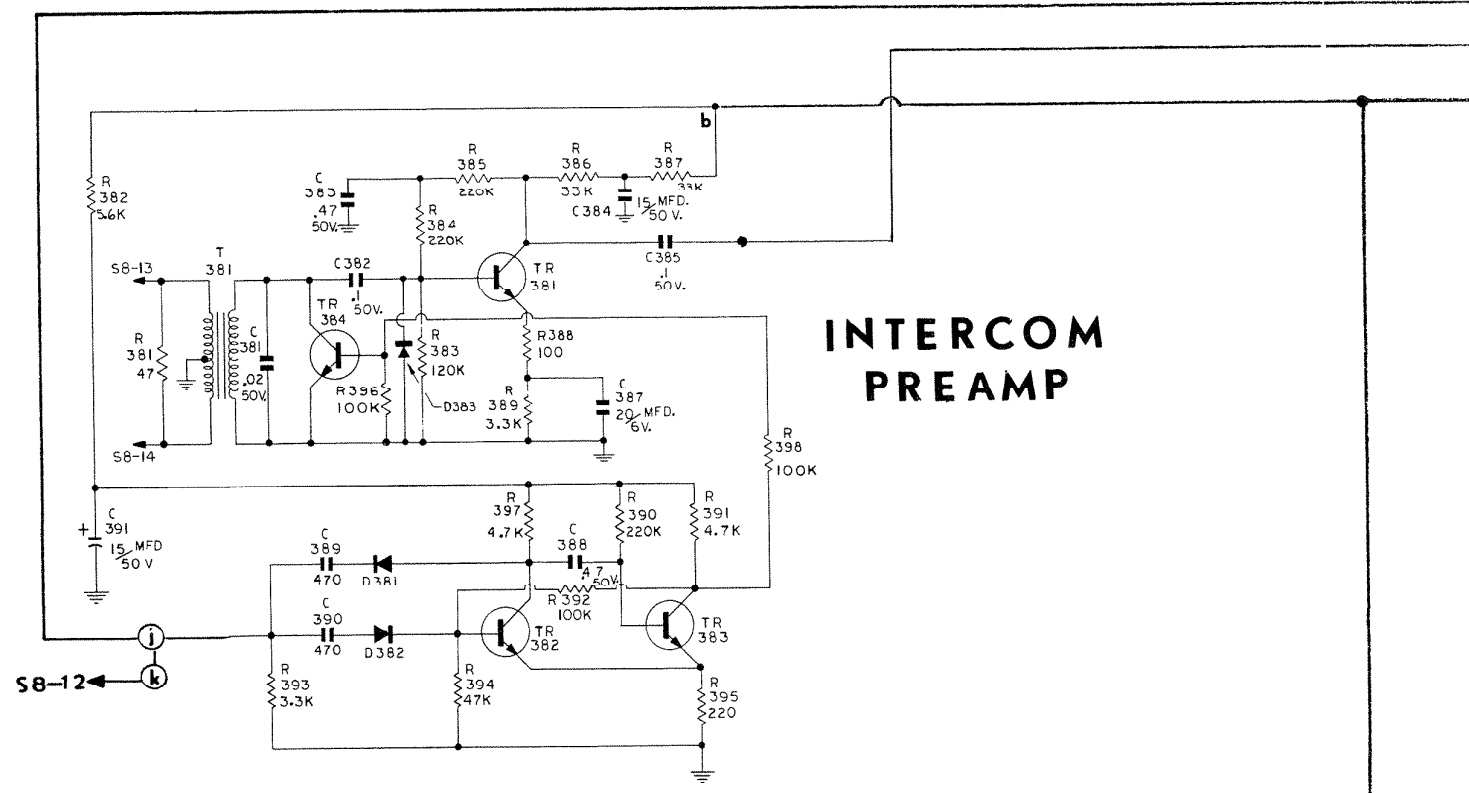
Schematic Symbol No.	NuTone Part No.	Description
C324, C325 C424, C425	35068-113	50 @ 50 WVDC Electrolytic
C326, C426	35100-147	.1
RESISTORS		
R321, R322 R323, R324 R421, R422 R423, R424	33101-562	5.6 K
R325, R425	33101-224	220 K
R326, R426	33101-273	27 K
R327, R329 R427, R429	33101-222	2.2 K
R328	33101-472	4.7 K
R330, R430	33101-272	2.7 K
R331, R431	33101-560	56
R332	33100-104	100 K
TRANSISTORS		
TR321, TR322 TR421, TR422	36580	Silicon, NPN Planar, Low Noise, T.I. SKA-4220. Motorola SPS-1216
MISCELLANEOUS		
	34035	50 Kohm Potentiometer Dual Bass Control Dual Treble Control
	34048	50 Kohm Potentiometer Dual Balance Control
	34049	50 Kohm Potentiometer Dual Volume Control (Includes ON/OFF Switch)
	34539	100 Kohm Potentiometer Dual Level Set Control (Not mounted on PC Board; installed in Front Panel)
DUAL AUDIO VOLTAGE AND POWER AMPLIFIER		
(Including Heat Sink Assy.)		
	41179	Voltage Amplifier and Driver PC Assy.
	37577	PC Board
	41178	Power Amplifier and Heat Sink Assy.
	38279	Heat Sink
	NOTE:	The PC board for Channel A (Top) and Channel B (Bottom) have identical component markings. On the Schematic Diagram: Channel A components are shown as 300 series and Channel B Components are shown as 400 series.

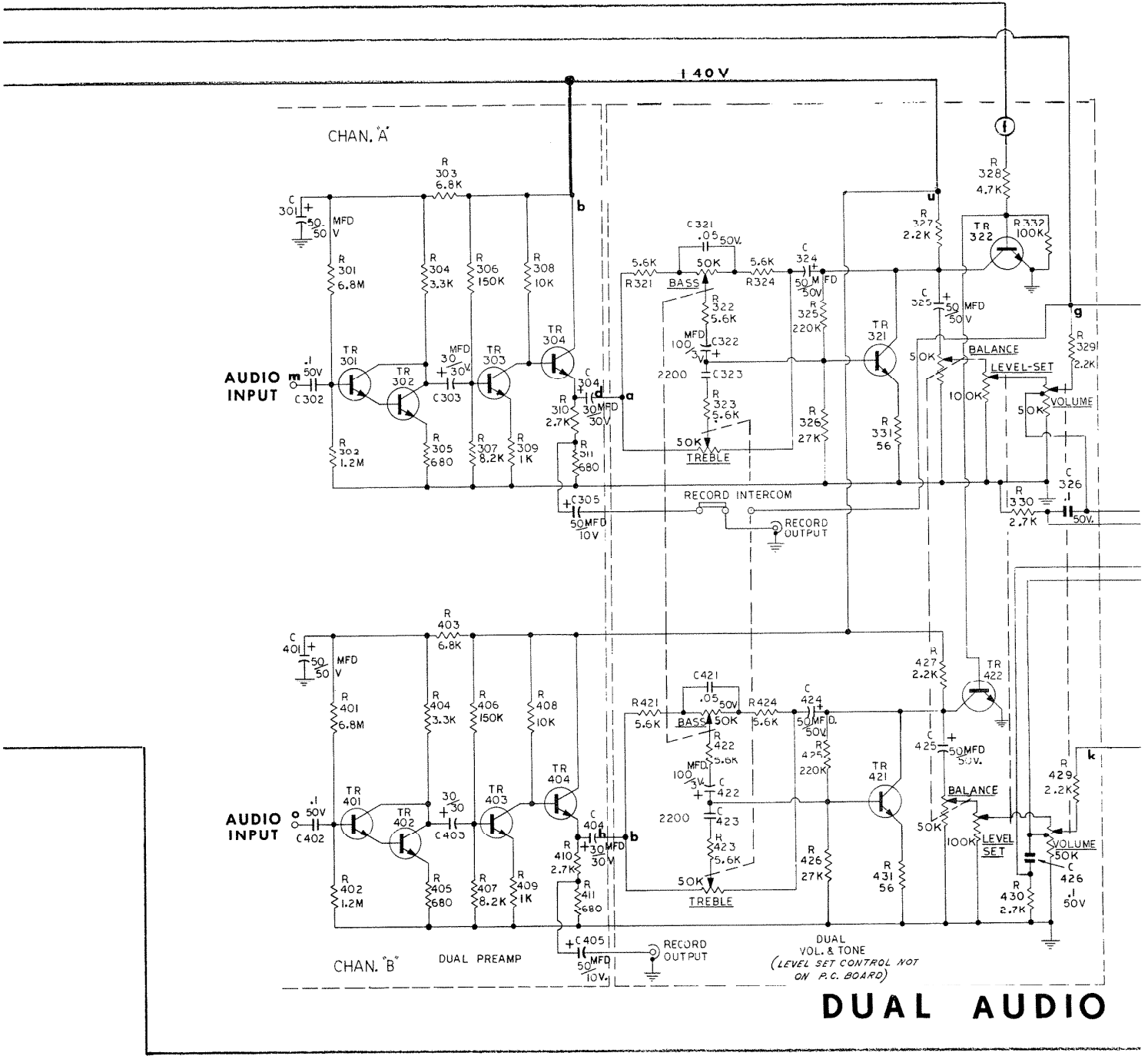
Schematic Symbol No.	NuTone Part No.	Description
CAPACITORS		
C341, C44	35068-109	15 @ 15 WVDC, Electrolytic
C3142, C442	35100-155	2700 pfd.
C343, C346 C347, C443 C446, C447	35068-113	50 @ 50 WVDC. Electrolytic
C344, C444	35100-158	39 pfd.
C345, C445	35068-124	50 @ 25 WVDC, Electrolytic
C348, C349 C355, C448 C449, C455	35100-140	.02
C350, C351 C352, C353 C354, C356 C450, C451 C452, C453 C454, C456	35100-146	.05
C357, C457	35100-125	220 pfd. (Used in production after April 12, 1971)
DIODES		
D341, D345 D346, D347 D348, D349 D350, D351 D441, D445 D446, D447 D448, D449 D450, D451	36549	Silicon Rectifier, 1N4002. Motorola MR-2065
D342, D343 D344, D442 D443, D444	36589	Silicon Rectifier, RCA 1N3754 (On Heat Sink Assy.)
COILS		
L341, L441	30081	10 micro Henries
RESISTORS		
R341, R346 R441, R446	33101-182	1.8 K
R342, R348 R442, R448	33101-183	18 K
R343, R349 R443, R449	33101-681	680
R344, R444	33101-123	12 K
R345, R445	33101-181	180
R347, R447	33101-222	2.2 K
R350, R352 R450, R452	33101-271	270
R351, R451	33101-470	47
R353, R354 R360, R361 R366, R453 R454, R460 R461, R466	33101-101	100

MODEL 2500 MUSICOM MASTER TUNER/AMPLIFIER PARTS LIST (Cont.)

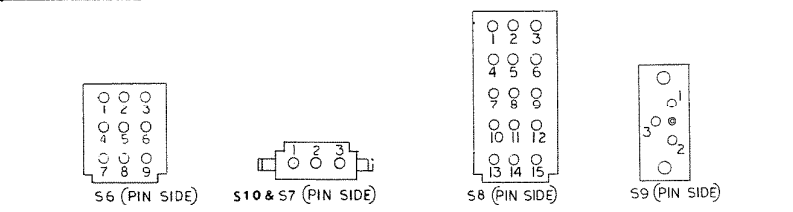
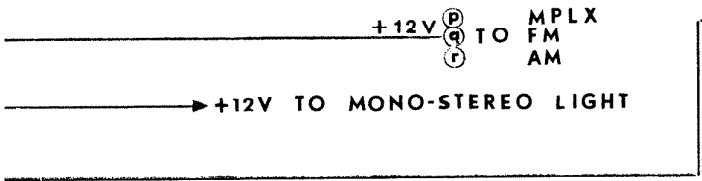
Schematic Symbol No.	NuTone Part No.	Description
D15	36594	Zener, 6.2 V., Motorola 5234A
	NOTE:	D14 & D15 are connected in series and occupy the space assigned to D14 on the PC Board.
RESISTORS		
R501	33028-271	270, 2 Watt
R502	33030-103	1,000, 5 Watt
R503	33028-471	470, 2 Watt
R504		Not Used
R505	33101-682	6.8 K
TRANSFORMER		
	30552	Power, Pri. 120 V, 60 Hz. Sec., 26 V, 40 V and 46 V. (Mounted on 2500 "A" Housing)
CHASSIS MOUNTED COMPONENTS		
CAPACITORS		
C1, C2	35100-131	100 pfd. (Mounted on Function Selector Switch)
RESISTORS		
R1, R2	33101-105	1 Meg (Mounted on Function Selector Switch)
R3, R4	33101-223	22 K
SOCKETS		
S6	39101	9-Pin, Natural
	41219	9-Pin Socket & Wire Assy.
S7	27240	3-Pin, Natural
	41215	3-Pin Socket & Wire Assy. (120 Vac Switching)
S8	39103	15-Pin, Natural
	41218	15-Pin Socket & Wire Assy.
S9	31446	3-Pin, Brown (DC Supply to 8-Track Tape Player)
S10	27240	3-Pin, Natural
	41214	3-Pin Socket & Wire Assy. (Switched 120 Vac to "B" Box Assy. for Record Player and Tape Recorder)
AUDIO JACKS		
J1, J2, J3 J4, J5, J6	31486	Assy. including 6 Audio Pin Jacks for Chan. A & Chan. B. Inputs for: Record Player, Tape Machine and Auxiliary.

Schematic Symbol No.	NuTone Part No.	Description
	31021	Dual Audio Pin Jacks for Tape Output
	39130	Phone Jack, (Stereo for Audio Output to Headset)
MISCELLANEOUS		
M2, M3	39138	Pilot Lamp, GE 1864
	39137	Socket, 1864 Pilot Lamp
	34598	Switch, Rocker DPDT, for AFC; STEREO/MONO; LOUDNESS and RECORD INTERCOM
	38272	Bracket, 4-Rocker Switches
	41156	Rocker Switch Assy.
R521	34047	100 K Potentiometer
	34599	Switch, Rotary Function Selector
	41157	Function Selector Switch Assy.
	38186	Front Panel
	38187	Dial, FM/AM and Lens
	39196	Dial Pointer
	39141	Dial Back
	16119	Screws, Machine #6 x 1" Round Head (Dial and lens retaining)
	39153	Lens, Green, FM Mono/Stereo Indicator
	39149	Knob, AM/FM Tuning
	39118	Knob, Function Selector Switch, Bass Control, Treble Control, Balance Control and Volume Control
	39096	Antenna Terminal Strip
2500-A HOUSING		
	41074	"A" Housing Complete (Part of 2500-A Frame and Housing)
	40072	FM Ant. Assy.
	32233	Outlet Box
	38205	Outlet Box Cover
	10591	Eyelet, Outlet Box Cover
P7	27282	Plug, 3-Pin Natural
	41092	3-Pin Plug and Wire Assy.
	37567	PC Terminal Board
P8	39073	Plug, 15-Pin Natural
	41077	PC Terminal Board and 15-Pin Plug Assy.
	30584	Transformer, Power
P6	39071	Plug, 9-Pin Natural
	41076	Transformer and 9-Pin Plug Assy.

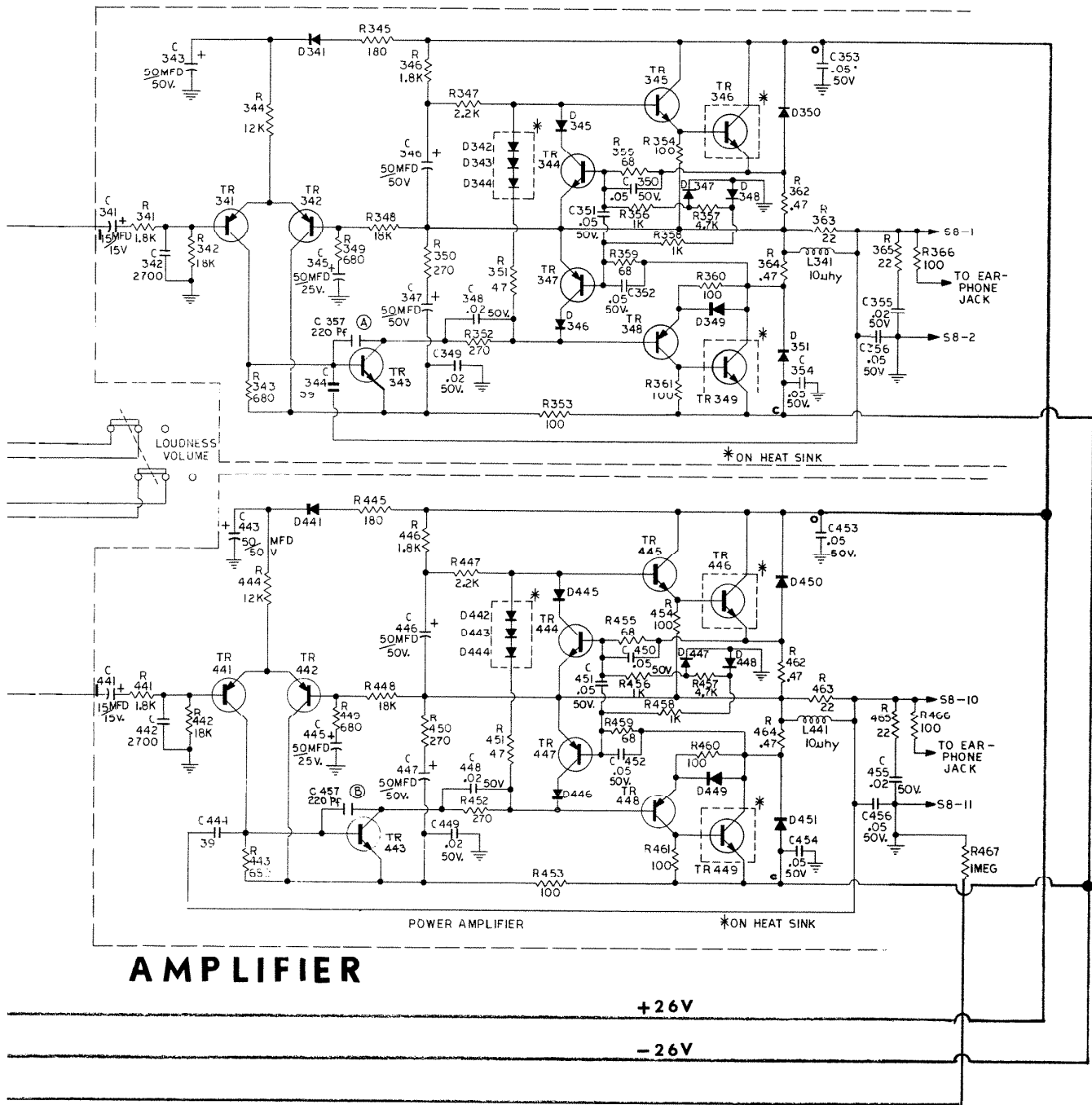




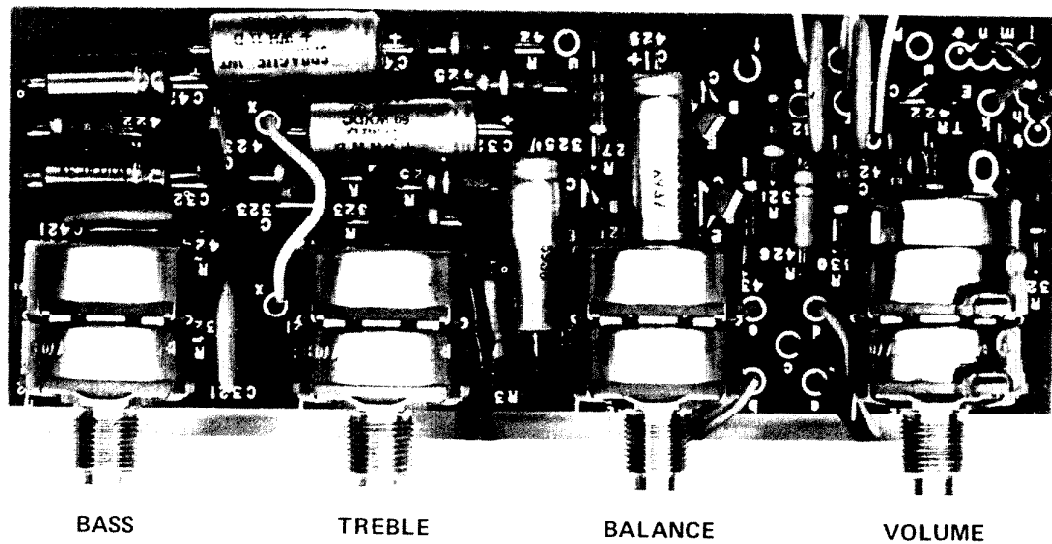
DUAL AUDIO



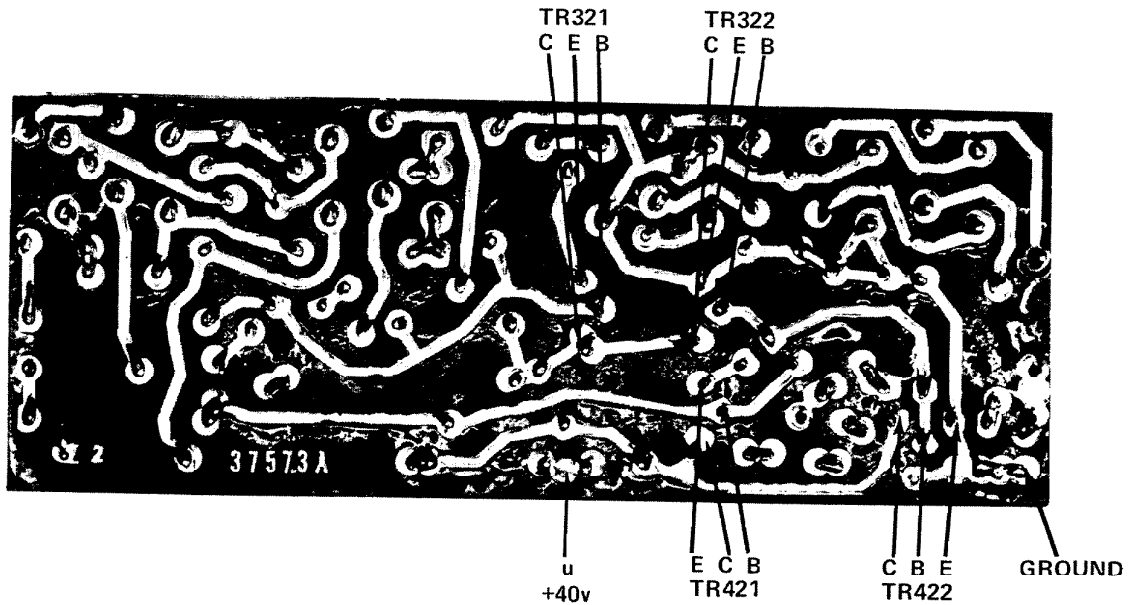
SEE OTHER SIDE FOR PARTS LIST



MODEL 2500 MUSICOM MASTER UNIT TUNER-AMPLIFIER
SCHEMATIC DIAGRAM (INTERCOM PREAMP, DUAL AUDIO AMPLIFIER AND POWER SUPPLY)



TOP VIEW



BOTTOM VIEW

Fig. 1.17 — DUAL VOLUME AND TONE CONTROL ASSY.

5. Only the audio signals from the preamplifier are effected by the Bass and Treble controls.
6. The preamplified (Bass and Treble compensated) audio signal is amplified through a Class A stage: TR301 channel A and TR401 channel B.
7. The collector of TR301 is coupled through a 50 mfd. capacitor to the high side of one section of the dual BALANCE CONTROL and, the collector of TR401 is coupled to the high side of the other section. The two sections of the dual BALANCE CONTROL are connected in opposite polarity so that the drive from one

increases as the other decreases. When in center position, the outputs are approximately equal. Clockwise rotation increases channel B's level and decreases channel A's level. At full clockwise position, channel B is at maximum level and channel A is silent. Counterclockwise rotation increases channel A's level and decreases channel B's level. At full counterclockwise position, channel A's level is maximum and channel B is silent.

8. The BALANCE CONTROL wiper drives the high side of the LEVEL SET CONTROL.
9. The LEVEL SET CONTROL (located behind

front panel, see DISASSEMBLY INSTRUCTIONS, Fig. 1.33) is used to set the volume of the entertainment program. After the VOLUME CONTROL is set so that the intercom signal level is sufficient at all intercom speakers, the LEVEL SET CONTROL should be adjusted so that the entertainment program is at the desired volume.

10. The DUAL VOLUME CONTROL will vary the level of both the entertainment program and of the intercom signal.

The intercom signal is amplified through channel A's audio voltage amplifier/driver/power output stages and fed to channel A's speaker(s) only.

The DUAL VOLUME CONTROL can reduce the entertainment program level to zero in both channels. Because of R329, the channel A section of the control can not attenuate the intercom signal to zero. R429 is used in channel B to balance the amplitude of the entertainment signal with that in channel A.

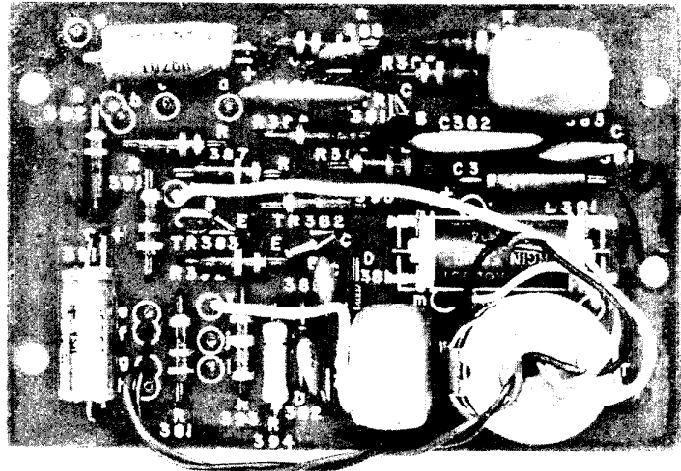
11. The LOUDNESS CONTROL compensates for the Fletcher-Munson effect of the human ear. When the control is ON, C326 (channel A) and C426 (channel B) are in the circuit, resulting in an increase of bass response. When the control is OFF, C326 and C426 are shorted out, loading of the audio frequencies is constant across R330 (channel A) and R430 (channel B).
12. The output of channel A's VOLUME CONTROL is fed through R329 to terminal (g) and then through shielded audio cable to terminal (1) on the channel A (upper) AUDIO AMPLIFIER/DRIVER PC ASSY. The intercom signal from the INTERCOM PREAMP is fed from the REC/INT REC SWITCH to terminal (j) (h) (g) on the DUAL VOLUME & TONE CONTROL ASSY., and then from terminal (g) to terminal (1) on the channel A AUDIO AMPLIFIER/DRIVER ASSY.
13. The output of channel B's VOLUME CONTROL is fed through R429 to terminal (k) and then through shielded audio cable to terminal (1) on the channel B (lower) AUDIO AMPLIFIER/DRIVER PC ASSY.
14. TR322 (channel A) and TR422 (channel B) are turned ON during intercom operation. When these transistors are ON, they short to ground the audio output at the collector of TR321 and TR421 respectively. (see MUTING AND KEY CLICK SUPPRESSION below)

INTERCOM PREAMPLIFIER

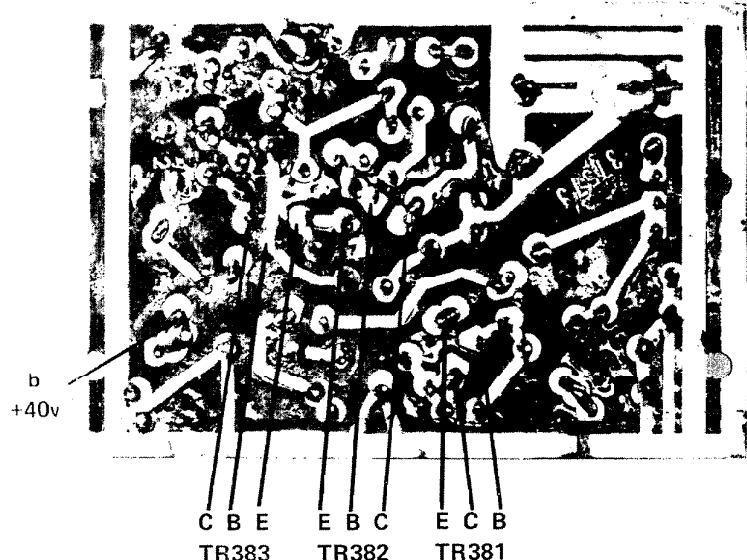
1. The single stage voltage amplifier PC Board is powered by the +40 Vdc supply connected

to terminal (b).

2. The intercom signal is fed through Input Transformer T381, whose secondary is coupled to the base of Class A preamp TR381 by C382. The preamplifier output is coupled from the collector of TR381 by C385 to terminal (d) and then through shielded cable to the REC/INT REC SWITCH and then to terminal (j) (h) (g) on the Dual Volume & Tone Control PC Assembly.
3. The Intercom Preamp PC Assy. includes the "One-kick" multivibrator TR382 and TR383 that controls the "Key Click" suppression when the intercom operation is turned ON or OFF.
4. There have been three production models of the Intercom Preamp PC Board:



TOP VIEW



BOTTOM VIEW

Fig. 1.18 — INTERCOM PREAMP
(Original Production)

(4.1) The first production units used a Reed relay (L381, Fig. 1.19) to short the output of T381 during switching.

(4.2) The second production units replaces the Reed Relay with transistor TR384. When TR384 is turned ON, it shorts the output of the secondary of T381. (see Schematic Diagram, center fold this manual). Diode D383 was added to protect TR381 from positive pulses during intercom switching. Replacing the Reed Relay with TR384 and Changing R383 from 10 K ohm to 5.6 K ohm increases the "Key Click Suppression" speed. R384; R385/ R386 and R387 values were changed. R396 and R397 were added.

(4.3) The third (and current at time of publication) production model has Diode D384 added to protect TR381 against negative pulses. (Fig. 1.20)

When service is required on earlier production units, the INTERCOM PREAMP ASSY. should be modified so as to agree with the circuitry of Fig. 1.20.

- The multivibrator is not keyed when an electronic door chime and/or security-fire alarm system signal is fed to the input transformer T381, therefore, there is no "Muting" of the entertainment program. These signals should over-ride the entertainment program.

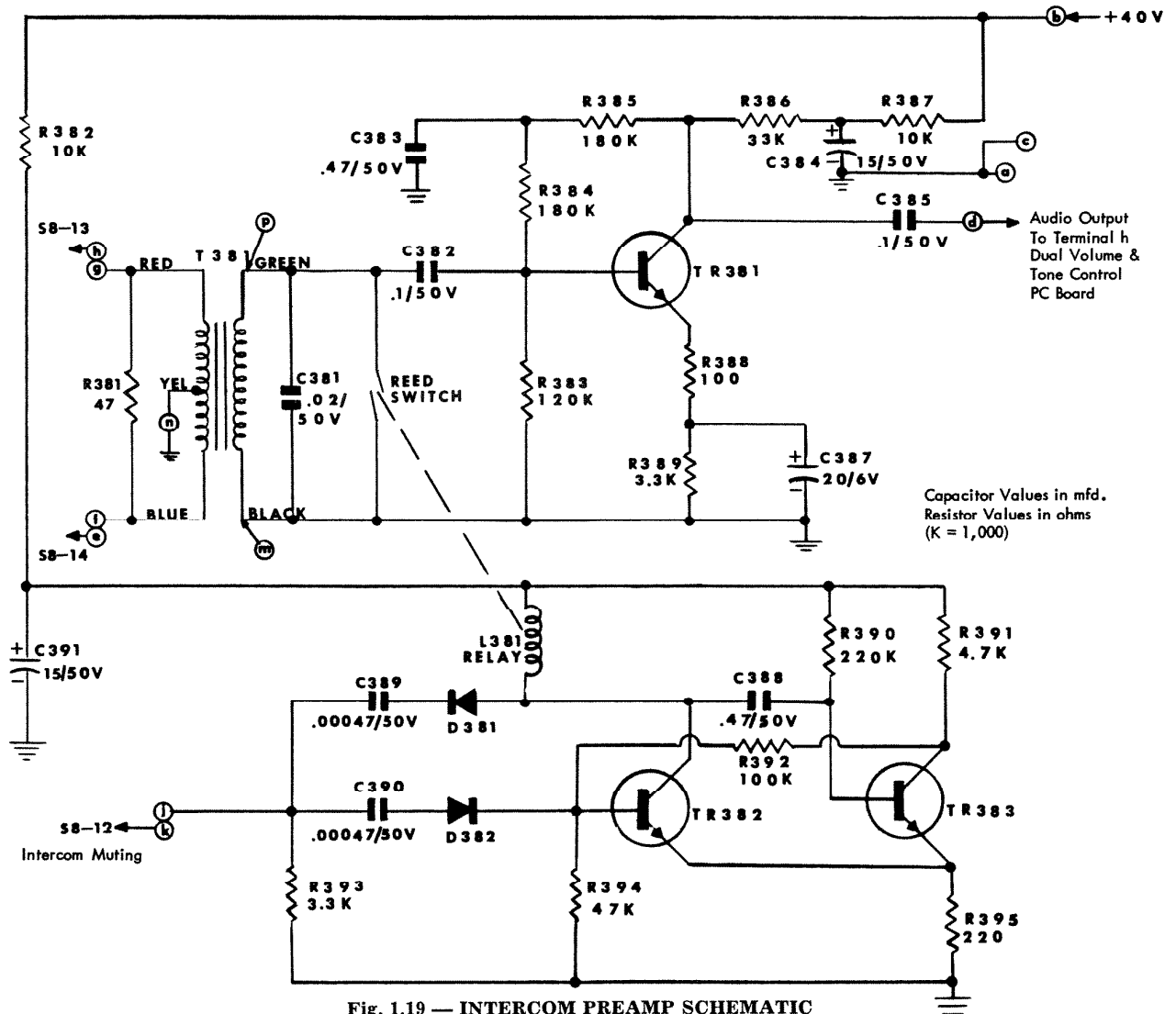


Fig. 1.19 — INTERCOM PREAMP SCHEMATIC
(Original Production)

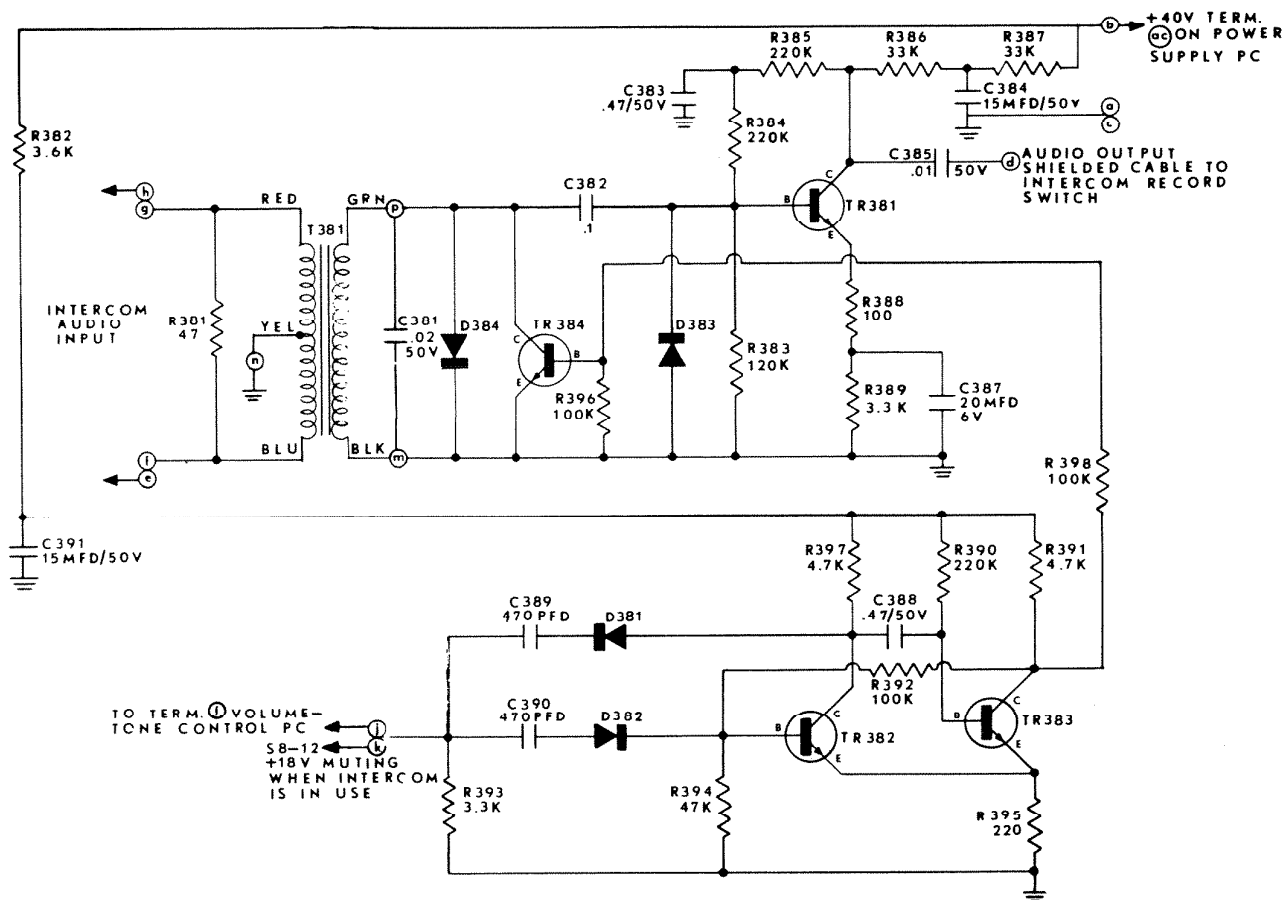


Fig. 1.20 — INTERCOM PREAMP SCHEMATIC
(Current Production)

MUTING AND KEY CLICK SUPPRESSION

Ref: Fig. 1.20; Fig. 1.21 and 2510 Service Manual-Schematic Diagrams: RELAY CONTROL PC BOARD and INTERCOM SPEAKER SWITCH SCHEMATIC.

1. When the INSIDE TALK or the DOOR TALK switch button, in the 2510-B or in a remote speaker control is depressed, the junction of R601, R602, R605, R608 and terminal (a) on the 2510-B Relay Control PC Board is connected through a 22K ohm resistor (in intercom speaker switch control) to ground.

This results in a reverse current through 3.9 V Zener Diode D603 causing the bias on PNP transistor TR603 to go in a negative direction, turning TR603 ON—activating the STANDBY relay.

(1.1) Terminal (e) at the junction of TR603 collector and the STANDBY relay on the Relay Control PC Board goes to +18 Vdc. (This voltage may vary between +14 Vdc and +19 Vdc, but will be referred to in this manual as +18 Vdc.)

2. When the INSIDE LISTEN or the DOOR LISTEN switch button, in the 2510-B or in a remote speaker control is depressed, the junction of R601, R602, R605, R608 and terminal (a) on the 2510-B Relay Control PC Board is connected to ground.

This activates the STANDBY relay as described in para. 1 with the +18 Vdc at terminal (e) as in para. 1.1 above. Also, reverse current flows through 9 volt Zener Diode D601, causing the bias on PNP Darlington transistor TR601 to go in a negative direction, turn-

ing TR601 ON—activating the TALK-LISTEN relay.

- When the DOOR TALK or the DOOR LISTEN switch button is depressed, terminal (g) on the Relay Control PC Board is connected through the second set of contacts on either of these switches—through a 6.8K ohm resistor (in intercom speaker switch control) to ground. This results in a reverse current through 3.9 volt Zener Diode D608 causing the bias on

NPN transistor TR606 to go in a positive direction, turning TR606 ON—activating the DOOR relay.

NOTE: TOGETHER WITH ACTIVATING THE RELAYS AS SHOWN IN PARA. 1, 2 and 3 above, WHEN ANY TALK OR LISTEN BUTTON IS DEPRESSED, THE +18 Vdc IS PRESENT AT TERMINAL (e) ON THE 2510-B's RELAY CONTROL PC BOARD.

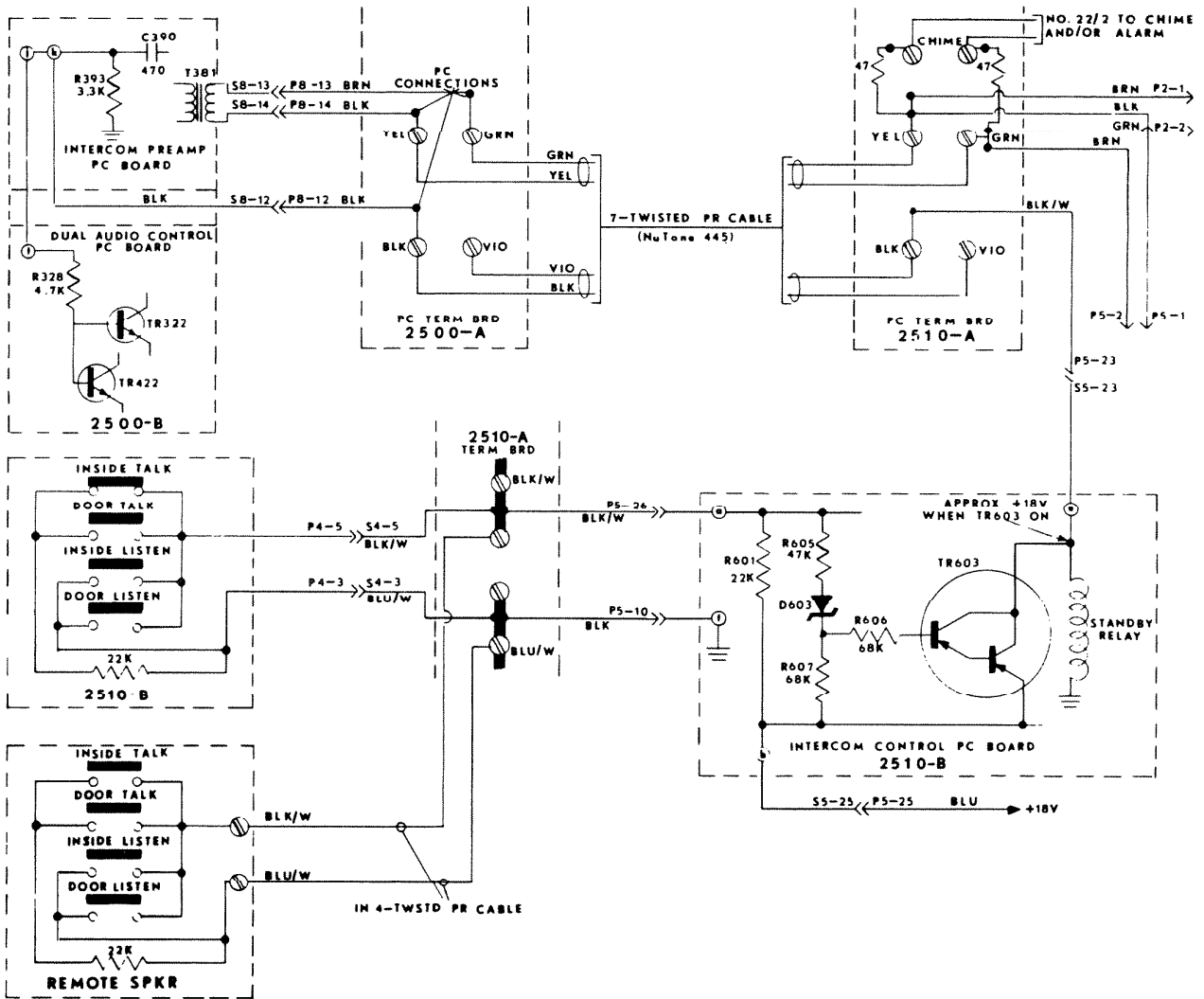


Fig. 1.21 — INTERCOM MUTING AND KEY CLICK SUPPRESSION WIRING DIAGRAM

- The +18 Vdc at terminal (e) is connected to the BLACK terminal of the BLACK/VIOLET pair in the 2510-A and in 2500-A (or 2600-A) and then to terminal (j) (k) on the INTERCOM PREAMP PC BOARD and to terminal (f) on the DUAL TONE & VOLUME CON-

TROL PC BOARD in the Master Unit.

- KEY CLICK SUPPRESSION: The +18 Vdc at terminal (j) (k) on the INTERCOM PREAMP PC BOARD is coupled through C390 and D382 causing a positive going voltage

pulse being applied to the base of TR382, turning it ON. With collector current in TR-382, the collector voltage decreases, and this negative going voltage is coupled through C-388 to the base of TR383, turning it OFF. With no collector current, the TR383 collector voltage climbs to Vcc less any drop across R382.

6. The positive going voltage on collector of TR-383 is coupled through R398 to the base of TR384, turning it ON. When TR384 is ON (saturated), it appears as a short across the secondary of input transformer T381.
7. REMEMBER: TR384 shorts the output of T381 only for the instant that the voltage is changing (in a positive direction) across C390.
8. When the switches (para. 1, 2 and 3 above) are released a negative going voltage is present at terminal **(j)** **(k)** and is coupled through C389 to collector of TR382 and to base of TR-383, this clamps TR382 OFF and turns TR383 OFF, again, causing the collector voltage of TR383 to go positive, turning TR384 ON and shorting the output of T381 while the voltage at terminal **(j)** **(k)** is going negative.
9. MUTING: The +18 Vdc at terminal **(f)** on the VOLUME & TONE CONTROL PC BOARD is fed through R328 to the base of TR322 (channel A) and to the base of TR422 (channel B), turning these transistors ON.
10. When TR322 and TR422 are turned ON, they effectively short the collectors of TR321 and TR421, respectively to ground — resulting in MUTING of the entertainment program in both channels A and B during intercom operation.

CHECKING MUTING OPERATION

1. The muting and key click suppression voltage may be measured at the terminal board in the 2510-A and in the 2500-A or 2600-A. (Fig. 1.6)
2. The YELLOW terminal of the YELLOW/BROWN pair is the system's common ground point, and all voltages at the "A" Housings' terminal boards should be made in respect to this terminal.
3. With music program playing through system, connect the neutral (ground) probe of a voltmeter to the YELLOW terminal of the YELLOW/BROWN pair and the high probe (posi-

tive) to the BLACK terminal of the BLACK/VIOLET pair. Voltage should be zero.

4. Depressing any TALK or LISTEN switch on the 2510-B or on a remote speaker control should result in the voltage at the BLACK terminal going to +18 Vdc, and the entertainment program should be silenced at all speakers (channel A and B).
5. If "MUTING" does not occur in para. 4 above, it should be determined whether the mal-function is in the MUSICOM Master; the Intercom Master Control; a remote speaker or in the interconnecting wires.

(5.1) At the 2510-A PC terminal board, determine if the +18 Vdc is present at the BLUE terminal of the YELLOW/BLUE pair.

(5.2) If the +18 Vdc is present at the BLUE terminal, connect a wire between the BLUE terminal and the BLACK (Muting) terminal of the BLACK/VIOLET pair. The entertainment program should be silenced at all speakers.

(5.3) When the muting in para. 5.2 takes place, it is a good indication that the +18 Vdc supply, the interconnecting wires, connectors, and terminal boards; and the muting transistors TR322 and TR422 are functioning normally. When the muting does not take place, the above sections of the circuit should be checked.

(5.4) When the circuits of para. 5.3 have been eliminated as the source of the mal-function, the 2510-A Housing; the Relay Board in the 2510-B and the speakers and interconnecting 4-twisted pair cable should be checked.

NOTE: If on depressing a LISTEN or a TALK switch there is an accompanying change in the AM to FM (or vice versa) mode, or a change in the Remote FM station tuning, check the phasing of the BLACK/BLACK W pair and of the BLUE/BLUE W pair between the 2510-A and the remote intercom control that causes these changes.

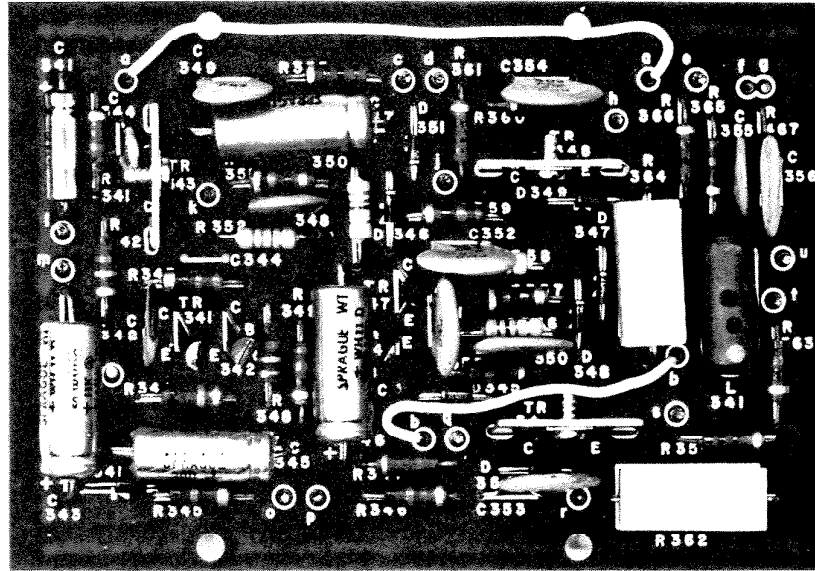
AUDIO AMPLIFIER/PHASE INVERTER ASSY. and OUTPUT POWER AMPLIFIER HEAT SINK ASSY.

1. The channel A audio amplifier/phase inverter and driver is constructed on its individual PC board. The components are numbered in the

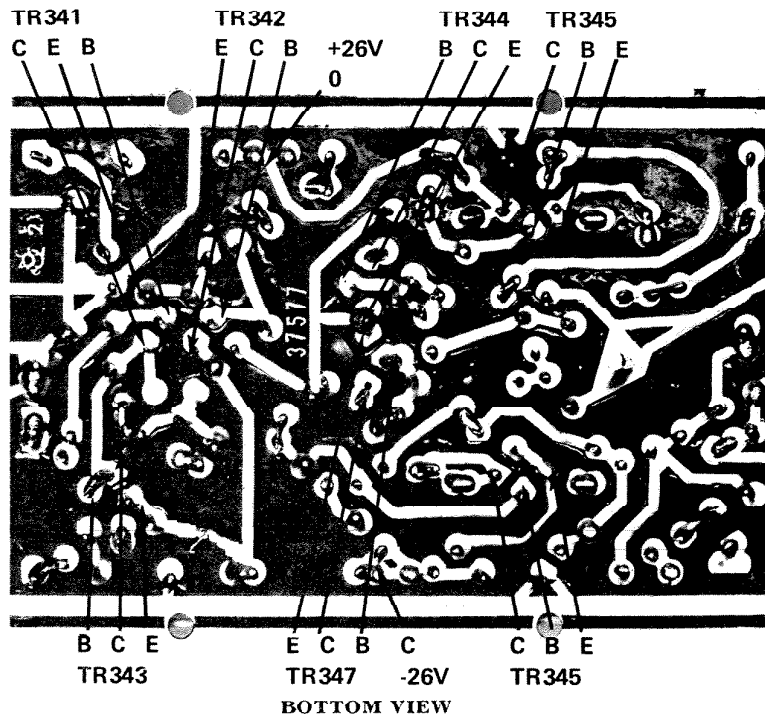
300 series on both the PC board and in the schematic diagram. This is the top PC board on the right rear chassis. (Fig. 1.35 & 1.36) (viewed from front)

and driver is constructed on its individual PC board. The components are numbered in the 300 series on the PC board but are numbered in the 400 series in the Schematic Diagram and in the following discussion. This is the bottom PC board on the right rear chassis.

2. The channel B audio amplifier/phase inverter



TOP VIEW



BOTTOM VIEW

Fig. 1.22 — AMPLIFIER/PHASE INVERTER PC ASSY

3. The channel A and channel B AMPLIFIER/DRIVER PC ASSEMBLY BOARDS are identical and thus interchangeable, except one side of the AC power line (AC neutral) is connected to terminal (f) on the channel B (bottom) board, then through a one Megohm resistor R467 to chassis ground. The resistor R467 is also on the channel A board, but is not used.

4. The Class AB push-pull output amplifiers and heat sensing diodes are installed on the HEAT SINK ASSY, which makes up the right end of the receiver chassis. (Fig. 1-23, 1-35 and 1-36)

Channel A: TR346, TR349, D342, D343 and D344

Channel B: TR446, TR449, D442, D443 and D444

5. The AMPLIFIER/DRIVER PC ASSEMBLIES are powered by the +26 Vdc supply fed to terminal (o) and by the -26 Vdc supply fed to terminal (c).

6. The power amplifiers on the HEAT SINK ASSY. is powered by the +26 Vdc and -26 Vdc fed from the AMPLIFIER/DRIVER ASSEMBLIES as shown in Fig. 1.23.

7. The channel A audio signal (either entertainment or intercom) is fed from terminal (g) on the DUAL TONE & VOLUME CONTROL ASSY. through shielded cable to terminal (1) on the top AMPLIFIER/DRIVER PC BOARD.

8. The channel B audio signal (entertainment program only) is fed from terminal (k) on the DUAL TONE & VOLUME CONTROL ASSY. through shielded cable to terminal (1) on the bottom AMPLIFIER/DRIVER PC BOARD.

NOTE: Channel A and channel B audio amplifiers are identical. The following descrip-

tion of the operation of channel A is equally applicable to the operation of channel B.

9. The preamplified audio input signal is coupled from terminal (1) through C341 and R341 to the base of the Class A voltage amplifier TR341.

TR341 in conjunction with TR342 operate in a differential amplifier configuration. The emitter-base voltage of TR341 is nearly equal to V_{eb} of TR342 thus, allowing the output DC voltage to be established as the differential base current flowing through the 18K resistor R348.

Since this voltage is approximately equal to the DC output voltage (junction of R362, R363 and R364), it will be near zero—in the order of 10 millivolts to 20 millivolts.

TR341 also acts as a common emitter amplifier, providing some gain.

10. The amplified output of TR341 is direct coupled to the base of TR343.

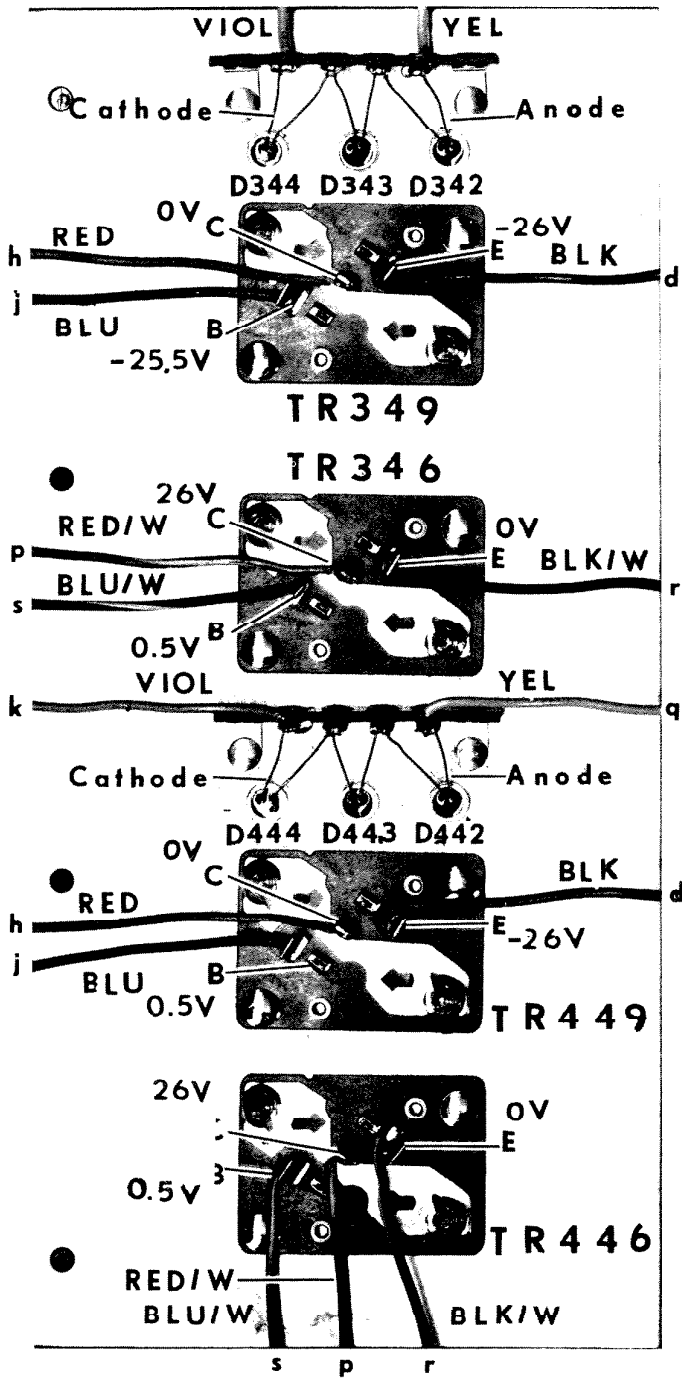
TR343 operates Class A, having a high-gain in excess of 40 db) and provides biasing current for the output stage.

Audio feedback is coupled from junction of R363 and R365 through C344 to the base of TR343.

Feedback is also coupled to the base of TR342 through the 18K ohm resistor R348 which also establishes DC feedback to the base of TR342.

C357 between the base and collector of TR343 is used to eliminate possibility of oscillation in this high-gain stage.

11. The output signal of TR343 is in phase with the audio input signal at the base of TR341 but, is of much greater amplitude.



NOTE: CHANNEL A

D342, D343, D344, TR346 and TR349 are connected to the TOP Audio Voltage Amplifier and Driver PC Board.

NOTE: CHANNEL B

D442, D443, D444, TR446 and TR449 are connected to the BOTTOM Audio Voltage Amplifier and Driver PC Board.

LOWER CASE LETTERS INDICATE IDENTITY OF TERMINALS ON AUDIO VOLTAGE AMPLIFIER AND DRIVER PC BOARD.

Fig. 1.23 — POWER AMPLIFIER HEAT SINK ASSEMBLY

12. The positive swing of TR343's output signal drives NPN transistor TR345 and NPN power output transistor TR346.
13. The negative swing of TR343's output signal drives PNP transistor TR348 and NPN power output transistor TR346.
14. TR346 (driven by TR345) and TR349 (driven by TR348) form a quasi-complementary Class AB push-pull linear audio output amplifier.

When operating in a linear manner, the audio signal current from TR346 equals the audio signal current from TR349. The currents from the transistors are out of phase i.e. opposite polarity, flowing through R363 and the load. (speakers).

15. The amplifier circuit is protected against shorts across the output, speaker leads, etc.

(15.1) TR344 is biased by the current through 0.47 ohm resistor R362, and under normal operating conditions is cut-off.

When the current from TR346 rises beyond a certain value, such as when a short is present across the output, the bias voltage for NPN transistor TR344 at the junction of R362 and the emitter of TR346 goes positive enough to turn TR344 ON, effectively shorting the base of TR345 and the driving signal to DC ground, thus, eliminating the drive to TR346.

(15.2) TR347 is biased by the current through 0.47 ohm resistor R364, and under normal operating conditions is cut-off.

When the current from TR349 rises beyond a certain value, such as when a short is present across the output, the bias voltage of PNP transistor TR347 goes negative enough to turn TR347 ON, effectively shorting the base of TR348 and the driving signal to DC ground.

16. The heat sensing diodes D342, D343 and D344, located on the HEAT SINK ASSEMBLY, assist in stabilizing the base bias of the output power transistors TR346 and TR349 by compensating for changes in the transistor's emitter-base junction voltage that results from changes in temperature.

These diodes are installed in holes in the Heat Sink and are coupled thereto with standard silicone heat transfer grease.

17. When the temperature of the output transistors rises, the emitter-base junction voltage decreases. This change in bias results in an increase in transistor current, and an increase in temperature of the heat sensing diodes.

As the temperature increases, the PN junction voltage across D342, D343 and D344 decreases, reducing forward bias of TR343 causing a decrease in TR343 collector current.

The decrease in current through TR345 emitter resistor R354 causes the base bias on TR346 to increase, compensating for the decrease in bias resulting from the increase in temperature.

At the same time the decrease in current through TR348 collector resistor R349 results in an increase in bias to TR349, compensating for the change in base bias resulting from the increase in temperature.

18. SERVICE INFORMATION:

(18.1) OUTPUT TRANSISTORS: Original production models used RCA 40633 (NuTone Part No. 36566). The manufacturer has discontinued this device.

NPN single diffused transistor 2N3055 (NuTone Part No. 36616) may be used as a direct replacement, and will be used in production units when supply of the RCA transistors has been exhausted.

The mounting bracket used with the RCA power output transistor is not required when the 2N3055 is used. The mica insulator and heat transfer lubricant must be used.

If the 2N3055 is used to replace a defective RCA 40633, it is recommended that they be replaced by push-pull pairs.

(18.2) When replacing diodes and/or transistors on the HEAT SINK ASSEMBLY, all dirt, metal particles and other foreign matter must be removed. The mica insulator must be clean and free of blemishes and new clean heat transfer grease be used.

(18.3) Since the audio amplifier is direct-coupled, measurement of the DC voltages on the transistor elements is the most feasible way of locating mal-functions in this stage. The voltages should be checked against the transistor voltage chart and the Interstage Wiring

Diagram. The actual voltages may vary, but the relationship between the voltages on the elements of the transistors should be close to those indicated in the transistor chart.

(18.4) The channel A and Channel B amplifiers are identical, comparison between similar stages should give a very accurate means of finding defective components in the channel requiring service.

(18.5) Care must be exercised when checking passive components such as resistors and capacitors. Leakage paths must be eliminated and when necessary the suspected component must be removed from the PC board before checking. Also, the voltage of common ohm meters may surpass the reverse voltage rating of the various solid state devices, and when making measurements polarity of the ohm meter must be observed.

DISASSEMBLY

REMOVING RECEIVER FROM BUILT-IN WALL MOUNTING (Models 2500, 2501 and 2502)

1. Remove Model 2522 Frame and Door Assembly: Extract the retaining screw in bottom of cabinet and while lifting assembly from top mounting bracket pull forward away from master unit.
2. Remove wires and cables connected to bottom of receiver:

MODEL 2500:

- (2.1) Loosen the two knurl nuts on weld screws each side of "B" Box Assy. and slide blank center panel forward away from "B" Box Assy. (Fig. 1.24)
- (2.2) Disconnect record player's audio cables from PHONO IN jacks in bottom of receiver chassis. (Fig. 1.25)
- (2.3) Disconnect 120 V., 60 Hz. power plug P10 from 120 V. socket S10 in bottom of receiver chassis. (Fig. 1.25)

MODEL 2501:

- (2.4) Loosen the two knurl nuts on weld screws each side of "B" Box Assy. and slide tape player's front panel forward, clearing tape player and center compartment of "B" Box Assembly. (Fig. 1.26)
- (2.5) Disconnect record player's audio cables from PHONO IN jacks in bottom of receiver chassis. (Fig. 1.25)
- (2.6) Disconnect 120 V., 60 Hz. power plug P10 from 120 V. socket S10 in bottom of receiver chassis. (Fig. 1.25)
- (2.7) Disconnect tape player's audio cables from TAPE IN jacks in bottom of receiver chassis. (Fig. 1.27)
- (2.8) Disconnect tape player's standard AC plug from AC outlet in center compartment of "B" Box Assy. (Fig. 1.27)

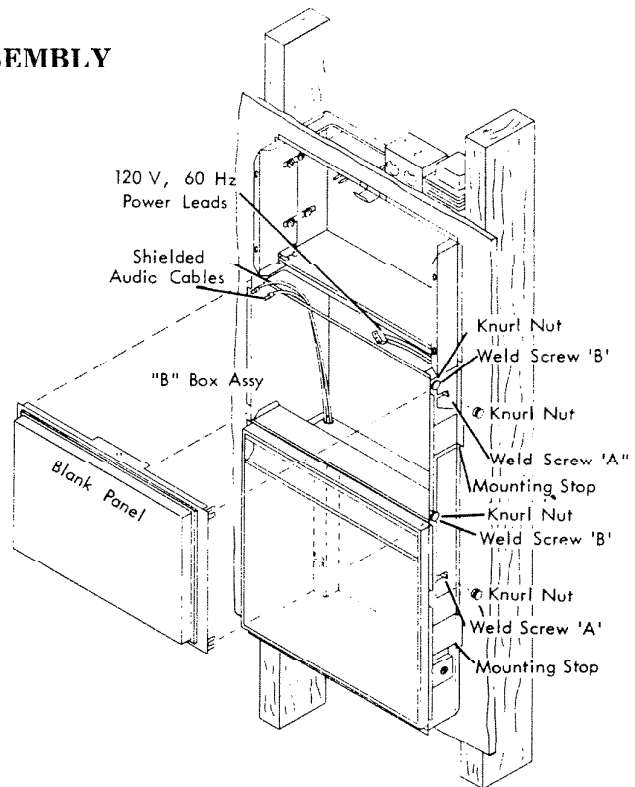


Fig. 1.24

MODEL 2500 MUSICOM MASTER WITH DOOR AND FRAME ASSEMBLY AND RECEIVER REMOVED (With Receiver Mtg. Brackets used in original production units)

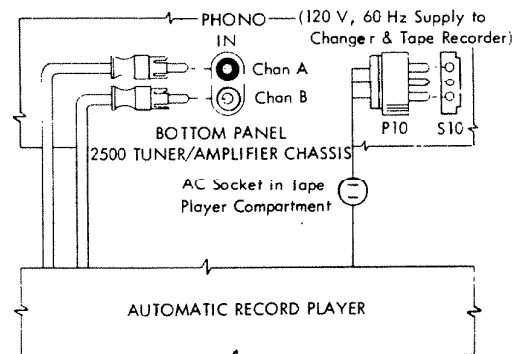


Fig. 1.25

CABLE AND WIRE CONNECTIONS BETWEEN RECORD PLAYER AND RECEIVER

(2.9) Disconnect tape player's DC supply plug P9 from socket S9 in bottom of receiver chassis. (Fig. 1.27)

NOTE: To remove 8-Track Tape Player from "B" Box Assembly, complete steps (2.4) and (2.7) through (2.9) above and, remove four screws "D" through bottom of center compartment into tinnerman clips holding table player in position. (Fig. 1.26)

MODEL 2502

(2.10) Loosen the two knurl nuts on weld screws each side of "B" Box Assy. and slide panel complete with cassette recorder forward away from center compartment. (Fig. 1.28)

(2.11) With mounting strap support, hold cassette assembly in one hand and disconnect the audio cables from the TAPE IN and TAPE OUT jacks in bottom of receiver chassis and disconnect the tape player's AC plug from the AC outlet in center compartment. (Fig. 1.29)

(2.12) Unfasten mounting strap from "B" Box Assy. and remove cassette assy.

(2.13) Disconnect the record player's audio cables from the PHONO IN jacks in bottom of receiver chassis. (Fig. 1.25)

(2.14) Disconnect 120 V., 60 Hz. power plug P10 from 120 V. socket S10 in bottom of receiver chassis. (Fig. 1.25)

Remove receiver from "A" Housing:

EARLY PRODUCTION UNITS:

(3.1) Remove two hex-head screws each side, holding receiver chassis to Mtg. Brackets in "A" Housing. (Fig. 1.24)

(3.2) While supporting receiver in one hand, disconnect the coax antenna lead from ant. term. strip; and plugs P6, P7 and P8 from sockets S6, S7 and S8 respectively. (Fig. 1.30)

CURRENT PRODUCTION UNITS:

(3.3) Loosen knurl nut supporting hanger bracket on each side of receiver. (Fig. 1.30)

(3.4) Pull receiver, in hanger bracket all the way forward and tighten knurl nuts. (Fig. 1.30)

(3.5) Lift receiver so that top shoulder rivet clears its rest and tilt receiver forward until resting in position shown in Fig. 1.30. Bottom shoulder rivet acts as stop.

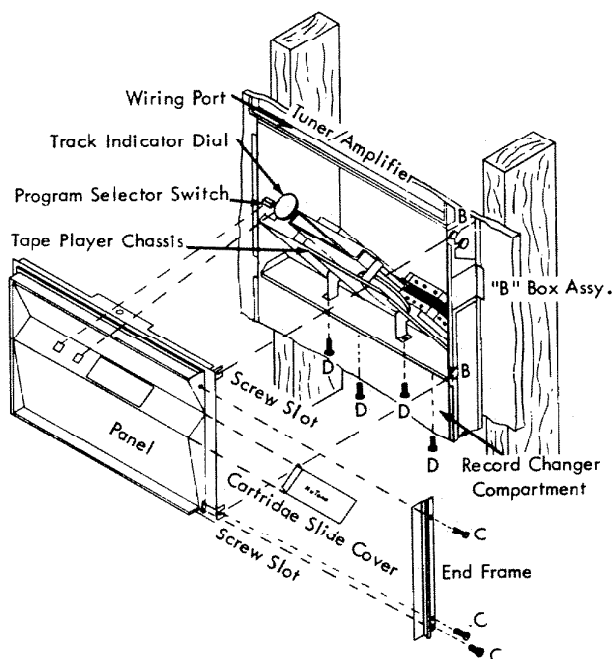


Fig. 1.26 — 8-TRACK TAPE PLAYER ASSEMBLY

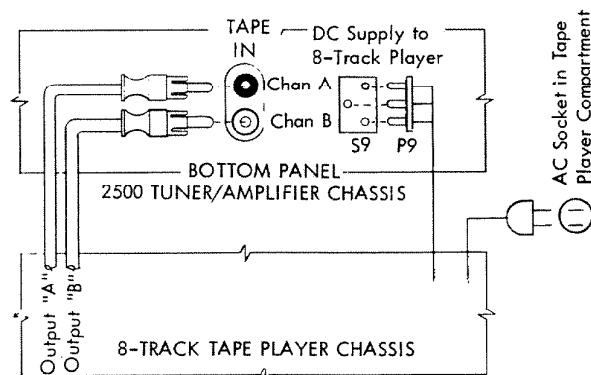


Fig. 1.27

CABLE AND WIRE CONNECTIONS BETWEEN 8-TRACK TAPE PLAYER AND RECEIVER

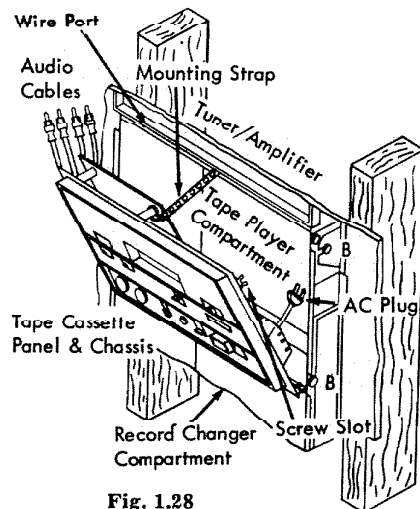


Fig. 1.28

TAPE CASSETTE ASSEMBLY

(3.6) Disconnect the coax antenna lead from ant. term. strip; and plugs P6, P7 and P8 from sockets S6, S7 and S8 respectively. (Fig. 1.30)

(3.7) Lift receiver chassis so that second rivet on each side clears its bottom rest and remove receiver from between mounting brackets. (Fig. 1.30)

REMOVING MODEL 2600 RECEIVER FROM BUILT-IN WALL MOUNTING

1. Remove decorative frame: Extract two retaining screws (one each end) in bottom of cabinet (Fig. 1.31)
2. When used, disconnect audio cables from record player, tape player, etc. from jacks in bottom of receiver chassis. (Fig. 1.30)
3. Loosen knurl nut supporting hanger bracket on each side of receiver. (Fig. 1.30)
4. Pull receiver in hanger brackets all the way forward and tighten knurl nuts. (Fig. 1.30)
5. Lift receiver so that top shoulder rivet clears its rest and tilt receiver forward until resting in position shown in Fig. 1.30. Bottom rivets should stop forward travel.
6. Disconnect the coax antenna lead from ant. term. strip; and plugs P6, P7 and P8 from sockets S6, S7 and S8 respectively. (Fig. 1.30)
7. Lift receiver chassis so that second rivet on each side clears its bottom rest and remove receiver from between mounting brackets. (Fig. 1.30)

RECEIVER DISASSEMBLY

1. Removing Front Panel: (Fig. 1.32)
 - (1.1) Remove knurl nut and washer from phone jack.
 - (1.2) Set FM/AM tuning dial to low end of scale and gently pull TUNING KNOB forward until free of tuning shaft.
 - (1.3) Remove knobs from SELECTOR SWITCH; BASS, TREBLE, LOUDNESS and VOLUME CONTROLS. These knobs are keyed. Pull forward gently and firmly, free of shafts.
 - (1.4) Loosen hex-head screw at each end and slide front panel forward away from receiver chassis.

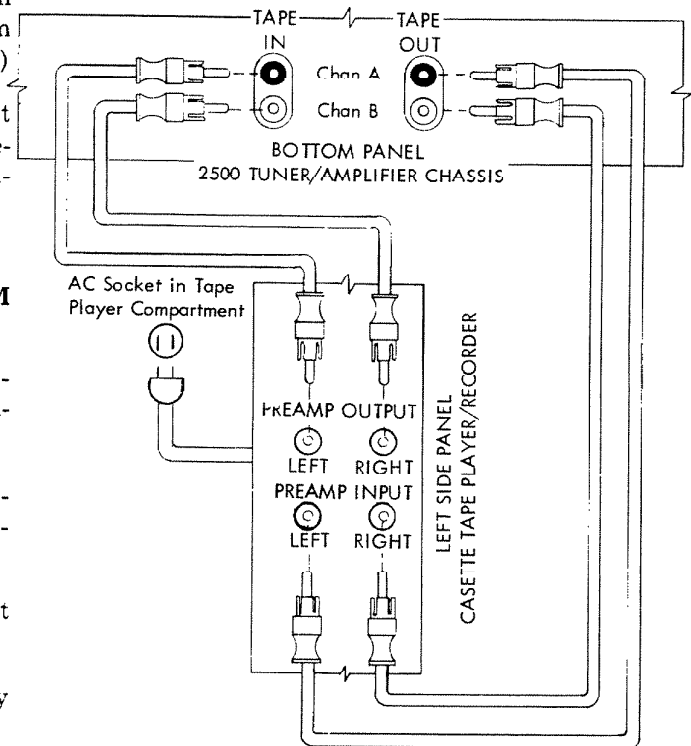


Fig. 1.29

CABLE AND WIRE CONNECTIONS BETWEEN CASSETTE TAPE RECORDER AND RECEIVER

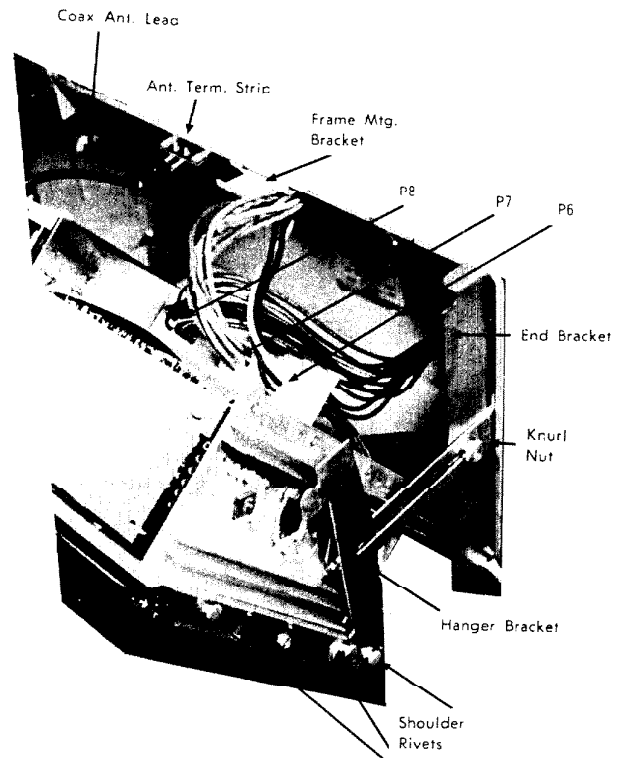


Fig. 1.30

RECEIVER IN "A" HOUSING WITH CURRENT PRODUCTION MOUNTING BRACKETS

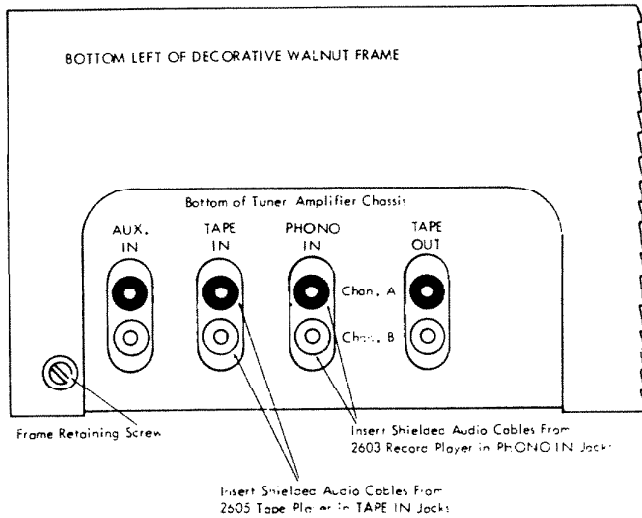


Fig. 1.31

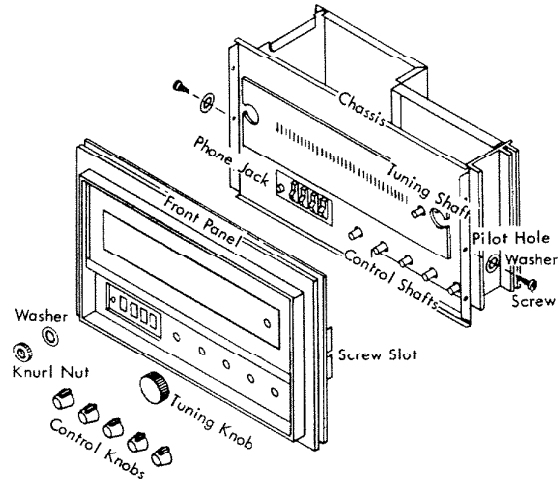


Fig. 1.32

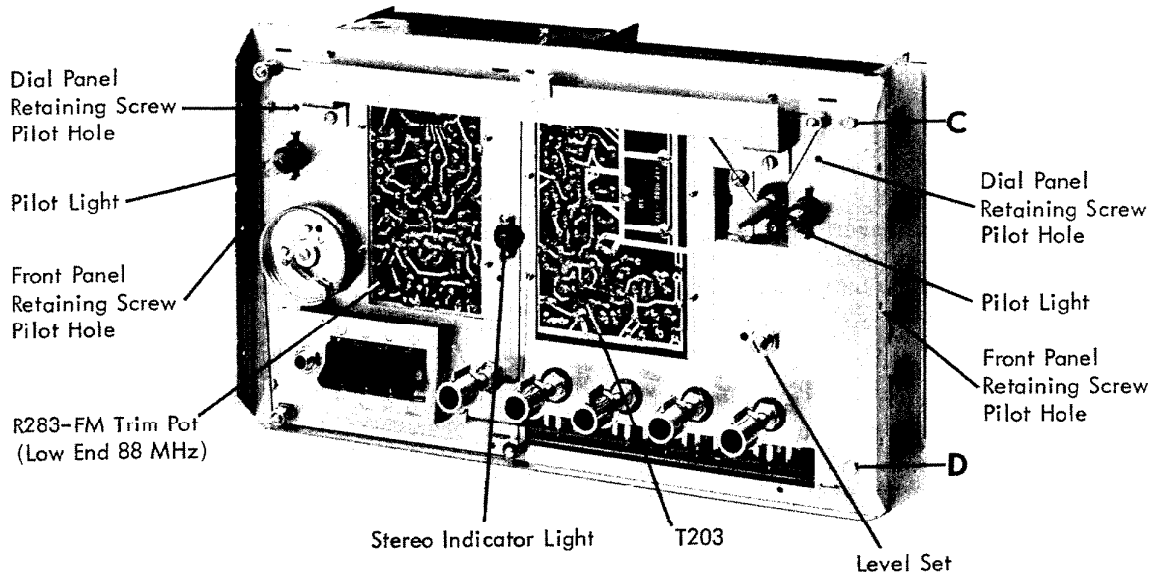


Fig. 1.33

2. Replacing Pilot Lights: (Fig. 1.33)

(2.1) Remove front panel as directed in para. 1 above.

(2.2) Defective bayonet style pilot light may be removed and new bulb installed. These lights are series connected and both will be out if either one is defective.

3. Removing Dial Panel: (Fig. 1.33)

(3.1) Remove front panel as directed in para. 1 above.

(3.2) Remove the 3 screws holding dial panel in place. Do not scratch nor mar this panel.

(3.3) Very carefully work panel from under dial pointer and from over the tuning shaft.

4. REPLACING DIAL CORD: (Fig. 1.33 and 1.34)

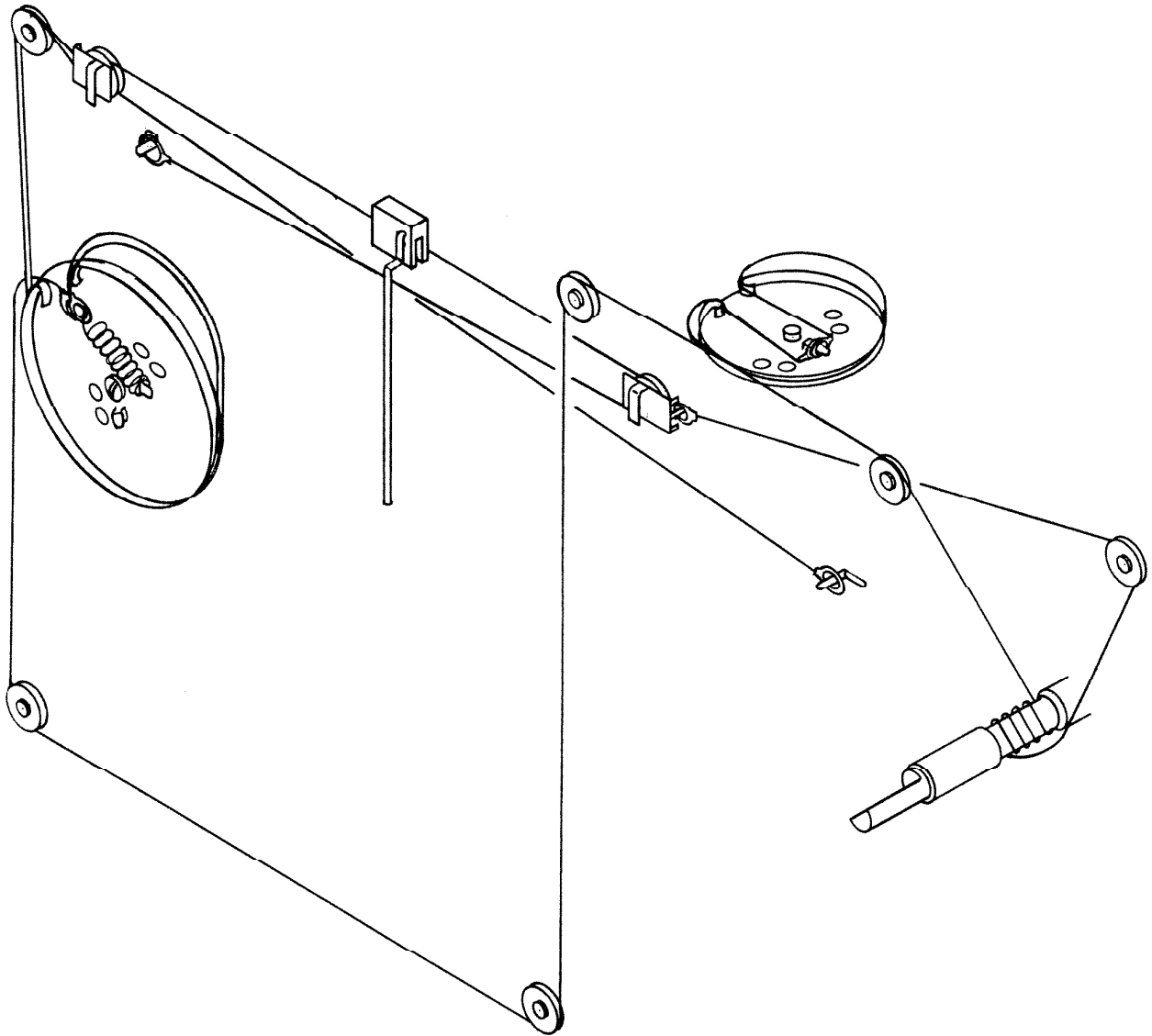


Fig. 1.34 — RECEIVER DIAL CORD INSTALLATION

- (4.1) Remove front panel as directed in para. 1 above, and dial panel as directed in para. 3 above.
- (4.2) Restring dial cord in accordance with diagram, Fig. 1.34.
5. Stereo Indicator Light: (Fig. 1.33)
- (5.1) Remove front panel as directed in para. 1 above, and dial panel as directed in para. 3 above.
- (5.2) Remove telephone type bulb by pulling straight out of keyed socket.
6. Separating Front and Rear Chassis for access to components on individual PC boards; for voltage measurements.

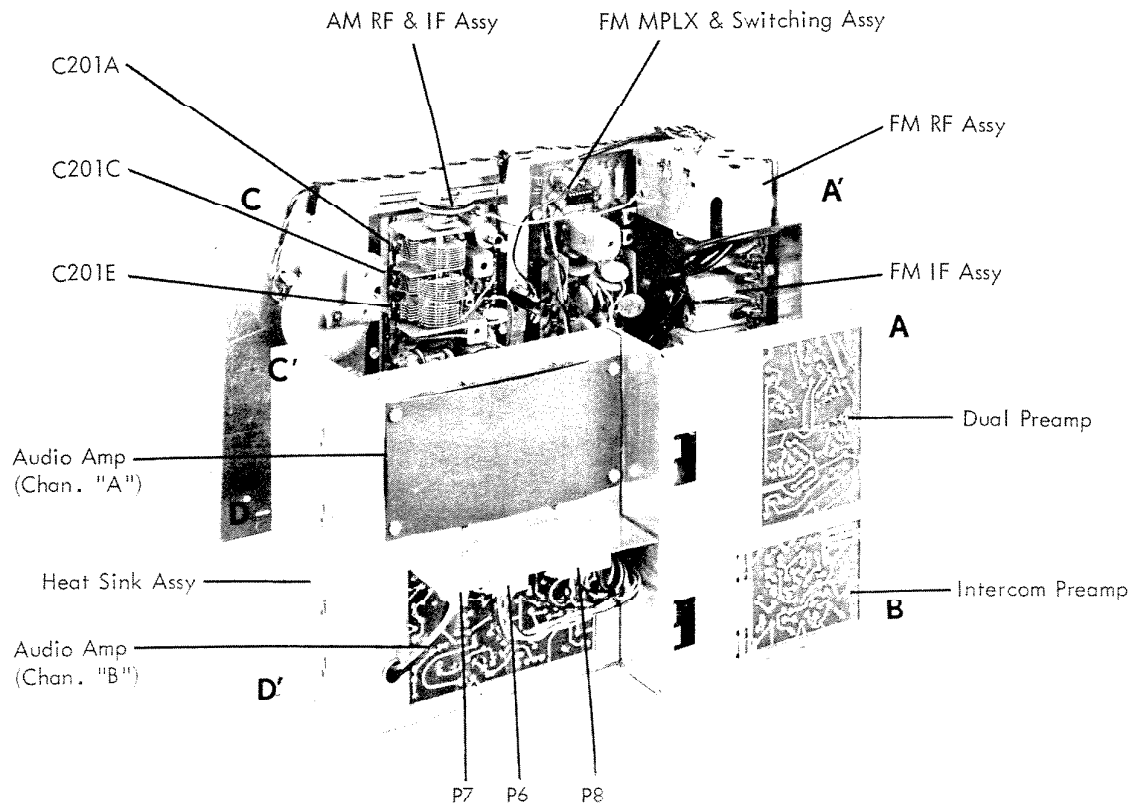


Fig. 1.35 — REAR VIEW FRONT AND REAR RECEIVER CHASSIS SEPARATED

(6.1) Remove front panel as directed in para. 1 above.

(6.2) Fig. 1.33: Remove ¼" hex-head screws C and D, right side of front chassis.

(6.3) Fig. 1.35: Left side of rear chassis; remove ¼" hex-head screws that hold rear chassis to left end chassis. These holes are installed through holes A and B into threaded holes A' and B'.

Front panel hex head screws are installed through holes C and D in front panel into threaded holes C' and D' in front edge of HEAT SINK ASSY.

(6.4) Remove two ¼" hex head screws holding fibre board insulator to right top edge of rear chassis. Lay fibre board insulator aside.

(6.5) For access to channel A audio amplifier, remove four ¼" hex-head screws holding fibre insulating board to top right side of rear chassis. (Fig. 1.5)

(6.7) Remove pilot light wires (BLACK) from terminal strip at top of inside left of rear chassis.

(6.8) For accessibility to all PC boards and their components, lay front chassis face down as shown in Fig. 1.36.

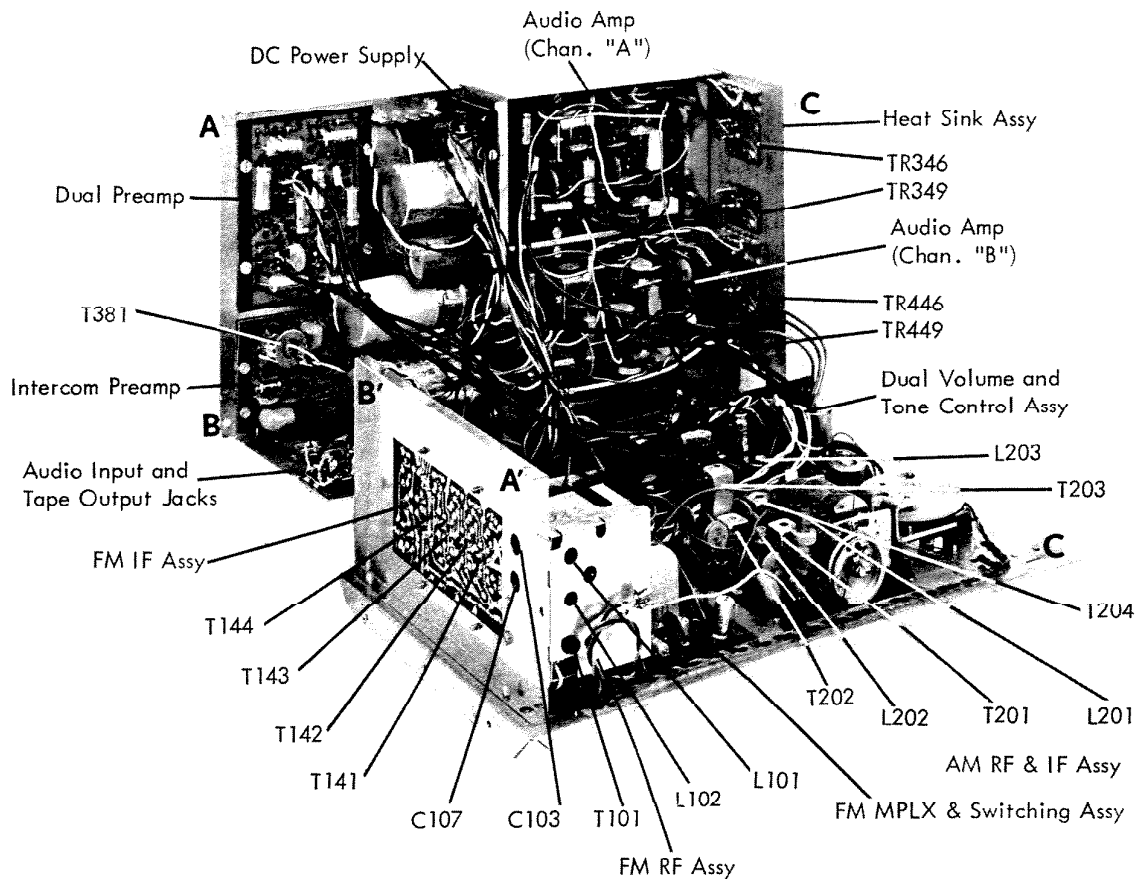


Fig. 1.36 — RECEIVER CHASSIS OPEN FOR SERVICING AND/OR ALIGNMENT

7. Replacement of individual PC boards: (Fig. 1.36)

(7.1) Receiver should be opened as shown above and directed in para. 6 above.

(7.2) Disconnect interconnecting wires/and or cables at subject PC board; refer to Interstage Wiring Diagram.

Wire or cable connections to solderless terminals should be gently pulled from the solderless connectors. Use needle-nose pliers if required.

Soldered connections should be broken by using solder sucking tool and soldering iron, or combination tool. **USE CARE WHEN SOLDERING ON PC BOARDS.**

(7.3) Remove screws holding PC board in place on chassis.

NOTE: If AM RF/IF Assembly is replaced, it will be necessary to remove dial cord and re-install with new board. (See para. 4 above)

POWER SUPPLY SERVICE KIT

1. In normal operation, a.c. operating voltages for the receiver are supplied by the power transformer on the "A" Housing.
2. When the receiver is removed from the "A" Housing for servicing, alignment, etc., the a.c. voltages may be supplied by the POWER SUPPLY SERVICE KIT (NuTone Part No. 69866). This kit is available from NuTone Parts Department.

3. The complete kit (Fig. 1.37) includes:

Power Transformer complete with ac power cord and plug and 9-pin plug P6A and wire assembly supplying transformer secondary a.c. voltages.

15-pin plug P8A and wire assembly for connecting audio output to speakers; connecting speaker to intercom input and for measuring the various operating voltages supplied to the 2510 Intercom Master Control.

The DC Rectifier PC Board with S6A for connecting to P6A and with P5A for connecting to P5 of the Relay Control PC Board in the 2510-B. (This board not required when servicing the receiver. See 2510 Service Manual.)

4. The POWER SUPPLY SERVICE KIT should be connected to the receiver chassis as shown in Fig. 1.38.

The ON/OFF switch on Receiver VOLUME CONTROL is bypassed when using the POWER SUPPLY SERVICE KIT.

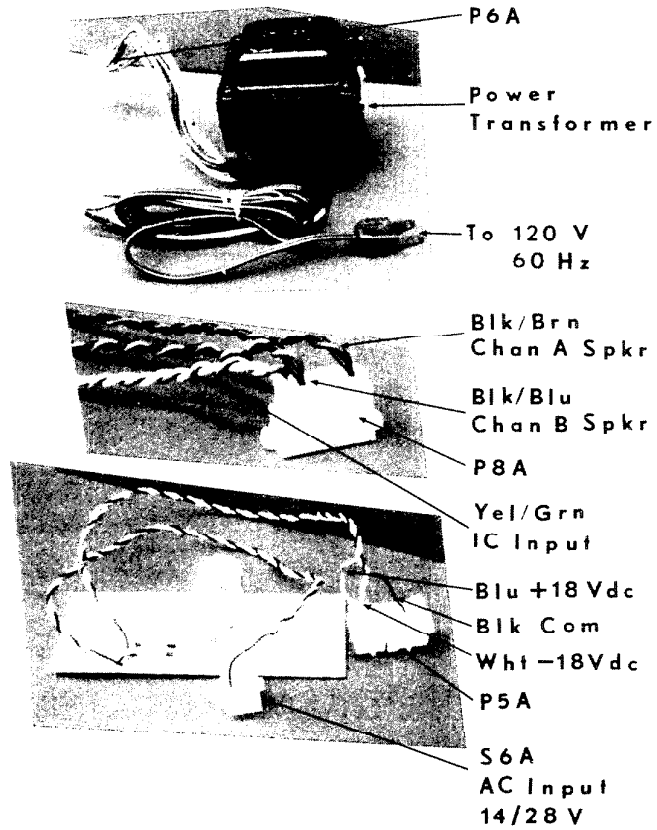


Fig. 1.37 — POWER SUPPLY SERVICE KIT COMPONENTS

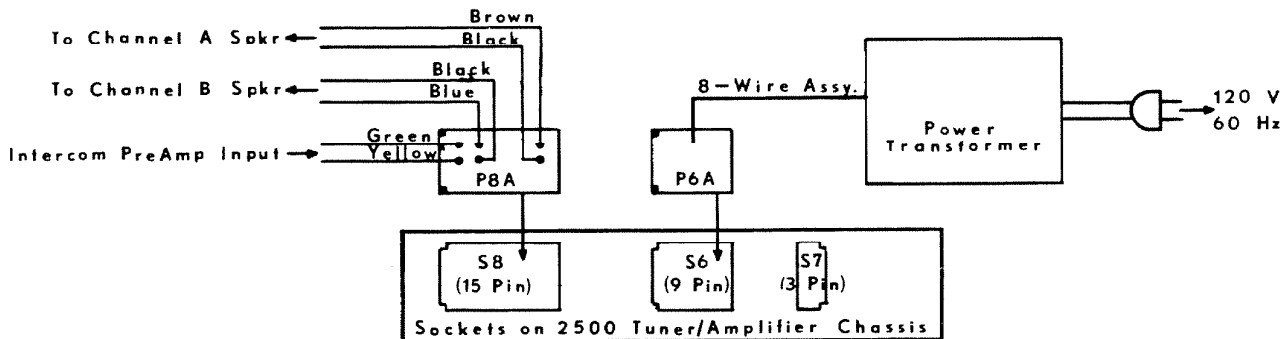


Fig. 1.38 — CONNECTING THE POWER SUPPLY SERVICE KIT TO RECEIVER CHASSIS

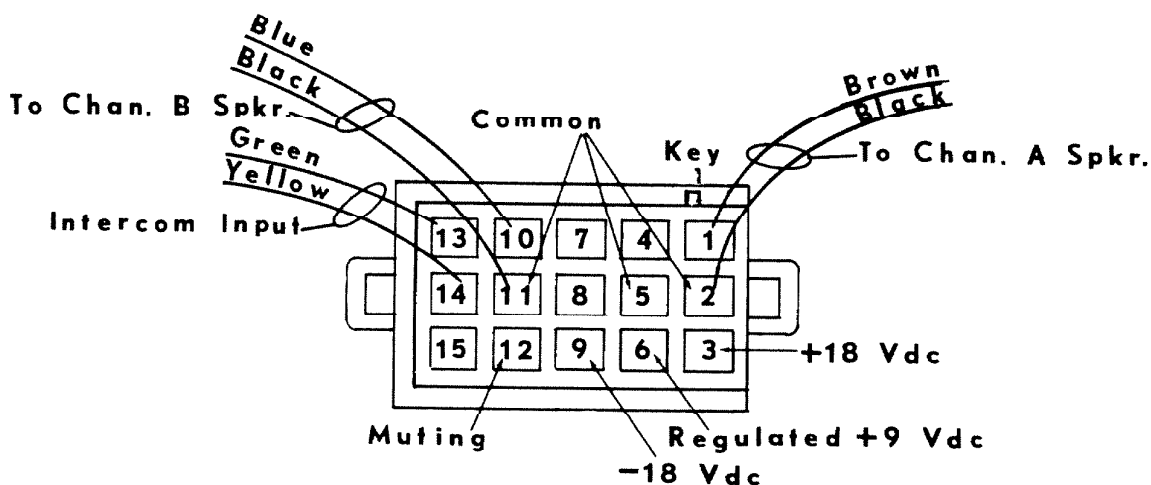


Fig. 1.39 — P8A (Wire Side View) WIRING AND VOLTAGE POINTS, CONNECTED TO RECEIVER

5. Connect speakers (8 to 45 ohm) to channel A and B speaker leads. (Fig. 1.39)
6. Connect speaker to Intercom Input leads. (for checking intercom operation of receiver unit. Volume may have to be reduced to prevent feedback from channel A speaker through the intercom speaker. (Fig. 1.39)
7. The POWER SUPPLY SERVICE KIT may be used for both "Bench" and "On the job" check-out of the MUSICOM receiver.
8. When used to check the Model 2510 Intercom Master Control, it should be connected as shown in Fig. 1.40. (See 2510 Service Manual, NuTone Part No. 45880-3)

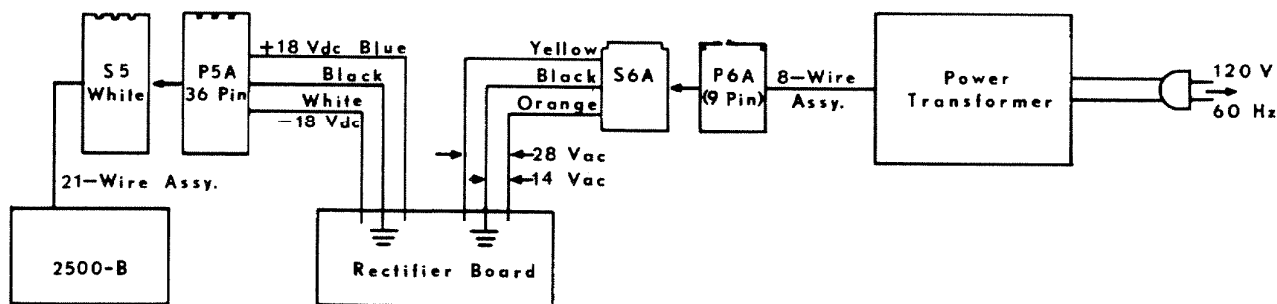


Fig. 1.40 — POWER SUPPLY SERVICE KIT CONNECTED TO INTERCOM MASTER CONTROL

RECEIVER CHECK OUT KIT

1. When necessary, the receiver should be removed from its in-the-wall mounting by following DISASSEMBLY instructions pages 40-43 above.
 2. Connect POWER SUPPLY SERVICE KIT to receiver as directed above. (Fig. 1.38). Connect test speakers. (para. 5 & 6 above)
 3. Connect test antenna to coax antenna lead to FM RF Assembly. DO NOT GROUND SHIELD OF COAX. The coax shield is coupled to antenna input of AM RF section.
 4. Check for FM and AM operation, and channel A and B audio operation through the test speakers.
 5. Check intercom operation by speaking into the intercom test speaker, the signal should be heard in the speaker connected to channel A leads.
- Check muting operation by connecting wire between -18 Vdc terminal 3 and muting terminal 12 of P8A. (Fig. 1.39) Entertainment program should be silenced in both channel A and B speakers, and at the same time speaking into intercom test speaker should result in

intercom signal coming through channel A speaker.

6. Measure: +18 Vdc; Regulated +9 Vdc; and -18 Vdc between terminals 3, 6 and 9 respectively and common terminal 5. (Fig. 1.39)
7. Check FM/AM remote switching on MPLX and Switching circuit:

Set FUNCTION SELECTOR SWITCH in AM and tune to AM station.

Set FUNCTION SELECTOR SWITCH in REMOTE.

Connect a 220K ohm resistor between +18 Vdc terminal 3 and terminal 0 of P8A: the AM station tuned above should be heard from both speakers.

Connect the 220K ohm resistor between +18 Vdc terminal 3 and terminal 7 of P8A: the receiver should switch to FM mode and FM background noise should be heard from both speakers.

8. Check remote FM tuning.

Set FUNCTION SELECTOR SWITCH in REMOTE.

Connect a 220K ohm resistor between terminals 3 and 7 on P8A (Fig. 1.41). Receiver should be in FM mode as in para. 7 above.

Connect a 500K potentiometer between terminals 4, 5, and 6 of P8A as shown in Fig. 1.41.

Adjusting the 500K Pot. should tune the FM RF, Oscillator and Mixer so as to receive FM stations all across the FM band.

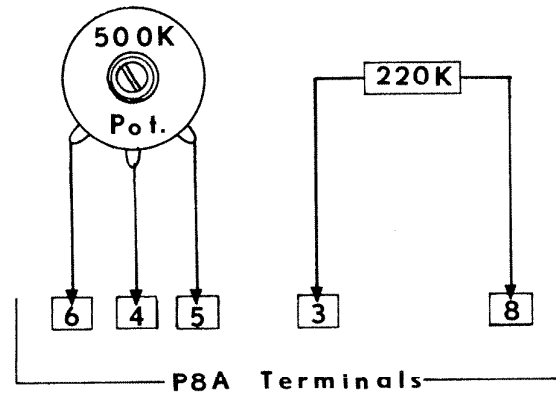


Fig. 1.41 — CONNECTIONS TO P8A FOR CHECKING FM TUNING

ALIGNMENT

ALL SETS ARE COMPLETELY ALIGNED AND CALIBRATED AT THE FACTORY.

REALIGNMENT AND CALIBRATION SHOULD BE PERFORMED, BY QUALIFIED PERSONNEL, ONLY WHEN ABSOLUTELY NECESSARY.

1. Remove receiver from in-the-wall mounting. (see DISASSEMBLY above).
2. POWER SUPPLY SERVICE KIT should be connected to the receiver as directed above.
3. With receiver as shown in position (Fig. 1.35 and 1.36) all adjustments as directed by ALIGNMENT INSTRUCTIONS, pages 48 and 49, may be made.
4. Use non-inductive type tuning wands when adjusting coils, transformers and capacitors.

MUSICOM MASTER RECEIVER ALIGNMENT INSTRUCTIONS AM ALIGNMENT

TEST EQUIPMENT: AM RF Signal Generator-Modulated 30% @ 400 Hz. Oscilloscope (or VTVM)

RECEIVER SETTING: Function Selector Switch in "AM" position

	DUMMY ANTENNA	SIGNAL GEN. COUPLING	SIGNAL GEN. FREQUENCY	RADIO DIAL	OSCILLOSCOPE OR VTVM	ADJUST	REMARKS
1.	.02 mfd	High Side to TR202 Base, Low Side to Chassis	455 KHz.	C201 Open	Vert. Amp. to K on AM PC Board, Low Side to Chassis —VTVM: Probe to k , ground lead to chassis	T202 T203 T204	Adjust for maximum indication on either Scope or VTVM
2.	(same)	(same)	537 KHz.	C201 Closed	(same)	L202	(same)
3.	(same)	(same)	1620 KHz	C201 Open	(same)	C201E	(same)
4.	56 pfd	High Side to Shield of Ant. Lead, Low Side to Chassis	600 KHz.	600 KHz.	(same)	L201 T201	(same)
5.	(same)	(same)	1500 KHz.	1500 KHz.	(same)	C201A C201C	(same)
6.				Repeat Steps 4 & 5			
7.	None: (10 KHz. Trap Adjustment)	High Side to D201 Anode. Low Side to Chassis	10 KHz. (30 millivolts, RMS) with Sig. Gen. Connected	Point of non-interference	(same)	L203	Adjust for Minimum indication of either Scope or VTVM

FM ALIGNMENT

TEST EQUIPMENT: FM RF Sweep Generator-400 KHz. Sweep, and Oscilloscope with 60 Hz. to Horizontal Input

RECEIVER SETTING: Function Selector Switch in "FM" position

	DUMMY ANTENNA	SWEEP GEN. COUPLING	SWEEP GEN. FREQUENCY	RADIO DIAL	OSCILLOSCOPE	ADJUST	REMARKS
1.	.02 mfd.	High Side to TR144 Base, Low Side to Chassis	10.7 MHz.	Point of non-interference	Vert. Amp. to p on FM IF PC Brd. Low Side to Chassis	T144	Adjust for symmetrical "S" Curve
2.	(same)	High Side to TR141 Base. Low Side to Chassis	10.7 MHz.	(same)	Vert. Amp. to TR144 Emitter. Low Side to Chassis	T141 T142 T143	Adjust for response curve of maximum amplitude and symmetry
3.	None	High Side to Center Conductor of Ant. Lead. Low Side to Shield of Ant. lead.	108 MHz.	108 MHz.	Vert. Amp. to p on FM IF PV Brd. Low Side to Chassis	R170 (High Freq. Trim Pot on FM IF PC Brd.)	Adjust for "S" Curve centered in Scope. Retain Symmetry.
4.	(same)	(same)	88 MHz.	88 MHz.	(same)	R283 (Low Freq. Trim Pot on MPLX PC Brd.)	(same)
5.				Repeat Steps 3 & 4			
6.	(same)	(same)	106 MHz.	106 MHz.	(same)	T101 C103 C107	(same)
7.	(same)	(same)	90 MHz.	90 MHz.	(same)	L101 L102	(same)

FM MPLX ALIGNMENT

TEST EQUIPMENT: FM Generator, MPLX Generator and Oscilloscope.
 FM Generator Modulated ± 75 KHz. by MPLX Generator set at 200 microvolts @ 106 MHz.
 MPLX Generator: 45% L + R; 45% L - R; 10% 19 KHz.

RECEIVER SETTING: RECORD/INT RECORD selector switch in "RECORD" position.
 STEREO/MONO selector switch in "STEREO" position
 FUNCTION selector switch in "FM" position

DUMMY ANTENNA	FM GEN. COUPLING	FM GEN. FREQUENCY	RADIO DIAL	MPLX GEN. OUTPUT	OSCILLOSCOPE	ADJUST	REMARKS
1. None	High Side to Center Conductor of Ant. lead. Low side to Shield or Ant. Lead	106 MHz.	106 MHz.	10% 19 KHz.	Vert. Amp. to Pin #1 of IC261 (Use Low Capacity Probe) Low Side to Chassis	L262 L261	Adjust for Maximum Amplitude of 19 KHz.
2. (same)	(same)	(same)	(same)	(same)	Vert. Amp. to Pin #13 of IC261 (Use Low Capacity Probe) Low Side to Chassis	L263	Adjust for Maximum Amplitude of 38 KHz. (See Note 1)
3. (same)	(same)	(same)	(same)	Composite Signal 45% L + R 45% L - R 10% 19 KHz. (see Note 2)	Vert. Amp. to "B" Channel TAPE OUTPUT jack. Low Side to Ground.	(same)	Adjust for Minimum

NOTE 1: L263 has 4 peaks (2 small and 2 large)—Adjust for either of the 2 larger peaks.

NOTE 2: If IC261 is a Motorola MC1304P: MPLX Generator must be set for "Left Channel Excited."
 When other MPLX IC's are used: MPLX Generator must be set for "Right Channel Excited."

FM MPLX ALIGNMENT — OFF THE AIR

(Use This Method When FM Signal Generator and/or MPLX Generator Are Not Available)

EQUIPMENT REQUIRED: Oscilloscope with Low Capacity Probe.

RECEIVER SETTINGS: Same as for regular MPLX alignment (above)

1. Tune MUSICOM Master Unit Receiver to a known FM Stereo Station
2. Place Oscilloscope's Low Capacity Probe on Pin #1 of IC 261 and adjust L262 and L261 for **Maximum** 19 KHz.
3. Place Oscilloscope's Low Capacity Probe on Pin #13 of IC 261 and adjust L263 for **Maximum** 38 KHz.
 NOTE: L263 has 4 peaks (2 small and 2 large) adjust L263 for **either** of the 2 **Larger** peaks.
4. Remove low capacity probe from Pin #13 of IC261, and **carefully** adjust the slug of L263 approximately $\frac{1}{4}$ turn for the best stereo separation during air test.

VOLTAGE AND RESISTANCE MEASUREMENTS

1. Unless otherwise noted, all voltages listed in this manual are measured in respect to common chassis ground.
2. Although standard volt/ohm/amp multi-meters may be used for measurements in the MUSICOM receiver with a fair degree of accuracy, it is recommended that a vacuum tube volt meter be used when available.
3. The voltages on the transistor elements (charts, pages 51 and 52) and at points in the circuit (Schematic Diagram and Interstage Wiring Diagram) may vary $\pm 10\%$.

The relationship of the voltages on the transistor elements and between points in the circuit should be essentially as shown.

4. Resistance measurements must be made with care. Leakage paths must be eliminated. It may be necessary to remove one end of a component being measured from its PC Board.
5. When standard ohm meters are used, polarity must be observed to prevent damage to the solid state components. The voltage of many ohm meters is greater than the listed breakdown voltages between elements of the various transistors.

TROUBLE SHOOTING

1. It is essential that the servicing technician understands the operation of the different circuits in this receiver. See: Theory of Operation, pages 11-37.

2. Extreme care should be used when soldering on PC Boards.

Use "Solder sucker" tools when unsoldering components from PC Boards.

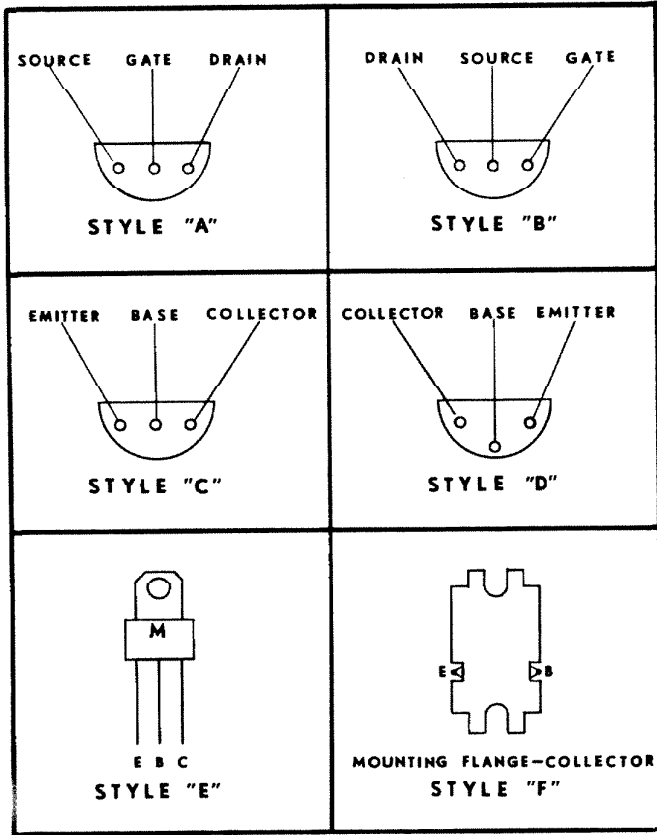
Do not overheat transistors. When soldering transistor leads to the PC Boards, hold the lead between solder point and transistor body with needle-nose pliers. The pliers will act as a heat sink, protecting the transistor.

Make certain there are no shorts, bridges, etc., and that there are no cold solder connections.

3. When the MUSICOM Master is used with the 2510 for systems including intercom, it will often be necessary to determine whether the mal-function is in the MUSICOM Master or in the Intercom Master Control.

This can often be determined by making voltage measurements on the terminal board in the 2500-A, (Fig. 1.6) or in the 2510-A (see 2510 Service Manual).

4. Performing RECEIVER CHECK OUT (pages 45-46 above) will help determine whether or not the receiver is operating properly and whether or not it is supplying the proper operating voltages to the 2510-B.
5. When transistors are replaced, make certain that the leads are in the proper PC Board holes. See configuration chart, page 50.



**TRANSISTOR LEAD CONFIGURATION
NUTONE MUSICOM RECEIVER.**

(Bottom View all transistors except style "E")

Motorola transistors marked "M"

Texas Instrument (Texas Inst.) transistors marked "T.I."

Radio Corporation of America transistors marked "RCA"

In listing at right: When no manufacturer is designated, all makes use same lead configuration.

Schematic Symbol No.	Manufacturer	Base Configuration
TR101	Texas Inst. Motorola	A B
TR102	Motorola Texas Inst.	C D
TR103		C
TR141		C
TR142		C
TR143		C
TR144		C
TR201		C
TR202		C
TR203		C
TR204		C
TR261		C
TR262		C
TR263		C
TR264		C
TR265		C
TR266		C
TR301/TR401		C
TR302/TR402		C
TR303/TR403		C
TR304/TR404		C
TR321/TR421		C
TR322/TR422		C
TR341/TR441	Texas Inst. Motorola	D C
TR342/TR442	Texas Inst. Motorola	D C
TR343/TR443		E
TR344/TR444		C
TR345/TR445		E
TR346/TR446*		F
TR347/TR447	Texas Inst. Motorola	D C
TR348/TR448		E
TR349/TR449*		F

NOTE: (*) Output transistors: Original production used RCA 40633; later production units use 2N3055 which will mount without modification in Heat Sink Assy.

INTERSTAGE WIRING DIAGRAM

MUSICOM MASTER UNIT TUNER / AMPLIFIER

USED IN MODELS 2500, 2501, 2502 & 2600

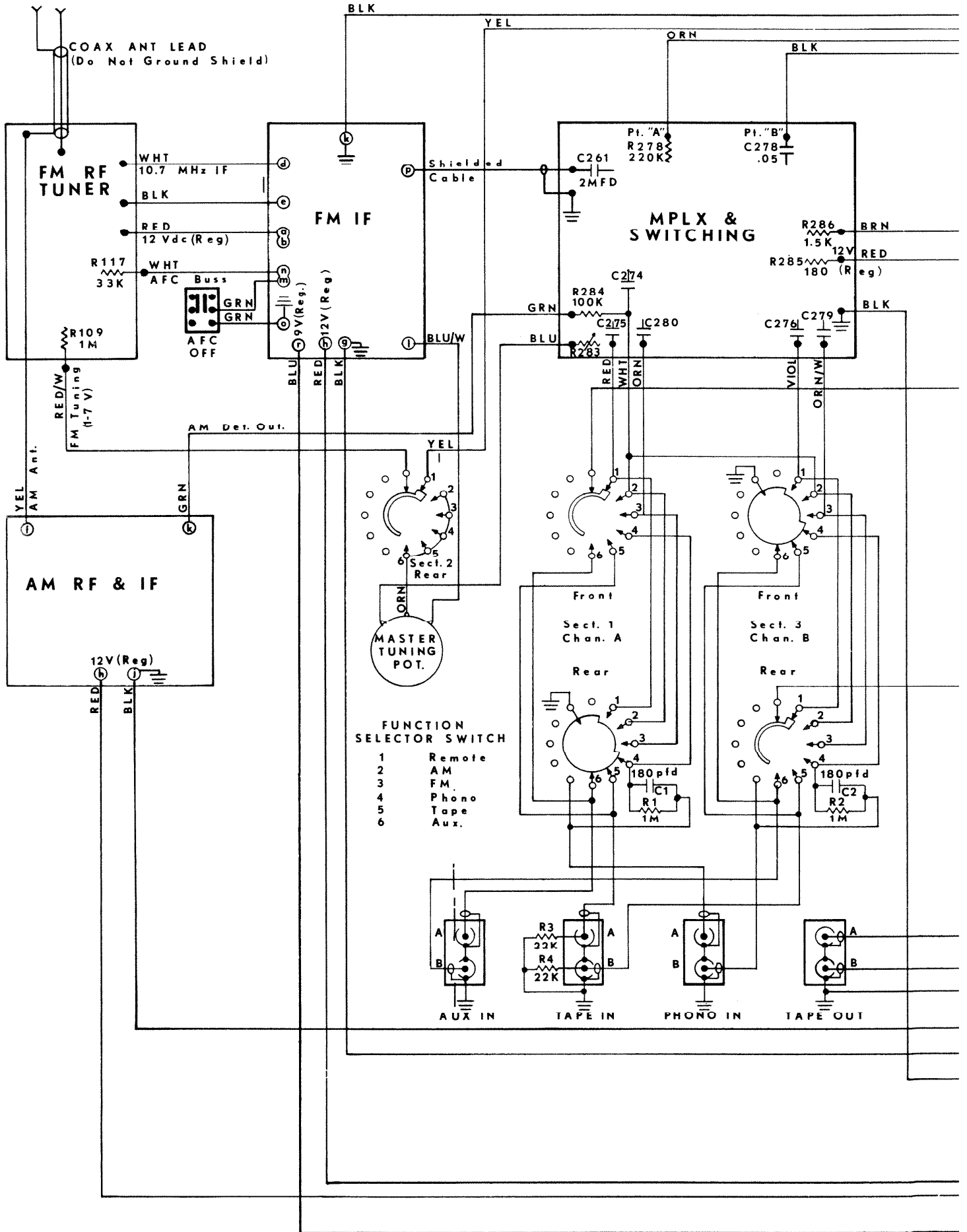
INDICATED VOLTAGES MAY VARY $\pm 10\%$

SWITCH	POSITION
RECORD-INT/REC	RECORD
STEREO-MONO	STEREO
LOUD-OFF	LOUD
AFC-OFF	AFC
FUNCTION SELECTOR	#1 (REMOTE)

NuTone Division

Madison and Red Bank Rds., Cincinnati, Ohio 45227 U.S.A.

Scovill



COAX ANT LEAD
(Do Not Ground Shield)

FM RF TUNER

WHT 10.7 MHz IF
BLK
RED 12 Vdc (Reg)

R117 33K
WHT AFC

R109 1M

RED/W FM Tuning (1-7 V)

AFC Buss
GRN
GRN
AFC OFF

FM IF

BLU/W
BLU 9V (Reg.)
RED 12V (Reg.)
BLK

AM Det. Out.

MPLX & SWITCHING

Pl. "A" R278 220K

Pl. "B" C278 .05

C261 2MFD

R286 1.5K BRN

R285 180 (Reg) RED

R284 100K GRN

C274

C280

C279

C278

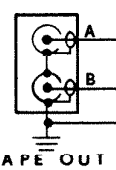
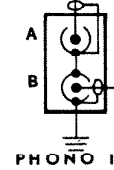
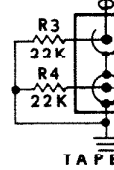
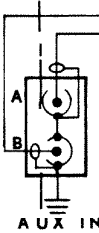
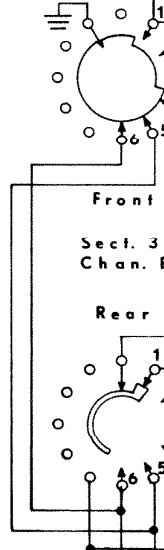
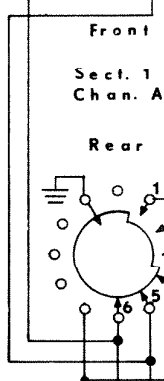
AM RF & IF

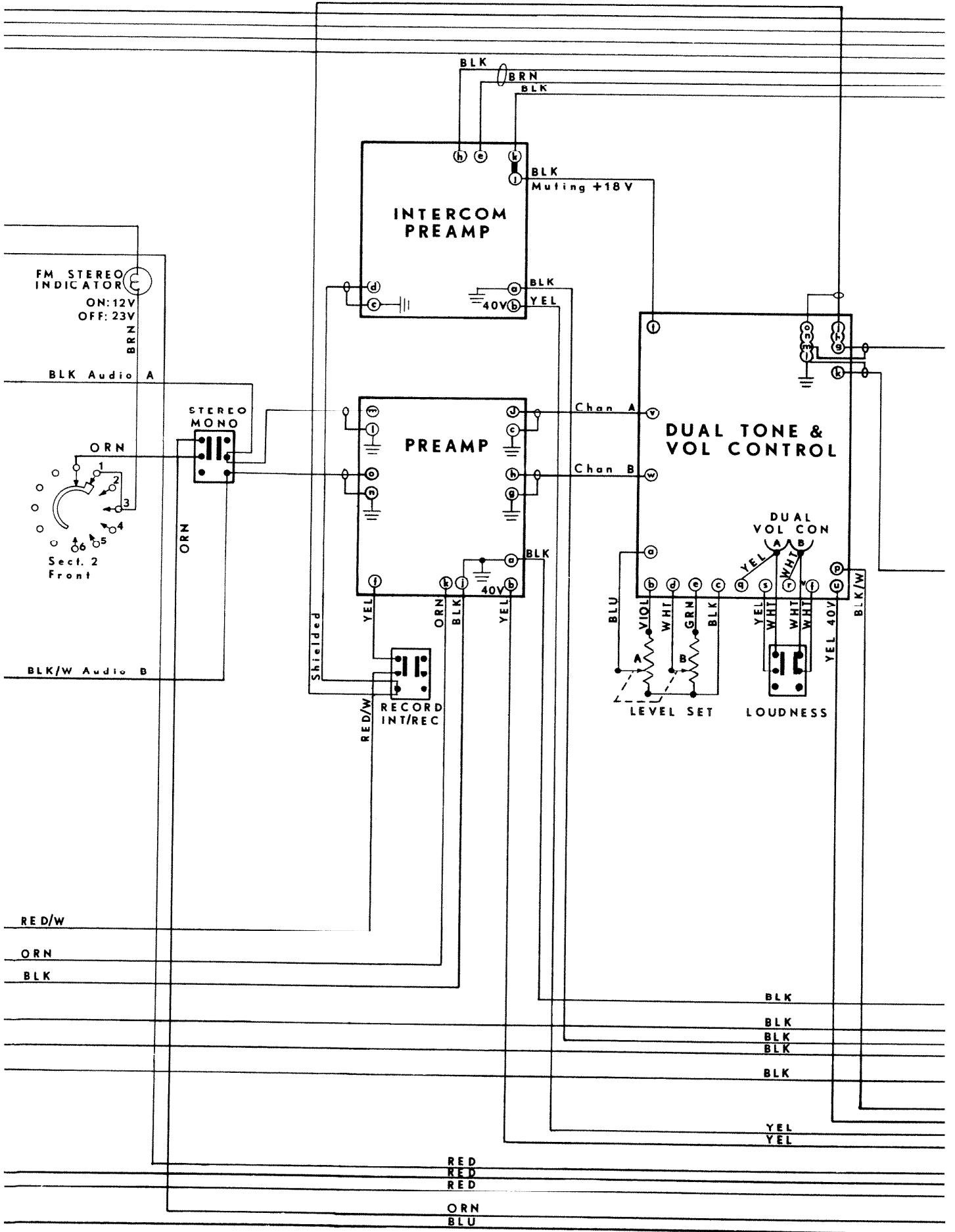
12V (Reg)

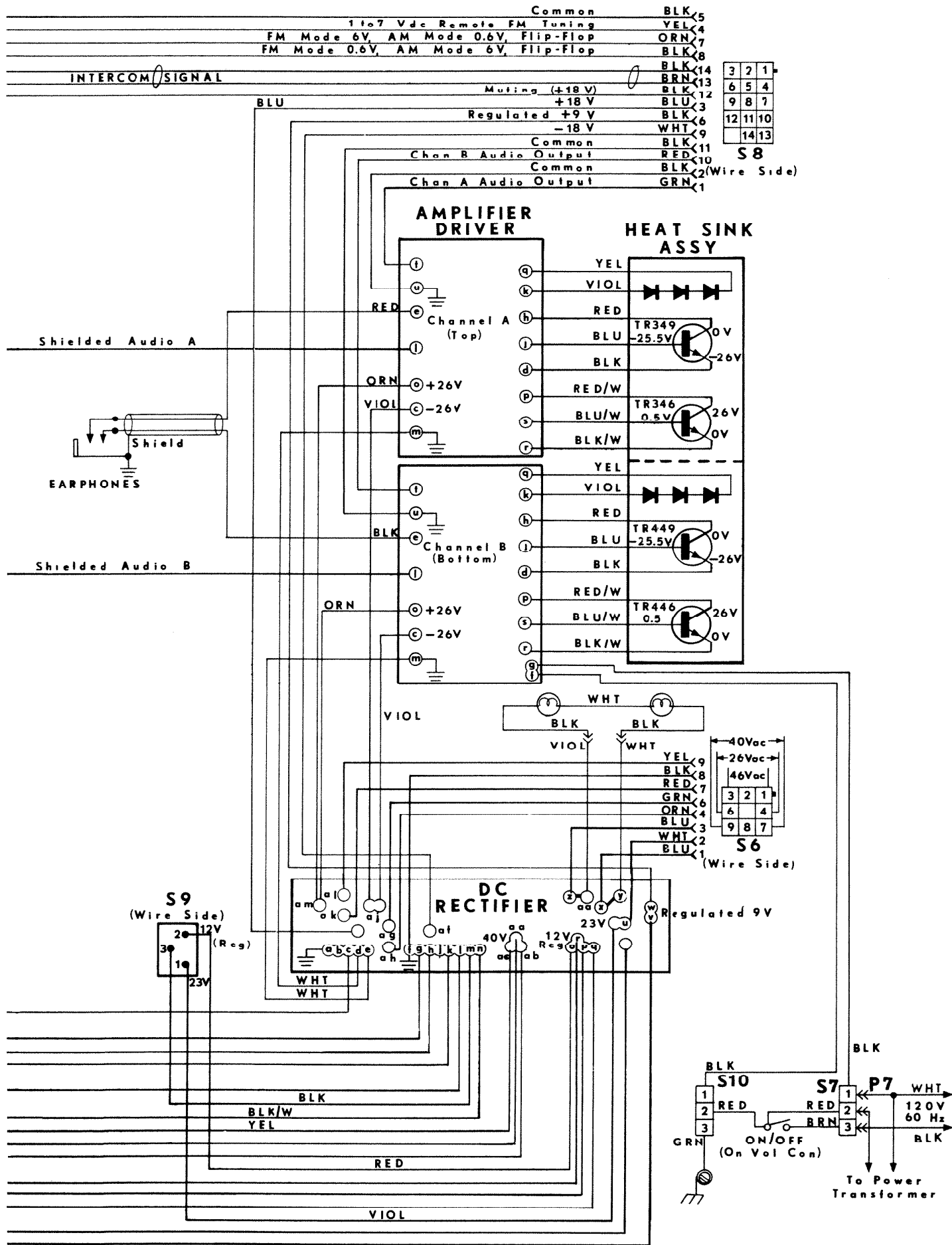


FUNCTION SELECTOR SWITCH

- 1 Remote
- 2 AM
- 3 FM
- 4 Phono
- 5 Tape
- 6 Aux.







MODEL 2500/2600 MUSICOM MASTER UNIT TUNER/AMPLIFIER

TYPICAL TRANSISTOR VOLTAGES (See Replacement Parts List for complete description of each device)

TEST CONDITIONS (Except when noted)

1. Line Voltage = 120 Vac, 60 Hz.
2. SELECTOR switch in Phono position.
3. STEREO/MONO switch in Stereo position.
4. VOLUME and LEVEL controls at minimum (full Counter-Clockwise setting)
5. Voltages Positive except where noted. All Voltages measured with respect to chassis.
6. DC Voltmeter should have minimum input impedance of 10 Megohm.

DEVICE	FUNCTION	EMITTER	BASE	COLLECTOR
TR101	FM TUNER & FM IF AMPLIFIER (Vcc = 12 V) FM RF Amplifier (FET)	1 (Source)	0 (Gate)	10 (Drain)
TR102	FM Mixer & 1st Detector	0.8	1.3	11
TR103	FM Oscillator	0.8	1.3	11
TR141	FM 1st. IF Amplifier	0.8	1.5	11
TR142	FM 2nd. IF Amplifier	0.8	1.5	11
TR143	FM 3rd. IF Amplifier	0.8	1.5	11
TR144	FM 4th. IF Amplifier	0.8	1.5	10.5
MULTIPLEX & SWITCHING (Vcc = 12 V, except, voltage for Pin #6 of IC261 is derived from R503 on DC Rectifier Power Supply PC Board; STEREO/MONO switch in Stereo position; FUNCTION SELECTOR switch in #1 or #3 setting; and through STEREO INDICATOR lamp M261)				
TR261	FM Channel B Program Audio Amplifier	2.4	3	7
TR262	FM Channel A Program Audio Amplifier	2.4	3	7
TR263	FM Channel A Emitter Follower Audio Amplifier when in Remote FM operation	0* 1.2** 1.2***	0* 0.1** 1.8***	9.7* 9.7** 9.7***
TR264	FM Channel B Emitter Follower Audio Amplifier when in Remote FM operation	0* 1.2** 1.2***	0* 0.1** 1.8***	9.7* 9.7** 9.7***
TR265	AM Audio Emitter Follower Audio Amplifier to Channel B in Remote	0* 1.2** 1.2***	0* 1.8** 0.1***	9.7* 9.7** 9.7***
TR266	AM Audio Emitter Follower Audio Amplifier to Channel A in Remote	0* 1.2** 1.2***	0* 1.8** 0.1***	9.7* 9.7** 9.7***

NOTE: *2500/2600 not connected to 2510; P8 disconnected from S8
 **2500/2600 connected to 2510: SELECTOR switch in Remote position; Set operating in AM mode.
 ***2500/2600 connected to 2510: SELECTOR switch in Remote position; Set operating in FM mode.

FM MULTIPLEX INTEGRATED CIRCUIT IC261 VOLTAGES

Pin No.	Voltage	Pin No.	Voltage
1	9.5	8.4	4.4
2	2.3	9	9.7
3	3.1	10	3.7
4	1.5	11	7.7
5	1.5	12	7.7
6	20*	13	3.7
7	0	14	0

NOTE: *FUNCTION SELECTOR switch in FM; STEREO/MONO switch in MONO; no signal

DEVICE	FUNCTION	EMITTER	BASE	COLLECTOR
TR201	AM RF & IF AMPLIFIER (Vcc = 12 V) AM RF Mixer	1	1.6	8
TR202	AM Oscillator	1	1.6	11
TR203	AM 1st. IF Amplifier	1.2	1.8	11
TR204	AM 2nd. IF Amplifier	1	1.6	11
	INTERCOM PREAMP (Vcc = 45 V)			
TR381	Audio Voltage Amplifier	1.5	2.1	11
TR382	Multivibrator	0.9	0.3	19
TR383	Multivibrator	0.9	1.6	1
TR384	Intercom Input Muting	0	0.4	0
	DUAL AUDIO PREAMP (Vcc = 45 V)			
TR301 TR401	Channel A Amplifier Channel B Amplifier	2.6	3.1	15
TR302 TR402	Channel A Amplifier Channel B Amplifier	2.1	2.6	15
TR303 TR403	Channel A Amplifier Channel B Amplifier	1.6	2.2	29
TR304 TR404	Channel A Amplifier Channel B Amplifier	28.4	29	45
	DUAL VOLUME & TONE CONTROL (Vcc = 45 V)			
TR321 TR421	Channel A Amplifier Channel B Amplifier	0.6* 0**	1.2* 0**	16* 0.1**
TR322 TR422	Intercom Muting (Channel A) Intercom Muting (Channel B)	0* 0**	0* 0.7**	16* 0.1**

NOTE: *2500/2600 Not connected to 2510 (P8 disconnected from S8)
**2500/2600 connected to 2510 (INSIDE LISTEN switch held depressed)

DEVICE	FUNCTION	EMITTER	BASE	COLLECTOR
	POWER AMPLIFIER (Vcc = +27.5 V to Pin o on PC Board.) (Vcc = -27.5 V to Pin c on PC Board.)			
TR341 TR441	Channel A Differential Voltage Stabilizer Channel B Differential Voltage Stabilizer	0.6	0.02	-26.2
TR342 TR442	Channel A Differential Voltage Stabilizer Channel B Differential Voltage Stabilizer	0.6	0.02	-26.9
TR343 TR443	Channel A Audio Voltage Amplifier Channel B Audio Voltage Amplifier	-26.9	-26.2	-3
TR344 TR444	Channel A Voltage Sensing Channel B Voltage Sensing	0	0	1.1
TR345 TR445	Channel A Current Amplifier Channel B Current Amplifier	0.5	1.1	27.5
TR347 TR447	Channel A Voltage Sensing Channel B Voltage Sensing	0	0	1.1
TR348 TR448	Channel A Current Amplifier & Phase Reversal Channel B Current Ampl. & Phase Reversal	-0.5	-1.1	-27
	POWER OUTPUT TRANSISTORS LOCATED ON HEAT SINK			
TR346 TR349	Channel A Push-Pull Power Output	0 -27.5	0.5 -27	27.5 0
TR446 TR449	Channel B Push-Pull Power Output	0 -27.5	0.5 -27	27.5 0

The above Transistor element voltages are representative of a typical circuit. There may be differences noted in an actual set under measurement, but, the element voltages of the individual transistor should be in the same ratio as shown on the above chart.

NuTone Warranty

READ CAREFULLY—DO NOT DISCARD

GUARANTEE AND SERVICE POLICY: NuTone products are designed for residential and light commercial use and have been carefully tested and inspected at the factory to insure against material and workmanship defects. All parts and labor (service) necessary to insure proper operation of this unit are warranted for a period of one full year (12 months) from date of use.

Provisions of Warranty:

- The above warranty applies only if the unit is delivered or returned prepaid to an Authorized NuTone Service Station.
- This warranty is void in case of abuse, misuse, abnormal usage, faulty installation or repair by unauthorized persons. NuTone's liability does not extend to consequential damages.
- This warranty does not include dial lights or record changer needles.

For the location of the nearest Authorized Service Station contact your local NuTone Sales Representative or Field Engineering Department, NuTone, Madison and Red Bank Roads, Cincinnati, Ohio 45227. Service after the warranty period will necessitate charges for the repair.

IMPORTANT: This warranty supersedes all previous warranties.

RADIO • STEREO • INTERCOM SYSTEMS

NuTone Housing Products

Scovill

MADISON & RED BANK ROADS - CINCINNATI, OHIO 45227

Part No. 45880-1
Printed in U.S.A.

10-72