THIS MANUAL ALSO COVERS THE 173, 185, CUSTOM 177 AND 187 RECEIVERS.

SERVICE MANUAL

PRICE $1.00

170/180

SERIAL NUMBERS BEGINNING 10001

The Fisher®

170

180

Stereophonic AM-FM Receivers

WORLD LEADER IN HIGH QUALITY STEREO

CONTENTS and SERVICE TIPS

The Fisher 170 and 180 receivers (also 173, Custom 177, 185 and Custom 187) are nearly identical in most respects. Except for the power transformer, their circuitry is on two boards: a TUNER board and an AUDIO/POWER board.
Even though the same boards are used, the audio output of the 180/185/187 is higher than that of the 170/173/177 due to larger output transistors, higher B+ supply, and changes in the value of some small components.

CAUTION: **This precision high-fidelity instrument should be serviced only by qualified personnel, trained in the repair of transistor equipment and printed circuitry.**

Many of these items are included only as a reminder — they are normal procedures for experienced technicians. Shortcuts may be taken, but these often cause additional damage to transistors, circuit components, or printed circuit boards.

SOLDERING: A well-tinned, hot, clean soldering iron tip will make soldering easier, without causing damage to the printed circuit board or the components mounted on it. Regular use of a sponge cleaner will maintain a clean soldering surface. The heat available at the tip, (not the wattage of the iron) is important. Some 50-watt irons reach temperatures of 1,000° F, while others will hardly melt solder. Small-diameter tips should be used for single solder connections, pyramid and chisel tips for large areas.

Always disconnect the AC power cord from the line when soldering. Turning the power switch OFF is not sufficient. Power-line leakage paths, through the heating elements of the iron, may destroy transistors.

PARTS REMOVAL: If a part is not being returned for in-warranty factory replacement, it may be cut in half (with diagonal cutting pliers) to make removal easier. Multiple terminal parts, such as IF transformers, or electrolytic capacitors, should be removed using special de-soldering tips made especially for this purpose. Removing solder from terminals, reduces the possibility of breaking the printed circuit board when the part is removed.

ACCIDENTAL SHORTS: A clean working area, free of metal particles, screws, etc., is an important preventive in avoiding servicing problems. Screws, removed from the chassis during servicing, should be stored in a box until needed. While a set is operating, it takes only an instant for a base-to-collector short to destroy a transistor (and others direct-coupled to it). In the time it takes for a dropped screw, washer, or screwdriver, to contact a pair of terminals (or terminal and chassis), a transistor can be ruined.

SOLID-STATE DEVICES: Integrated Circuits contain the equivalent of many circuit parts, including transistors, diodes, resistors, and capacitors. The preferred troubleshooting procedure requires isolating the trouble to one stage using AC signal tracing methods. Once the suspected stage is located the DC voltages at the input and output leads are measured to give an accurate indication of the operating conditions of the IC. DO NOT use an ohmmeter, to check continuity with the IC mounted on the printed circuit board. Forward biasing the internal junctions within the IC may burn out the transistors. Do not replace a defective IC until all external resistors, capacitors, and transformers are checked first, to prevent the replacement IC from failing immediately due to a defect in the connecting components. Solder and unsolder each lead separately using a pliers or other heat sink on the lead to prevent damage from excessive heat. Check that the leads are connected to the correct locations on the printed circuit board before turning the set on.

Whenever possible, a transistor tester should be used to determine the condition of a transistor or diode. Ohmmeter checks do not provide conclusive data, and many even destroy the junction(s) within the device.

Never attempt to repair a transistor power amplifier module until the power supply filter-capacitors are fully discharged.

If an output or driver transistor becomes defective (opens or shorts), always check ALL direct-coupled transistors and diodes in that channel. In addition, check the bias pot., and other parts in the bias network, before installing replacement transistors. All output and driver transistors in one channel may be destroyed if the bias network is defective. After parts replacement, check bias for specified idling current.

In some applications, replacement of transistors must be made from the same beta group as the original type. The beta group is indicated by a colored marking on the transistor. Include this information when ordering replacements.

When mounting a replacement power transistor, be sure the bottom of the flange, mica insulator, and the surface of the heat sink, are free of foreign matter. Dust and grit will prevent flat contact, reducing heat transfer to the heat sink. Metallic particles can puncture the insulator, cause a short, and destroy the transistor.

Silicone grease must be used between the transistor and the mica insulator and between the mica and the heat sink for best heat transfer. Use Dow-Corning DC-3, or an equivalent compound made for power transistor heat conduction.

Use care when making connections to speakers and output terminals. To reduce the possibility of shorts, lugs should be used on the exposed ends, or stranded wire should be tinned to prevent frayed wire ends. Current in the speakers and output circuitry is quite high — poor contacts, or small wire, can cause significant power losses. For wire lengths greater than 30 feet, 16 AWG, or heavier, should be used.

VOLTAGE MEASUREMENTS: All voltages are measured with the line voltage adjusted to 120 volts. All measured voltages are ± 20%. DC voltages are measured to chassis with a VTVM, with no signal input unless otherwise noted. AC signal voltages are measured under the conditions specified on the schematic.

ALIGNMENT PROCEDURES: DO NOT attempt realignment unless the required test equipment is available, and the alignment procedure is thoroughly understood.

The following equipment is required to completely test and align the 205 AM-FM Receiver.

- Line Voltage Autotransformer or Voltage Regulator
- DC Vacuum Tube Voltohmmeter
- Accurately Calibrated AC Vacuum Tube Voltmeter
- Oscilloscope (Flat to 100 KHz Minimum)
- Low-Distortion Audio (Sine Wave) Generator
- Harmonic Distortion Analyzer
- 2 – Load resistors, 4-Ohms, 100 Watt (Minimum Rating)
- AM/FM Signal Generator
- 10.7 MHz Sweep Generator (Fisher 3024*)
- Multiplex Generator (Fisher 1536*)
- 455 KHz Sweep Generator (Fisher 3025*)
- Stereo Source – Turntable, Tape Recorder, etc.
- Soldering Iron with Small Tip, Fully Insulated from AC Line
- Suction Desoldering Tool

*with Power Supply (Fisher 1561)

REMOVING DRESS PANEL

(1) Remove screws securing cabinet to chassis. Remove cabinet.
(2) Gently pull POWER/SPKRS, BASS, TREBLE, BALANCE, VOLUME, SELECTOR, and TUNING knobs from their control shafts.
(3) Remove two screws from top and two screws from bottom of dress panel. Remove the panel.
(4) Reverse above procedure to reassemble the dress panel.

REPLACING DIAL GLASS

(1) Remove dress panel as instructed above.
(2) Remove right and left dial lamp assemblies.
(3) Remove right and left glass holding clips, and remove the glass.
(4) Install a new dial glass and reverse above procedure.

REPLACING DIAL LAMPS

(1) Remove dress panel as instructed above.
(2) Remove lamp assembly by removing screw securing dial lamp assembly to the chassis.
(3) Snap out defective lamp and replace with new lamp.
(4) Reassemble lamp assembly and replace dress panel.

REPLACING METER LAMP

(1) Remove screws securing cabinet to chassis and remove cabinet.
(2) Remove aluminum meter lamp housing by removing two screws which secure housing to chassis.
(3) Snap out defective meter lamp and replace with a new one.
(4) Reassemble in reverse order.

REPLACING METER

(1) Remove screws securing cabinet to chassis and remove cabinet.
(2) Remove aluminum meter lamp housing by unscrewing two Phillips head screws which secure housing to chassis.
(3) Release meter retaining spring.
(4) Unsolder two meter leads and label for future reference.
(5) Gently pry meter loose from back of dial panel, and scrape residue from back of dial panel. Solder meter leads to new meter.
(6) Peel backing from one side of a new adhesive mounting pad and affix pad to new meter. Peel backing from the other side of pad, align meter face behind panel cutout, and press meter firmly into place at rear of panel.
(7) Engage meter retaining spring. Replace meter lamp housing.
(8) Check meter calibration (referring to TUNER ALIGNMENT). Reinstall receiver in cabinet.

REPLACING STEREOBEACON LAMP

(1) Remove screws securing cabinet to chassis and remove the cabinet.
(2) Disconnect leads from pins L and E6 of the Audio/Power board.
(3) Remove lamp by pulling it backwards out of its black rubber holder.
(4) Insert new lamp into lampholder.
(5) Route leads from new lamp to pins L and E6 of Audio/Power board and solder in place.
(6) Replace receiver in cabinet.

REMOVING AUDIO/POWER BOARD

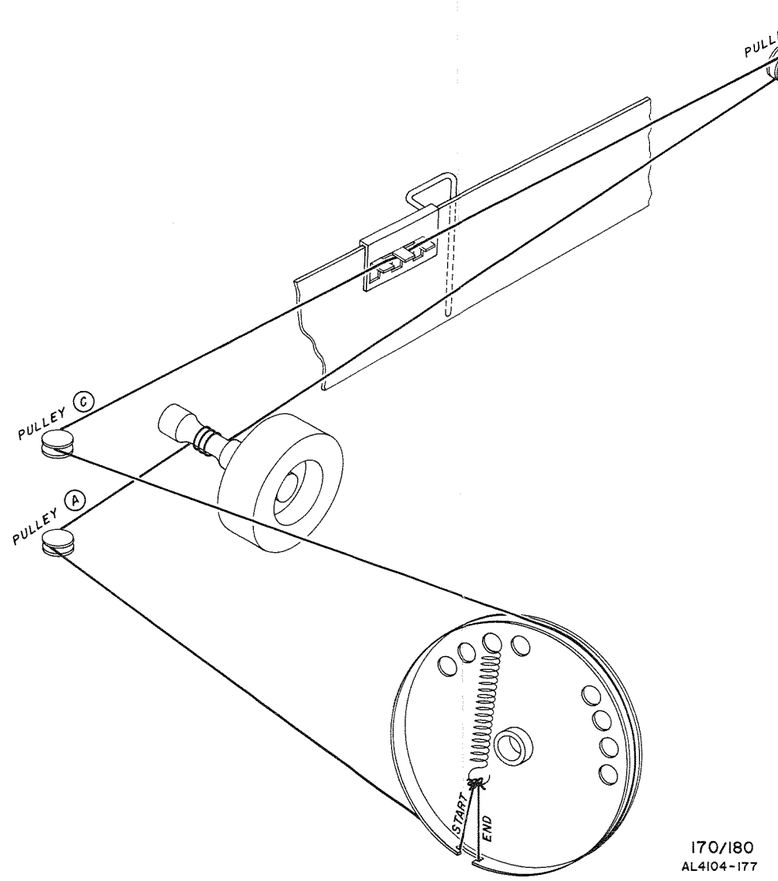
(1) Remove dress panel.
(2) Remove two Phillips head machine screws (between PHONES JACK and POWER/SPKRS switch) which secure control panel (Audio/Power board) to chassis front. Also remove two Phillips head machine screws at extreme right of front panel.
(3) Remove three self-tapping Phillips head screws which secure large vertical aluminum plate (output transistor heat sink) to main chassis. Remove four-inch bracket which secures middle of vertical aluminum heat sink to the front panel.
(4) Remove the self-tapping Phillips head screw at end of board near right side (next to PHONES jack).
(5) Turn chassis back upright. Disconnect and label all wires from board terminals, one at a time.
(6) Lift board slightly toward rear of chassis and remove by lifting upward carefully, taking care to avoid dislodging dial cord.
(7) Replace in reverse order.

REMOVING TUNER BOARD

(1) Use same general procedure as above (Removing Audio/Power Board), except removal of dress panel and bracket (steps 1 & 3, above) are not required for Tuner Board removal.

CAUTION:
(A) Measure one channel at a time.
(B) Limit measurements to 10 minutes.
(C) Use a load resistor with a minimum rating of 50 watts.
(1) Set BASS, MIDRANGE, and TREBLE controls flat, SELECTOR switch to AUX 1, and POWER/SPKRS switch to AC OFF.
(2) Connect a low-distortion sine wave signal generator between L AUX IN jack and chassis ground. Set the generator output at 1000 Hz, minimum output.
(3) Connect the 4-ohm load resistor between L MAIN SPKR and COM terminals. Connect an AC VTVM, scope, and harmonic distortion analyzer across the 4-ohm load.
(4) Set POWER/SPKRS switch to MAIN. Turn VOLUME control slowly to maximum.
(5a) FOR MODELS 170, 173, 177: Adjust the generator output until VTVM indicates 8 volts RMS. The distortion analyzer should indicate less than 1% harmonic distortion.
(5b) FOR MODELS 180, 185, 187: Adjust the generator output until VTVM indicates 9 volts RMS. The distortion analyzer should indicate less than 1% harmonic distortion.
(6) Repeat steps (1) through (5) for the right channel.

(1) Remove screws securing cabinet to chassis and remove cabinet. Place receiver face down on bench, with top toward technician, bottom leaning back against a firm support.
(2) Remove dial cord from tabs on dial pointer. Leave dial pointer on its rail.
(3) Rotate tuning knob fully clockwise (88 MHz).
(4) Remove old dial cord after marking which hole secures spring to drum.
(5) Tie end of new cord to end of dial spring. Make sure dial spring is hooked to drum as shown in illustration.
(6) Guide dial cord out of drum, through upper side of rim opening, toward rear of chassis, down under drum and around pulley (A). Wind dial cord counterclockwise three times around tuning shaft, around pulley (B), then around pulley (C),
(7) Guide dial cord to drum, and inside, through rim opening.
(8) Pull dial cord taut and hook cord temporarily to end of dial cord spring.
(9) Rotate tuning knob clockwise, then counterclockwise, to distribute the tension evenly.
(10) Repeat steps (8) and (9) until spring and cord are evenly tensioned. Then tie dial cord securely to end of spring.
(11) Place dial cord over, under, and over the tabs on dial pointer.
(12) Turn tuning knob fully counterclockwise. Slide pointer to indicate zero on tuning dial while holding drum fully counterclockwise (rim opening *up*).



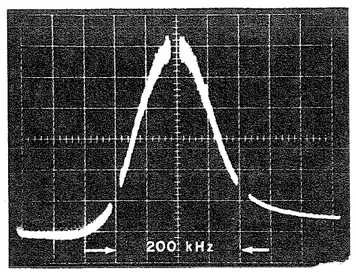
170/180
AL4104-177

TUNER ALIGNMENT

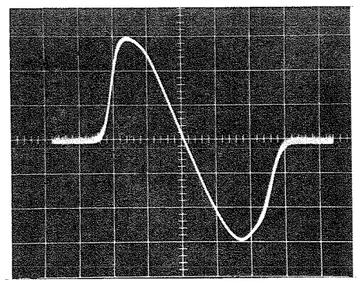
FM ALIGNMENT—FM MUTING OFF TONE CONTROLS and BALANCE to center. SPEAKER/PHONES Switch to PHONES, MODE to STEREO, SELECTOR to FM, VOLUME to MIN, TAPE MONITOR OFF.

Maintain generator output as low as possible for suitable indication.

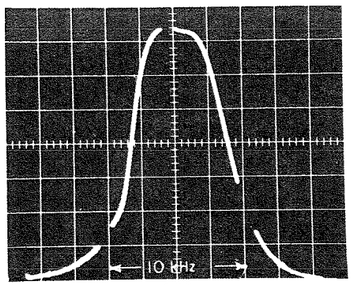
ITEM	GENERATOR	DIAL SETTING	INDICATOR	PROCEDURE
Note: The FM IF circuit utilizes a non-tunable ceramic filter which establishes the IF bandpass. To insure symmetrical tuning and selectivity, the IF must be aligned precisely to the center of the filter bandpass, rather than to 10.7 MHz as in conventional LC circuits.				
1. IF ALIGNMENT	Connect to 10.7 MHz sweep through 2 pF capacitor and 22K resistor to TP1 (FM IN). Connect ground lead to rear of chassis. Markers are not required.	Position of non-interference.	Scope vertical input to TP2 (FM OUT). Ground lead to rear of chassis.	Short FM oscillator variable capacitor (section nearest L4) with a clip lead as shown in alignment layout. Detune T9 by turning core up (CCW). Adjust T5, T3, T2, T1, for curve as shown in photograph. Repeat as required to obtain best shape. Adjust T9 for best shape (widest bandpass, not for max amplitude).
2. PRELIMINARY DETECTOR ALIGNMENT	Readjust generator output to 100 uV. Reduce output amplitude as much as possible throughout this procedure.		Connect scope vert input through a 100K resistor to TP3 (DISCRI).	Adjust T7 top and bottom for best gain and symmetry. S-curve should appear as shown in photograph.
Note: 120-ohm composition resistors in series with each lead from the RF generator match the 50-ohm output to the 300-ohm input impedence. Generator output voltage is reduced to one-half at antenna terminals. Signal voltages specified in this table are generator output levels, not antenna voltages.				
3. FRONT END ALIGNMENT		Tuning knob fully CCW.		Center dial pointer on 0 and cement it in place.
4.	Connect FM RF generator through two 120-ohm resistors to FM ANT screw terminals. Set generator to position of non-interference near 90 MHz, modulate with 400 Hz to provide ±75 kHz deviation. Output amplitude should be sufficient to provide reading on receiver front panel meter of 3.	Position of non-interference near 90 MHz.	Receiver front panel meter. Caution: To ensure that meter is not indicating a local broadcast station connect scope for step 5, below.	Adjust L4 for maximum gain. Adjust L2, then L7 for maximum gain. Repeat the two steps above as required.
5.	Change generator setting to position of non-interference near 106MHz.	Position of non-interference near 106 MHz.		Adjust TC3 for maximum gain. Adjust TC1, then TC2, for maximum gain. Repeat the two steps above as required.
6. FINAL DETECTOR ALIGNMENT	As above, except set to position of non-interference near 100 MHz. Set output amplitude to 1 mV (500 mV at receiver antenna terminals).	Position of non-interference near 100 MHz.	Distortion meter to RCDR OUT jack. DC VTVM through 100K resistor to TP3 (DISCRI).	Adjust top core of T7 for zero point on 0.1 V scale. Adjust bottom core of T7 for minimum distortion (should be below 1%) on distortion meter.
7. FM OUTPUT	As above (100 MHz), deviation set to ±22.5 kHz.	Position of non-interference near 100 MHz.	VTVM and scope to RCDR OUT jack.	Adjust VR1 (FM Level Adjust) for 350 mV RCDR OUT jack.
8. FM METER ADJUSTMENT	As above; set amplitude of generator output to 1 Millivolt.	Position of non-interference near 100 MHz.	Receiver front panel meter.	Adjust VR5 (FM Meter Drive Adjust) so the front panel meter reads 4.
9a. MUTING LEVEL ADJUSTMENT (180 only)	Same except generator output set to 16 uV.		VTVM and scope to RCDR OUT jack.	Set MUTING ON-OFF switch on receiver front panel to ON Adjust VR6 (Muting Adjust) until generator output signal overcomes MUTING (until signal shows on scope)
9b. (170 only)	Same except modulation changed to 19 kHz, amplitude sufficient to cause deviation of ±6 kHz.			Adjust VR7 (STEREOBEACON adjust) until the STEREOBEACON lights. Decrease generator output slowly, STEREOBEACON should go out at slightly lower output. Check by increasing and decreasing generator output slightly to turn STEREOBEACON ON and OFF.
10. STEREO SEPARATION	As above, except amplitude increased to 1.		Move VTVM and scope to TP5 (19 kHz) and GND. Move VTVM and scope to TP6 (38 kHz).	A. Set VR2 (Separation adjust) to the middle of its rotation. B. Adjust L6 and L9 (19 kHz) for maximum output. Adjust L7 for maximum.
11.	Change amplitude of 19 kHz modulation to 8%, and modulate with 400 Hz main signal, (Left) amplitude sufficient to produce deviation 42 kHz.		Scope and VTVM to Right RCDR OUT jack.	Adjust L9 for maximum output. If L9 requires more than ½ turn, readjust L6, then L9, several times to get best settings fo: maximum. Adjust VR2 for minimum.
12.	As above, except 19 kHz amplitude to produce 3.75 kHz deviation.		Move scope and VTVM to Left RCDR OUT jack.	Adjust VR7 so the STEREOBEACON just lights. Reduce amplitude of modulation until the STEREOBEACON just goes out. Note the amount of deviation. Increase the deviation until the light comes ON again. The STEREOBEACON should light and go out between 3 and 4.



FM IF



FM DETECTOR

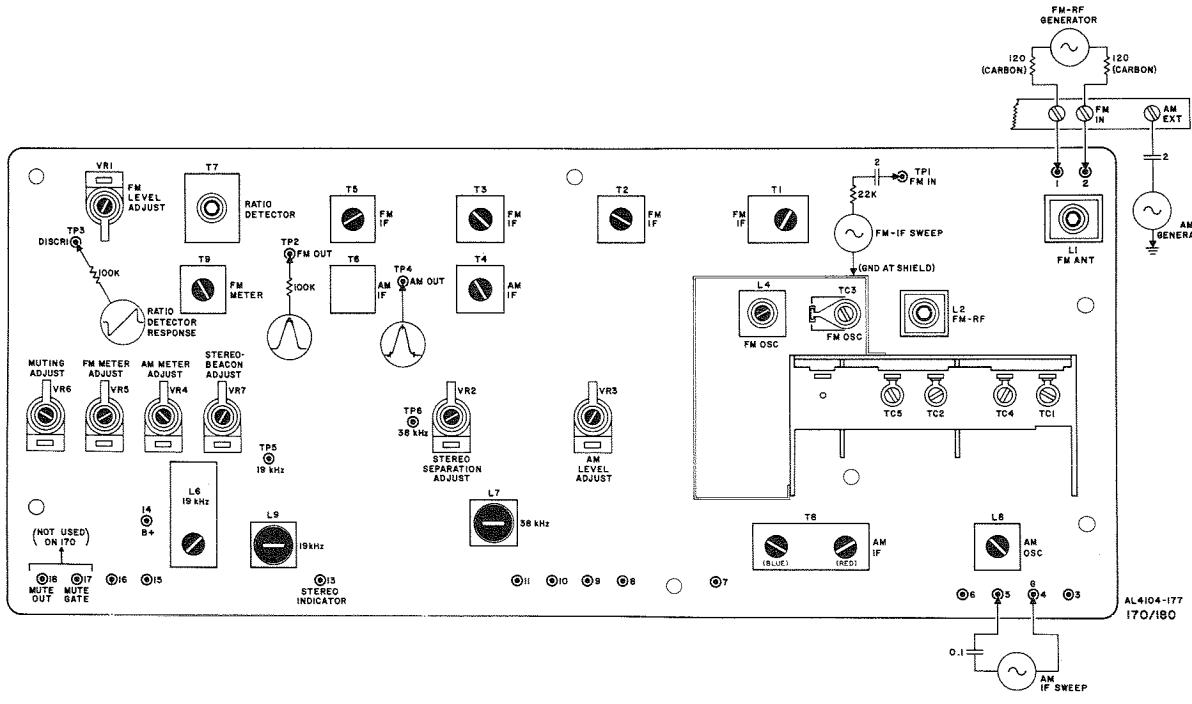


AM IF

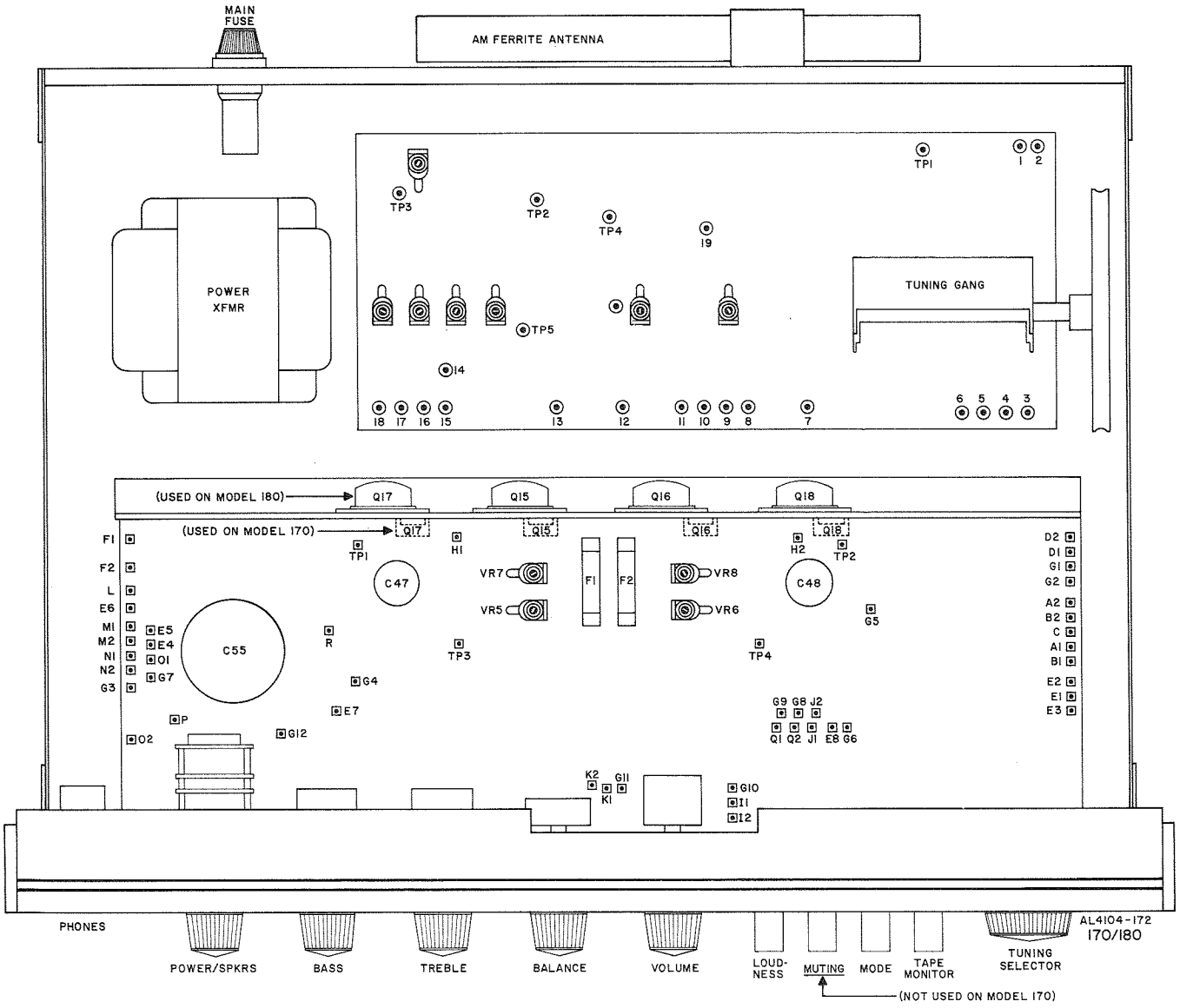
AM ALIGNMENT—SAME FRONT PANEL SETTINGS as FM ALIGNMENT EXCEPT SELECTOR SET to AM

Maintain generator output as low as possible for suitable indication.

ITEM	GENERATOR	DIAL SETTING	INDICATOR	PROCEDURE
1. AM IF	Connect 445 kHz sweep generator to AM EXT ANT terminals. Note: After each adjustment reduce generator output as required to keep front panel meter near 2.5.	Position of non-interference.	Scope vertical input to TP4 (AM OUT).	Adjust T8 for maximum gain. Adjust T4 for maximum. Repeat above two steps as required.
2. AM RF	Connect RF AM generator to antenna terminals and set output position of non-interference near 550 kHz, modulated 30% with 1 kHz audio, amplitude 5 mV.	Position of non-interference near 550 kHz.	Scope and VTVM to RCDR OUT jack.	Adjust L8 (AM Osc) for maximum.
3.	Change the RF output frequency to position of non-interference near 1,600 kHz.	Position of non-interference near 1,600 kHz.		Adjust TC5 for maximum.
4.	Reset the output frequency to position of non-interference near 600 kHz.	Position of non-interference near 600 kHz.		Repeat steps 2 and 3, above for maximum at both 600 and 1,400 kHz.
5.	Reset output to 1,400 kHz.	Position of non-interference near 1,400 kHz.		Remove tape from ferrite antenna case and adjust slide for maximum gain signal. Repeat steps 4 and 5.
6. AM OUTPUT	Reset generator output to position of non-interference near 1,000 kHz, amplitude 5 mV.	Position of non-interference near 1,000 kHz.		Adjust VR3 (AM Output) for 315 mV.
7. AM METER ADJUSTMENT	Reset generator output to position of non-interference near 1,000 kHz, amplitude 5 mV.	Position of non-interference near 1,000 kHz.	Receiver front panel meter.	Adjust VR4 (AM Meter Adjust) so that signal meter reads 4.



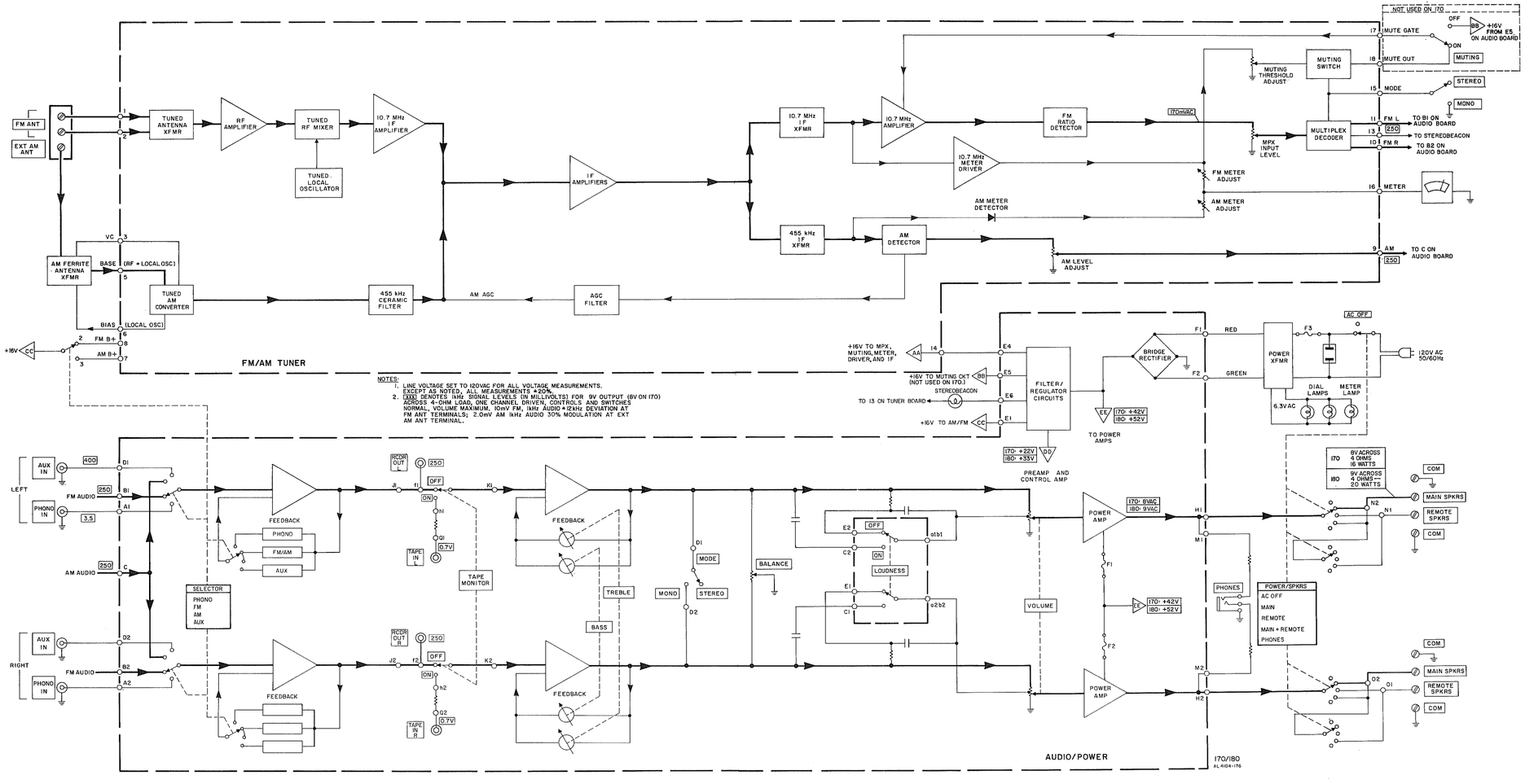
CHASSIS LAYOUT

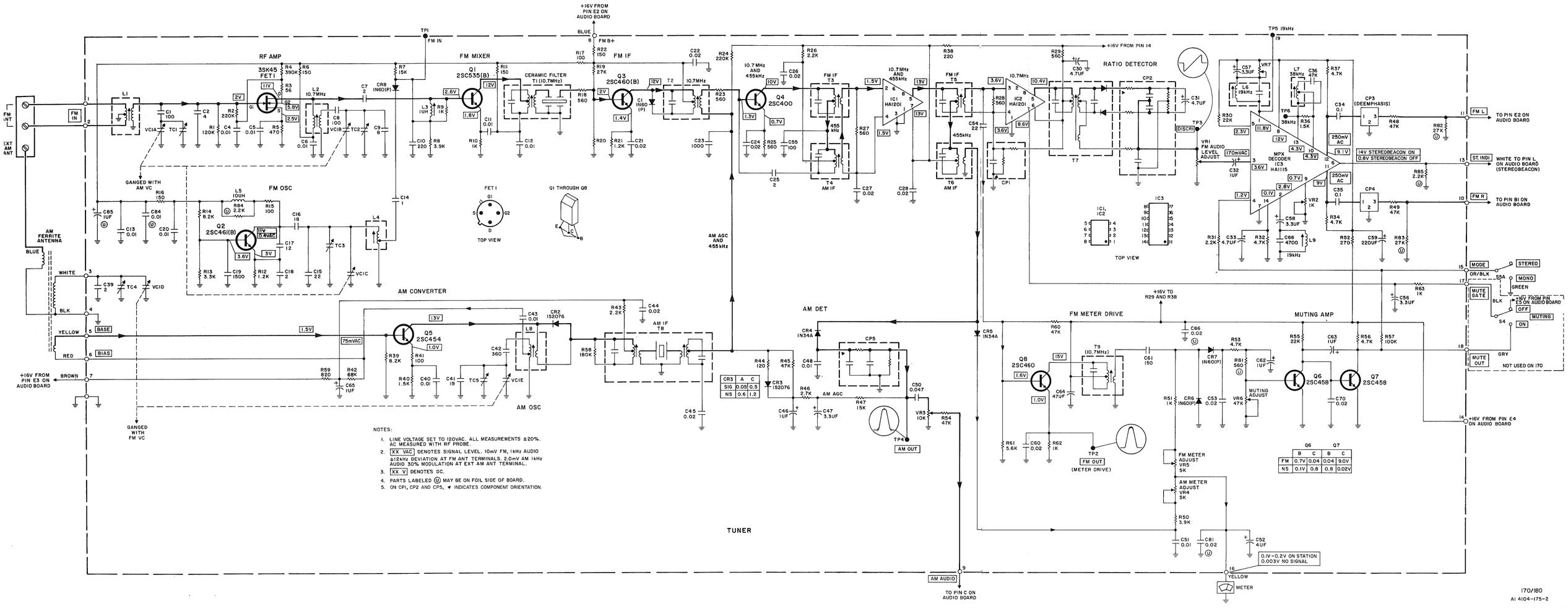


PLEASE READ CAREFULLY: The parts lists on this and following pages do not include shipping charges. Please include the serial number of the Fisher equipment for which the part(s) are intended. Send your order to: PARTS DEPARTMENT, FISHER RADIO, 11-40 45th Road, Long Island City, N.Y. 11101.

MAIN CHASSIS

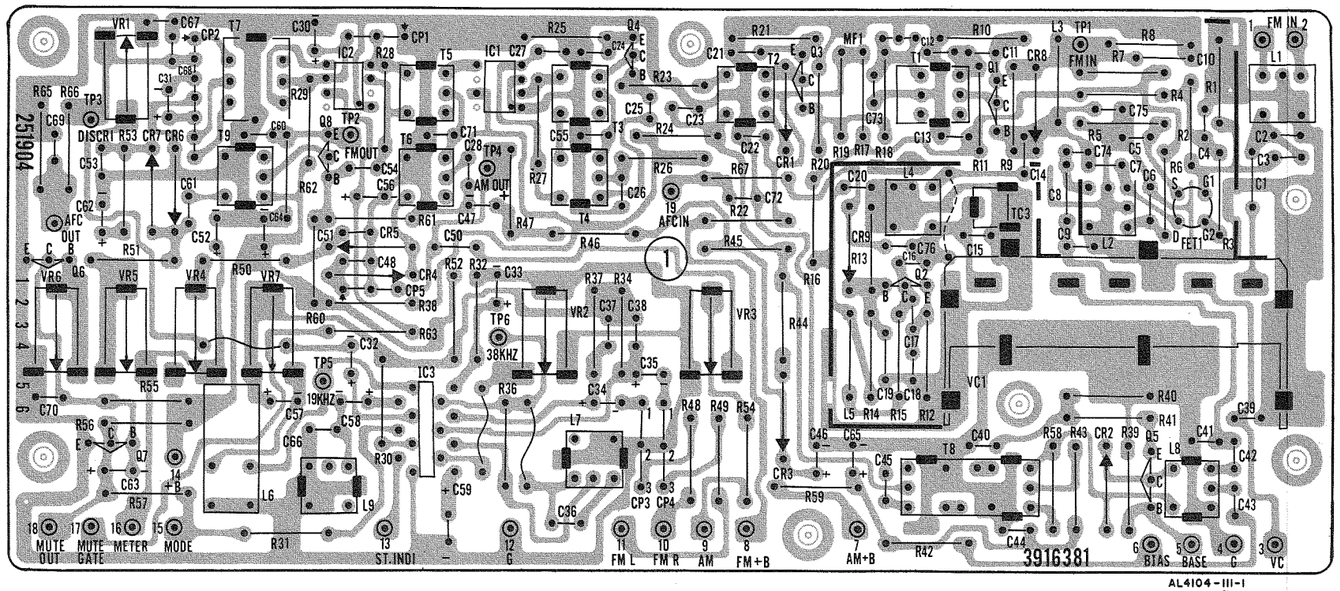
Symbol	Description	Part No.	Sug. Ret.
I1, 2	Lamp, Dial and Meter Glass, Fuse type, 6V, 250 ma	LM4083-2767201	1.30
I3	Lamp, STEREOBEACON 30 mA, 8V (sub-min)	LM4104-2767233	1.85
	STEREOBEACON Jewel	4104-3913554	.40
	STEREOBEACON lamp Holder (rubber)	4104-4680101	.60
	Dial Glass	AS4104-3198092	5.85
	Dial Pointer assembly	AS4104-3386491	1.40
	Signal Meter	MC4083-2577122	7.70
F3	Fuse, Main Power, 2A	FL-51313-13A	.90
F4	Fuse, Meter, Pigtail, 2A	FL51313-37	.90
	Fuseholder, Main Power	EM4083-2727062	1.75
	AM Ferrite Antenna	LA4104-2134401	5.10
	Receiver Cabinet	AS4104-4927241	26.00
	Tuning Shaft assembly	AS4104-4561482	3.30
	Jack, Headphones	JK4104-2677061	1.90
R1, 2	470, ½W (Phones attenuators)	RC20BF471J	.40
R3	2.7M	RC20BF275K	.40
	ANT Terminal Strip	ET4104-2681353	1.55
	SPKRS Terminal Strip	ET4083-2687321	3.70
	PHONO, TAPE, AUX Jack Strip	ET4104-2677161	3.40
	Transformer, Power, 120 V (180,185,187)	TD4105-2217152	26.15
	Transformer, Power 120V (170,173,177)	TD4104-2217135	26.15
	Transformer, Power 120/240V (180,185,187)	TE4105-2217342	35.55
	*Transformer, Power 120/240V (170,173,177)	TE4104-2217085	35.75
	AC Power Cord	4104-2740241	2.55
	Dress Panel, 170	AS4104-3241794	20.90
	Dress Panel, 173	AS4104-324021	20.90
	Dress Panel, Custom 177	AS4104-324022	20.90
	Dress Panel, 180	AS4105-3241793	20.90
	Dress Panel, 185	AS4105-3242023	20.90
	Dress Panel, Custom 187	AS4105-3242024	20.90
	Knob, TUNING, 170,180	EK4083-3280791	2.30
	Knob, Small, 170,180	EK4104-3280802	1.70
	Knob, TUNING, 173, 177, 185, 187	EK4104-3280792	2.30
	Knob, Small, 173, 177, 185, 187	EK4104-3280803	1.70
VR1, 2	Potentiometer, Treble Bass, 200K-B	RV4104-0156601	3.35
VR3	Potentiometer, Balance, 200K-W	RV4104-0153234	1.65
VR4	Potentiometer, Volume, 100K-B	RV4104-0153710	1.40
SW1	Switch, Rotary (Power/SPKR)	SR4104-261782	5.50
SW2	Switch, Rotary (Selector)	SR4105-2617251	6.05
SW3, 4, 5, 6	Switch, Toggle (Loudness, Mute, Mode, Tape monitor)	SU4104-2337263	1.90
	170 Audio/Power Board (complete)	4104-2519051	168.60
	180 Audio/Power Board (complete)	4105-2519052	172.45
	170/180 Tuner Board (complete)	4104-2519041	136.70





NOTES:

1. LINE VOLTAGE SET TO 120VAC. ALL MEASUREMENTS ±20%. AC MEASURED WITH RF PROBE.
2. XX VAC DENOTES SIGNAL LEVEL. 10mV FM, 1kHz AUDIO ±12kHz DEVIATION AT FM ANT TERMINALS. 2.0mV AM 1kHz AUDIO 30% MODULATION AT EXT AM ANT TERMINAL.
3. XX V DENOTES DC.
4. PARTS LABELED (U) MAY BE ON FOIL SIDE OF BOARD.
5. ON CP1, CP2 AND CP5, ◄ INDICATES COMPONENT ORIENTATION.

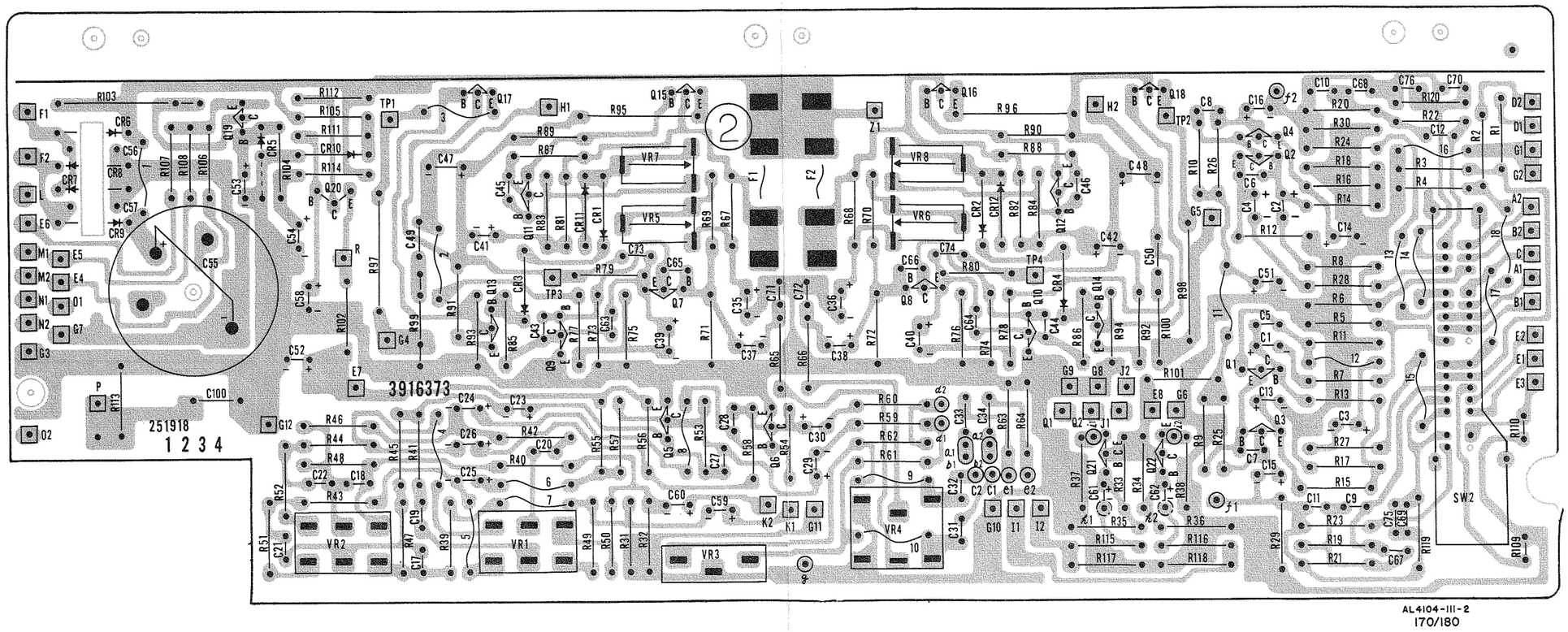


Symbol	Description	Part No.	Sug. Ret.
C1, 8	Ceramic, 100 pF, 50V, NPO	CK4104-0246464	.50
C2	Ceramic, 4 pF, 50V, NPO		.45
C3	Ceramic, 47 pF, 50V	CK4104-0248676	.45
C4, 5, 6, 11, 12, 13, 20	Ceramic, 0.01 uF, 25V	CK4104-1245017	.45
C7, 18, 25, 39	Ceramic, 2 pF, 50V	CK4104-248142	.50
C9	Ceramic, 8 pF, 50V, NPO	CK4104-0246418	.45
C10	Ceramic, 220 pF, 50V, N470	CK4104-0248362	.50
C14	Ceramic, 1 pF, 50V	CK4104-0248631	.45
C15	Ceramic, 22 pF, 50V	CK4104-0248338	.45
C16	Ceramic, 18 pF, 50V, NPO	CK4104-0246446	.50
C17	Ceramic, 12 pF, 50V, NPO	CK4104-0246442	.45
C19	Ceramic, 1,500 pF, 500V	CK4104-0244443	.45
C21, 22, 24, 26, 27, 28 44, 45, 53, 60, 67, 70, 81, 86	Ceramic, 0.02 uF, 50V	CK4104-0245108	.45
C23	Mylar, 1,000 pF, 50V	CY4104-1274011	.45
C30, 31, 33	Electrolytic, 4.7 uF, 16V	CE4104-1252515	.65
C32, 46, 62, 63 85	Electrolytic, 1 uF, 50V	CE4104-1252811	.75
C34, 35, C36	Mylar, 0.1 uF, 50V Polystyrene, 2200 pF, 50V	CY4104-0276011 CP4104-0221343	.90 .75
C40, 43, 48, 51	Mylar, 0.01 uF, 50V	CY4031-0275011	.50
C41	20 pF, 50V	CK4104-0248667	.65
C42	Polystyrene, 360 pF, 50V	CP4083-0220324	.80
C47, 56, 57, 58	Electrolytic, 3.3 uF, 25V	CE4031-0252613	.65
C50	Mylar, 0.047 uF, 50V	CV4104-1275015	.50
C52, 64	Electrolytic, 47 uF, 16V	CE4031-0152525	.65
C54	Ceramic, 22 pF, 50V	CK4104-0248687	.45
C55	Ceramic, 100 pF, 50V	CK4104-0248724	.40
C59	Electrolytic, 220 uF, 16V	CE4042-0252532	.40

Symbol	Description	Part No.	Sug. Ret.
C61	Ceramic, 150 pF, 50V	CK4104-0248728	.50
C66	Polystyrene, 4700 pF, 50V	CP4104-0221513	1.10
C84	Ceramic, 0.01 uF, 50V	CK4031-0246007	.50
VC1	FM-AM Variable Capacitor GANG	CV4104-0281172	7.90
TC3	Trimmer Capacitor	CT4104-0283115	1.00
R1	120K	RF25DC124J	.35
R2, 24	220K	RF25DC224J	.35
R3	56	RF25DC560J	.35
R4	390K	RF25DC394J	.35
R5	470	RF25DC471J	.35
R6, 11, 16, 22	150	RF25DC151J	.35
R7, 47	15K	RF25DC153J	.35
R8, 50	3.9K	RF25DC392J	.35
R9, 10, 51, 62, 63	1K	RF25DC102J	.35
R12, 21	1.2K	RF25DC122J	.35
R13	3.3K	RF25DC332J	.35
R14, 39	8.2K	RF25DC822J	.35
R15, 17, 41	100	RF25DC101J	.35
R18, 23, 25, 27, 28, 29, 81	560	RF25DC561J	.35
R19, 82, 83	27K	RF25DC273J	.35
R20, 32, 34, 37, 53, 56	4.7K	RF25DC472J	.35
R26, 31, 43, 84, 85	2.2K	RF25DC222J	.35
R30, 55	22K	RF25DC223J	.35
R36, 40	1.5K	RF25DC152J	.35
R38	220	RF25DC221J	.35
R42	68K	RF25DC683J	.35
R44	120	RF25DC121J	35
R45, 48, 49, 54, 60	47K	RF25DC473J	.35
R46	2.7K	RF25DC272J	.35
R52	270	RF25DC271J	.35
R57	100K	RF25DC104J	.35
R58	180K	RF25DC184J	.35

Symbol	Description	Part No.	Sug. Ret.
R59	820		
R61	5.6K	RF25DC562J	.35
CR1, 2, 3	Diode, IS2076	TR4083-2337011	.80
CR4, 5	Diode, IN34A	TR4031-0575002	.95
CR6, 7, 8	Diode, IN60(P)	TR4104-0575019	.75
L1	FM Antenna Coil	LC4104-2134411	1.30
L2	FM RF Coil	LC4104-2134412	1.20
L3	Choke, 1 uH	LC4104-2227081	.70
L4	FM Oscillator Coil	LC4104-2134413	1.40
L5	Choke, 10 uH	LC4104-2227033	.65
L6	19 kHz Coil	LC4104-2134392	2.25
L7	38 khz Coil	LC4104-2134373	1.80
L8	AM Oscillator Coil	LC4031-2134204	1.10
L9	19 kHz Coil	LC4104-2134372	1.75
T1	FM IF Transformer	ZZ4104-2154171	5.35
T2, 3, 5, 9	FM IF Transformer	ZZ4104-0322203	1.55
T4	AM IF Transformer	ZZ4104-2154183	2.90
T6	AM IF Transformer	ZZ4104-2154161	1.10
T7	Ratio Detector Transformer	ZZ4031-2140242	3.85
T8	AM IF Transformer	ZZ4104-2154121	1.10
VR1	Variable resistor, 20K	RV4104-0151281	.75
VR2	Variable resistor, 1K	RV4104-0151282	.75
VR3	Variable resistor, 10K	RV4104-0151224	.75
VR4, 5	Variable resistor, 5K	RV4104-0151283	.75
VR6	Variable resistor, 47K	RV4104-0151225	.75
VR5	Variable resistor, 1K	RV4104-0151282	.75
CP1	Filter network	EP4104-0186021	.75
CP2	Filter network	EP4104-0186041	1.65
CP3, 4	Deemphasis network	EP4104-0186051	1.50
CP5	Filter network	EP4104-0186031	.90
IC1	IC HA1201	TR4083-2327312	2.50
IC2	IC HA1202	TR4104-2327411	2.75
IC3	IC HA1115	TR4104-2327421	8.75
FET1	FET 35K45	TR4104-2327431	3.30
Q1	Transistor, 2SC535(B)	TR4031-0573510	4.50
Q2	Transistor, 2SC461(B)	TR4031-0573507	2.05
Q3, 4, 8	Transistor, 2SC400(B)	TR4031-0573486	3.85
Q5	Transistor, 2SC454(B)	TR4104-0573491	1.85
Q6, 7	Transistor, 2SC458(C)	TR4031-2320063	1.65
CP3, 4	Encapsulated Circuit	EP4104-0186051	1.25

Unless otherwise specified, all resistors are Deposited Film in ohms, 5%, ¼ watt. K=Kilohm, M=Megohm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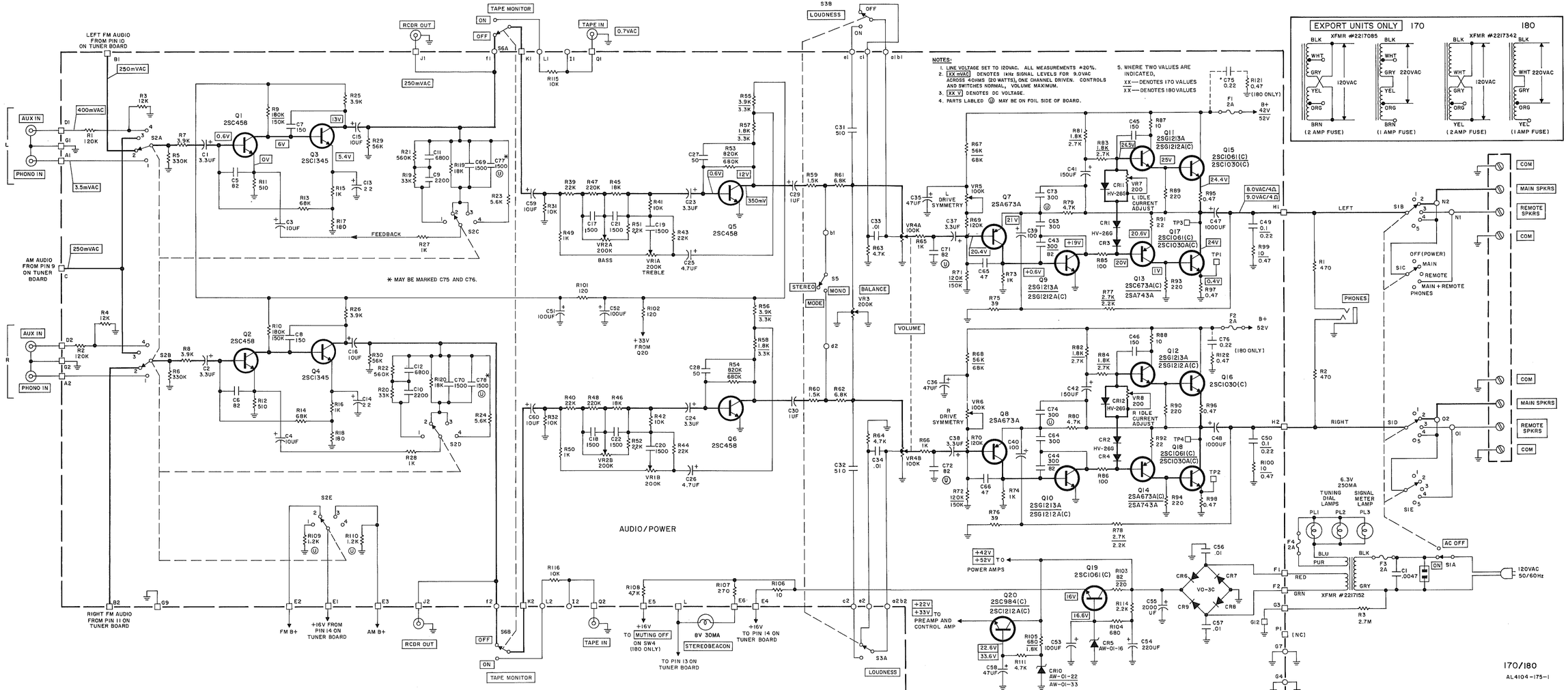

EXPORT UNITS ONLY 170 180
XFMR #2217085
XFMR #2217342
120VAC
220VAC
(2 AMP FUSE)
(1 AMP FUSE)
NOTES:
1. LINE VOLTAGE SET TO 120VAC. ALL MEASUREMENTS ±20%.
2. XX mVAC DENOTES 1kHz SIGNAL LEVELS FOR 9.0VAC ACROSS 4OHMS (20 WATTS), ONE CHANNEL DRIVEN. CONTROLS AND SWITCHES NORMAL, VOLUME MAXIMUM.
3. XX V DENOTES DC VOLTAGE.
4. PARTS LABLED Ⓤ MAY BE ON FOIL SIDE OF BOARD.
5. WHERE TWO VALUES ARE INDICATED, XX—DENOTES 170 VALUES XX—DENOTES 180 VALUES
LEFT FM AUDIO FROM PIN 10 ON TUNER BOARD
AM AUDIO FROM PIN 9 ON TUNER BOARD
RIGHT FM AUDIO FROM PIN 11 ON TUNER BOARD
AUX IN
PHONO IN
TAPE MONITOR
RCDR OUT
TAPE IN
0.7VAC
LOUDNESS
VOLUME
BALANCE
MODE
STEREO
MONO
BASS
TREBLE
FEEDBACK
* MAY BE MARKED C75 AND C76.
AUDIO/POWER
L DRIVE SYMMETRY
R DRIVE SYMMETRY
IDLE CURRENT ADJUST
+42V TO POWER AMPS
+22V +33V TO PREAMP AND CONTROL AMP
+16V TO MUTING OFF ON SW4 (180 ONLY)
8V 30MA STEREOBEACON
+16V TO PIN 14 ON TUNER BOARD
TO PIN 13 ON TUNER BOARD
FM B+
+16V FROM PIN 14 ON TUNER BOARD
AM B+
LEFT
RIGHT
PHONES
MAIN SPKRS
REMOTE SPKRS
OFF(POWER)
MAIN
REMOTE
MAIN + REMOTE PHONES
6.3V 250MA
TUNING DIAL LAMPS
SIGNAL METER LAMP
AC OFF
120VAC 50/60Hz
XFMR #2217152
(NC)
170/180
AL4104-175-1

Symbol	Description	Part No.	Sug. Ret.
C1, 2, 37, 38	Electrolytic, 3.3 uF, 25V	CE4104-1252613	.50
C3, 4, 15, 16, 59, 60	Electrolytic, 10 uF, 25V	CE4104-1252621	.65
C5, 6, 71, 72	Ceramic, 82 pF, 50V	CK4104-0248722	.40
C7, 8, 45, 46	Ceramic 150 pF, 50V	CK4083-0248728	.40
C9, 10	Mylar, 0.0022 uF, 50V	CY4104-1274013	.45
C11, 12	Mylar, 0.0068 uF, 50V	CY4104-1274016	.45
C13, 14	Electrolytic, 22 uF, 16V	CE4104-1252522	.75
C17, 18, 19, 20, 21, 22, 69, 70, 77, 78	Mylar, 0.0015 uF, 50V	CY4104-1274012	.45
C23, 24	Electrolytic, 3.3 uF, 50V	CE4104-1252313	.75
C25, 26	Electrolytic, 4.7 uF, 50V	CE4104-1252815	.75
C27, 28	Ceramic, 56 pF, 50V	CK4084-0248718	.50
C29, 30	Electrolytic, 1 uF, 50V	CE4104-1252811	.50
C31, 32	Polystyrene, 510 pF, 50V	CP4031-0221328	.40
C33, 34	Mylar, 0.1 uF, 50V	CY4031-0276011	.90
C35, 36, 58	Electrolytic, 47 uF, 50V	CE4104-1252825	1.00
C39, 40, 41, 42, 51, 52	Electrolytic, 100 uF, 50V	CE4104-1252831	1.20
C47, 48	Electrolytic, 1000 uF, 50V	CE4104-0252841	2.85
C53	Electrolytic, 100 uF, 25V	CE4104-1252631	.90
C54	Electrolytic, 220 uF, 25V	CE4084-0252632	1.15
C55	Electrolytic, 2200 uF, 63V	CE4104-0250139	7.55
C56, 57	Ceramic, 0.01 uF	CK4104-0245408	.50
C63, 64, 73, 74	Ceramic, 300 pF	CK4104-0248695	.50
C65, 66	Ceramic, 47 pF	CK4104-0248076	.45
CR1, 2, 3, 4, 11, 12	Diode, HV-26G	TR4083-2337071	.75
CR5	Diode, AW-01-16	TR4031-2327077	3.00
CR6, 7, 8, 9	Diode, VO-3C	TR4031-2327031	1.20
F1, 2	Fuse, 2A Fuseholder, output fuses	FL 51313-13A EM4031-2720022	.90 .80
Q1, 2	Transistor, NPN, 2SC458	TR4031-2320073	2.00
Q3, 4	Transistor, NPN, 2SC1345(E)	TR4104-2327363	1.50
Q5, 6	Transistor, 2SC458	TR4031-2320073	2.00
Q7, 8	Transistor, PNP, 2SA673A(C)	TR4083-2327283	1.65
Q19	Transistor, 2SC1061(C)	TR4031-2327153	3.95
R1, 2, 69, 70	120K	RF25DC124J	.35
R3, 4	12K	RF25DC123J	.35
R5, 6	330K	RF25DC334J	.35
R7, 8, 25, 26, 114	3.9K	RF25DC392J	.35
R11, 12	510	RF25DC511J	.35
R13, 14	68K	RF25DC683J	.35
R27, 28 49, 50, 65, 66, 73, 74	1K	RF25DC102J	.35
R89, 90, 93, 94	220	RF25DC221J	.35
R19, 20	33K	RF25DC333J	.35
R21, 22	560K	RF25DC564J	.35
R23, 24	5.6K	RF25DC562J	.35
R29, 30	56K	RF25DC563J	.35
R31, 32, 41, 42, 116	10K	RF25DC103J	.35
R39, 40 43, 44	22K	RF25DC223J	.35
R45, 46, 119, 120	18K	RF25DC183J	.35
R47, 48	220K	RF25DC224J	.35
R51, 52	2.2K	RF25DC222J	.35
R59, 60	1.5K	RF25DC152J	.35
R61, 62	6.8K	RF25DC682J	.35
R63, 64, 79, 80, 108, 111	4.7K	RF25DC472J	.35
R75, 76	39	RF25DC390J	.35
R85, 86	100	RF25DC101J	.35
R87, 88, 106	10	RC20BF100K	.35
R91, 92	22	RC20BF220K	.35
R95, 96, 97, 98	Resistor, Metallic Oxide, 0.47 2W	BP4083-0119127	.60
R101, 102	120	RF25DC121J	.35
R104	680, ½W	RC20BF681K	.35
R107	270, ½W	RC20BF271K	.35
R109, 110	1.2K	RF25DC122J	.35
VR1, 2	Potentiometer, Treble, Bass, 200K-B	RV4104-0156601	3.35
VR3	Potentiometer, Balance 200K-W	RV4104-0153234	1.65
VR4	Potentiometer, Volume, 100K-B	RV4104-0153710	1.40
VR5, 6	Potentiometer, 100K-B	RV4083-0151226	.75
VR7, 8	Potentiometer, 200-B	RV4083-0151223	.75

Unless otherwise specified, all resistors are Deposited Film in ohms, 5%, ¼ watt. K=Kilohm, M=Megohm

PARTS USED ONLY IN 170

Symbol	Description	Part No.	Sug. Ret.
C43, 44	Ceramic 300 pF, 50V	CK4031-0248724	.40
C49, 50	Mylar, 0.1 uF, 50V	CY4031-0276011	.90
R71, 72	120K	RF25DC124J	.35
R55, 56	3.9K	RF25DC392J	.35
R9, 10	180K	RF25DC184J	.35
R15, 16	820	RF25DC821J	.35
R17, 18	220	RF25DC221J	.35
R53, 54	820K	RF25DC824J	.35
R67, 68	56K	RF25DC563J	.35
R57, 58, 81, 82, 83, 84	1.8K	RF25DC182J	.35
R77, 78	2.7K	RF25DC272J	.35
R99, 100	10	RC20BF100K	.35
R105	680, 1W	RC30BF681K	.45
R103	Resistor, Metal Oxide 82, 2W	RP4104-0111230	.45
CR10	Diode AW-01-22	TR4031-2337063	2.55
Q9, 10, 11, 12	Transistor, 2SC1213A(C)	TR4031-2327293	1.85
Q13, 14	Transistor, PNP, 2SA673A(C)	TR4083-2327283	1.65
Q15, 16, 17, 18	Transistor, NPN, 2SC1061(C)	TR4031-2327153	3.95
Q20	Transistor, NPN, 2SC984(C)	TR4105-2327029	1.85

PARTS USED ONLY IN 180

Symbol	Description	Part No.	Sug. Ret.
C43, 44	Ceramic, 82 pF, 50V	CK4084-0248726	.40
C49, 50, 75, 76	Mylar, 0.22 uF, 50V	CY4105-1276013	.90
R9, 10 71, 72	150K	RF25DC154J	.35
R15, 16	1K	RF25DC102J	.35
R17, 18	180	RF25DC181J	.35
R77, 78	2.2K	RF25DC222J	.35
R53, 54	680K	RF25DC684J	.35
R55, 56, 57, 58	3.3K	RF25DC332J	.35
R67, 68	68K	RF25DC683J	.35
R81, 82, 83, 84	2.7K	RF25DC272J	.35
R99, 100, 121, 122	Resistor, Metal Oxide, 0.47, 2W	RP4083-0119127	.60
R103	220, 2W	RP0114410	.45
R105	1.8K ½W	RC208F182K	.40
CR10	Diode, AW-01-33	TR4031-2327077	3.30
Q9, 10, 11, 12, 20	Transistor, 2SC1212A(C)	TR4105-2327403	3.45
Q13, 14	Transistor, 2SA743A(C)	TR4105-2327393	4.40
Q15, 16, 17, 18	Transistor, 2SC1030(C)	TR4105-2327053	7.70
Q20	Transistor, 2SC1212(A)	TR4083-0573557	3.55
--	Output Transistor socket	ES4105-2650113	.75

DRIVE SYMMETRY ADJUSTMENT

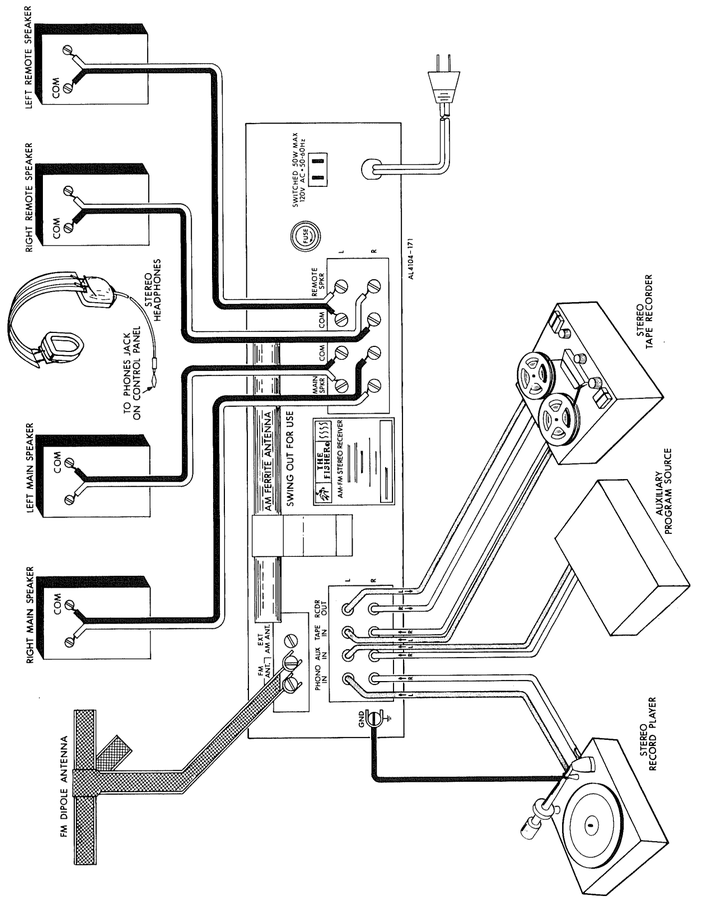
CAUTION:
Use a load resistor with at least 50 watt dissipation rating.

(1) Connect 4-ohm 50 watt load resistor between L MAIN SPKR and COM, and between R MAIN SPKR and COM. Connect vertical input of scope across left load resistor. Set SELECTOR switch to AUX.
(2) Connect a low distortion sine wave signal generator to Left AUX input jack. Set output of generator to 1000 Hz, 400 mV.
(3) Observe the sine wave on scope while turning VOLUME control up until the sine wave barely begins to clip. Adjust, VR5 (Drive Sym. Adjust) until the clip level is identical for each half-cycle cycle.
(4) Repeat above procedure for Right channel, adjusting VR6 until the clip level is even on both halves of the cycle.

IDLE CURRENT ADJUSTMENT

NOTE: This adjustment is very sensitive to changes in ambient temperature. Warm set up for at least 10 minutes before proceeding.

(1) Turn VOLUME control to minimum.
(2) Connect DC VTVM between terminals TP2 and G5 (Gnd) on the AUDIO/POWER board.
(3) Adjust VR8 (R Idle Adjust) for 15-35 mV on the VTVM.
(4) Move the VTVM to TP1 and G4 (Gnd) on AUDIO/POWER board.
(5) Adjust VR7 for 15-35 mV on the VTVM.



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