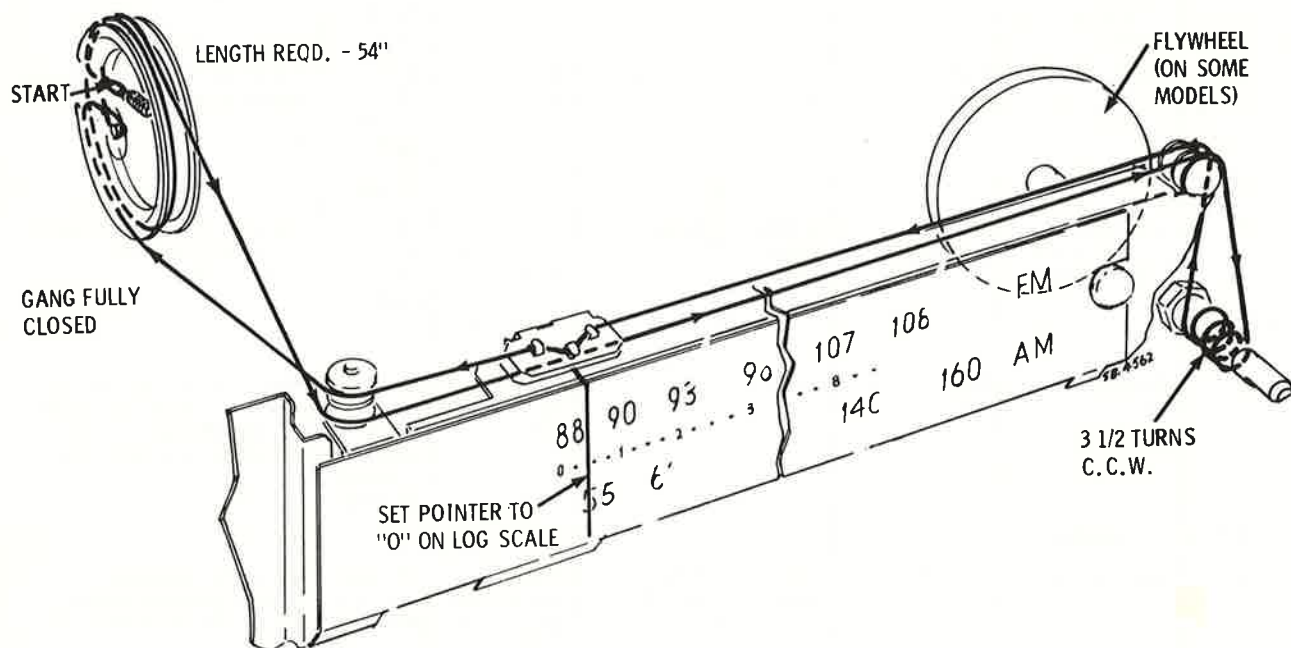


MODEL	RADIO CHASSIS	TAPE CHASSIS	RECORD CHANGER
FH200HW	LHS62403		
FH201HW	LHS62403		
FH204JW	VHS62403		
FH210HW	LHS62403	TD203J	
FH211HW	LHS62403	TD203J	
FH212JW	VHS62403	TD203J	
FH215JW	THS62403		
FH220HW	EHS62403		BR116RC
FH220HW-1	EHS62403		BR116RC/117RC
FH225HW	FHS62403	TD203J	
FH230HW	FHS62403	(CASSETTE)	
SK454HP	DHS62403		VM143RC
SK463HP	DHS62403		VM143RC
ZL220HW	ZEHS62403		BR116RC/117RC



*Dial Stringing Detail -All Models*

# ALIGNMENT

## FM-AM ALIGNMENT

### PRELIMINARY PROCEDURE

Either AM or FM alignment may be performed independently of the other. When aligning the AM or FM IF stages, load the signal generator by placing a 2.7 ohm resistor across its output terminals. As stages are brought into alignment, keep reducing signal generator output. Note position of cores in coils and transformers as shown in alignment detail.

Control settings - loudness, treble and bass at maximum. Balance at electrical center.

STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	FUNCTION SWITCH	OUTPUT INDICATOR	ADJUST	REMARKS
<b>AM ALIGNMENT</b>							
1.	Generator thru .1 mf to base of AM mixer (white lead on AM rod antenna).	455KHz	High end of dial	AM	Output meter across speaker or 16 ohm load.	AM detector and IF coils T101 T102 (top & bottom)	Short out AM osc. section of gang. Keep signal low. Adjust for maximum. Adjust T101 first, then T102.
2.	To radiation loop. Loose couple to AM antenna.	1620KHz	High end of dial	AM	Same as Step 1	AM oscillator trimmer CT102	Remove short from osc. gang. Adjust for maximum.
3.	Same as Step 2	532KHz	Low end of dial	AM	Same as Step 1	AM oscillator coil L102	Adjust for maximum while rocking gang.
4.	Same as Step 2	1400KHz	1400KHz	AM	Same as Step 1	Antenna trimmer CT101	Adjust for maximum. Check for mistrack. Repeat Steps 3 & 4 if mistrack exists.
NOTE: Repeat Steps 1, 2 and 3 until no change occurs.							
<b>FM IF ALIGNMENT</b>							
1.	Test point (A) 1st FM-IF Amp input through a .01 mf capacitor. Ground side to gang frame.	10.7MHz 75KHz dev.	Closed	FM Mono-stereo switch to mono. AFC switched off.	VTVM to test point (B)	Detune ratio detector secondary (top slug of T52)	Switch AFC off. Detune until an output is obtained on the VTVM. Place 2.7 ohm resistor across generator (refer to preliminary procedure)
2.	Same as Step 1	Same as Step 1.	Same as Step 1.	Same as Step 1.	Same as Step 1	Adjust T51 (top & bot) & T52 bottom	Adjust for maximum. Reduce output of generator.
3.	Antenna thru matching pad (see detail)	98MHz 75KHz Dev.	98MHz 75KHz Dev.	Same as Step 1	Output meter across speaker or 16 ohm load.	T2, top & bottom (mixer output)	Adjust for maximum. Keep generator output below limiting level.
4.	Same as Step 3	Same	Same	Same	VTVM to test point (B)	Adjust ratio detector secondary (top slug of T52)	Adjust for zero output, a positive or negative reading will be obtained on either side of the correct setting.
<b>FM RF ALIGNMENT</b>							
5.	Same as Step 3	108.5MHz 75KHz Dev.	Full open	Same as Step 1	Output meter across speakers or 16 ohm loads.	FM oscillator trimmer CT3	Adjust for maximum. Reduce generator output as required to prevent limiting.

# Motorola Chassis DHS/EHS/FHS/LHS/ THS/VHS/ZEHS62403

STEP	GENERATOR CONNECTION	GENERATOR FREQUENCY	GANG SETTING	FUNCTION SWITCH	OUTPUT INDICATOR	ADJUST	REMARKS
6.	Same as Step 3.	87.5MHz 75KHz Dev.	Full closed	Same as Step 1.	Same as Step 5	FM Oscillator coil L3.	Adjust for maximum.
7.	Same as Step 3.	106MHz 75KHz Dev.	Rock gang at 106MHz	Same as Step 1	Same as Step 5	FM-RF & ANT trimmer capacitor CT2 & CT1	Adjust for maximum.
8.	Same as Step 3.	90MHz 75KHz	Rock gang at 90MHz	Same as Step 1.	Same as Step 5.	FM antenna & RF coils L1 & T1.	Adjust for maximum. Check for proper tracking.

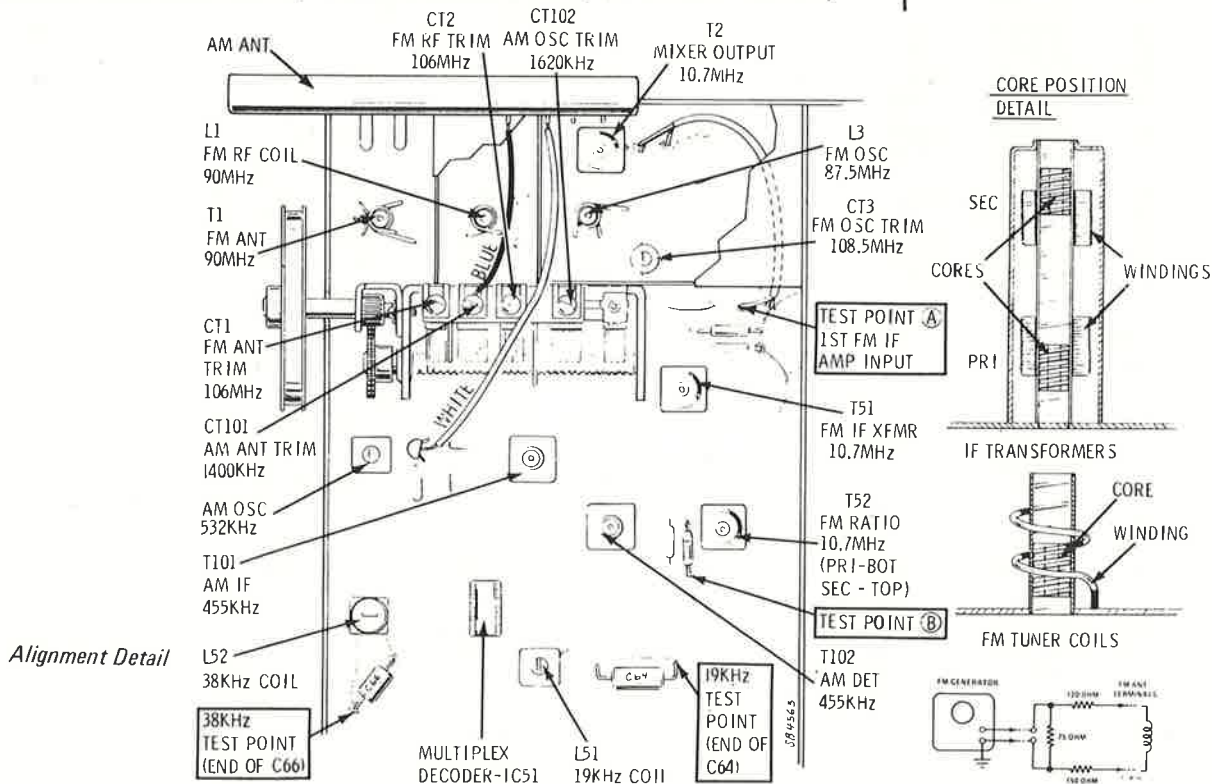
Repeat Steps 5, 6, 7 & 8 until no further increase.

Remove equipment. Set dial to station and turn off frequency to make signal weaker. Switch FM-AFC ON (button "IN"). AFC should pull to center of station. If not, repeat Step 4.

## FM MULTIPLEX ALIGNMENT

1.	Antenna thru matching pad (see detail)	FM-RF signal with 19KHz multiplex modulation	Rock gang to center of FM-RF signal used.	FM Stereo Mono switch to stereo.	Scope to pin No. 2 on 19KHz coil (at jct of C64)	19KHz coil, L51	Adjust for maximum. 19KHz signal on scope.
2.	Same	Same	Same	Same	Scope to pin No. 5 on 38KHz coil (at jct of C66)	38KHz coil L52	Adjust for maximum 38KHz output on scope.
3.	Same	Standard stereo test signal. Modulate one channel at a time.	Same	Same	VTVM (AC) monitor on left and right channel outputs	19KHz coil 38KHz transformer	Adjust for maximum separation. Verify for correct channel. (Should require slight adjustment only).

STEREO LAMP MUST BE LIT. REMOVE 19KC CARRIER. LAMP MUST GO OUT.



# SEMICONDUCTORS

ITEM PART NO. TYPE  
(RADIO)

D1 48B63494A01  
D51 48C61074B01  
D52 48C61074B01  
D101 48S137299 D4R  
D102 48S137299 D4R  
D201 48S134990 D1L  
D202 48S134990 D1L  
D301 48S191A05 91A05  
D302 48S191A05 91A05  
D303 48S137000 D1S  
IC50 51S10600A01 TZE (5,6,7)  
Q1 48S134932 A1U  
Q2 38S134932 A1U  
Q3 38S134857 M4857  
Q51 38S134946 A3D  
Q52 48S134979 A2V  
Q101 48S134960 A2L  
Q102 48S134960 A2L  
Q103 48S134997 A3K  
Q201 48S137015 A4B  
Q202 48S137015 A4B  
Q203 48S137315 ABG (1,2,3)  
48S137115 A5U (4)  
Q204 48S137315 ABG (1,2,3)  
38S137115 A5U (4)  
Q205 48S137314 P3Y (1,2,3,5,7)  
48S137321 P4B (4,6)  
Q206 48S137314 P3Y (1,2,3,5,7)  
48S137321 P4B (4,6)  
Q207 48S137311 ABF (1,2,3,5,7)  
48S137369 ABY (4,6)  
Q208 48S137311 ABF (1,2,3,5,7)  
48S137369 ABY (4,6)  
Q209 48S137312 P3V (1,2,3,5,7)  
48S137370 P4J (4,6)  
Q210 48S137312 P3V (1,2,3,5,7)  
48S137370 P4J (4)  
Q301 48S134903 A1F

(8-TRACK TAPE DECK)

D1 48C40235601  
D2 48S191A05 91A05  
Q1 48S40246601 25C732  
Q2 48S40247602 25C733  
Q3 48S40246601 25C732  
Q4 48S40247602 25C733

(CASSETTE)

D1 48K644681 1N60  
D2 48K644681 1N60  
D3 48X97048A10 10D1  
D4 48X97048A10 10D1  
D5 48X97048A10 10D1  
D6 48X97048A10 10D1  
D7 48X97048A10 10D1  
D10 48X97048A06 0A90  
Q1 48X97046A60 25C644F  
Q2 48X97046A60 25C644F  
Q3 48X97046A61 25C644  
Q4 48X97046A61 25C644  
Q5 48X97046A62 25C828  
Q6 48X97046A62 25C828  
Q7 48X97046A62 25C828  
Q8 48X97046A62 25C828  
Q9 48X97046A62 25C828  
Q10 48X97046A62 25C828  
Q11 48X97046A62 25C828  
Q12 48X97046A62 25C828  
Q13 48X97046A48 25B324

# ELECTROLYTIC/VARIABLE CAPS

ITEM PART NO. VALUE  
(RADIO)

C1 19D61941B01 Tuning Gang  
C56 23S10229A27 5 uF 6V  
C60 23S10218A18 6.8 uF 20V  
C61 23S10229A25 1 uF 10V  
C67 23S10229A25 1 uF 10V  
C74 23S10229A25 1 uF 10V  
C102 23S10218A18 6.8 uF 20 V (1,2,3,5,7)  
23S10229A26 3 uF 6V (4,6)  
C120 23S10229A26 3 uF 6V  
C207 23S10229A25 1 uF 10V  
C208 23S10229A25 1 uF 10V  
C215 23S10229A25 1 uF 10V  
C216 23S10229A25 1 uF 10V  
C221 23S10255A31 470 uF 35V (1,2,3,5,7)  
23S10255A24 470 uF 25V (4,6)  
C222 23S10255A31 470 uF 35V (1,2,3,5,7)  
23S10255A24 470 uF 25V (4,6)  
C229 23C63517A01 2.5 uF 25V  
C230 23C63517A01 2.5 uF 25V  
C231 23C63517A02 33 uF 25V (5,7)  
C232 23C63517A02 33 uF 25V (5,7)  
C303 23S10255A61 2000 uF 60V (1,2,3,5,7)  
23S10255A11 2000 uF 35V (4,6)  
C304 23S10255A61 2000 uF 60V (1,2,3,4,5,7)  
23S10255A11 2000 uF 35V (4,6)

C305 23S10255A56 100 uF 50V (1,2,3,5,7)  
23C61075B06 100 uF 35V (4,6)  
C306 23S10255A56 100 uF 50V  
C307 23S10255A72 1000 uF 16V  
CT103 20C64388A01 Trimmer

(8-TRACK TAPE DECK)

C1 23C40231G03 20 uF 16V  
C2 23C40528G04 .5 uF 16V  
C4 23C40231G01 16 uF 16V  
C6 23C40231G03 20 uF 16V  
C7 23C40528G04 .5 uF 16V  
C9 23C40231G01 16 uF 16V  
C11 23C40231G02 80 uF 16V  
C12 23C40231G05 32 uF 10V  
C13 23C40231G05 32 uF 10V  
C14 23C40231G04 40 uF 16V  
C15 23C61077B04 50 uF 15V  
C16 23C61077B07 1500 uF 30V

(CASSETTE)

C3 23X97220A15 10 uF 10V  
C4 23X97220A15 10 uF 10V  
C5 23X97220A15 10 uF 10V  
C6 23X97220A15 10 uF 10V  
C9 23X97068A32 4.7 uF 10V  
C10 23X97068A32 4.7 uF 10V  
C11 23X97220A38 100 uF 6.3V  
C12 23X97220A38 100 uF 6.3V  
C13 23X97220A15 10 uF 10V  
C14 23X97220A15 10 uF 10V  
C17 23X97220A24 47 uF 16V  
C18 23X97220A24 47 uF 16V  
C21 23X97220A38 100 uF 6.3V  
C22 23X97220A38 100 uF 6.3V  
C25 23X97220A15 10 uF 10V  
C26 23X97220A15 10 uF 10V  
C27 23X97068A33 .47 uF  
C28 23X97068A33 .47 uF  
C29 23X97220A15 10 uF 10V  
C30 23X97220A15 10 uF 10V  
C31 23X97068A32 4.7 uF 10V  
C32 23X97068A32 4.7 uF 10V  
C37 23X97068A32 4.7 uF 10V  
C38 23X97068A32 4.7 uF 10V  
C39 23X97068A32 4.7 uF 10V  
C40 23X97068A32 4.7 uF 10V  
C41 23X97220A23 100 uF 16V  
C44 23X97220A42 1000 uF 16V  
C45 23X97220A42 1000 uF 16V  
C46 23X97220A42 1000 uF 16V  
C48 23X97220A23 100 uF 16V  
C50 23X97220A58 1 uF 12V  
C51 23X97220A57 .1 uF 12V

# CONTROLS/SPECIAL RESISTORS

ITEM PART NO. DESCRIPTION

(RADIO)

R205 & 18D61799B02 500K Dual Loudness  
R206  
R213 & 18D617999B01 250K Dual Bass  
R214  
R215 & 18D61799B03 50K Dual Treble  
R216  
R227 17S488266 .47 ohm 10% 2W WW  
R228 17S488266 .47 ohm 10% 2W WW (4,6)  
R229 17S488266 .47 ohm 10% 2W WW (4,6)  
R230 17S488266 .47 ohm 10% 2W WW (4,6)  
R235 18D61799B04 500K Balance  
R240 17S488266 .47 ohm 10% 2W WW (1,2,3,5,7)  
R241 17S488266 .47 ohm 10% 2W WW (1,2,3,5,7)  
R242 17S488266 .47 ohm 10% 2W WW (1,2,3,5,7)

(CASSETTE)

R71 18X97066A30 500 ohm Motor Speed  
R76 6S10053D23 3.3 ohm 10% 1/4W  
VR1 18X97066A27 50K Equalization  
VR2 18X97066A27 50K Equalization  
VR3 18X97066A27 50K Record Level  
VR4 18X97066A27 50K Record Level  
VR5 18X97161A12 3000 ohm Level Meter  
VR6 18X97161A12 3000 ohm Level Meter  
VR7 18X97161A22  
VR8 18X97161A22  
VR9 18X97066A27 50K Play Level  
VR10 18X97066A29 10K Record Level  
VR11 18X97066A29 10K Record Level

# COILS/TRANSFORMERS

ITEM PART NO.

(RADIO)

L1 24D61967B02  
L2 24B62587A01  
L3 24D61967B03  
L51 24C60565B01  
L52 24C60565B03  
L101 24C61968B01  
L102 24C61224B02  
L103 24D68002A90

# Motorola Chassis DHS/EHS/FHS/LHS/THS/VHS/ZEHS62403

T1	24D61967B01
T2	24D61965B02
T51	24D61965B02
T52	24D61966B01
T101	24C60461B03
T102	24C60461B02
T301	25D61962B04 (1,2,3,4)
	25D61962B06 (5)
	25D61962B08 (6)
	25D62569B01 (7)

## (8-TRACK TAPE DECK)

L1	24B50638G01
Power	25C61379B02

## (CASSETTE)

L1	24X97044A48
L2	24X97044A47
L3	24X97044A48
L4	24X97044A47
T1	25X97076A15

## MISCELLANEOUS

ITEM	NAME	PART NO.
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### (RADIO)

F301	Fuse 0.5 A	65C67985A08
M301	Meter, Tuning	72C62180B01
SW301	Switch, AC	40B6200B01
SW302	Switch, AFC	40P63085A64
SW303	Switch, FM	40P63085A65
SW304	Switch, AM	40P63085A65
SW305	Switch, Tape	40P63086A42
SW306	Switch, Phono	40P63086A42
SW307	Switch, Mode	40P63085A64

### (8-TRACK TAPE DECK TD203J)

E1	Head, Play	59C40481G01
E3	Motor, Tape Drive	59C40555B03
L1	Solenoid, Track Change	24B40638G01
SW1	Switch, Auto Detent	40B40409G02
SW2	Switch, Program Select	40C62048B01
SW4	Switch, Motor Power	40B40160G04
	Belt, Tape Drive	42B3871A03

### (8-TRACK TAPE DECK TD209J)

E1	Head, Play	59C40481G01
E3	Motor, Tape Drive	1V40952G32
L1	Solenoid, Track Change	24B40638G01
SW1	Switch, Auto Detent	40B41236G01
SW2	Switch, Program Select	40C62048B01
SW4	Switch, Motor Power	40B40160G04
	Belt, Tape Drive	42B43003B01

### (CASSETTE)

M	Motor, Tape Drive	59X97001A14
MIC	Microphone	50P63086A20
SW1	Switch, Record/Play	40X97002A51
VU	Meter, Level	72X97000A17
	Head, Record/Play	59X97052A10
	Head, Erase	59X97052A11
	Belt, Play	42X97028A12
	Belt, Rewind	42X97028A11

### (RECORD CHANGER BR116RC)

Stylus, Phono	92-818DS
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### (RECORD CHANGER VM143RC)

Stylus, Phono	92-810DS
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### (SPEAKER SYSTEMS)

LS201	Speaker, Horn (Model SK463HP)	50D60621B02
	Speaker, 5-3/4" (Chassis LHS62403)	50D62061B02
LS202	Speaker, Horn (Model SK463HP)	50D60621B02
	Speaker, 5-3/4" (Chassis LHS62403)	50D62061B02
LS203	Speaker, 4" (Model SK463HP)	50D63575A04
LS204	Speaker, 4" (Model SK463HP)	50D63575A04
LS205	Speaker, 10" (Model SK463HP)	50D60191B06
LS206	Speaker, 10" (Model SK463HP)	50D60191B06
LS207	Speaker, 3-1/2" (Model SK454HP)	50D63543A07
LS208	Speaker, 3-1/2" (Model SK454HP)	50D63543A07
LS209	Speaker, 3-1/2" (Model SK454HP)	50D63543A07
LS210	Speaker, 3-1/2" (Model SK454HP)	50D63543A07
LS211	Speaker, 6" x 9" (Model SK454HP)	50D63515A06
LS212	Speaker, 6" x 9" (Model SK454HP)	50D63515A06
LS213	Speaker, 3-1/2" (Models FH220W/225W/230HW)	50D62338B01
	Speaker, 3-1/2" (Chassis THS62403)	50D62338B02
	Speaker, 3-1/2" (Alternate; Chassis THS62403)	50D62338B03
LS214	Speaker, 3-1/2" (Models FH220W/225W/230HW)	50D62338B01
	Speaker, 3-1/2" (Chassis THS62403)	50D62338B02
	Speaker, 3-1/2" (Alternate; Chassis THS62403)	50D62338B03
LS215	Speaker, 8" (Models FH220W/225W/230HW)	50D60909B05
LS216	Speaker, 8" (Models FH220W/225W/230HW)	50D60909B05

## CABINET PARTS

NAME	PART NO.
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### (MODELS FH200HW)

Cabinet, Main	16E62318B01
Cabinet, Speaker	16C62325B01
Escutcheon, Front	13E62294B02
Knob, Control	36C61403B04
Knob, Tuning	3661084B05

### (MODEL FH201HW)

Cabinet, Main	16E62318B01
Cabinet, Speaker	16C62325B01
Escutcheon, Front	13E62294B01
Knob, Control	36C62386B02
Knob, Tuning	36C62386B01

### (MODEL FH204JW)

Cabinet, Main	16E62318B01
Escutcheon, Front	13E62294B01
Knob, Control	36C1403B01
Knob, Tuning	36C1084B13

### (MODEL FH210HW)

Cabinet, Main	16E62320B01
Cabinet, Speaker	16C62325B01
Escutcheon, Front	13E62294B02
Knob, Control	36C61403B04
Knob, Tuning	36C1084B05

### (MODEL FH211HW)

Cabinet, Main	16E62320B01
Cabinet, Speaker	16C52325B01
Escutcheon, Front	13E62294B02
Knob, Control	36C62386B02
Knob, Tuning	36C52386B01

### (MODEL FH212JW)

Cabinet, Main	16E62320B01
Cabinet, Speaker	16C62325B01
Escutcheon, Front	13E62294B02
Knob, Control	36C1403B07
Knob, Tuning	36C61084B13

### (MODEL FH215JW)

Cabinet, Main	16E62585B01
Escutcheon, Front	13P63086A36
Knob, Control	36C61403B06
Knob, Tuning	36C61084B07

### (MODEL FH220HW)

Cabinet, Main	16E62307B01
Cabinet, Speaker	16D62247B01
Escutcheon, Front	13P63086A36
Knob, Control	36C61403B06
Knob, Tuning	36C61084B07
Cover, Dust	15D61954B01

### (MODEL FH220HW-1)

Cabinet, Main	16E52307B01
Cabinet, Speaker	16D62247B01
Escutcheon, Front	13P63086A36
Knob, Control	36C61403B06
Knob, Tuning	36C61084B07
Cover, Dust	15D61954B01

### (MODEL FH225HW)

Cabinet, Main	16E62307B02
Cabinet, Speaker	16D62247B01
Escutcheon, Front	13P63086A37
Knob, Control	36C61403B06
Knob, Tuning	36C61084B07

### (MODEL FH230HW)

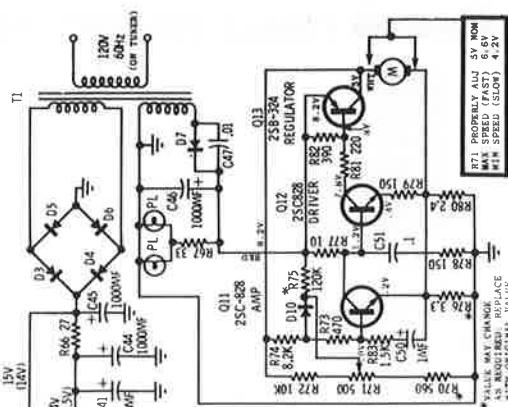
Cabinet, Main	16E62307B03
Cabinet, Speaker	16D62247B01
Escutcheon, Front	13P63086A38
Knob, Control	36C61403B06
Knob, Tuning	36C61084B07

### (MODEL ZL220HW)

Cabinet, Main	16D62247B01
Escutcheon, Front	13P63086A36
Knob, Control	36C61403B06
Knob, Tuning	36C61084B07
Cover, Dust	15D61954B01

- (1) Chassis DHS62403
- (2) Chassis EHS62403
- (3) Chassis FHS62403
- (4) Chassis LHS62403
- (5) Chassis THS62403
- (6) Chassis VHS62403
- (7) Chassis ZEHS62403

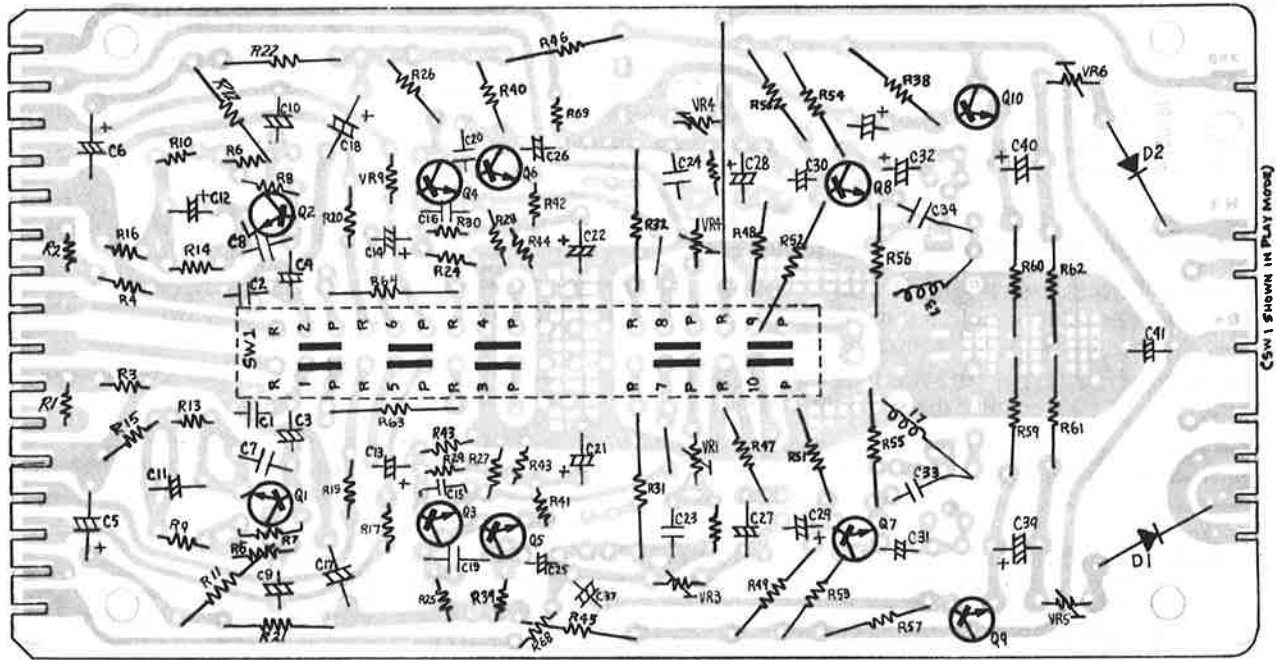
NOTE 54  
CAPACITORS - UNLESS OTHERWISE SPECIFIED VALUES LESS THAN 1 IN MF; ALL OTHERS IN PF.  
VOLTAGES - MEASURED FROM POINT INDICATED TO  $\pm 1\%$  WITH A VTVM  $\pm 10\%$ ; NO SIGNAL INPUT.  
VOLTAGES IN ( ) ARE TAKEN IN "RECORD," SW1 IN "PLAY" POSITION.



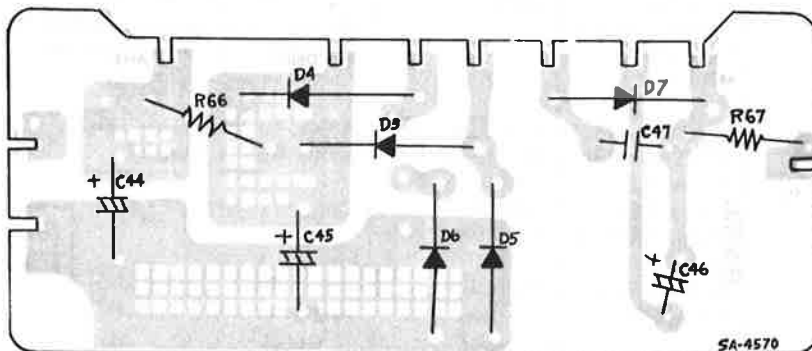
### FH230 Cassette - Schematic Diagram



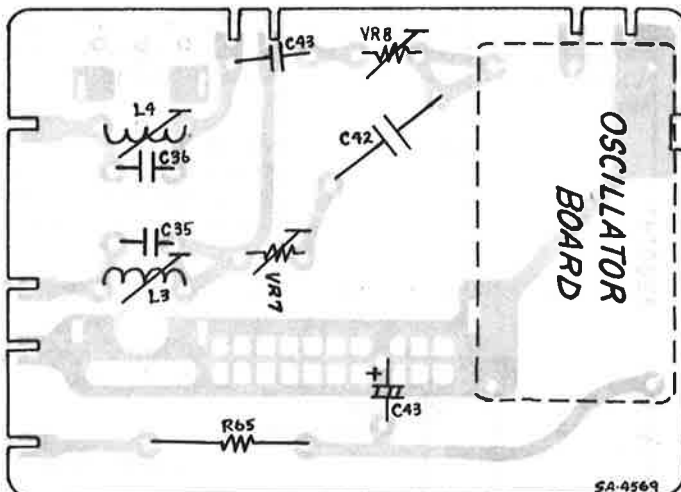
# Motorola Chassis DHS/EHS/FHS/LHS/THS/VHS/ZEHS62403



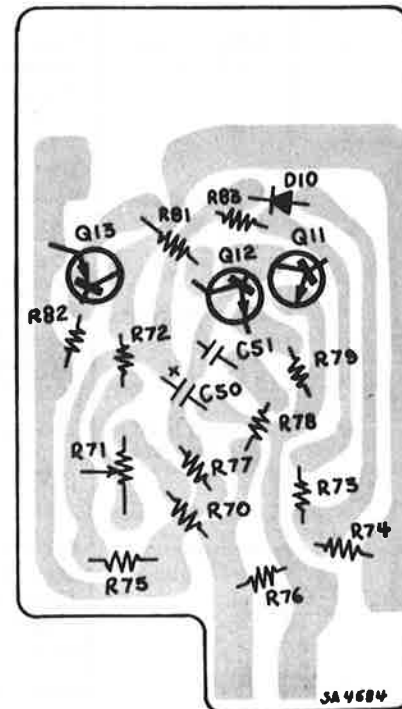
Main Amplifier Panel - Top View



Power Supply - Top View



Oscillator Panel - Bottom View



Motor Governor - Top View

# CASSETTE DECK SERVICE INFORMATION (For Model FH230HW)

## SERVICE NOTES

The FH230 cassette mechanism is a self contained unit. The cassette recorder player has its own full wave, transformer power supply. The power

supply circuit board is mounted at the rear of the mechanism. The tape player has three other boards (oscillator, regulator and main amplifier) which are easily serviced in their original position (refer to the "circuit wiring diagram") or can be removed for greater access to all

components.

## ELECTRICAL ADJUSTMENTS

Most electrical adjustments are performed without panel removal. Electrical adjustments should be made only after all other possibilities have been considered.

## CASSETTE ELECTRICAL ADJUSTMENTS

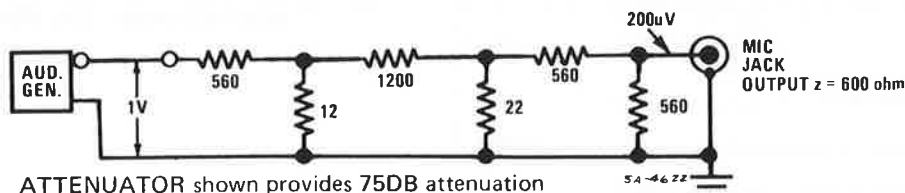
**CASSETTE ALIGNMENT PROCEDURE CONTROL SETTINGS...** Push in "TAPE" function selector record level controls: Max clockwise volume level: .5 watt output. Operation mode: RECORD, (insert cassette, or manually trip the record safety lever to allow the record & play buttons to depress).

**IMPORTANT:** VR1 and VR2 are frequency equalization adjustments. They are factory pre-set with precision equipment. Adjustment of these controls should not be attempted.

The 200UV input recommended is a 1 volt signal reduced by 75db. This voltage is the equivalent of a microphone output (refer to the "CASSETTE ALIGNMENT DETAIL"). Refer to the service information pictures for control location.

STEP	ADJUSTMENT	SIGNAL SOURCE	OUTPUT CONNECTION	OPERATION MODE	REMARKS
1.	Record level current adj. VR3 & VR4	200 UV input to microphone jacks. (400Hz)	VTVM or scope across R63 and R64 (See Remarks)	Record mode: Disable bias oscillator by unsoldering B+ lead to the "oscillator block". Same	Adjust the output across R63 & R64 to equal approx. 2.8 millivolts.
2.	Level meter adjustment VR5 & VR6	Same	View level meters. Record level VR10, VR11 set to max.	Same	Adjust VR5 & VR6 until the VU meter pointers deflect BETWEEN red and black level zones on the meters.
3.	53KHz traps L2 & L4	Remove audio input to microphone jacks	VTVM across R63 when adjusting L2, across R64 when adjusting L4.	Record mode. Reconnect B+ lead to oscillator block disconnected in Step 1.	Adjust for maximum voltage across R63 & R64.
4.	Record bias VR7 & VR8	Same	Same as Step 3 for VTVM	Record	Adjust VR7 & VR8 until voltage across R63 & R64 equals 28MV.
5.	Playback level adj. VR9	200UV input (monaural) to Q1 & Q2 inputs, TP AA. Must be same level.	VTVM or scope across R53 & R54.	Play	Adjust VR9 to equalize the voltages across R53, & R54. Voltages should equal each other +3db.
6.	Record level VR3 & VR4	200UV input to microphone jacks (400Hz)	Level meter (Record level VR10, VR11 set to max.)	Record	Adjust VR3 & VR4 for needle deflection between red & black areas on level meter.
7.	R71 motor speed adjustment	Pre-recorded alignment test tape with a known frequency standard.*		Play	Adjust R71 for proper (speed) frequency. Compare output (frequency) with a known frequency from a calibrated generator.

\*Adjust R71 for proper speed using a known tape. Adjustment can be made using a watch second hand to gauge the playing time of a "pre-timed" passage.



ATTENUATOR shown provides 75DB attenuation for 1.0 volt output from Audio Generator.

Cassette Alignment Detail



# RECORD CHANGER ADJUSTMENTS( Refer to correct detail)

## TONE ARM HEIGHT

To raise, hold plastic nut firmly and turn screw head by hand counterclockwise; to lower, turn screw head clockwise. Adjust stylus to clear a full stack of 6 records by 1/8".

## STYLUS PRESSURE

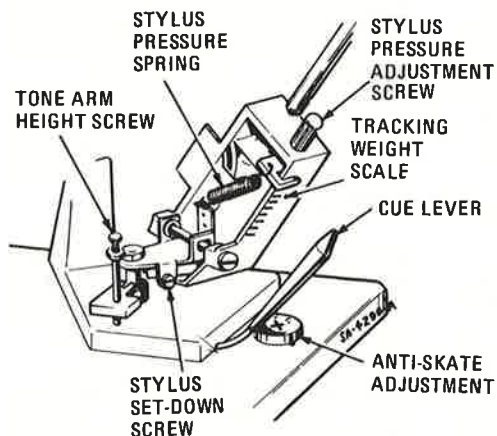
Turn stylus pressure adjustment clockwise to reduce stylus pressure. Counterclockwise to increase pressure. The stylus pressure is pre-set at 4 grams for FH220, and 2-3 grams for SK454HP, SK463HP.

## STYLUS SET-DOWN

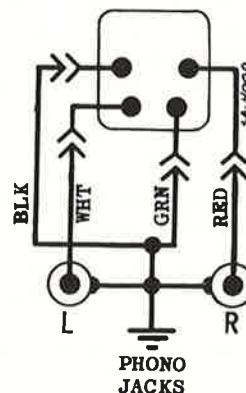
This screw is adjusted to obtain correct set-down for a 12 inch record. It should be adjusted so that stylus will set down 1/8 inch in from the outside edge of the record. When adjusted, the set-down position of the stylus on the record will automatically be correct for 7 and 10 inch records.

## ANTI-SKATE (Model FH220HW only)

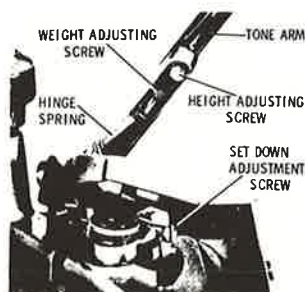
This control has three positions: 2, 4 and 6 grams. Set this control to the number that is closest to the stylus pressure setting. This anti-skate feature prevents the tone arm from making quick lateral movements, such as skating through the "lead-in" grooves of a record.



Tone Arm Adjustment Detail - Model FH220HW

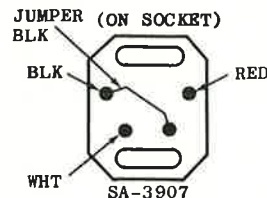
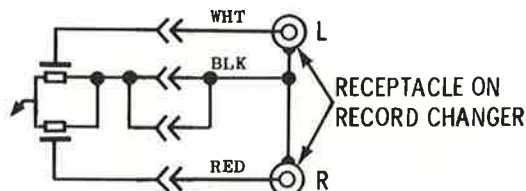


Cartridge Wiring - Model FH220HW



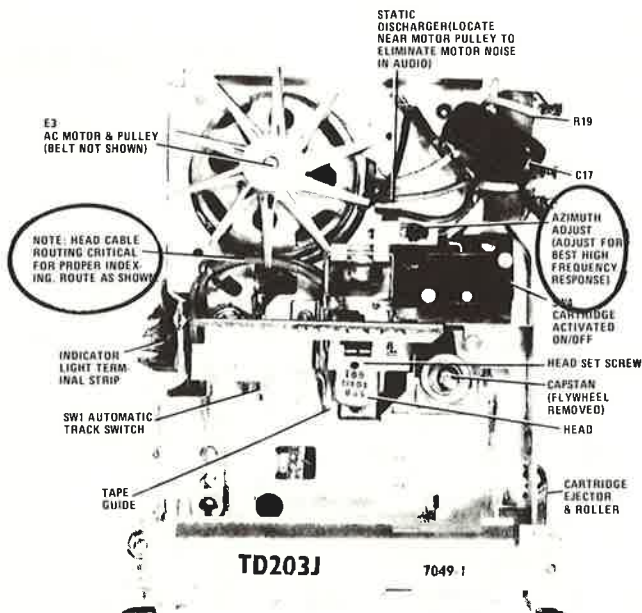
Tone Arm Adjustments -

Models SK454HP, SK463HP



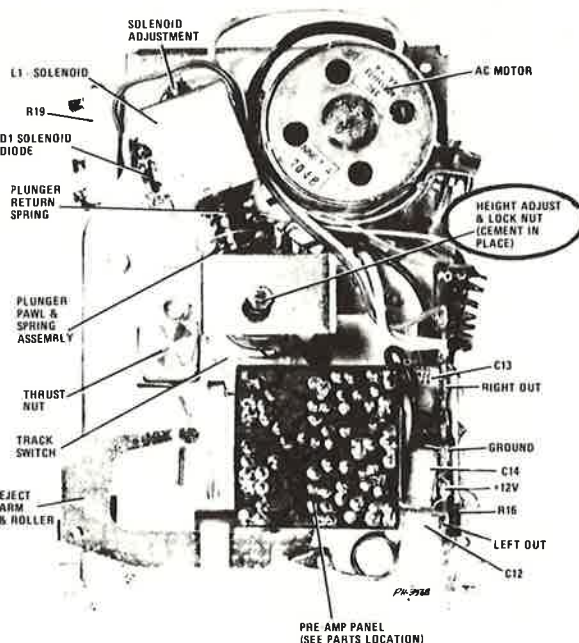
REAR VIEW

Cartridge Wiring - Models SK454HP, SK463HP



Top

Tape Deck Parts Location



Bottom

## HEAD ADJUSTMENTS

### Height

This is the adjustment to move the tape head up or down so that it can be positioned exactly in line with the pre-recorded information on the tape. Misadjustment of this screw would cause cross-talk and/or poor separation.

With the Motorola test tape Part No. 99P43309A01, proceed as follows:

1. Insert the test tape cartridge into tape slot and position head to tracks 2 and 6.
2. Connect scope (or VTVM) across left channel output (track 2 information - 1KHz will be presented). Adjust height adjusting screw (on bottom) for a null. The reason for the

null is that the 1KHz information is recorded not on track 2 but on the guard bands adjacent to track 2. This adjustment will minimize cross-talk. To be assured of proper setting, make sure there is a peak on either side of the null.

3. Azimuth - Connect scope or VTVM across the right channel output (track 6 information 8KHz will be presented).

Adjust azimuth adjusting screw (Figure 4) for maximum output. Misadjustment of this screw would cause poor high frequency response.

4. Repeat Steps 2 and 3 to optimize these adjustments, - then cement adjusting screws in place with glyptal or other non-hardening cement.

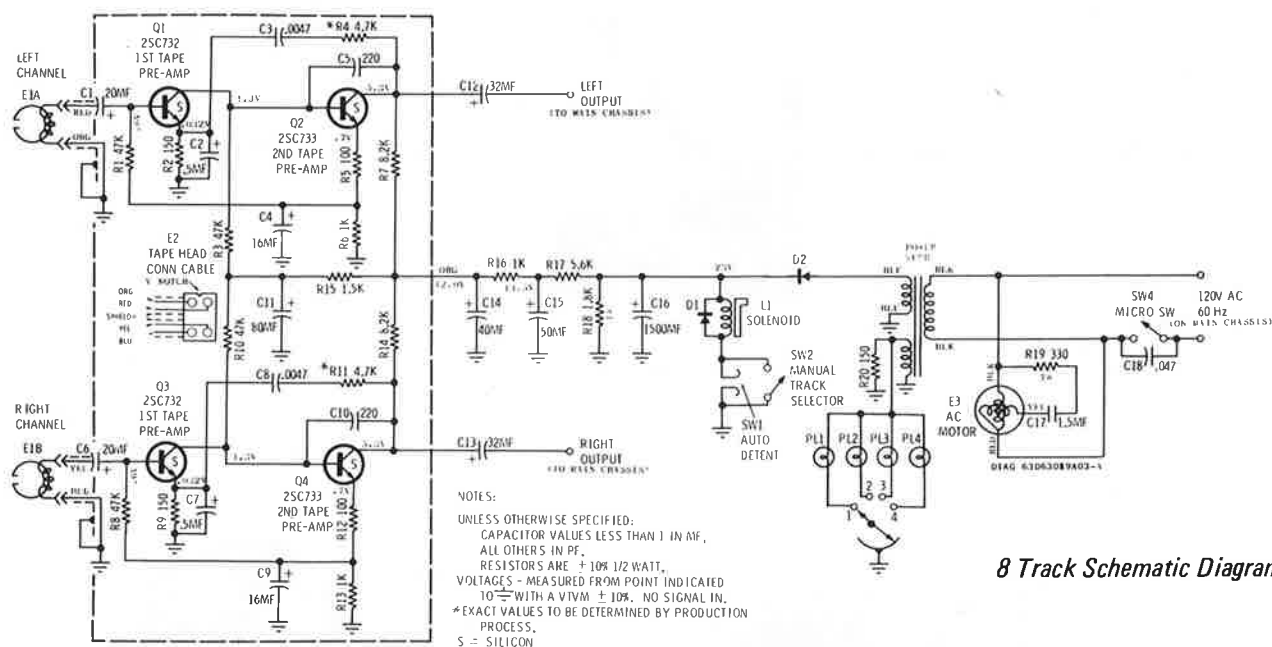
## SOLENOID ADJUSTMENTS

1. Reduce the supply voltage to 105 volts AC. Adjust supply with cartridge seated and deck operating.

2. Turn the solenoid adjustment screw clockwise (IN) while indexing the tape player. Continue adjusting the screw in ¼ turn increments, until the head fails to index.

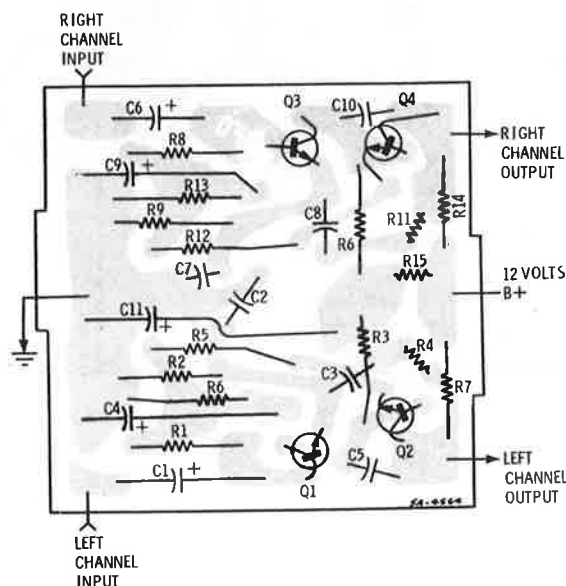
3. Back the screw OUT just to the point where the head starts indexing. Continue the adjustment ¼ turn past the point where indexing starts. The adjustment is now complete. When securing the lock nut for the index adjustment, do not disturb this setting.

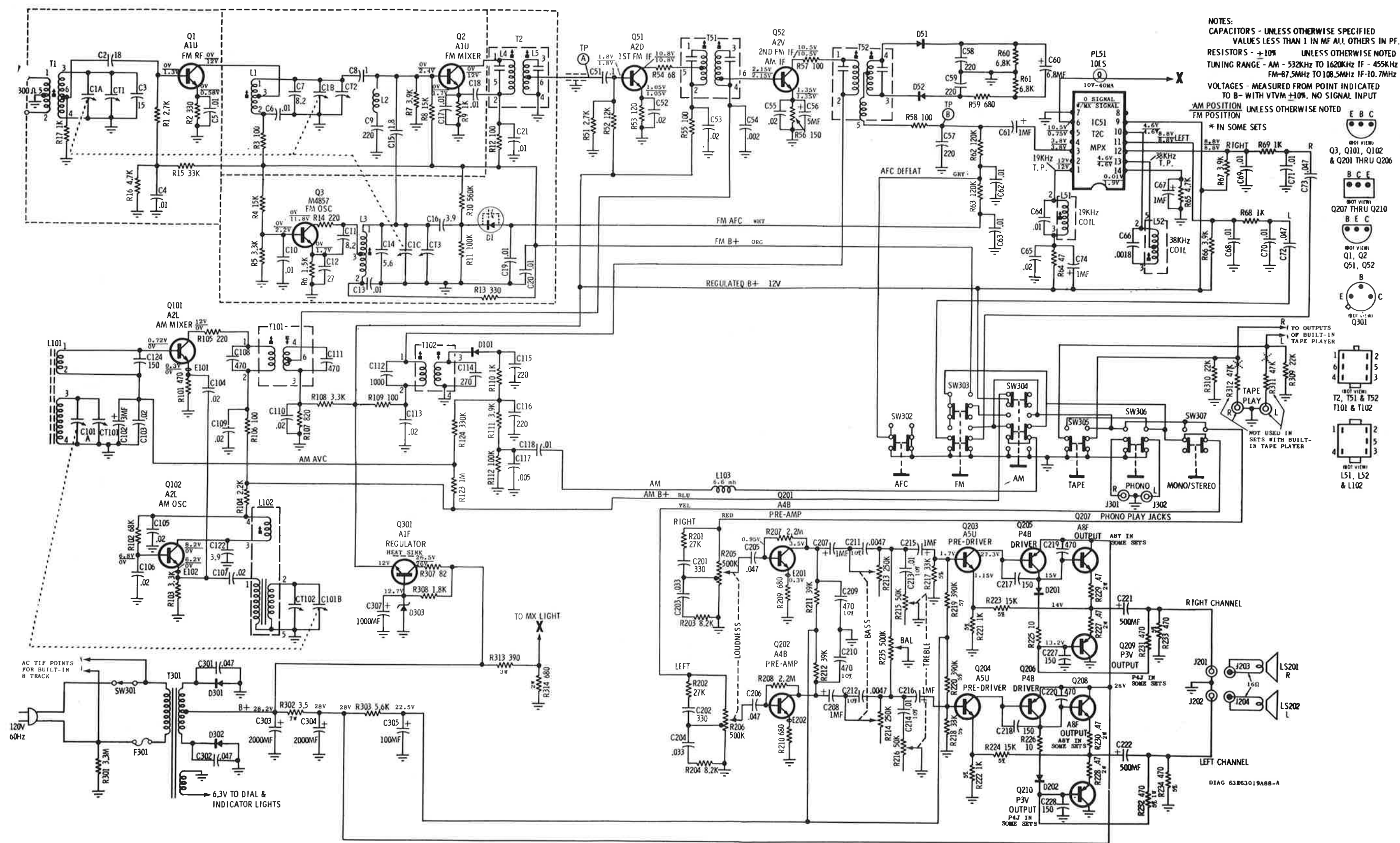
4. Increase the voltage supply to 135 volts AC. Check for proper indexing. If set fails to index properly recheck steps 1 through 4.



8 Track Schematic Diagram

8 Track Preamp - Parts Location

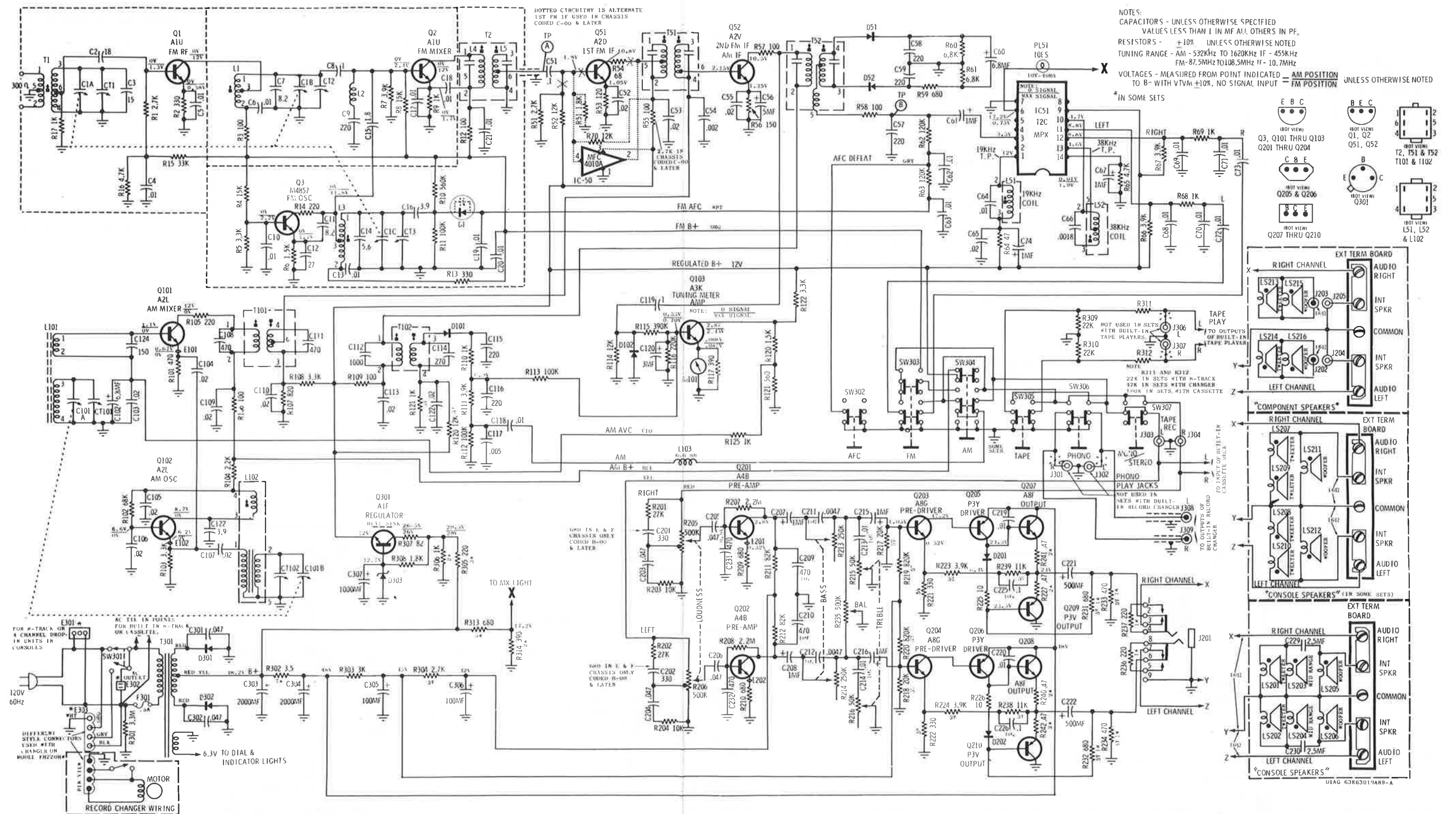




Schematic Diagram LHS62403

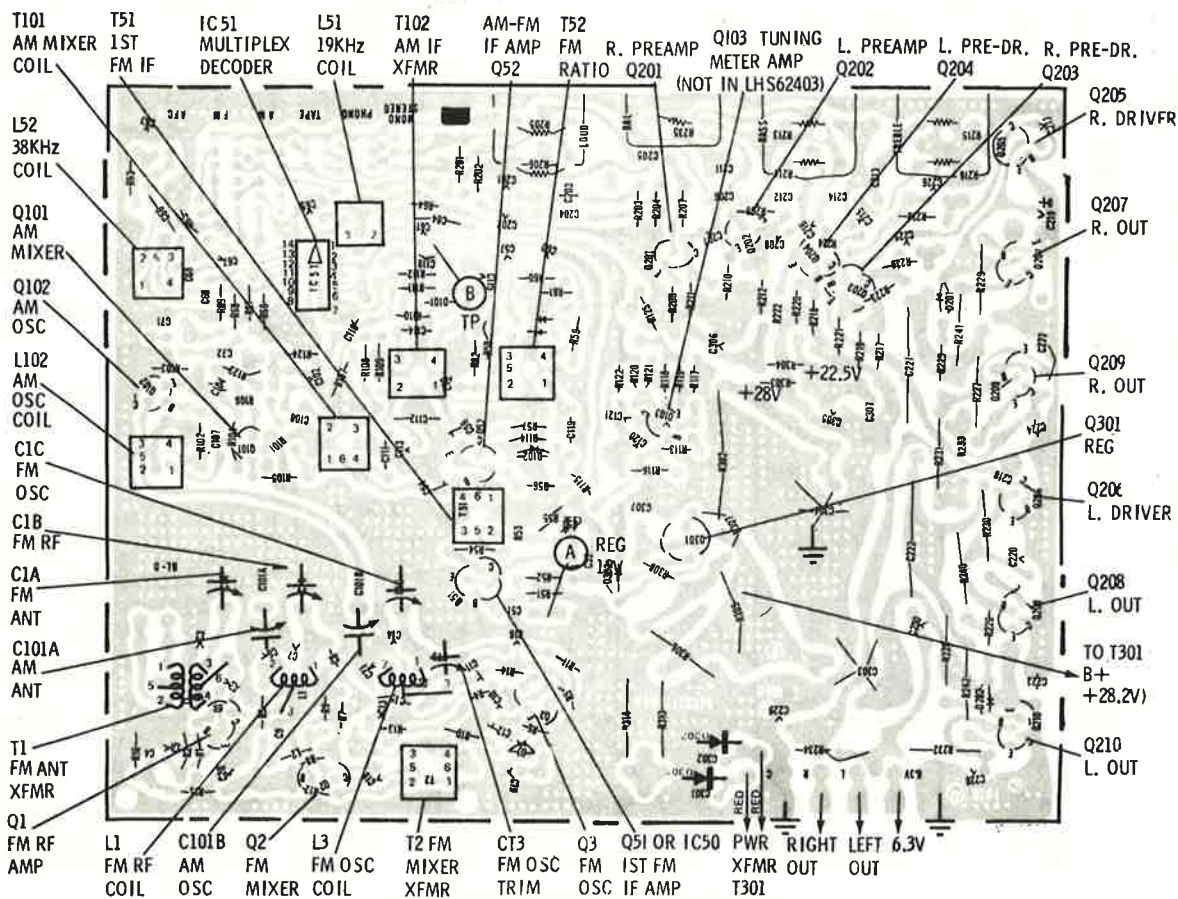
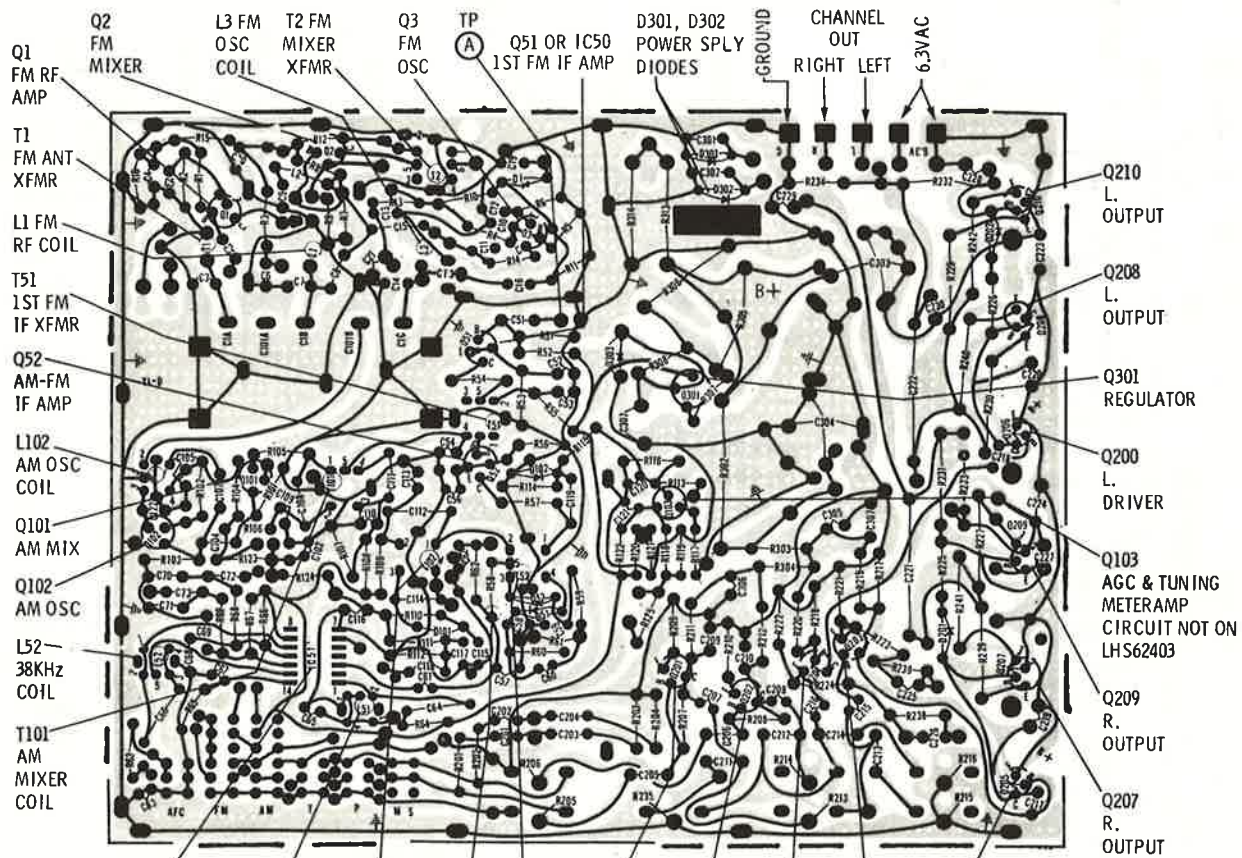


# **Motorola Chassis DHS/EHS/FHS/LHS/ THS/VHS/ZEHS62403**



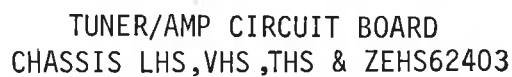
Schematic Diagram D, E & FHS62403

# Motorola Chassis DHS/EHS/FHS/LHS/THS/VHS/ZEHS62403



TUNER/AMP CIRCUIT BOARD  
CHASSIS DHS,EHS,FHS & LHS62403

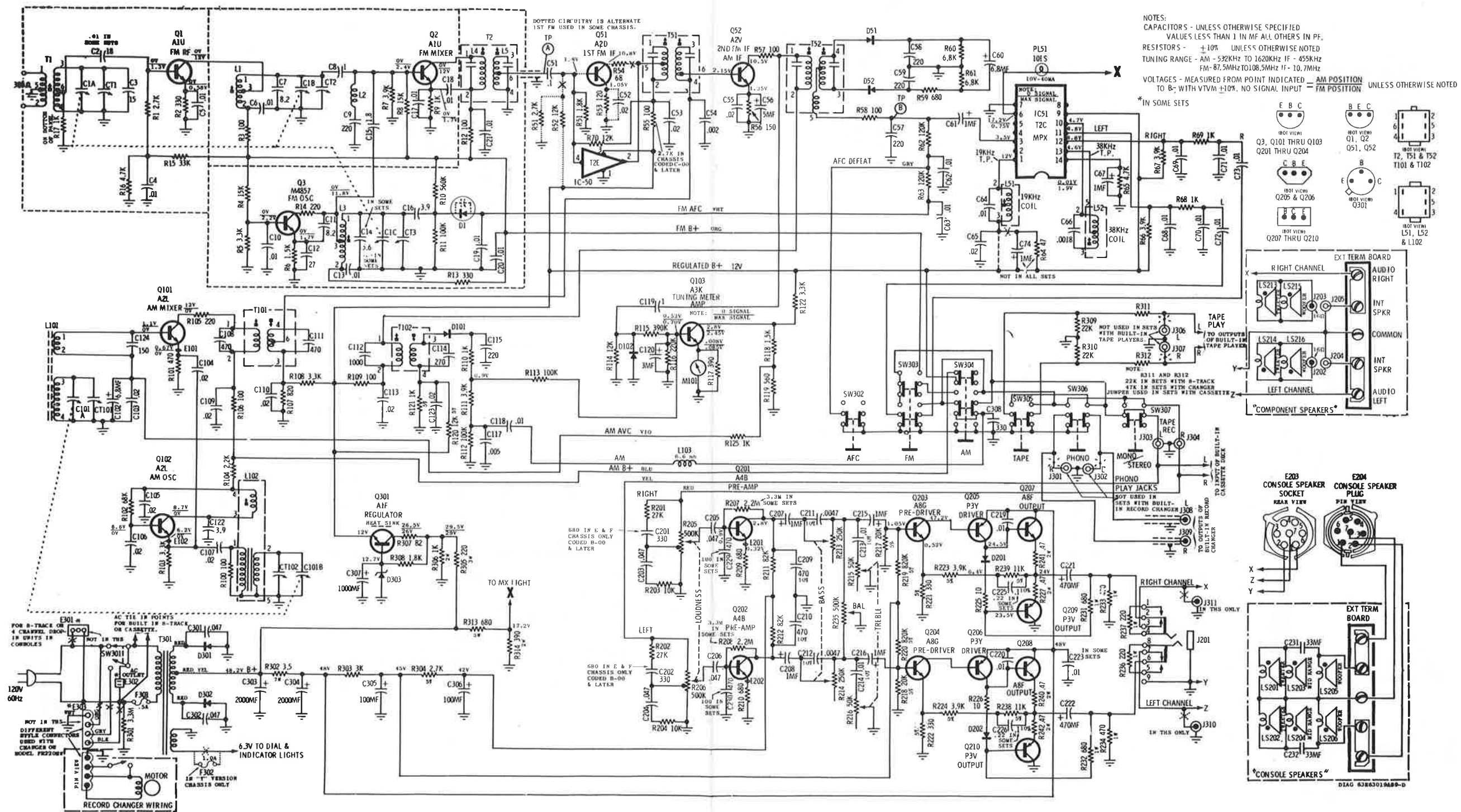








**Motorola Chassis DHS/EHS/FHS/LHS/  
THS/VHS/ZEHS62403**



*Schematic Diagram ZE, T, HS62403*