MOTOROLA

"HT90" SERIES

"Handie-Talkie" Portable Radios

136-174 MHz

SPECIFICATIONS

GENERAL

FREQUENCY RANGE: 136-174MHz

POWER SUPPLY: (1) Nickel-cadmium battery, (1) Mercury battery, or (1) Alkaline battery

BATTERY DRAIN–*

at 12.5Vdc	H23	H33
Standby:	12mA	12mA
Receive:	85mA	85mA
Transmit:	450mA	1000mA

*For "Private-Line" models, add 4mA to drain.

TRANSMITTER

	H23	H33
RF OUTPUT– Nickel-cadmium battery:	2.0W at 12.5Vdc	5.0W at 12.5Vdc
Mercury/Alkaline battery:	1.25W at 11.5Vdc	3.0W at 11.5Vdc

FREQUENCY: Within ±750Hz of desired frequency

MODULATION: Type 16F3, ±5kHz for 100% modulation at 1000Hz (±4.0kHz min.) including PL modulation for PL models

PL MODULATION: ±1kHz max. ±500Hz min.

AUDIO DISTORTION: Less than 5% at 1000Hz, 3kHz deviation

MAX. PERMISSIBLE CHANNEL SEPARATION: 1MHz (no degradation)

RECEIVER

AUDIO OUTPUT: 500mW at less than 5% distortion

FREQUENCY: 455kHz ± 1.5Hz measured at M2

SENSITIVITY: 0.25uV max. (12dB SINAD), 0.35uV max. (20dB quieting)

NOISE SQUELCH SENSITIVITY: Noise compensated type, adjustable; opens from 0.18uV

MAX. PERMISSIBLE CHANNEL SEPARATION: 1MHz (no degradation)

Specifications Subject To Change Without Notice

NOTE:

- ALL BATTERIES MUST BE CHARGED PRIOR TO USE.
- USE OF CHEMICALS (DETERGENTS, ALCOHOL, AEROSOL SPRAY, PETROLEUM PRODUCTS) MAY BE HARMFUL AND DAMAGE THE RADIO HOUSING. WE RECOMMEND A MILD DISHWASHING SOAP FOR CLEANING THE EXTERIOR OF THE PRODUCT.
- O-RING SEALS MUST BE PROPERLY LUBRICATED AND ASSEMBLED TO INSURE CONFORMANCE TO MIL-810C SPECIFICATIONS FOR WATER INTRUSION.

HT90 MODELS				NUMBER OF CHANNELS	TYPE OF SQUELCH
HMB SERIES		HMU SERIES			
2W	5W	2W	5W		
H23HMB'	H33HMB'	H23HMU'	H33HMU'		
1124A	1124A	1124A	1124A	2	Carrier
3124A	3124A	3124A	3124A	2	Tone PL
6124A	6124A	6124A	6124A	2	Digital PL

Related Publications Available Separately

Operating Instructions	68P81022C70
Theory/Maintenance Manual	68P81022C85
Quick Reference Card	68P81022C71

Service Manual
68P81022C75-D

OTHER SPECIFICATIONS

GENERAL

BATTERY LIFE:
Based on 5% transmit, 5% receive with rated af output, 90% standby (H33) or 10% - 10% - 80% (H23)
Nickel-cadmium battery, 8 hours/charge
Mercury battery, 30 hours
Alkaline battery, 30 hours

DIMENSIONS:

Height:	7.26"	(184mm)
Width:	2.70"	(69mm)
Depth:	1.95"	(50mm)

WEIGHT:*	**H23**	**H33**
Nickel-cadmium battery:	25.2 oz. (706 g.)	25.4 oz. (710 g.)
Mercury battery:	27.2 oz. (761 g.)	27.3 oz. (770 g.)
Alkaline battery:	23.6 oz. (661 g.)	23.8 oz. (665 g.)

*For "Private-Line" models, add 0.7 oz. (20 g.)

TRANSMITTER

FREQUENCY STABILITY:
±.0005% from −30°C to +60°C (+25°C ref.)

SPURIOUS & HARMONIC FREQUENCIES:
More than 53dB below carrier

FM NOISE:
At least 50dB below ±3.0kHz deviation at 1000Hz

AUDIO RESPONSE:
+1, −3dB from 6dB/octave pre-emphasis characteristic from 300-3000Hz

RECEIVER

FREQUENCY STABILITY:
±.0010% from −30°C to +60°C (+25°C ref.)

USEABLE BANDWIDTH: ±5kHz

SPURIOUS & IMAGE FREQUENCY REJECTION:
More than 55dB below carrier (136-140MHz)
More than 65dB below carrier (140-174MHz)

SELECTIVITY:
More than 75dB at ±30kHz (12dB SINAD)

INTERMODULATION:
More than 65dB at adjacent channel

CHANNEL SPACING: 30kHz

Specifications Subject To Change Without Notice

FCC REGULATIONS

State that:

1. Radio transmitters may be tuned or adjusted only by persons holding a general radiotelephone operator license or by personnel working under their immediate supervision.
2. The rf power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and the local conditions.
3. Frequency, deviation and power output of a transmitter must be checked before it is placed in service and re-checked whenever radio is serviced.

TEPF-13027-A

FCC DESIGNATIONS

H23 Series Models: AZ489FT3623
H33 Series Models: AZ489FT3624

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TEPF-11413-B

DISASSEMBLY PROCEDURE

① With a screwdriver or coin, turn the spring-loaded latch on the bottom of the radio in a counterclockwise direction and lift the battery from the radio housing.

② On the top of the radio (control panel), loosen the two captive screws. Do not completely remove the screws from the control panel.

③ Remove the six Phillips-head screws located inside the battery compartment. Notice the nylon washer under the head of each screw.

④ Lift the front cover from the radio housing, being careful not to pull against the speaker/microphone wires.

⑤ Disconnect the speaker/microphone 5-pin connector from the circuit board by grasping the plug (not the wires) and pulling it straight out and away from the circuit board. Notice the polarized connector's pin orientation.

⑥ With a forefinger placed into speaker hole, pull the control panel and circuit board through the top of the radio until it is clear and free from the radio housing.

NOTE

If further disassembly is necessary, refer to the exploded view diagram for assistance.

Assemble the radio in the reverse order of disassembly, keeping in mind:

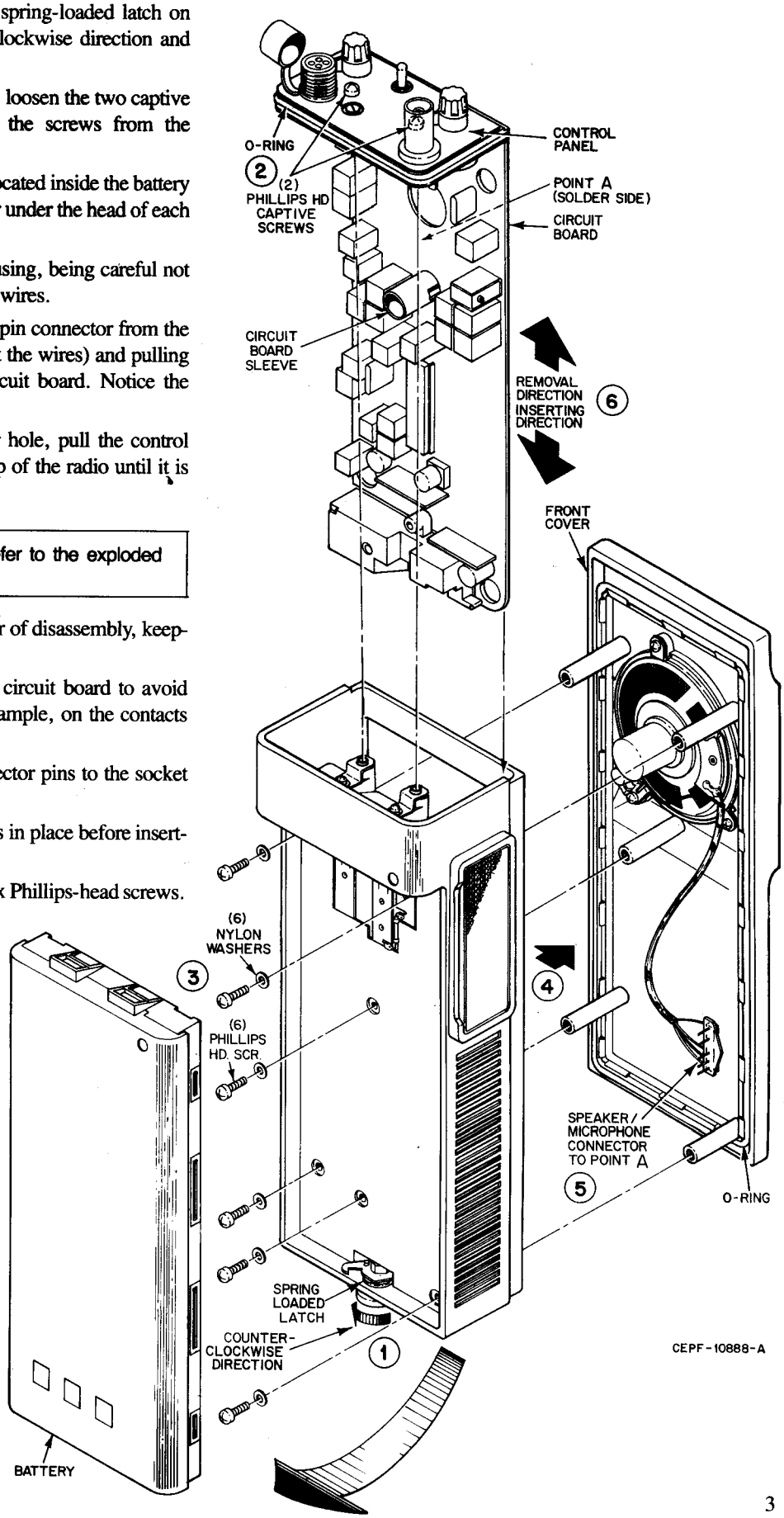
- to dress the wires when inserting the circuit board to avoid snagging them on the housing (for example, on the contacts near the top of the housing).
- to align the speaker/microphone connector pins to the socket before pressing the connector in place.
- to ensure that the circuit board sleeve is in place before inserting the circuit board into the housing.
- that nylon washers are on each of the six Phillips-head screws.

CAUTION

Inspect and replace front cover and control panel O-rings if they are damaged or have taken a permanent set.

NOTE

The battery will snap back into place without the use of a coin or screwdriver.



GENERAL

This radio has been factory aligned and does not require any adjustments. Realignment may be required if components are replaced or have aged. If it is necessary to realign the radio, perform the following procedures:

1. Remove the battery and disassemble the radio as shown in the "Disassembly Procedure." Do not disconnect the front cover receptacle from the main circuit board plug.
2. Connect a dc power supply to the housing battery contacts: power supply negative to radio negative charging contact and power supply positive to radio positive charging contact (see "Disassembly Procedure").
3. Adjust the power supply output for 12.5Vdc. Set current limit to 1.5A.
4. Perform either the "Receiver Alignment" procedure or "Transmitter Alignment" procedure or both procedures as required.

TRANSMITTER ALIGNMENT

Preliminary Adjustments:

1. Connect an rf wattmeter to the antenna connector through a 50Ω, 30dB attenuating pad.
2. Set frequency switch S201 to lowest frequency channel. Frequency allocations for each channel are on the back-cover label.
3. Set each core ⅛" above solder side of board.
4. Set "Instantaneous Deviation Control" (IDC) potentiometer R203 to midrange.
5. Make all measurements with radio "keyed" (i.e., PTT switch S202 depressed).

STEP	ADJUST	FOR	MEASURED AT	USING	NOTE
1	L106, L107	Maximum negative dc voltage	M101	DC Voltmeter	Repeat at least once to ensure that a maximum has been obtained.
2	L101, L102, L103, or L104	Maximum negative dc voltage	M101	DC Voltmeter	Tune only warp coil of lowest frequency channel.
3	L109	Maximum negative dc voltage	M102	DC Voltmeter	
4	L108	Maximum negative dc voltage	M102	DC Voltmeter	
5	Repeat steps 3 and 4 several times to ensure lowest dip.				
6	L111, L114	Maximum power output	Antenna Connector Jack J203	RF Wattmeter	With non-metallic tool, tune L111 first. Tune for maximum power and repeat once to ensure peak.
7	C144 Trimmer Capacitor	Rated rf power output	Antenna Connector Jack J203	Ammeter Wattmeter	Tune for rated rf power with the least current drain.
8	Retune L109 then L108 for maximum negative voltage at M102. Retune L111 then L114 for maximum power output.				
9	Warp Coil of lowest frequency channel	Carrier frequency	Antenna Connector Jack J203	Frequency Counter (thru a 30dB attenuating pad)	Be sure to set frequency switch to channel being aligned.
10	Repeat step 9 for highest frequency channel. Be sure to set the frequency switch to the channel being aligned (L101-F1, L102-F2).				
11	L114, C144 Alternate between lowest and highest frequency channels when tuning	Balanced rated rf power output	Antenna Connector Jack J203	Ammeter Wattmeter	Balanced tuning of L114 and C144 may be necessary to achieve power and current balance between channels. When tuning C144, rated rf power may be obtained at more than one point. Adjust for the point that produces rated rf power with the least current drain.
12	PL Deviation Control (Tone PL - R309; Digital PL - R305) if applicable	± 1000Hz deviation max. ± 500Hz deviation min.	Antenna Connector Jack J203	Deviation Meter (thru a 30dB pad)	
13	IDC Potentiometer R203	+ 5kHz deviation max. ± 4kHz deviation min.	Antenna Connector Jack J203	1. Audio Oscillator connected to IDC Module U101, Deviation Meter (thru a 30dB pad) 2. When making a deviation measurement, if a test cable is not available, audio input to IDC module at pin 6 should be fed thru a 15k resistor in series with an 0.15uF capacitor.	Set audio oscillator for an output of 0.25Vrms at 1000Hz. Check the deviation on all channels, and adjust R203 for ± 5.0kHz deviation on the channel that produces the highest deviation.

f_c – carrier frequency, f_o – oscillator frequency, $f_c = 9f_o$

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RECEIVER ALIGNMENT

Preliminary Adjustments:

1. Set PL squelch control switch S203, R201 to its maximum counterclockwise position before detent (radio unsquelched).
2. Set frequency switch S201 to the highest frequency channel.
3. Set cores of L1, L2, L3, L4, L16, and L17 flush with the circuit board solder side.
4. Set cores of L9, L10, L11, and L12 to middle of coil form and set cores of L5 and L6 six turns down from solder side of circuit board.

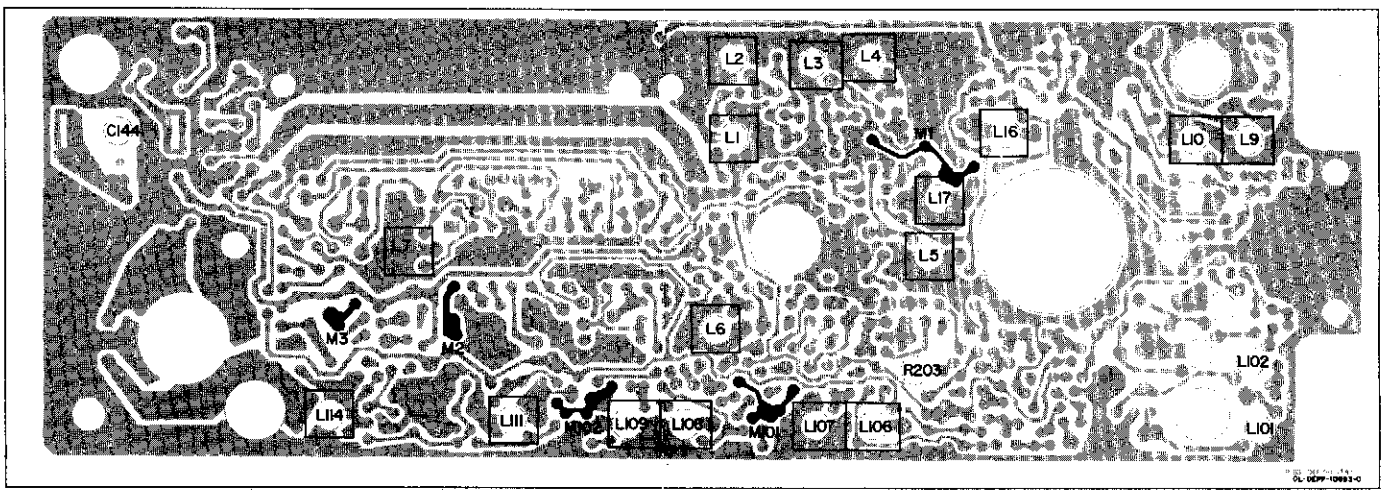
NOTE: If a frequency counter and a SINAD meter are available, perform the Perferred Method of Alignment (steps 1 through 6); otherwise, perform the Alternate Method (start at step 2 and perform steps 2, 3A, 4, 5, and 6A).

	STEP	ADJUST	FOR	MEASURED AT	USING	NOTE
	1 (See Note Above)	Second oscillator frequency	Correct conversion of first i-f frequency	Pin 24 of U1 (M2)	17.9MHz Oscillator, AC Voltmeter, Frequency Counter	Determine second i-f frequency as follows: 1. Connect an ac voltmeter to pin 24 of U1 and a frequency counter to the output of the ac voltmeter. 2. Inject a signal from a 17.9MHz ± 100Hz crystal oscillator into pin 19 of U1 to produce at least a −30dBm output at pin 19 of U1; then adjust voltmeter to peg the needle for full-scale deflection by turning the range selector down two levels. This is necessary in order to drive the frequency counter in the following step. 3. Count the second i-f frequency through the ac voltmeter and frequency counter at pin 24 of U1. Record the reading within ±10Hz; this reference must read 455kHz ± 1.5kHz. Then turn off the 17.9MHz oscillator.
PREFERRED METHOD	2	L6, L5, L16, L17, L4, L3, L2, L1	Nearest resonant point that results in a −30dBm reading on meter	Pin 24 of U1 (M2)	Service Monitor or Signal Generator, AC Voltmeter, Frequency Counter	Adjust signal generator for maximum output. If level of signal at pin 24 of U1 on ac meter is not −30dBm, adjust the coils in the sequence shown until it is; then adjust meter to peg the needle for full-scale deflection by turning range selector down one level.
PREFERRED METHOD	3	L9, L10, L11, L12	Reference-frequency recorded in step 1	Pin 24 of U1 (M2)	Service Monitor or, Signal Generator, AC Voltmeter, Frequency Counter	Adjust the warp coil for the selected radio channel (L9-F1, L10-F2, L11-F3, L12-F4) until the frequency counter indicates the same as the reference frequency recorded in step 1. Repeat this step until all channels of the radio are warped onto frequency.
ALTERNATE METHOD	3A	L9, L10, L11, L12	Zero beat at 455kHz second i-f	Pin 24 of U1 (M2)	17.9MHz Oscillator, Signal Generator or, Service Monitor, AC Voltmeter	1. Adjust warp coil for the selected radio channel (L9-F1, L10-F2, L11-F3, L12-F4) as follows: Reduce signal generator output to minimum and inject a signal from the 17.9MHz ± 100Hz crystal oscillator at pin 19 of U1. Adjust the output level for a −30dBm reading. 2. Use one of the following methods for zero beat measurement. a. Using an Oscilloscope (1) Connect the output of the ac voltmeter to the oscilloscope and set the time base to 5ms per division and gain to display signal amplitude of approximately 3 divisions. (2) Set the signal generator to the exact carrier frequency and increase the output until the waveform on the oscilloscope appears as an amplitude modulated signal. This signal is the result of the 17.9MHz crystal oscillator mixing with the first i-f signal, which will not be exactly 17.9MHz until the oscillator is warped to the precise frequency by adjusting the channel warp coil. (3) Adjust warp coil while viewing the signal on the oscilloscope for a zero beat or the lowest possible amplitude modulating frequency. This method will provide an accuracy of ±100Hz adjustment of the channel warp coil. b. Listening for an Audio Tone (1) Adjust volume control to listen to the audio output. (2) Set the signal generator to the exact carrier frequency and increase the output until an audio tone is heard. This tone is the product of the mixing signals described in step 4A. Note 2.a.(2). (3) Adjust warp coil for a zero beat (no audio tone is heard when properly adjusted). 3. Repeat Notes 1 and 2 of this step until all channels of the radio are warped onto frequency.
	4	L7	Maximum audio output	External Speaker Jack J202	DC Multimeter, Service Monitor, or Signal Generator	1. Set signal generator to rf signal frequency of radio and adjust output to approximately 1mV and 3kHz deviation with 1kHz modulation. 2. Set radio volume control to maximum. 3. Tune L7 for maximum reading.

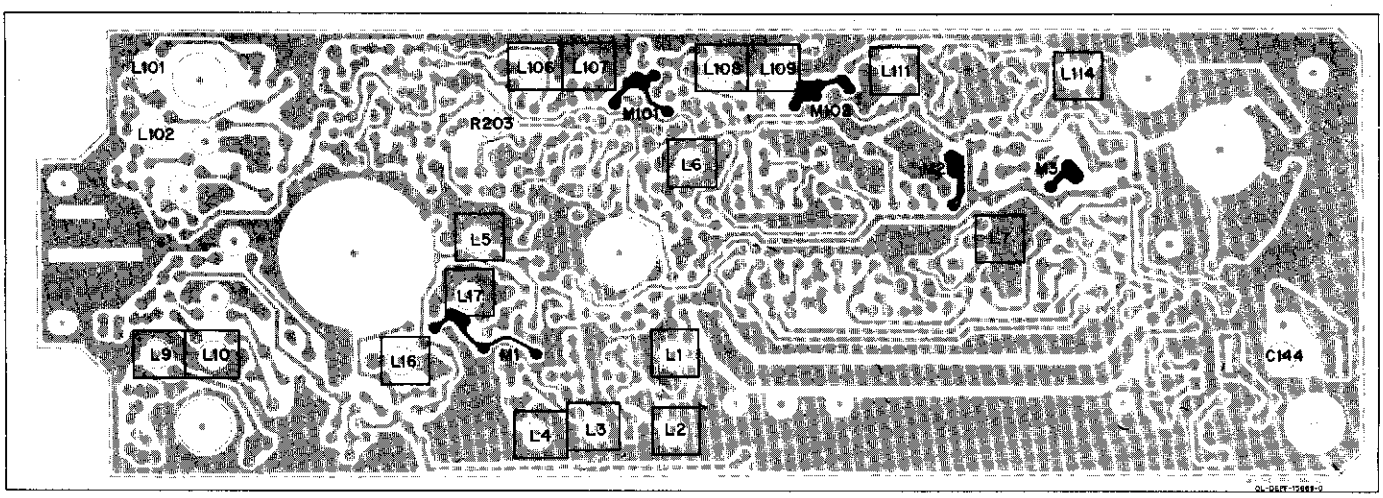
	5	L6, L5, L16, L17	Maximum 455kHz signal	Pin 24 of U1 (M2)	AC Voltmeter	Reduce signal generator level for a reading in the negative (–)30dBm range of the ac meter. Repeat the tuning in the sequence shown at least once to insure a maximum has been obtained.
PREFERRED METHOD	6	L4, L3, L2, L1	Proper bandwidth using 12dB SINAD method	External Speaker Jack J202	SINAD Meter, Service Monitor, or Signal Generator, AC Voltmeter	1. With the signal generator set to the highest frequency of the radio being tested and 3kHz deviation with 1kHz modulation frequency applied, turn the generator output up to 1mV. 2. Adjust the audio output at the external speaker jack to approximately 3.5Vrms at 12.5V supply. 3. Connect the SINAD meter to the external speaker jack. In consecutive order, adjust L4 through L1 (repeating as necessary) for the best SINAD meter indication, reducing the signal generator output as required. This completes the receiver tuning procedure.
ALTERNATE METHOD	6A	L4, L3, L2, L1	Peak indication using best quieting method	External Speaker Jack J202	Service Monitor, or Signal Generator, AC Voltmeter	1. Adjust audio output at the speaker jack to approximately 2.2Vac. 2. Increase signal generator output until audio output starts to quiet. 3. In consecutive order, adjust L4, L3, L2, and L1 for the best quieting, reducing the signal generator output as required. This completes the tuning procedure.
	20dB QUIETING TEST (Perform on each channel)					
	1	Volume Control R202	1.73Vac noise out	External Speaker Jack J201	AC Voltmeter, Tuneup Cable NKN6248	Establishes reference noise level.
	2	Signal Generator Frequency	Carrier frequency	External Antenna Jack J202	Signal Generator, Tuneup Cable NKN6248	Reduce output level to zero after setting frequency.
	3	Signal Generator Output Level	Slowly increase until noise decreases 20dB	External Speaker Jack J201	AC Voltmeter, Tuneup Cable NKN6248	Signal level must be less than 0.35uV.

f_c = carrier frequency, f_o = oscillator frequency, $f_c = 3f_o + 17.9MHz$ TEPF-10857-A

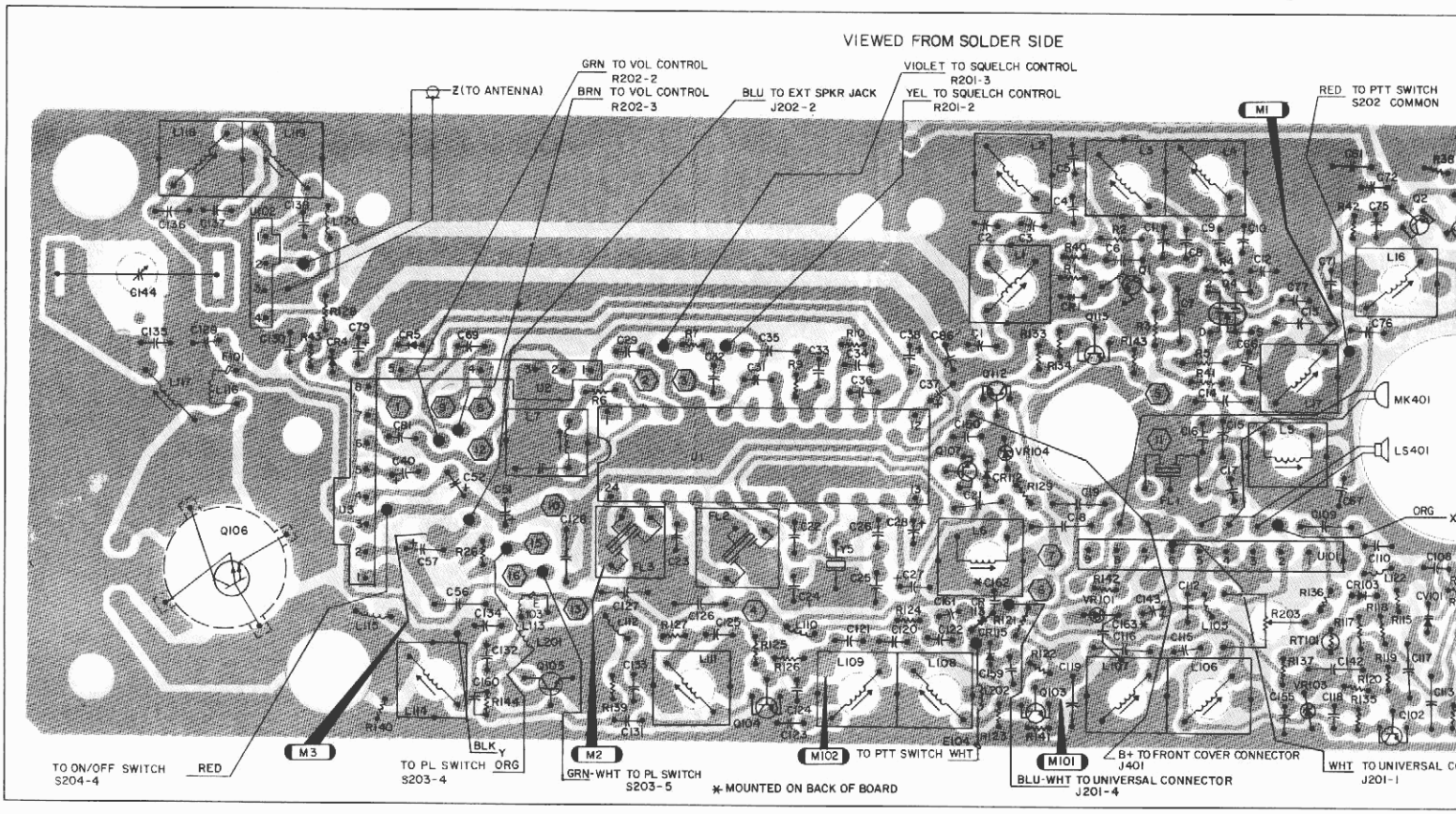
ALIGNMENT ADJUSTMENT LOCATIONS THROUGH "B-2" ITEM NOS.



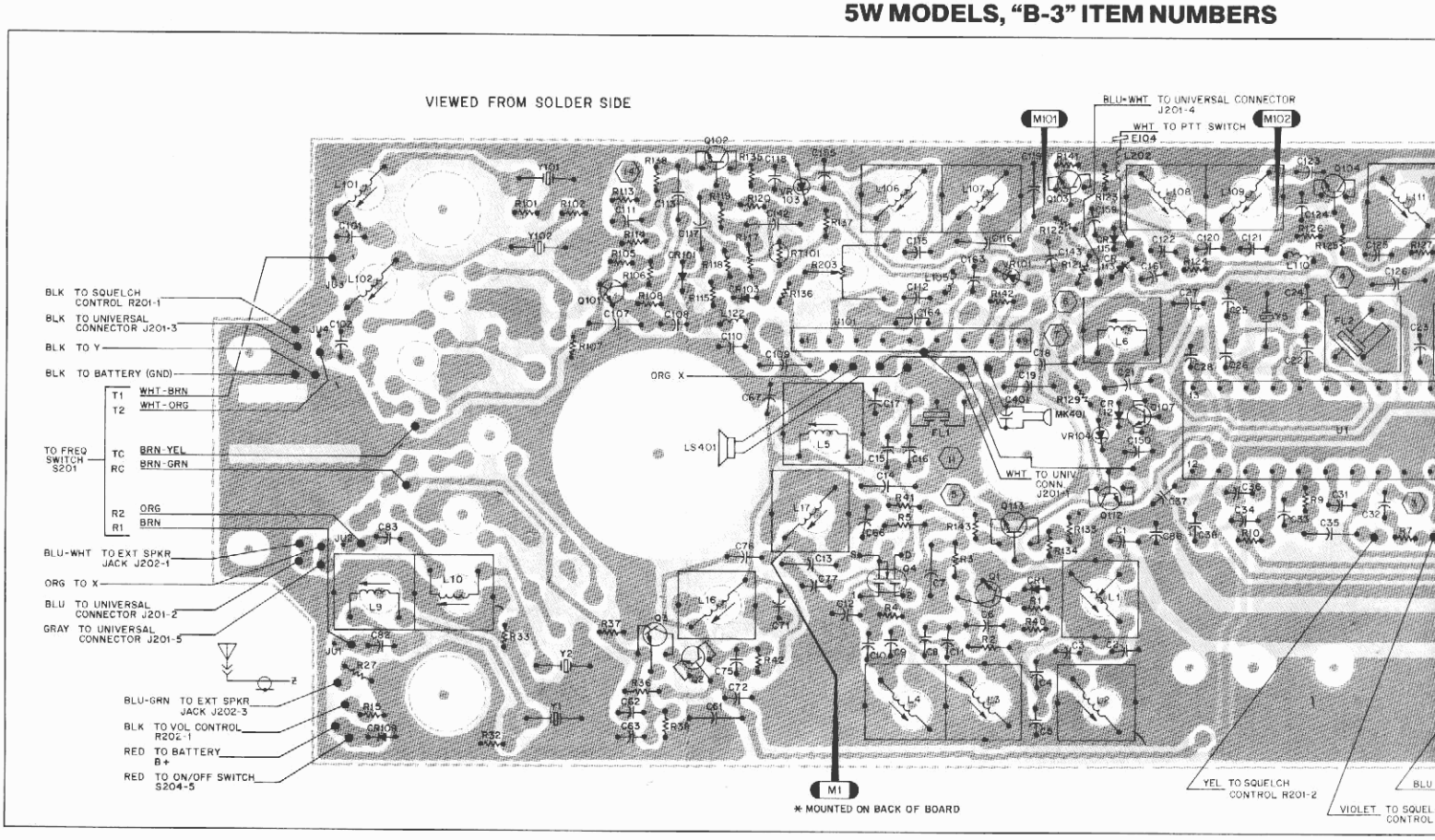
ALIGNMENT ADJUSTMENT LOCATIONS "B-3" ITEM NOS.

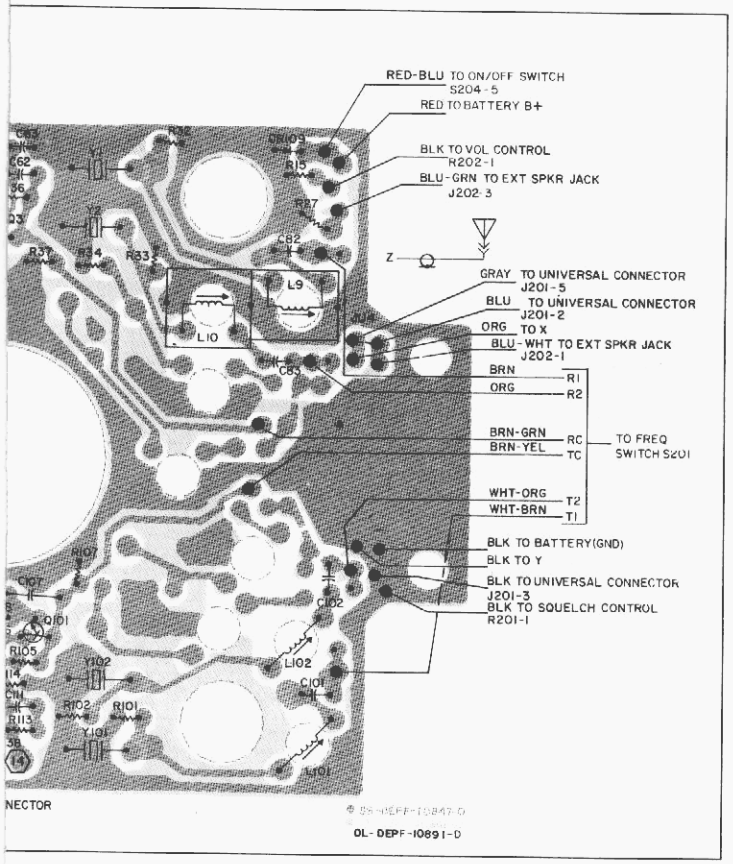


5W MODELS THROUGH "B-2" ITEM NUMBERS



5W MODELS, "B-3" ITEM NUMBERS





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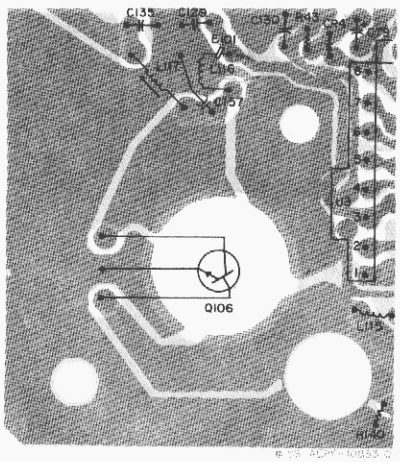
2W MODELS (PARTIAL)



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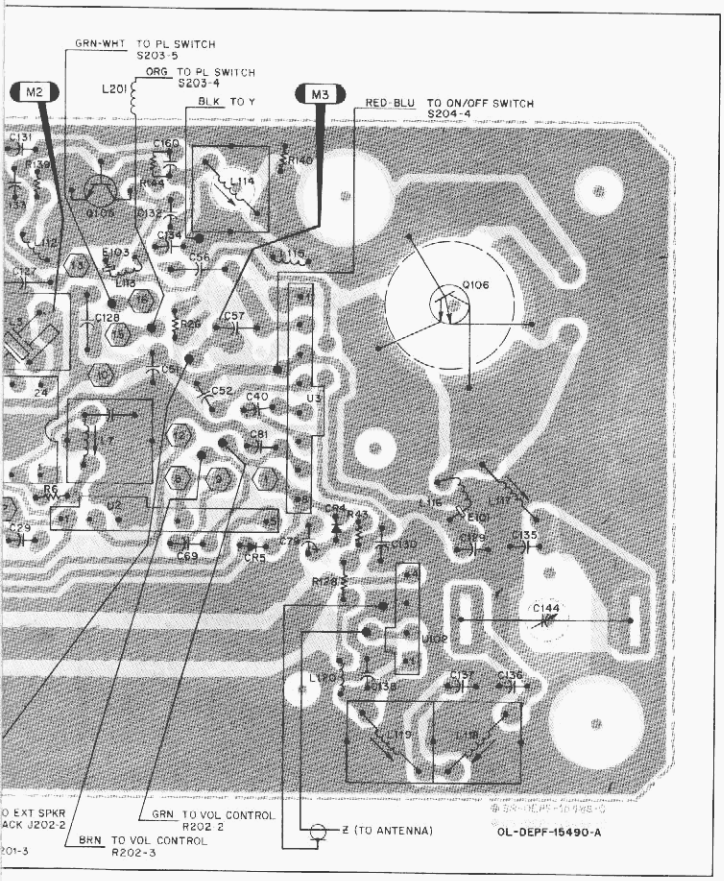
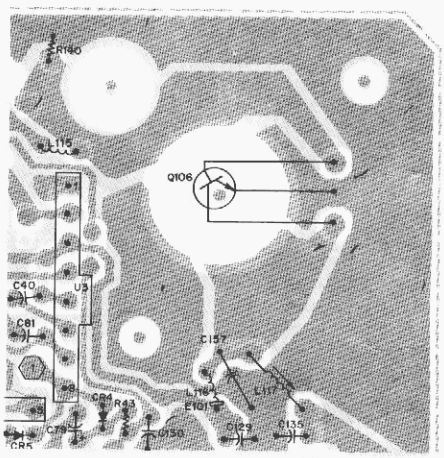


OL-DEPF-15490-A

2W MODELS (PARTIAL)



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SCHEMATIC AND CIRCUIT BOARD NOTES

1. Unless otherwise stated, resistances are in ohms (k = 1000), capacitances less than 1 are in microfarads, and capacitances 1 or greater are in picofarads.
2. DC voltages are measured from point indicated to chassis ground using Motorola DC Multimeter or equivalent. Transmitter measurements should be made with a 12uH rf choke in series with voltage probe to prevent circuit loading.
3. Reference designations are assigned in the following manner:

   UNIT SERIES = RECEIVER
   100 SERIES = TRANSMITTER
   200 SERIES = CONTROLS AND INTERCONNECTIONS
   400 SERIES = FRONT COVER

4. ⬡ Indicates Interconnect Tie Points as follows:
   - ① Squelch Control
   - ② Detector Output
   - ③ Limiter Output
   - ④ 12.2Vdc (Transmit Mode Only)
   - ⑤ 11.8Vdc (Receive Mode Only)
   - ⑥ Internal PTT
   - ⑦ DC Switch PTT
   - ⑧ Audio Preamplifier Output
   - ⑨ Audio to Volume Control
   - ⑩ 12.5Vdc (Battery B + After Switch)
   - ⑪ Ground
   - ⑫ To PL Low-Pass Filter
   - ⑬ 12.2Vdc (Same as ④)
   - ⑭ Transmit PL Input
   - ⑮ PL Switch
   - ⑯ PL Switch
5. JU4 open on Universal Models, closed on Basic Models.
   JU5 open on PL Models.
   JU6 normally closed.

TEPF-10733-O

NOTES:

A. 1000uV Carrier Signal.
B. Disable first oscillator for this reading.
C. Disable second oscillator for this reading.
D. 1000uV carrier signal with 1000Hz tone at 3kHz deviation.
E. Measurement made with Motorola Model S-1339A Analog RF Millivoltmeter.
F. Measurement made with Motorola Model S-1053 AC Voltmeter.
G. Receiver squelched.
H. No RF signal in.
J. Rated audio output set at 12.5Vdc (3.46Vrms).

TEPF-10734-O

RECEIVER OSCILLATOR CRYSTAL FREQUENCIES

CARRIER FREQUENCY f_c	FIRST OSCILLATOR CRYSTAL FREQUENCY f_{01}	SECOND OSCILLATOR CRYSTAL FREQUENCY f_{02}
136.00-138.00	39.3667-40.0333	17.445
138.00-140.48	40.0333-40.8600	18.355
140.48-148.00	40.8600-43.3667	17.445
148.00-154.80	43.3667-45.6333	18.355
154.80-157.00	45.6333-46.3667	17.445
157.00-164.28	46.3667-48.7933	18.355
164.28-171.70	48.7933-51.2667	17.445
171.70-174.00	51.2667-52.0333	18.355

Crystal formula: $f_c = 3f_{01} + 17.9MHz$

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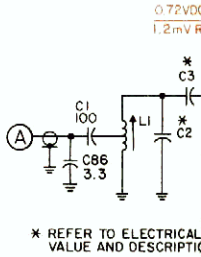
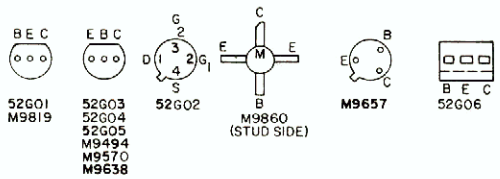
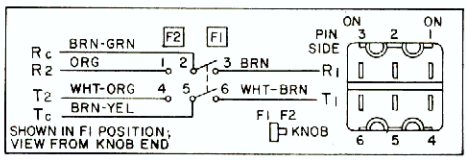


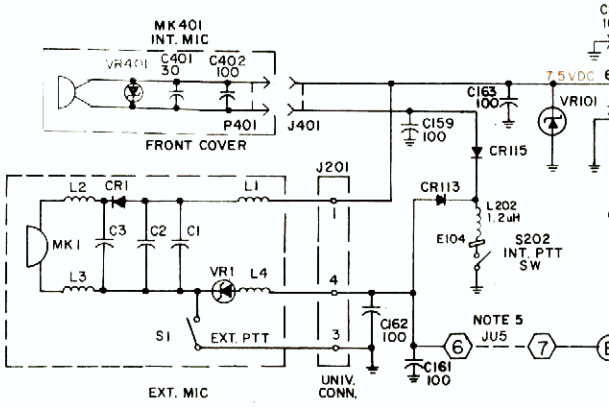
* REFER TO ELECTRICAL VALUE AND DESCRIPTIO

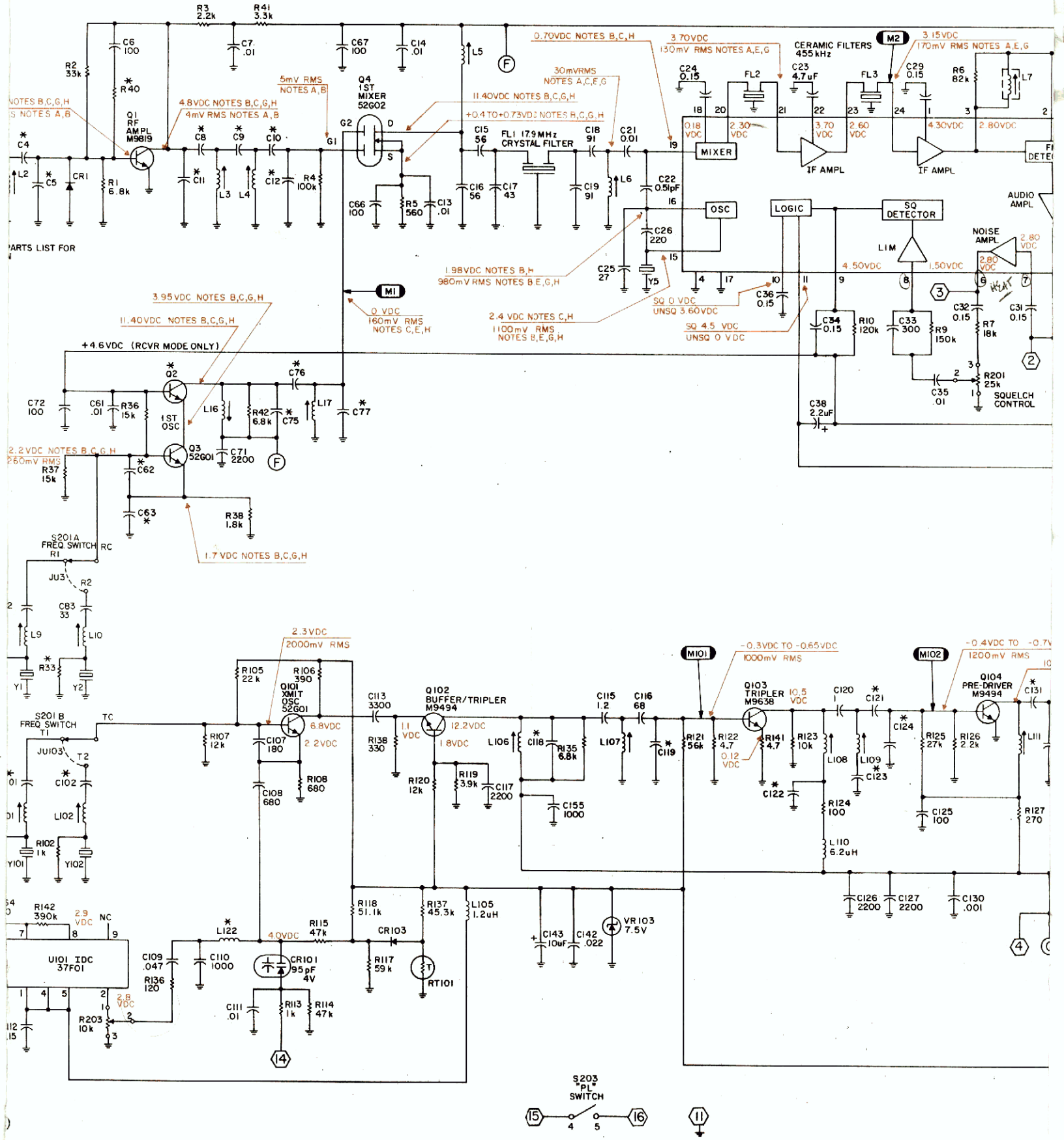


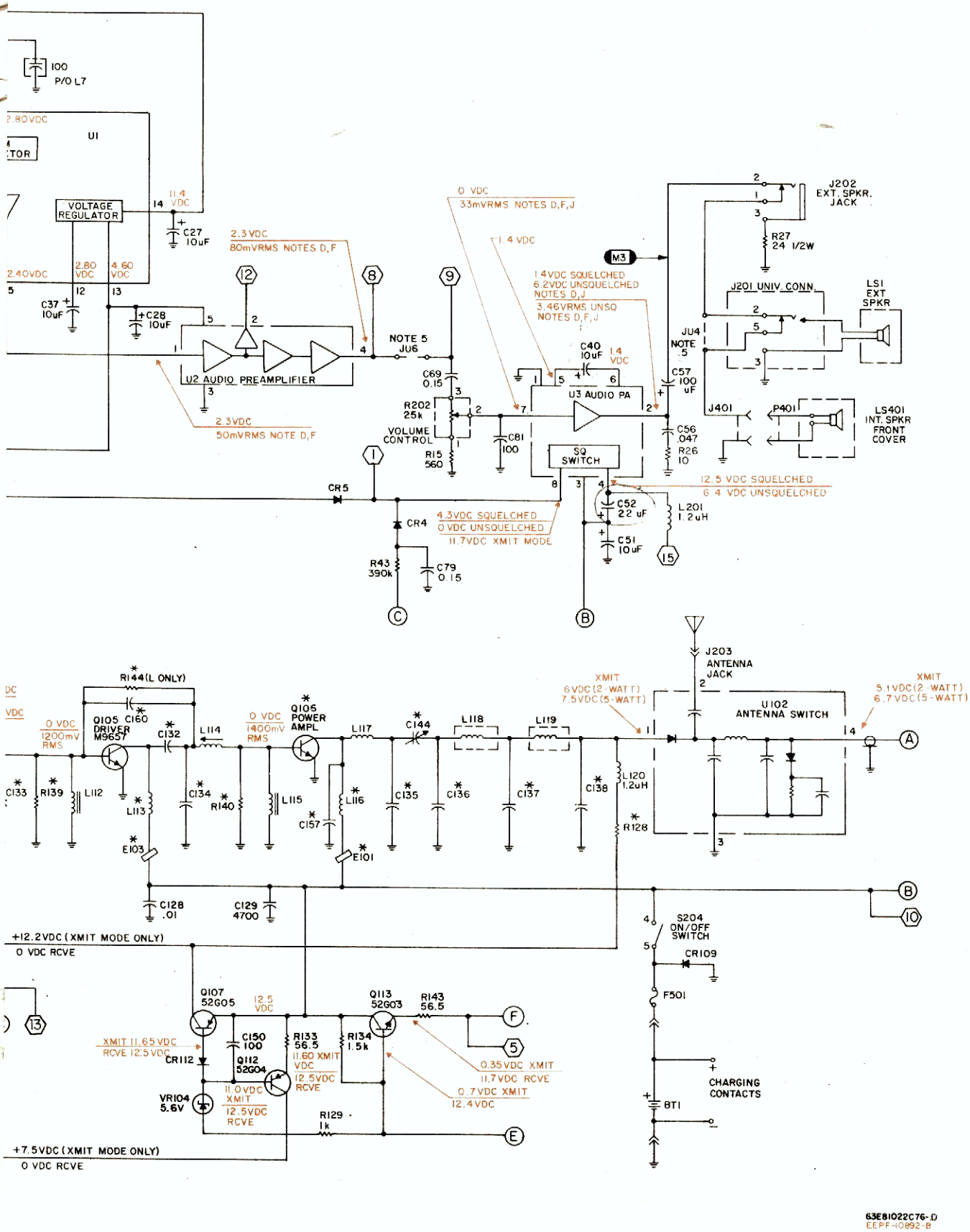
ITEM REVISIONS CHART

ITEM NO.	FREQ(MHz)	POWER(W)	SUFFIX
NUD6421B	136-150.799	2	4
NUD6422B	150.8-161.999	2	4
NUD6423B	162-174	2	4
NUD6431B	136-150.799	5	4
NUD6432B	150.8-161.999	5	4
NUD6433B	162-174	5	4
NUD6682B	150.8-162	5	4






R3 2.2k
R41 3.3k
C6 100
C7 .01
C67 100
C14 .01
L5
R2 33k
R40
Q1 RF AMPL M9819
Q4 1ST MIXER 52G02
0.70VDC NOTES B,C,H
3.70VDC 130mV RMS NOTES A,E,G
CERAMIC FILTERS 455kHz
M2
3.15VDC 170mV RMS NOTES A,E,G
5mV RMS NOTES A,B
30mVRMS NOTES A,C,E,G
11.40VDC NOTES B,C,G,H
+0.4 TO +0.73VDC NOTES B,C,G,H
4.8VDC NOTES B,C,G,H
4mV RMS NOTES A,B
C24 0.15
FL2
C23 4.7uF
FL3
C29 0.15
R6 82k
L7
C4
L2
C5
CR1
R1 6.8k
C8
C9
C10
C11
L3
L4
C12
R4 100k
G2
D
G1
S
C15 56
FL1 17.9MHz CRYSTAL FILTER
C18 91
C21 0.01
C16 56
C17 43
C19 91
L6
C66 100
R5 560
C13 .01
0.18 VDC
2.30 VDC
3.70 VDC
2.60 VDC
4.30VDC
2.80VDC
MIXER
IF AMPL
IF AMPL
AUDIO AMPL
C22 0.51pF
OSC
LOGIC
SQ DETECTOR
C26 220
NOISE AMPL
2.80 VDC
LIM
1.98VDC NOTES B,H
980mV RMS NOTES B,E,G,H
C25 27
Y5
4.50VDC
1.50VDC
C36 0.15
M1
0 VDC
160mV RMS NOTES C,E,H
3.95VDC NOTES B,C,G,H
11.40VDC NOTES B,C,G,H
2.4 VDC NOTES C,H
1100mV RMS NOTES B,E,G,H
SQ 0 VDC UNSQ 3.60VDC
SQ 4.5 VDC UNSQ 0 VDC
C34 0.15
R10 120k
C33 300
R9 150k
C32 0.15
R7 18k
C31 0.15
R201 25k
SQUELCH CONTROL
C35 .01
C38 2.2uF
+4.6VDC (RCVR MODE ONLY)
Q2
C76
C72 100
C61 .01
R36 15k
1ST OSC
L16
R42 6.8k
C75
L17
C77
Q3 52G01
C71 2200
2.2VDC NOTES B,C,G,H
260mV RMS
R37 15k
C62
C63
R38 1.8k
1.7VDC NOTES B,C,G,H
S201A FREQ SWITCH R1
RC
JU3
R2
C83 33
L9
L10
R33
Y1
Y2
2.3VDC 2000mV RMS
R105 22k
R106 390
Q101 XMIT OSC 52G01
6.8VDC
2.2VDC
C107 180
C108 680
R108 680
S201B FREQ SWITCH T1
TC
JU103
T2
C102
L102
R102 1k
Y101
Y102
R107 12k
C113 3300
Q102 BUFFER/TRIPLER M9494
1.1 VDC
12.2VDC
1.8VDC
R138 330
R120 12k
R119 3.9k
C117 2200
L106
C118
R135 6.8k
C155 1000
C115 1.2
C116 68
L107
C119
M101
-0.3VDC TO -0.65VDC 1000mV RMS
R121 56k
R122 4.7
0.12 VDC
Q103 TRIPLER M9638
10.5 VDC
R141 4.7
C122
R123 10k
C120 1
C121
L108
L109
C123
C124
R124 100
L110 6.2uH
M102
-0.4VDC TO -0.7V
1200mV RMS
Q104 PRE-DRIVER M9494
C131
R125 27k
R126 2.2k
L111
C125 100
R127 270
C126 2200
C127 2200
C130 .001
R142 390k
2.9 VDC
NC
U101 IDC 37F01
L122
4.0VDC
R115 47k
CR103
R118 51.1k
R137 45.3k
L105 1.2uH
C109 .047
R136 120
C110 1000
CR101 95pF 4V
R117 59k
RT101
C143 10uF
C142 .022
VR103 7.5V
C111 .01
R113 1k
R114 47k
2.8 VDC
R203 10k
S203 "PL" SWITCH
15
16
11
14
4
5



63E81022C76-D
EEPF-10892-B

TRANSCEIVER SCHEMATIC DIAGRAM 7

ELECTRICAL PARTS LIST

136-150.8MHz (L)
150.8-162MHz (M)
162-174MHz (H)

TPLF-1889-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed: pF ± 5%; 63V; N150 unless stated
C1	2105455G20	100 ± 10%; 50V; N2200
C2	2105454G45	13 (L)
	or 2105454G02	11; 50V (M)
	or 2105454G15	9 ± 0.25pF; 50V (H)
C3	2182450B24	0.47 ± 10%; 500V (L)
	or 2182450B21	0.39 ± 10%; 500V (M, H)
C4	2105454G18	22; 50V (L)
	or 2105454G30	18 (M)
	or 2105454G29	15 (H)
C5	2105454G66	60 (L)
	or 2105454G49	39 (M)
	or 2105454G19	27 (H)
C6	2105455G20	100 ± 10%; 50V; N2200
C7	2105457G14	0.01uF + 80 – 20%
C8	2105454G67	25 (L)
	or 2105454G26	20; 50V (M)
	or 2105454G73	16 (H)
C9	2182450B21	0.39 ± 10%; 500V (L)
	or 2182450B26	0.30 ± 10%; 500V (M, H)
C10	2105454G67	25 (L)
	or 2105454G18	22; 50V (M)
	or 2105454G30	18 (H)
C11	2105454G48	43 (L)
	or 2105454G32	36 (M)
	or 2105454G19	27 (H)
C12	2105454G48	43 (L)
	or 2105454G38	33 (M)
	or 2105454G19	27 (H)
C13, 14	2105457G14	.01uF + 80 – 20%
C15	2105454G91	56
C16	2105454G54	56; N220
C17	2105454G48	43
C18, 19	2105455G34	91
C21	2105457G14	.01uF + 80 – 20%
C22	2182450B29	0.51; 500V
C23	2383397D09	4.7uF + 20%
C24	2184008H03	0.15uF + 80 – 20%; 50V
C25	2105454G19	27; 50V
C26	2105455G07	220; N1500
C27	2305499G20	10uF ± 20%; 20V
C28	2305499G16	10uF ± 20%; 16V
C29	2184008H03	0.15uF + 80 – 20%; 50V
C31, 32	2184008H03	0.15uF + 80 – 20%; 50V
C33	2105455G08	300 ± 10%; N750
C34	2184008H03	0.15uF + 80 – 20%; 50V
C35	2105457G14	.01uF + 80 – 20%
C36	2184008H03	0.15uF + 80 – 20%; 50V
C37	2305499G14	10uF ± 20%
C38	2305499G04	2.2uF ± 20%; 16V
C40	2305499G14	10uF ± 20%
C51	2305499G20	10uF ± 20%; 20V
C52	2305499G01	22uF + 20%; 16V
C56	2105228K02	.047uF ± 10%; 25V
C57	2305263K01	100uF ± 20%; 25V
C61	2105457G14	.01uF + 80 – 20%
C62	2105455G09	33; N750 (L)
	or 2105455G10	27; N750 (M, H)
C63	2105454G71	27; N470 (L)
	or 2105454G76	22; N470 (M, H)
C66, 67	2105455G20	100 ± 10%; 50V; N2200
C69	2184008H03	0.15uF + 80 – 20%; 50V
C71	2105457G22	2200 + 50 – 20%
C72	2105455G20	100 ± 10%; 50V; N2200
C75	2105454G18	22; 50V (L)
	or 2105454G73	16 (M)
	or 2105454G45	13 (H)
C76	2182450B42	0.75 + 10%; 500V (L)
	or 2182450B24	0.47 + 10%; 500V (M, H)
C77	2105454G26	20 ± 2% 50V (L)
	or 2105454G29	15 (M)
	or 2105454G34	12 (H)
C79	2184008H03	0.15uF + 80 – 20%; 50V
C81	2105455G12	100 ± 10%; N750
C82, 83		temperature compensating capacitor, 2W models selected per corresponding crystals (Y1 thru Y2) color code
	2105455G18	33; N1500 (if crystal color code is BLU or GRN)
	or 2105455G09	33; N750 (if crystal color code is BLACK)
C86	2105453G27	3.3 ± 0.25pF; 63V; NPO (M)
C101, 102		temperature compensating capacitor, selected per corresponding crystals (Y101 thru Y102) color code
	2105453G40	39; NPO (L) if crystal color code is YEL
	or 2105454G53	39; N220 (L) if crystal color code is RED
	or 2105454G90	39; N470 (L) if crystal color code is BLACK
	or 2105453G20	33; NPO (M, H) if crystal color code is YEL
	or 2105454G39	33; N220 (M, H) if crystal color code is RED
	or 2105454G40	33; N330 (M, H) if crystal color code is BLACK
C107	2105455G13	180; N1500
C108	2105453G05	680; 50V; NPO
C109	2105228K02	.047uF ± 10%; 25V
C110	2105457G09	1000 ± 10%; 10% TC
C111	2105457G08	.01uF ± 10%; 50V; 10% TC
C112	2184008H03	0.15uF + 80 – 20%; 50V
C113	2105457G10	3300 ± 10%; 10% TC
C115	2105453G23	1.2 ± 0.25pF; NPO
C116	2105454G42	68
C117	2105457G13	2200 ± 10%; 10% TC
C118	2105454G48	43 (L, M)
	or 2105454G49	39 (H)
C119	2105454G43	150 (L)
	or 2105454G31	120 (M)
	or 2105454G33	100 (H)
C120	2105453G09	1.0 ± 0.25pF; 50V; NPO
C121	2105454G19	27; 50V (L)
	or 2105454G29	15 (M, H)
C122	2105454G48	43 (L, H)
	or 2105454G44	47 (M)
C123	2105454G19	27; 50V (L)
	or 2105454G26	20 ± 2%; 50V (M, H)
C124	2105455G06	15; 50V; N750 (L)
	or 2105455G09	33; N750 (M, H)
C125	2105455G12	100; N750
C126, 127	2105457G13	2200 ± 10%; 10% TC
C128	2105457G14	.01uF + 80 – 20%
C129	2105457G21	4700 + 80 – 20%
C130	2105457G15	.001uF + 50 – 20%
C131	2105454G14	10; 50V (L)
	or 2105454G45	13 (M) 2W models
	or 2105454G34	12 (M) 5W models
	or 2105454G34	12 (H) 2W models
	or 2105454G14	10; 50V (H) 5W models
C132	2105453G26	2.7 ± 0.25pF; NPO (L) 2W models
	or 2105454G59	4.3 (L) 5W models
	or 2105453G25	2.2 ± 0.25pF NPO (M, H) 2W models
	or 2105454G60	3.9 ± 0.25pF (M) 5W models
	or 2105453G21	3 ± 0.25pF; NPO (H) 5W models
C133	-----	Not Used on (L)
	or 2105454G02	11 (M) 2W models
	or 2105454G29	15 (M) 5W models
	or 2105454G14	10; 50V (H) 2W models
	or 2105454G14	10; 50V (H) 5W models
C134	2105454G34	12; (L) 2W models
	or 2105454G45	13 (L) 5W models
	or 2105454G02	11 (M)
	or 2105454G14	10; 50V (H) 2W models
	or 2105454G15	9 ± 0.25pF (H) 5W models
C135	2105454G60	3.9 ± 0.25pF (L) 2W models
	or 2105454G37	8.2 ± 0.25pF (L) 5W models
	or 2105454G60	3.9 ± 0.25pF (M) 2W models
	or 2105454G45	13 (M) 5W models
	or 2105453G25	2.2 ± 0.25pF NPO (H) 2W models
	or 2105454G15	9 ± 0.25pF (H) 5W models
C136	2105454G47	30 (L)
	or 2105454G28	24 (M, H)
C137	2105454G44	47 (L)
	or 2105454G32	36 (M, H)
C138	2105454G47	30 (L)
	or 2105454G28	24 (M, H)
C142	2105457G16	.022 + 80 – 20%
C143	2305499G16	10uF ± 20%; 16V
C144	2083201B14	Trimmer, 8-60pF (M) 5W models and all 2W models
	or 2083201B15	Trimmer, 4-40pF (L, H) 5W models)
C150	2105455G12	100 ± 10%; N750
C155	2105457G09	1000 ± 10%; 10% TC
C157	2105454G56	5.6 ± 0.25pF (M) 2W models only
	or 2105454G58	4.7 ± 0.25pF (H) 2W models only

C159	2105455G20	100 ± 10%; 50V; N2200
C160	2105454G58	4.7 ± 0.25pF (M) 2W models only
	or 2105454G60	3.9 ± 0.25pF (H) 2W models only
C161, 163, 164	2105455G20	100 ± 10%; 50V; N2200
C162	2182358G94	100 ± 10%; 75V; N2200
C401	-----	30; (P/O 0105950G02)
C402	-----	100; (P/O 0105950G02)
		DIODE: See Note I
CR1	4882363E03	Silicon
CR4, 5	4883654H01	Silicon
CR101	4805746G01	Varactor
CR103	4883654H01	Silicon
CR109	4805490G02	Silicon
CR112, 113	4883654H01	Silicon
CR115	4883654H01	Silicon
		CORE:
E101	7683960B01	Ferrite Bead (L, H) 2W models and all 5W models
	or 7683960B04	Ferrite Bead (M) 2W models
E103	7683960B04	Ferrite Bead (2W models only)
E104	7683960B04	Ferrite Bead
		FUSE:
F501	6505214E01	Axial Lead, 2A
		FILTER:
FL1	4805245J02	Crystal, 17.9MHz
FL2	4805368G04	Ceramic, 455kHz
FL3	4805368G03	Ceramic, 455kHz
		JACK:
J201	0905184J01	Universal Connector, 4-contact female
J202	0105950G12	External Speaker
J203	0905545M02	Antenna, BNC connector
J401	0905287C07	Front Cover Connector Pins, female
		COIL, RF: unless stated
L1	2405262E11	Coded: GRN, 5½ turns spacewound; includes: 7605374B03 CORE
L2, 3, 4	2405262E08	Coded: YEL, 4½ turns spacewound; includes: 7605374B03 CORE
L5	2405765D01	Coded: CLEAR, 14¼ turns closewound; includes: 7682451B08 CORE
L6	2405937J01	17.9MHz
L7	2405492G03	1mH choke, 100pF capacitor
L9 thru L12	2405937J04	Coded: BLU, 13 turns; includes 7605361N01, core (L)
	or 2405937J03	Coded: YEL, 12 turns; includes 7605361N01, core (M)
	or 2405937J02	Coded: RED, 11 turns; includes 7605361N01, core (H)
L16, 17	2405669G28	Coded: ORG, 3½ turns spacewound; includes: 7605374B04 CORE
L101 thru L104	2405444F19	Coded: VIOLET, 33½ turns closewound; includes: 7605374B06 CORE (L)
	or 2405444F31	Coded: ORG, 31½ turns closewound; includes: 7605374B07 CORE (M)
	or 2405444F32	Coded: YEL, 28½ turns closewound; includes: 7605374B07 CORE (H)
L105	2482723H01	1.2uH Choke
L106	2405669G26	Coded: GRAY, 8½ turns closewound; includes: 7605374B01 CORE (L)
	or 2405669G25	Coded: VIOLET, 7½ turns closewound; includes: 7605374B01 CORE (M, H)
L107	2405669G26	Coded: GRAY, 8½ turns closewound; includes: 7605374B01 CORE (L)
	or 2405669G25	Coded: VIOLET, 7½ turns closewound; includes: 7605374B01 CORE (M, H)
L108	2405669G26	Coded: GRAY, 8½ turns closewound; includes: 7605374B01 CORE (L)
	or 2405669G24	Coded: BLU, 6½ turns closewound; includes: 7605374B01 CORE (M, H)
L109	2405669G22	Coded: BLU, 6½ turns spacewound; includes: 7605374B01 CORE (L, M)
	or 2405669G21	Coded: GRN, 5½ turns spacewound; includes: 7605374B01 CORE (H)
L110	2482723H06	6.2uH Choke
L111	2405669G21	Coded: GRN, 5½ turns spacewound; includes: 7605374B01 CORE (L)
	or 2405669G20	Coded: YEL, 4½ turns spacewound; includes: 7605374B01 CORE (M, H)
L112	2405913C01	Coded: BRN, 3 turns
L113	2482723H13	.085uH Choke (2W models)
	or 2482723H01	1.2uH Choke (5W models)

L114	2405669G27	Coded: ORG, 3½ turns spacewound; includes: 7605374B01 CORE (L) 2W models & (L, M) 5W models
	or 2405669G15	Coded: RED, 2½ turns spacewound; includes: 7605374B01 CORE (M, H) 2W models
	or 2405669G28	Coded: ORG, 3½ turns spacewound; includes: 7605374B04 CORE (H) 5W models
L115	2405913C01	Coded: BRN, 3 turns
L116	2482723H11	0.2uH Choke (L, H) 2W models
	or 2482723H13	0.85uH Choke (M) 2W models and all 5W models
L117	2483203B21	5½ turns (L) 2W models
	or 2483203B20	5½ turns (L) 5W models
	or 2483203B19	4½ turns (M, H) 2W models
	or 2483203B13	3½ turns (M, H) 5W models
L118, 119	2483203B19	4½ turns, 20 ga. wire (L)
	or 2483203B14	4½ turns (M, H)
L120	2482723H01	1.2uH Choke
L122	2405691G16	2.8uH Choke (L)
	or 2405691G12	2.3uH Choke (M)
	or 2405691G13	2.0uH Choke (H)
L201	2482723H01	1.2uH Choke (P/O R201)
L202	2482723H01	1.2uH Choke
		SPEAKER:
LS401	5005181E02	Dynamic, 2"; 24Ω
		MICROPHONE:
MK401	-----	P/O 0105950G02
		PLUG:
P401	-----	P/O 0105950G02
		TRANSISTOR: See Note I
Q1	4800869819	NPN; type M9819
Q2	4800869494	NPN; type M9494 (L)
	or 4800869570	NPN; type M9570 (M, H)
Q3	4805452G01	NPN; type 52G01
Q4	4805452G02	Dual Gate; type 52G02
Q101	4805452G01	NPN; type 52G01
Q102	4800869494	NPN; type M9494
Q103	4800869638	NPN; type M9638
Q104	4800869494	NPN; type M9494
Q105	4800869657	NPN; type M9657
Q106	4805452G06	NPN; type 52G06 (2W models)
	or 4800869860	NPN; type M9860 (5W models)
Q107	4805452G05	PNP; type 52G05
Q112	4805452G04	PNP; type 54G04
Q113	4805452G03	NPN; type 52G03
		RESISTOR, Fixed: Ω ± 5%; ⅛W unless stated
R1	0660075C69	6.8k
R2	0660075C85	33k
R3	0660075C57	2.2k
R4	0660075C97	100k
R5	0660075C43	560
R6	0660075C95	82k
R7	0660075C79	18k
R9	0660075D02	150k
R10	0660075C99	120k
R15	0660075C43	560
R26	0605139G03	10; ¼W
R27	0605139G14	24; ½W
R32 thru R35	0660075C49	1k (L)
	or 0660075C51	1.2k (M, H)
R36, 37	0660075C77	15k
R38	0660075C55	1.8k
R40	0660075C55	1.8k (L)
	or 0660075C57	2.2k (M, H)
R41	0660075C61	3.3k
R42	0660075C69	6.8k
R43	0660075D12	390k
R101, 102	0660075C49	1k
R105	0660075C81	22k
R106	0660075C39	390
R107	0660075C75	12k
R108	0660075C45	680
R113	0660075C49	1k
R114, 115	0660075C89	47k
R117	0683175C63	59.0k ± 1%; ¼W
R118	0683175C60	51.1k ± 1%; ¼W
R119	0660075C63	3.9k
R120	0660075C75	12k
R121	0660075C91	56k
R122	0660075C65	4.7k
R123	0660075C73	10k
R124	0605139G18	100 ± 1%; ¼W

R125	0660075C83	27k
R126	0660075C57	2.2k
R127	0660075C35	270
R128	0605931J02	270; ¼W (2W models)
	or 0605931J01	150; ¼W (5W models)
R129	0660075C49	1k
R133	0605139G16	56.5 ± 1%; ¼W
R134	0660075C53	1.5k
R135	0660075C69	6.8k
R136	0600185A27	120
R137	0605886D72	45.3 ± 1%; ¼W (L)
R138	0660075C37	330
R139	-----	Not used on 2W models in the 136-150.8MHz range
	or 0605139G11	47; ¼W (M, H) 2W models
	or 0605139G18	100 ± 1%; ¼W (L) 5W models
	or 0605139G11	47; ¼W (M) 5W models
	or 0600185A23	82 (H) 5W models
R140	0605139G18	100 ± 1%; ¼W (L, H) 2W models
	or 0605139G16	56.5 ± 1%; ¼W (L, M) 5W models
	or 0600185A23	82 (M) 2W models and (H) 5W models
R141	0605139G02	4.7
R142	0660075D12	390k
R143	0605139G16	56.5 ± 1%; ¼W
R144	0660075C43	560 (L) 2W models
	or 0660075C63	3.9k (L) 5W models
R201	0105956H99	Pot. 25k, Squelch Control; includes S203 and L201
R202	0105956H97	Pot. 25k, Volume Control; includes S204
R203	1805690G06	Pot. 10k ± 20%; IDC Control
		THERMISTOR:
RT101	0605796B04	Disc type, 10k ± 5% at 25°C
		SWITCH:
S201	4005120E03	Toggle, DPDT (2-Freq. Models)
	or 4005119E01	Rotary, 5-pos. (4-Freq. Models)
S202	4005163J02	Sub-miniature, SPDT; PTT
S203	-----	PL, part of R201
S204	-----	ON-OFF, part of R202
		HYBRID MODULE: See Note I
U1	5105479G05	Nucleus, Integrated Circuit
U2	5105144J02	Audio Preamplifier
U3	5105144J13	Audio Power Amplifier
U101	5105337F01	IDC Module
U102	5105144J10	Antenna Switch
		DIODE: See Note I
VR101	4883461E12	27.0V Zener
VR103	4805189E05	7.5V Zener
VR104	4805189E03	5.6V Zener
VR401	-----	23.8V Zener (P/O 0105950G02)
		CRYSTAL: See Note II
Y1, 2	KXN6207A	Receiver (includes corresponding temperature compensating capacitor C82 thru C85)
Y5	NXN6115A	2nd Oscillator (Lo Side) 17.445MHz
	or NXN6116A	2nd Oscillator (Hi Side) 18.355MHz
Y101, 102	KXN6206A	Transmitter (includes corresponding temperature compensating capacitor C101, 102)
	NONREFERENCED ITEMS	
	0300114445	SCREW, Slotted; 4-40 × 3/16"
	0300139939	SCREW, Phillips; 2-56 × 3/16"
	0200007007	NUT
	0105950G22	BRACKET, Switch; for S202
	0705196A02	SUPPORT, Crystal Mounting
	1400861196	INSULATOR, for Q105
	1405880G01	INSULATOR, for L7
	1482590G01	INSULATOR, Crystal; for Y1, Y2, Y5, Y101, and Y102
	2282218J03	PIN, Circuit Board Connector
	2605160J01	HEAT SINK, for Q106 (5W models)
	or 2605190J01	HEAT SINK, for Q106 (2W models)
	2605820D07	SHIELD, Coil can; for L1 thru L4, L16, L17, L106 thru L109, L111, and L114
	2682671D21	SHIELD, Coil can; for L118 and L119
	2683080J01	SHIELD, Coil can; for L5
	2605188L01	HEAT SINK, for Q105
	2982204J02	TERMINAL PIN
	4305209J01	STANDOFF, Circuit Board
	4383168D07	SPACER, Threaded
	7505295B02	PAD, for FL1
	7505506D06	PAD, Module; for U1[illegible]
	7505506D10	PAD, Module; for U2 and U3
	7505506D11	PAD, Module; for U101
	8405639M01	CIRCUIT BOARD

NOTES:

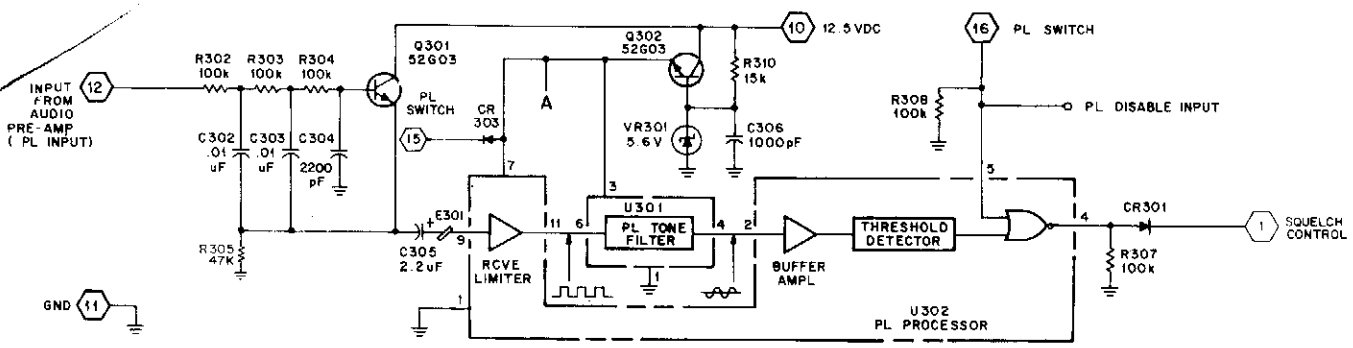
I. For optimum performance, order replacement diodes, transistors, integrated circuits, and hybrid modules by Motorola part number only.

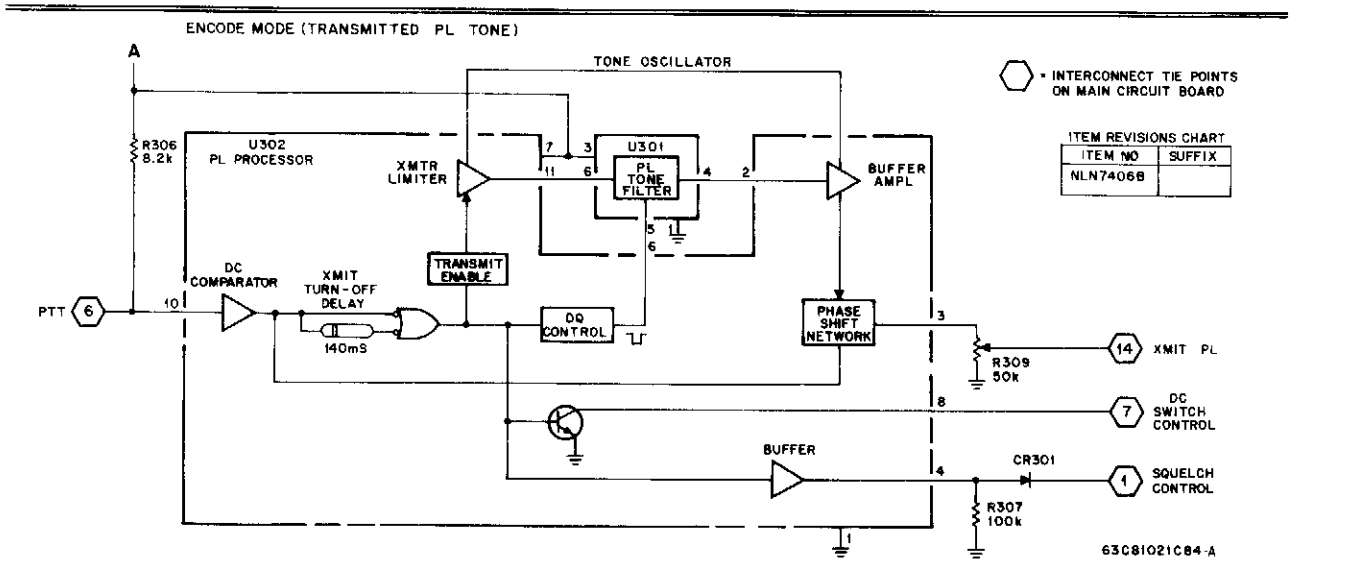
II. When ordering crystal units, specify carrier frequency(s), crystal frequency(s), and crystal part number.

BACK-DATING INFORMATION

TPLF-3209-A

ITEM NO.	REF. SYMBOL / CHANGES		CHANGED TO
NUD6421A NUD6431A	L122 WAS 2505691G15, 3.0uH		NUD6421A-1 NUD6431A-1
NUD6422A	ADDED C86		NUD6422A-1
NUD6431A-1	C132 WAS 2105454G60; 4.3pF C135 WAS 2105455G45; 8.2pF L117 WAS 2483203B14; 4½ turns		NUD6431A-2
NUD6421A-1 NUD6422A-1 NUD6423A NUD6431A-2 NUD6432A NUD6433A	R201 WAS 0105953G80; Pot.; 25kΩ R202 WAS 0105953G77; Pot.; 25kΩ **NOTE:** Items were changed to "B" suffix due to mechanical changes only.		NUD6421B NUD6431B NUD6423B NUD6431B NUD6432B NUD6433B
NUD6421B NUD6422B NUD6423B NUD6431B NUD6432B NUD6433B NUD6682B	ADDED L201	Part of R201; S203-4 to tie point 15	NUD6421B-1 NUD6422B-1 NUD6423B-1 NUD6431B-1 NUD6432B-1 NUD6433B-1 NUD6682B-1
NUD6421B-1 NUD6422B-1 NUD6423B-1 NUD6431B-1 NUD6432B-1 NUD6433B-1 NUD6682B-1	R203 WAS 1805690G03 C79 WAS 2305499G19 CR109 WAS 4882466H13		NUD6421B-2 NUD6422B-2 NUD6423B-2 NUD6431B-2 NUD6432B-2 NUD6433B-2 NUD6682B-2
NUD6421B-2 NUD6422B-2 NUD6423B-2 NUD6431B-2 NUD6432B-2 NUD6433B-2 NUD6682B-2	NEW CIRCUIT BOARD		NUD6421B-3 NUD6422B-3 NUD6423B-3 NUD6431B-3 NUD6432B-3 NUD6433B-3 NUD6682B-3
NUD6421B-3 NUD6422B-3 NUD6423B-3 NUD6431B-3 NUD6432B-3 NUD6433B-3 NUD6682B-3	C1,6,66,67,72,159, 161 thru 164 WERE 2105455G01; 100 ÷ 10%; 50V; N2200 C52 WAS 2305499G04; 2.2uF ± 20%; 16V C56, 109 WERE 2105228K01; .047uF ± 10%; 25V C144 WAS 2083201B02; 8-60pF (M) or 2083201B06; 4-40pF (L,H) VR103 WAS 4805189E02; 7.5V J203 WAS 0900855268		NUD6241B-4 NUD6422B-4 NUD6423B-4 NUD6431B-4 NUD6432B-4 NUD6433B-4 NUD6682B-4
NUD6421B-4 NUD6422B-4 NUD6423B-4 NUD6431B-4 NUD6432B-4 NUD6433B-4 NUD6682B-4	AS SHOWN		





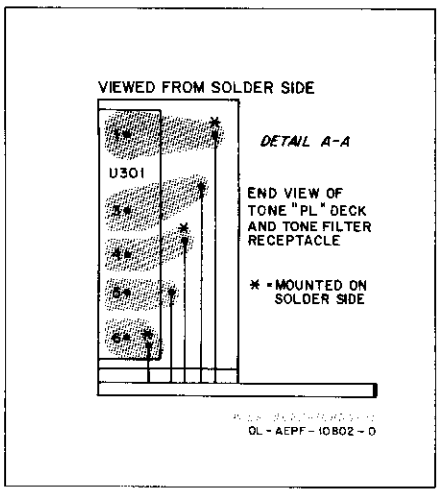
PL TEST MEASUREMENTS CHART

PIN NO.	ENCODE		DECODE	
	DC VOLTS	AC VOLTS	DC VOLTS	AC VOLTS
PL PROCESSOR (U302)				
2	1.7	100mVrms (2)	1.7	160mVrms (2)
3	0	350mVrms (2)	0	–
4	3.0	–	0.5 (OPEN) 3.0 (CLOSED)(1)	–
6	4.8 (3)	–	4.8 (3)	–
7	4.9 (3)	–	4.9 (3)	–
8	1.5	–	12.0	–
9	1.9 (TYPICAL)	–	1.9 (TYPICAL)	120mVrms (TYPICAL)
10	1.0		1.0	–
11	4.7 (3)	150mVrms (2)	4.5 (3)	300mVrms (2)
PL TONE FILTER (U301)				
3	4.9 (3)	–	4.9 (3)	–
4	1.7	100mVrms (2)	1.7	160mVrms (2)
5	4.8 (3)	–	4.8 (3)	–
6	4.7 (3)	150mVrms (2)	4.5 (3)	300mVrms (2)
LOW-PASS FILTER (Q301 CIRCUIT) – DECODE ONLY				
MONITOR POINT			**DC VOLTS**	**AC VOLTS**
R301 (INTERCONNECT POINT 12)			2.3 (TYPICAL)	95mVrms (TYPICAL)
BASE OF Q301			2.2 (TYPICAL)	–
EMITTER OF Q301			1.7 (TYPICAL)	120mVrms (TYPICAL)

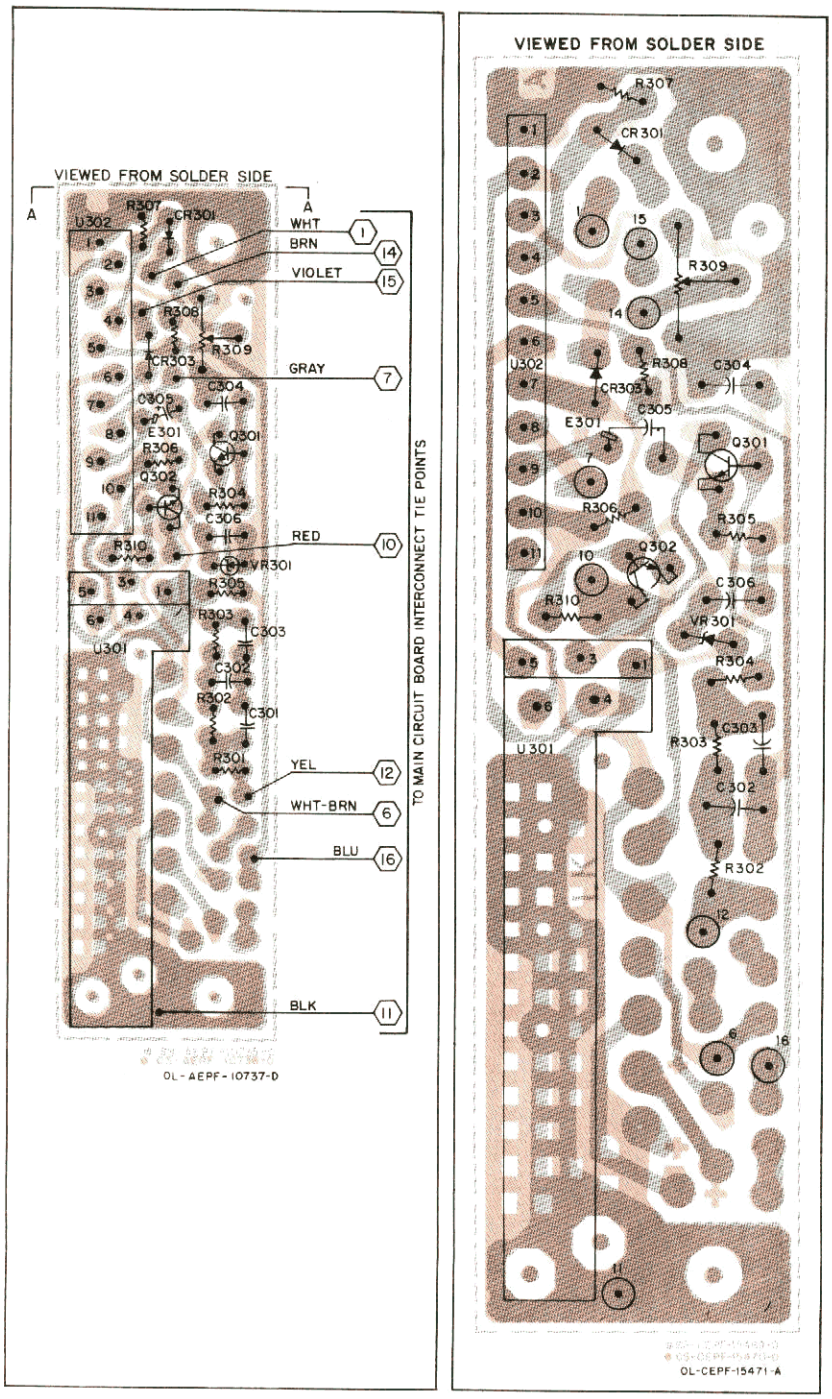
TEST MEASUREMENTS ARE NOMINAL. DC VOLTAGES ARE WITH 12.5VDC POWER SUPPLY AND AC VOLTAGES ARE WITH RADIO FULLY QUIETED AND 0.5kHz DEVIATION (PL TONE FILTER – 192.8Hz) ON GENERATOR. PL SWITCH IS ON OR OFF AND NO CARRIER INPUT.

NUMBERS IN ( ) REFER TO THE FOLLOWING NOTES:

(1) PL SWITCH ON.
(2) DEPENDS ON PL TONE FILTER U302. TYPICAL VALUES GIVEN ARE WITH 192.8Hz PL TONE FILTER.
(3) VALUES GIVEN ARE TYPICAL. THEY DEPEND ON THE ZENER REGULATOR OUTPUT VOLTAGE WHICH LIES BETWEEN 4.50V MIN. AND 5.30V MAX.



CIRCUIT BOARD DETAIL



NLN7406A **NLN7406B**

PL SQUELCH SENSITIVITY CHECK

1. SET THE PL/SQUELCH CONTROL SWITCH (S203/R201) FULLY COUNTERCLOCKWISE PAST DETENT TO THE PL ON POSITION.
2. APPLY AN ON-FREQUENCY CARRIER SIGNAL FROM THE SIGNAL GENERATOR WITH THE PROPER PL TONE, AT ±0.5kHz DEVIATION.
3. THE SQUELCH CIRCUIT SHOULD OPEN WHEN THE SIGNAL GENERATOR OUTPUT IS INCREASED ABOVE 0.18uV (VHF) OR 0.25uV (UHF).

TEPF-10794-O

NLN7406B Tone "Private-Line" Deck TPLF-3124-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed: pF ± 5%; 50V unless stated
C301	-----	Not Used
C302, 303	2184008H16	.01uF
C304	2105453G28	2200
C305	2305499G04	2.2uF ± 20%; 16V
C306	21055457G09	100 ± 10%; 63V
		DIODE: See Note
CR301, 303	4883654H01	Silicon
E301	7683960B04	**FERRITE BEAD**
		TRANSISTOR: See Note
Q301, 302	4805452G03	NPN; type LM9014D
		RESISTOR, Fixed: Ω ± 5%; ⅛W unless stated
R301	-----	Not Used
R302 303, 304	0605886D09	100k ± 1%
R305	0660075C89	47k
R306	0660075C71	8.2k
R307, 308	0660075C97	100k
R309	1805157J01	Pot., 50k ± 10%
R310	0660075C77	15k
		HYBRID MODULE: See Note
U301	NFN6010A	PL Tone Filter (not part of PL kit)
U302	5105144J15	PL Processor
		DIODE: See Note
VR301	4805189E03	Zener, 5.6V
NONREFERENCED ITEMS		
	0300138028	SCREW, Slotted; 2-56 × 5/32" with LOCKWASHER
	0705699J01	BRACKET
	0905287C07	SOCKET, Printed Circuit
	0905604C06	SOCKET, Spring
	0905648F01	RECEPTACLE, Tone Filter
	8405335E01	CIRCUIT BOARD, Tone Filter
	8405610L02	CIRCUIT BOARD, Tone PL

NOTE: For optimum performance, order replacement diodes, transistors, and hybrid modules by Motorola part number only.

BACK-DATING INFORMATION TPLF-3205-A

ITEM NO.	REF. SYMBOL / CHANGES	LOC.	CHANGED TO
NLN7406A	L302, 303 DELETED; WAS 2482723H04; 0.29uH E301 ADDED		NLN7406A-1
NLN7406A-1	L301 DELETED; WAS 2482723H04; 0.29uH	Between anode of CR301 and wire to tie point 15	NLN7406A-2
NLN7406A-2	C301 DELETED; WAS 4883654H01; 0.1uF R301 DELETED; WAS 0660075C83; 27k R305 WAS 060075C77; 15k NEW CIRCUIT BOARD	PL input to R302/ C302	NLN7406B
NLN7406B	L301 DELETED; WAS 2482723H04; 0.29uH	Between anode of CR301 and tie point 15	NLN7406B-1
NLN7406B-1	AS SHOWN		

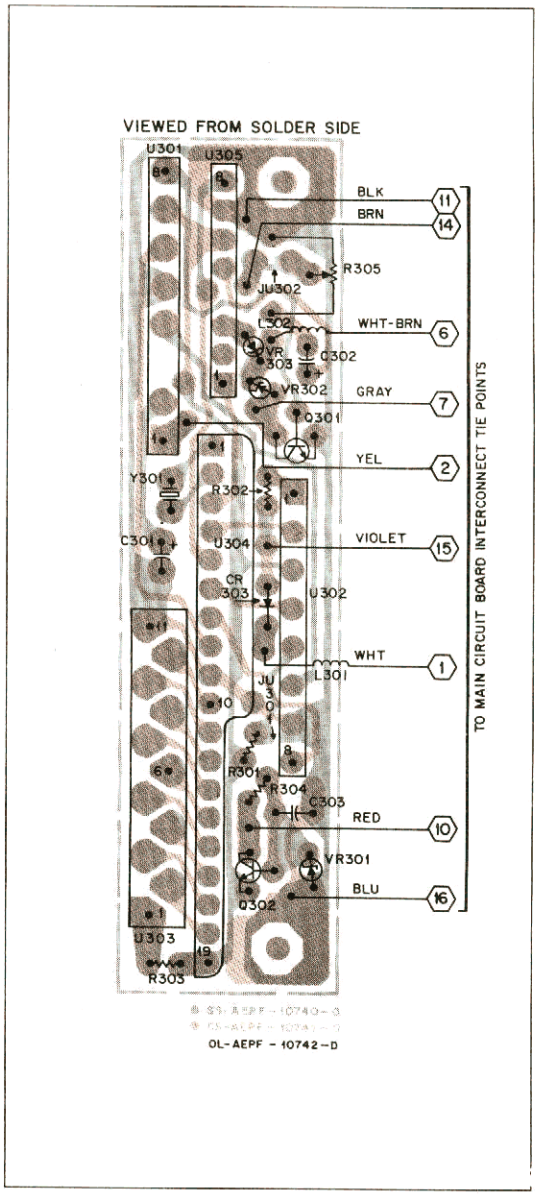
NLN7407A "Digital Private-Line" Deck

TPLF-1880-F

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed:
C301, 302	2305499G16	10uF ± 20%; 16V
C303	2105457G09	1000pF ± 10%; 63V
		DIODE: See Note
CR303	4883654H01	Silicon
CR301, 302		Not Used
		COIL:
L301, 302	2482723H04	0.29uH Choke
		TRANSISTOR: See Note
Q301	4800869642	NPN; type M9642
Q302	4805452G03	NPN; type LM9014D
		RESISTOR, Fixed: Ω ± 5%; ⅛W unless stated
R301	0660075C97	100k
R302	0660075C73	10k
R303	0660075C89	47k
R304	0660075C77	15k
R305	1805157J01	Pot., 50k ± 10%
		HYBRID MODULE: See Note
U301	5105337F05	Decode Filter
U302	5105337F06	Data Clock
U303	NLN5762A	Code Plug (not part of DPL kit)
U304	5105337F17	Digital Processor
U305	5105337F10	Encode Filter
		DIODE: See Note
VR301	4805189E03	Zener, 5.6V
VR302, 303	4882256C44	Zener, 7.5V
		CRYSTAL:
Y301	4882656M01	50kHz
NONREFERENCED ITEMS		
	0300139982	SCREW, Slotted; 2-56 × 5/32"
	0400008406	LOCKWASHER
	0705699J01	BRACKET
	0905287C07	SOCKET, Printed Circuit
	1405621L01	CRYSTAL BOOT
	4205175E02	RETAINER, Spacer
	7505506D10	PAD, Module (for U301)
	7505506D13	PAD, Module (for U304)
	7505506D14	PAD, Module (for U302)
	8405700J01	CIRCUIT BOARD

NOTE: For optimum performance, order replacement diodes, transistors, and hybrid modules by Motorola part number only.

CIRCUIT BOARD DETAIL



PL SQUELCH SENSITIVITY CHECK

1. **SET THE PL/SQUELCH CONTROL SWITCH (S203/R201) FULLY COUNTERCLOCKWISE PAST DETENT TO THE PL ON POSITION.**
2. **APPLY AN ON-FREQUENCY CARRIER SIGNAL FROM THE SIGNAL GENERATOR WITH THE PROPER PL TONE, AT ±0.5kHz DEVIATION.**
3. **THE SQUELCH CIRCUIT SHOULD OPEN WHEN THE SIGNAL GENERATOR OUTPUT IS INCREASED ABOVE 0.18uV (VHF) OR 0.25uV (UHF).**

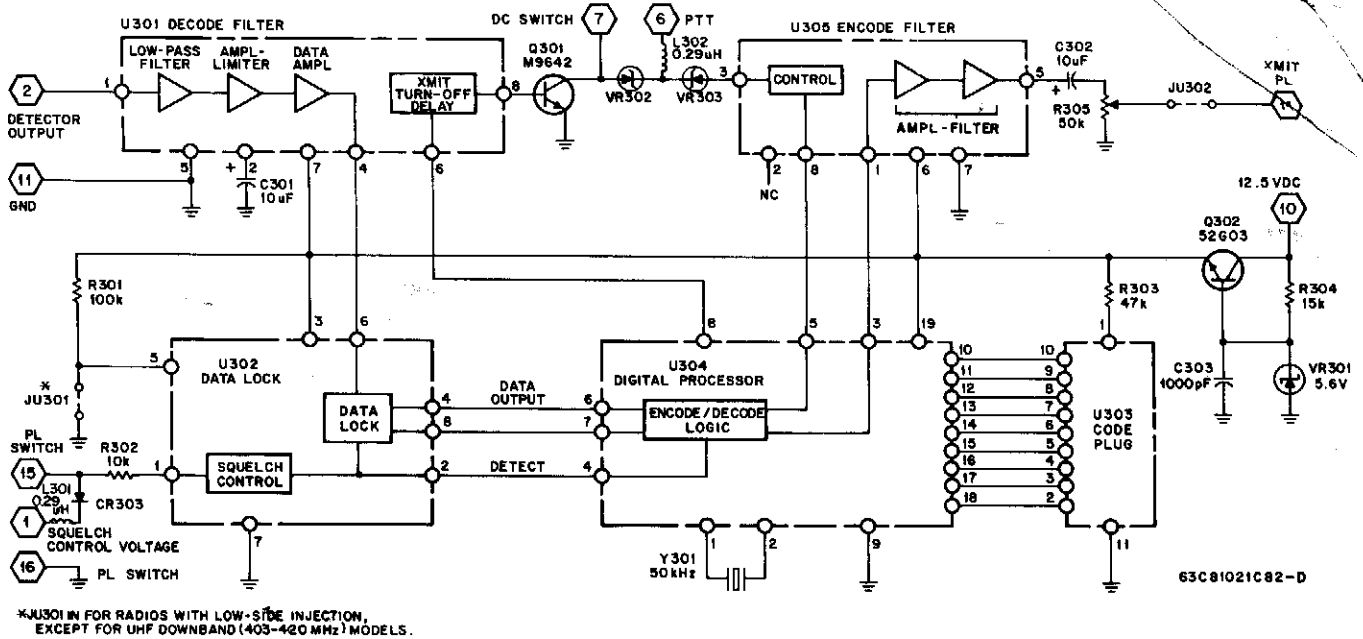
TEPF-10794-O

BACK-DATING INFORMATION

TPLF-3365-O

ITEM NO.	REF. SYMBOL/CHANGES	LOC.	CHANGED TO
NLN7407A	L302 ADDED		NLN7407A-1
NLN7407A-1	CR301 (WAS 4883654H01) REPLACED BY VR303		NLN7407A-2
NLN7407A-2	AS SHOWN		

SCHEMATIC DIAGRAM



*JU301 IN FOR RADIOS WITH LOW-SIDE INJECTION, EXCEPT FOR UHF DOWNBAND (403-420 MHz) MODELS.

DPL TEST MEASUREMENTS CHART

PIN NO.	ENCODE VOLTAGE	ENCODE WAVEFORM	DECODE VOLTAGE	DECODE WAVEFORM
DECODE FILTER U301				
1	0 Vdc	- - -	2.3 Vdc	- - -
2	0.14 Vdc	- - -	2.3 Vdc	- - -
4	5.0 Vdc	- - -	- - -	5.0 V p-p (1)
6	5.0 Vdc	- - -	0 Vdc	- - -
7	5.0 Vdc	- - -	5.0 Vdc	- - -
8	0.79 Vdc	- - -	0 Vdc	- - -
DATA LOCK U302				
1	5.0 Vdc	- - -	0Vdc	- - -
2	0. Vdc	- - -	5.0Vdc	- - -
3	5.0 Vdc	- - -	5.0 Vdc	- - -
4	1.0 Vdc	5.0 V p-p at 100 Hz	- - -	5.0 V p-p (1)
5	0 Vdc (4)	- - -	0 Vdc (4)	- - -
6	5.0 Vdc	- - -	- - -	5.0 V p-p (1)
8	- - -	5.0 V p-p, 537 Hz Pulse Train	- - -	5.0 V p-p, 537 Hz Pulse Train
CODE PLUG U303				
1	5.0 Vdc	- - -	5.0 Vdc	- - -
2 thru 10	0 Vdc (2)	- - -	0 Vdc (2)	- - -

PIN NO.	ENCODE VOLTAGE	ENCODE WAVEFORM	DECODE VOLTAGE	DECODE WAVEFORM
DIGITAL PROCESSOR U304				
1	2.75 Vdc	- - -	2.75 Vdc	- - -
2	- - -	0.5 V p-p at 50 kHz	- - -	0.5 V p-p at 50 kHz
3	2.4 Vdc	5.0 V p-p (3)	2.0 Vdc	- - -
4	0 Vdc	- - -	0 Vdc	- - -
5	5.0 Vdc	- - -	0 Vdc	- - -
6	1.0 Vdc	5.0 V p-p at 100 Hz	- - -	5.0 V p-p (1)
7	- - -	5.0 V p-p, 537 Hz Pulse Train	- - -	5.0 V p-p, 537 Hz Pulse Train
8	5.0 Vdc	- - -	0 Vdc	- - -
10 thru 18	0 Vdc (2)	- - -	0 Vdc (2)	- - -
19	5.0 Vdc	- - -	5.0 Vdc	- - -
ENCODE FILTER U305				
1	2.4 Vdc	5.0 V p-p (3)	2.0 Vdc	- - -
2	2.0 Vdc	- - -	2.0 Vdc	- - -
3	0.88 Vdc	- - -	5.0 Vdc	- - -
5	2.0 Vdc	1.2 V p-p (3)	2.0 Vdc	- - -
6	5.0 Vdc	- - -	5.0 Vdc	- - -
8	5.0 Vdc	- - -	0 Vdc	- - -

*TEST MEASUREMENTS ARE NOMINAL; PL SWITCH ON OR OFF AND NO CARRIER INPUT. NUMBERS IN ( ) REFER TO THE FOLLOWING NOTES:

(1) DIGITAL WAVEFORM.
(2) CODE PLUG REMOVED.
(3) RANDOM DIGITAL DPL WAVEFORM; CHANGES TO 135 Hz WAVEFORM ON DEKEY OF PTT SWITCH.
(4) JU301 SHORTED (5.0 VDC IF JU301 IS OPEN).

EPF-10739-B