

THIS MANUAL APPLIES TO THE FOLLOWING MODELS:
H23BAC, H23BAM, P33BAC, AND P33BAM

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MOTOROLA



"Handie-Talkie"® Radiophone

FM Two-Way Radio

136 -174 MC 1 & 3-5 W RF POWER

MANUAL 68P81005A40-E



MOTOROLA H.T. FM RADIO TELE.

MOTOROLA

HANDIE-TALKIE

FM TWO-WAY RADIO

1 & 3-5 W RF POWER

136-174 MC

PORTABLE

TRANSISTORIZED



"H" SERIES WITH SPEAKER,
MICROPHONE AND RECHARGEABLE
NICKEL-CADMIUM 6/12 VOLT
POWER PACK



"H" SERIES WITH HANDSET AND
STANDARD BATTERY POWER PACK



"P" SERIES WITH SPEAKER,
MICROPHONE AND RECHARGEABLE
NICKEL-CADMIUM 6/12 VOLT
POWER PACK

NAD6121A AND
NAD6122A ANTENNA

CE1040E

CE2090B

CE2090C

AEPD-6154-O (CE1040D)



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Engineering Publications

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GUARANTEED PERFORMANCE SPECIFICATIONS

GENERAL

RADIOPHONE MODEL	H23 Series			P33 Series	
FREQUENCY	136-174 MC			144-174 MC	
POWER SUPPLY	Standard Dry Cell (2) "D" Cells (1.5 v) (2) Z4; 724 or A4 Cell (6 v) (2) K45 or 457 Cells (67.5 v)	Extra-Duty Dry Cell (1) 4D Cell (1.5 v) (1) F4P1 or 744 Cell (6 v) (2) V45 or 467 Cells (67.5 v)	Nickel-Cadmium--6/12 Volt Rechargeable Nickel-Cadmium Wet Cell 6 Volt--4 ampere hours	Extra-Duty Dry Cell (3) M30 or 482 Cells (45 v) -- (2) F4P1 or 744 Cell (6.0 v) (1) 2F Cell (1.5 v) -- (1) Z30 or 738 Cell (45 v)	Nickel-Cadmium--6/12 Volt Rechargeable Nickel-Cadmium Wet Cell, 6 volt--(2) 4 ampere-hour batteries
DIMENSIONS (overall, excluding antenna) a. 1-Freq. & 2-Freq. Transmitter Models b. 2-Transmitter Models	11-7/8" x 3-1/8" x 8-1/2" 11-7/8" x 3-1/8" x 9-5/8"	11-7/8" x 3-1/8" x 10-1/8"* 11-7/8" x 3-1/8" x 11-1/4"*	11-7/8" x 3-1/8" x 10-1/8"* 11-7/8" x 3-1/8" x 11-1/4"*	11-7/8" x 4-7/16" x 13-7/8" 11-7/8" x 4-7/16" x 16-5/8"	11-7/8" x 4-7/16" x 13-7/8" 11-7/8" x 4-7/16" x 16-5/8"
WEIGHT (total) a. 1-Freq. & 2-Freq. Transmitter Models b. 2-Transmitter Models	7 lbs., 11 ozs. 8 lbs., 12 ozs.	9 lbs., 11 oz.* 10 lbs., 9 oz.*	11 lbs., 1 oz.* 12 lbs., 1 oz.*	19 lbs., 2 ozs. 21 lbs., 2 ozs.	18 lbs., 9 ozs. 20 lbs., 9 ozs.
POWER INPUT	Handset Models .12 w rcvr standby .15 w rcvr operate 8.5 w transmit	Speaker-Mic. Models .17 w rcvr standby .75 w rcvr operate 8.5 w transmit	Handset Models .13 w rcvr standby .17 w rcvr operate 15 w transmit	Speaker-Mic. Models .19 w rcvr standby .96 w rcvr operate 15 w transmit	.17 w rcvr standby .75 w rcvr operate 27 w transmit .19 w rcvr standby .96 w rcvr operate 54 w transmit

*Units with 300 mw loudspeaker and microphone operation are 3/4" less in height and have approximately the same weight.

TRANSMITTER

CHASSIS MODEL	NTD6000A Series			NTD6000A Series with NLD6020A/NLD6040A/NU143A Series Power Amplifier	
RF POWER OUTPUT	1.0 watt at full battery voltage (135 volts) 0.8 watts at nominal battery voltage (120 volts)			3 watts at 162 volts (extra duty dry cell) 4 watts at 180 volts (extra duty dry cell) 5 watts at 240 volts (Nickel-Cadmium cell)	
POWER INPUT	55 ma at 120 volts 875 ma at 1.3 volts 114 ma at -5.2 volts (mic and relay current)			55 ma at 120 volts 95 ma at 160 volts 875 ma at 1.3 volts 714 ma at -5.2 volts	
CRYSTAL MULTIPLICATION	24 times			24 times	
SPURIOUS AND HARMONIC EMISSIONS	more than 50 db below carrier			more than 60 db below carrier	
TUBE AND TRANSISTOR COMPLEMENT	1AD4 -- oscillator 1AD4 -- modulator 1AD4 -- tripler	1AD4 -- doubler 1AD4 -- doubler 6397 -- doubler-driver	(2) 6397 -- final amplifier 1 transistor -- IDC ampl and clipper	1AD4 -- oscillator 1AD4 -- modulator 1AD4 -- tripler	1AD4 -- doubler 6397 -- doubler (2) 6397 -- driver 2E24 -- final amplifier 1 transistor -- IDC ampl and clipper
FREQUENCY STABILITY	±.0025% from -30°C to +60°C (+25°C reference)			±.0005% from -30°C to +60°C (+25°C reference)	
AUDIO RESPONSE	within +1, -3 db of 6 db/octave pre-emphasis from 300 to 3000 cps			within +1, -3 db of 6 db/octave pre-emphasis from 300 to 3000 cps	
MODULATION	36F3: ±15 kc for 100% at 1000 cps	16F3: ±5 kc for 100% at 1000 cps		36F3: ±15 kc for 100% at 1000 cps	16F3: ±5 kc for 100% at 1000 cps
FM NOISE	at least 40 db below ±10 kc deviation at 1000 cps		at least 30 db below ±3.3 kc deviation at 1000 cps	at least 40 db below ±10 kc deviation at 1000 cps at least 30 db below ±3.3 kc deviation at 1000 cps	
AUDIO DISTORTION	less than 6% at 1000 cps: ±10 kc deviation		less than 6% at 1000 cps: ±3.3 kc deviation	less than 6% at 1000 cps: ±10 kc deviation less than 6% at 1000 cps: ±3.3 kc deviation	

RECEIVER

CHASSIS MODEL	NRD1080A Series for handset operation NRD1090A Series for speaker-mic operation			NRD1090A Series for speaker-mic operation	
CHANNEL SPACING	60 kc	30 kc	60 kc	30 kc	30 kc
MODULATION ACCEPTANCE	±15 kc		±5 kc	±15 kc	±5 kc
SELECTIVITY	more than 80 db at ±60 kc		more than 80 db at ±30 kc	more than 80 db at ±60 kc	more than 80 db at ±30 kc
TUNED CIRCUITS	29 (6 plastic-sealed in miniature "Permakay"® filter)			29 (6 plastic-sealed in miniature "Permakay" filter)	
SENSITIVITY	less than 0.7 uv for 20 db quieting; 50 ohms r-f input impedance			less than 0.7 uv for 20 db quieting; 50 ohms r-f input impedance	
FREQUENCY STABILITY	±.0025% from -30°C to +60°C (+25°C reference)			±.0025% from -30°C to +60°C (+25°C reference)	
SPURIOUS AND IMAGE REJECTION	more than 60 db down for all except (f -227.5 kc) which is 50 db down			more than 60 db down for all except (f -227.5 kc) which is 50 db down	
SQUELCH SENSITIVITY	adjustable, will open at less than 0.35 uv			adjustable, will open at less than 0.35 uv	
NUMBER OF TRANSISTORS AND DIODES	11 transistors and 7 diodes (1-freq. handset models) 12 transistors and 8 diodes (2-freq. handset models) 13 transistors and 7 diodes (1-freq. speaker-mic models) 14 transistors and 8 diodes (2-freq. speaker-mic models)			13 transistors and 7 diodes (1-freq. models) 14 transistors and 8 diodes (2-freq. models)	
NOMINAL POWER INPUT	Dry Batteries 20 ma at -5.2 volts (squelched) - handset model 26 ma at -5.2 volts (squelched) - speaker-mic model 8 ma at 1.3 volts	Nickel-Cadmium Batteries 21 ma at 6 volts (squelched) - handset model 31 ma at 6 volts (squelched) - speaker-mic model		Dry Batteries 26 ma at 5.2 volts (squelched)	Nickel-Cadmium Batteries 31 ma at 6 volts (squelched)
AUDIO OUTPUT	3 mw at less than 10% distortion for handset operation 300 mw at less than 10% distortion for speaker-mic operation			300 mw at less than 10% distortion	

Crystal filter for reduction of spurious responses, intermodulation and desensitizing available as an optional feature.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

FCC LICENSE DESIGNATION: "H" Series: CC3502
"P" Series: CC3500

MOTOROLA

MODEL CHART
FOR
CARRIER SQUELCH
136-174 MC "HANDIE-TALKIE"
RADIOPHONES

CODE:

- ☑ = ITEMS INCLUDED WITH RADIO SET DEPENDING ON FREQUENCY.
- ☒ = ITEMS INCLUDED WITH RADIO SET.
- ② = TWO ITEMS INCLUDED WITH RADIO SET.
- ① = ONE ITEM SUPPLIED WITH FIVE (OR LESS) RADIO SETS.
- ⊗ = TWO ITEMS INCLUDED WITH RADIO SET DEPENDING ON FREQUENCY.

*REPRESENTS A SERIES OF MODELS AND NOT A SPECIFIC MODEL. THE SPECIFIC MODEL, AS STAMPED ON THE CHASSIS, IS DETERMINED BY ITS APPLICATION.

ITEM	DESCRIPTION				ITEM	DESCRIPTION	REFERENCE DIAGRAM
	XMTR. FREQS.	RCVR. FREQS.	CHANNEL SPACING	POWER TYPES			
H23BAC-1000AH	1	1	60 KC	STD. DRY BAT.	ND1080AA*	RECEIVER UNIT (1-FREQ.) W/3 MW AUDIO OUTPUT 60 KC CHANNEL SPACING	63E81005A41
" -1001AH	1	1	60 KC	HVY. DUTY BAT.	ND1080AB*	RECEIVER UNIT (1-FREQ.) W/3 MW AUDIO OUTPUT 30 KC CHANNEL SPACING	63E81005A41
" -1010AH	2	1	60 KC	STD. DRY BAT.	ND1090AA*	RECEIVER UNIT (1-FREQ.) W/300 MW AUDIO OUTPUT 60 KC CHANNEL SPACING	63E81005A41
" -1011AH	2	1	60 KC	HVY. DUTY BAT.	ND1090AB*	RECEIVER UNIT (1-FREQ.) W/300 MW AUDIO OUTPUT 30 KC CHANNEL SPACING	63E81005A41
" -1031AH	2	2	60 KC	HVY. DUTY BAT.	ND1080AC*	RECEIVER UNIT (2-FREQ.) W/3 MW AUDIO OUTPUT 60 KC CHANNEL SPACING	63E81005A41
" -1060AH	2	1	60 KC	STD. DRY BAT.	ND1080AD*	RECEIVER UNIT (2-FREQ.) W/3 MW AUDIO OUTPUT 30 KC CHANNEL SPACING	63E81005A41
" -1100AH	1	1	30 KC	STD. DRY BAT.	ND1090AC*	RECEIVER UNIT (2-FREQ.) W/300 MW AUDIO OUTPUT 60 KC CHANNEL SPACING	63E81005A41
" -1101AH	1	1	30 KC	HVY. DUTY BAT.	ND1090AD*	RECEIVER UNIT (2-FREQ.) W/300 MW AUDIO OUTPUT 30 KC CHANNEL SPACING	63E81005A41
" -1110AH	2	1	30 KC	STD. DRY BAT.	ND6000AA	TRANSMITTER UNIT (1-FREQ.) 136-150.8 MC	63E856910
" -1111AH	2	1	30 KC	HVY. DUTY BAT.	ND6000AB	TRANSMITTER UNIT (1-FREQ.) 150.8-174 MC	63E856910
" -1131AH	2	2	30 KC	HVY. DUTY BAT.	ND6000AC	TRANSMITTER UNIT (2-FREQ.) 136-150.8 MC	63E856910
" -1160AH	2	1	30 KC	STD. DRY BAT.	ND6000AD	TRANSMITTER UNIT (2-FREQ.) 150.8-174 MC	63E856910
" -1001AM	1	1	60 KC	HVY. DUTY BAT.	ND6020A	POWER AMPLIFIER UNIT (TRANSMITTER), 136-150.8 MC	63E856910
" -1011AM	2	1	60 KC	HVY. DUTY BAT.	ND6020B	POWER AMPLIFIER UNIT (TRANSMITTER), 150.8-174 MC	63E856910
" -1031AM	2	2	60 KC	HVY. DUTY BAT.	ND6021A	POWER SUPPLY (LESS BATTERIES) "H" SERIES STD DRY BATTERIES	63E81005A44
" -1061AM	2	1	60 KC	HVY. DUTY BAT.	ND6021B	POWER SUPPLY (LESS BATTERIES) "H" SERIES EXTRA DUTY DRY BATTERIES	63E81005A44
" -1101AM	1	1	30 KC	HVY. DUTY BAT.	ND6022A	POWER SUPPLY (LESS BATTERIES) "P" SERIES DRY BATTERIES	63E81005A44
" -1111AM	2	1	30 KC	HVY. DUTY BAT.	ND6022B	POWER SUPPLY (LESS BATTERIES) "P" SERIES EXTRA DUTY DRY BATTERIES	63E81005A44
" -1131AM	2	2	30 KC	HVY. DUTY BAT.	ND6023A	BATTERY KIT (DRY BATTERIES FOR NP6022A POWER SUPPLY)	63E81005A44
" -1161AM	2	1	30 KC	HVY. DUTY BAT.	ND6023B	BATTERY KIT (DRY BATTERIES FOR NP6022A POWER SUPPLY)	63E81005A44
" -1001AR	1	1	60 KC	HVY. DUTY BAT.	ND6010A	BATTERY KIT (DRY BATTERIES FOR NP6023A POWER SUPPLY)	63E81005A44
" -1101AR	1	1	30 KC	HVY. DUTY BAT.	ND6010B	POWER SUPPLY (LESS BATTERIES) "H" SERIES NICKEL-CADMIUM BATTERIES	63D81005A42
H23BAM-1001AH	1	1	60 KC	6/12 V PWR. PACK	ND6011A	POWER SUPPLY (LESS BATTERIES) "P" SERIES NICKEL-CADMIUM BATTERIES	63D81005A42
" -1101AH	1	1	30 KC	6/12 V PWR. PACK	ND6011B	NICKEL-CADMIUM BATTERY KIT (1 REQ'D FOR NP6010A, 2 REQ'D FOR NP6011A)	63D81005A42 & 3
" -1001AM	1	1	60 KC	6/12 V PWR. PACK	ND6012A	TOP PANEL KIT (1-FREQ. TRANSMITTER AND RECEIVER)	63D81005A42
" -1011AM	2	1	60 KC	6/12 V PWR. PACK	ND6012B	TOP PANEL KIT (2-FREQ. TRANSMITTER, 1-FREQ. RECEIVER)	63D81005A42
" -1101AM	1	1	30 KC	6/12 V PWR. PACK	ND6013A	TOP PANEL KIT (2-FREQ. TRANSMITTER, 1-FREQ. RECEIVER)	63D81005A42
" -1111AM	2	1	30 KC	6/12 V PWR. PACK	ND6013B	TOP PANEL KIT (2-FREQ. TRANSMITTER, 2-FREQ. RECEIVER)	63D81005A42
P33BAC-1001AM	1	1	60 KC	HVY. DUTY BAT.	NGN6021A	CONTROL PANEL ("H" SERIES 1-FREQ. XMITR., 1-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1011AM	2	1	60 KC	HVY. DUTY BAT.	NGN6021B	CONTROL PANEL ("H" SERIES 2-FREQ. XMITR., 1-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1031AM	2	2	60 KC	HVY. DUTY BAT.	NGN6022A	CONTROL PANEL ("H" SERIES TWO 1-FREQ. XMITRS., 1-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1061AM	2	1	60 KC	HVY. DUTY BAT.	NGN6022B	CONTROL PANEL ("H" SERIES 1-FREQ. XMITR., 1-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1101AM	1	1	30 KC	HVY. DUTY BAT.	NGN6023A	CONTROL PANEL ("P" SERIES 1-FREQ. XMITR., 1-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1111AM	2	1	30 KC	HVY. DUTY BAT.	NGN6023B	CONTROL PANEL ("P" SERIES 2-FREQ. XMITR., 1-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1131AM	2	2	30 KC	HVY. DUTY BAT.	NGN6024A	CONTROL PANEL ("P" SERIES 2-FREQ. XMITR., 1-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1161AM	2	1	30 KC	HVY. DUTY BAT.	NGN6024B	CONTROL PANEL ("P" SERIES TWO 1-FREQ. XMITRS., 1-FREQ. RCVR., SPR. & MIC.)	63D81005A46
P33BAM-1001AM	1	1	60 KC	6/12 V PWR. PACK	NGN6031A	CONTROL PANEL ("H" SERIES 2-FREQ. XMITR., 2-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1011AM	2	1	60 KC	6/12 V PWR. PACK	NGN6031B	CONTROL PANEL ("H" SERIES 1-FREQ. XMITR., 2-FREQ. RCVR., SPR. & MIC.)	63D81005A46
" -1061AM	2	1	60 KC	6/12 V PWR. PACK	NGN6032A	HOUSING AND HARDWARE ("H" SERIES 2-FREQ. XMITR., 1-FREQ. RCVR.)	63D81005A46
" -1101AM	1	1	30 KC	6/12 V PWR. PACK	NGN6032B	HOUSING AND HARDWARE ("H" SERIES 1-FREQ. XMITR., 1-FREQ. RCVR.)	63D81005A46
" -1111AM	2	1	30 KC	6/12 V PWR. PACK	NGN6033A	HOUSING AND HARDWARE ("H" SERIES TWO 1-FREQ. XMITRS., 1-FREQ. RCVR.)	63D81005A46
" -1131AM	2	2	30 KC	6/12 V PWR. PACK	NGN6033B	HOUSING AND HARDWARE ("H" SERIES 1-FREQ. XMITR., 1-FREQ. RCVR.)	63D81005A46
" -1161AM	2	1	30 KC	6/12 V PWR. PACK	NGN6034A	HOUSING AND HARDWARE ("H" SERIES TWO 1-FREQ. XMITRS., 1-FREQ. RCVR.)	63D81005A46
P33BAM-1001AM	1	1	60 KC	6/12 V PWR. PACK	NGN6034B	HOUSING AND HARDWARE ("H" SERIES 1-FREQ. XMITR., 1-FREQ. RCVR.)	63D81005A46
" -1011AM	2	1	60 KC	6/12 V PWR. PACK	NGN6035A	HOUSING AND HARDWARE ("P" SERIES 2-FREQ. XMITR., 1-FREQ. RCVR.)	63D81005A46
" -1061AM	2	1	60 KC	6/12 V PWR. PACK	NGN6035B	HOUSING AND HARDWARE ("P" SERIES TWO 1-FREQ. XMITRS., 1-FREQ. RCVR.)	63D81005A46
" -1101AM	1	1	30 KC	6/12 V PWR. PACK	NGN6036A	HANDSET	63D81005A46
" -1111AM	2	1	30 KC	6/12 V PWR. PACK	NGN6036B	CARRYING STRAP	63D81005A46
" -1131AM	2	2	30 KC	6/12 V PWR. PACK	NGN6037A	TUNING TOOL KIT	63D81005A46
" -1161AM	2	1	30 KC	6/12 V PWR. PACK	NGN6037B	ANTENNA (136-150.8 MC)	63D81005A46
" -1011AM	2	1	60 KC	6/12 V PWR. PACK	NGN6038A	ANTENNA (150.8-174 MC)	63D81005A46
" -1061AM	2	1	60 KC	6/12 V PWR. PACK	NGN6038B	ANTENNA (150.8-174 MC)	63D81005A46
" -1101AM	1	1	30 KC	6/12 V PWR. PACK	NGN6039A	CRYSTAL KIT (RECEIVER)	63E81005A41
" -1111AM	2	1	30 KC	6/12 V PWR. PACK	NGN6039B	CRYSTAL KIT (TRANSMITTER)	63E856910
" -1131AM	2	2	30 KC	6/12 V PWR. PACK	NGN6040A	CRYSTAL KIT (RECEIVER)	63E856910
" -1161AM	2	1	30 KC	6/12 V PWR. PACK	NGN6040B	CRYSTAL KIT (TRANSMITTER)	63E856910

*When ordering transmitter replacement crystal, refer to the following table:

EQUIPMENT MODEL NUMBER	REPLACEMENT
H23 Series	AN-1 Crystal
F33 Series	NED6000A Crystal Kit

ACCESSORY TABLE

MODEL	DESCRIPTION
NPN6012A	117 V AC Power Supply for "H" series
NPN6013A	117 V AC Power Supply for "P" series
NLN6135A	Shock Mount Rack
NLN6130A	Carrying Case for "H" series
NLN6131A	Carrying Case for "P" series
P-7208-A	RF Dummy Load for "H" series
P-7208	RF Dummy Load for "P" series
NLN6145A	Dummy Load Antenna for "H" series
NLD6060A	Dummy Load Antenna for "P" series
NKN6040A	6/12 V DC Vehicular Cable Kit for "H" series
NKN6041A	6/12 V DC Vehicular Cable Kit for "P" series
NLN6132A	Back Pack Harness complete with microphone, earpiece and volume control
NLN6133A	Back Pack Harness less microphone and earpiece
NMN6009A	Headset and Microphone
NLN6029A	Nickel-Cadmium Battery Charger
NKN6052A	Cable Kit for use in charging nickel-cadmium batteries in "H" series (NPN6010A Power Supplies)
NKN6053A	Cable Kit for use in charging nickel-cadmium batteries in "P" series (NPN6011A Power Supplies)
NLN6126A	Cushion for use with Back Pack Harnesses
NLN6136A	Cover for extra power supplies
NLN6137A	Squelch and Volume Locking Nut
NKN6042A	Antenna Extension Cable (20' RG-58/AU)
NKN6057A	12 V DC Vehicular Cable Kit for "H" Series (Ni-Cad only) Cigarette Lighter Plug-in Type
NKN6058A	12 V DC Vehicular Cable Kit for "P" Series (Ni-Cad only) Cigarette Lighter Plug-in Type
NDD6000A	Antenna, vehicle rain gutter mounting, with 10 ft. of RG-58A/U coaxial cable and connector.
TEK-13A	Battery Tester for testing dry batteries under simulated load conditions.
TEKA-28	Power Extension Cable for easy repair and/or alignment.

ACCESSORIES



117 V AC POWER SUPPLY

Model NPN6012A
For "H" Series units
Model NPN6013A
For "P" Series units

SHOCKMOUNT RACK

Model NLN6135A



CARRYING CASE

Model NLN6130A
Weather resistant case
for use with "H" Series
models only.



CARRYING CASE

Model NLN6131A
Weather resistant case
for use with "P" Series
models only.

RF DUMMY LOAD

Model P-7208
For "P" Series units
Model P-7208-A
For "H" Series units



DUMMY LOAD ANTENNA

Model NLN6145A
For "H" Series units
Model NLD6060A
For "P" Series units

6/12 V DC

VEHICULAR CABLE KIT

Model NKN6040A
For use with "H" Series
models only.

Model NKN6041A
For use with "P" Series
models only.



BACK PACK HARNESS

Model NLN6132A
Kit is complete with mi-
crophone, earpiece and
volume control.

Model NLN6133A
Same as NLN6132A less
microphone and earpiece.



HEADSET AND MICROPHONE

Model NMN6009A

NICKEL CADMIUM BATTERY CHARGER

Model NLN6029A



MC2346

MC2344

4865-6

6610-4

MC1971

7273-1

MC2345

14107-4

MC3243

MC6289

DESCRIPTION AND OPERATION

1. DESCRIPTION OF MODELS

The Motorola "Handie-Talkie" radiophone is a transistorized commercial and industrial portable communications radio set. It features greater transmitter r-f and receiver audio outputs as well as all the aspects inherent to transistors such as low drain, long life, ruggedness and greater performance. The radiophones are complete, self-powered, portable FM transmitter and receiver units for two-way communication.

This manual covers carrier squelch models operating in the 136-174 mc band. In addition Motorola also offers:

- (1) "Private-Line" radiophones operating in the 144-174 mc band.
- (2) Carrier squelch and "Private-Line" radiophones operating in the 25-54 mc band.

Two series of models are available in the "Handie-Talkie" radiophone line. The lighter weight "H" series for maximum portability and the "P" series where higher r-f power output is required. The "H" series units deliver 1.0 watt of r-f power at full battery voltage throughout the 136-174 mc band and weigh as little as 7 lbs. 11 oz. depending on the model. The "P" series units deliver from 3 to 5 watts of r-f power output, depending on the power supply used, and weigh as little as 18 lbs. 9 oz.

Both series of the radiophones are available with one or two-frequency receivers, one or two frequency transmitters or two transmitters. The single-frequency models operate on one specific frequency. The two-frequency models operate on any two available channels with a maximum separation of 250 kc with no degradation in performance on either channel. Two-frequency operation is accomplished by using two separate oscillators controlled by a channel selector switch. This permits independent operation on either channel without simultaneous operation. The performance specifications of the two-frequency models are similar to those of single-frequency units. The two transmitter models operate on any two available channels. There is no degradation in single frequency performance specifications of either transmitter.

All types of units are available with dry batteries, nickel-cadmium batteries used with a transistor power supply, or a 117 v a-c power supply (accessory item). Operation

is also possible from either a 6 or 12 volt external battery when the nickel-cadmium power supplies are used.

All models feature a semi-automatic ON-OFF switch. This switch automatically turns the radiophone off when the microphone or handset is replaced in its holder, to prevent accidental discharge of the batteries. Continuous monitoring of the receiver in microphone equipped models may be accomplished by placing the microphone in its holder face up. Placing the microphone in its holder face down turns the radiophone off.

All "H" series handset models supply 3 milliwatts of audio power to the handset. All "H" series speaker models and all "P" series models supply 300 milliwatts of audio power to the speaker. All "P" series models are equipped with a speaker and microphone.

VOLUME and SQUELCH controls are conveniently located at either side of the antenna receptacle. Two-frequency transmitter, two single-frequency transmitter and two-frequency receiver models have a channel selector switch located near the handset or microphone receptacle.

Power packs are changed by unsnapping two spring snaps located at the ends of the unit and separating the power pack from the radio section. Another power pack, (dry battery, nickel-cadmium 6/12 v or the 117 v a-c power supply) can then be attached to the radio section to again form one integral package.

Access to the radio section is accomplished by loosening two quarter-turn fasteners and removing the sleeve. The transmitter and receiver chassis swing out individually, like the pages of a book, after loosening an additional set of captive screws. This "fold-out" feature permits complete access to the top and bottom of the individual chassis for servicing or alignment.

2. MODEL COMPLEMENT

The "Handie-Talkie" radiophone consists of a group of units and kits as follows:

- Antenna
- Handset or Microphone
- Top Panel Kit
- Control Panel Kit
- Housing Kit

Transmitter(s) (1-frequency, 2-frequency
or two single-frequency units)
Transmitter Crystal(s)
Receiver (1 or 2-frequency)
Receiver Crystal(s)
Power Pack
Carrying Strap

There are various types of each of the kits mentioned above. The various types are described in paragraph 3, DESCRIPTION OF UNITS AND KITS.

The unique modular construction permits assembly of the various units and kits in a wide variety of models. This variety of models is shown on the MODEL CHART appearing at the beginning of this manual. A complete line of accessories for both the "H" and "P" series units are listed immediately following the MODEL CHART.

3. DESCRIPTION OF UNITS AND KITS

a. Antenna

The Model NAD6120A, NAD6121A and NAD6122A Antennas are flexible steel whips terminated in uhf connectors. The NAD6120A operates in the 136-150.8 mc range, the NAD6121A operates in the 150.8-162 mc range, and the NAD6122A operates in the 162-174 mc range.

NOTE

The Motorola "Handie-Talkie" radio-
phone may be used with a fixed or ele-
vated antenna. The antenna circuit
provides a 50 ohm termination at the
antenna receptacle; therefore, any 50
ohm antenna resonant to the transmitter
frequency can be used. The higher the
antenna, the greater the area that can
be covered.

b. Handset

The NMN6007A Handset is supplied complete with a rubber covered coiled cord, which extends to about 5 ft., and a weatherproof connector. A push-to-talk bar on the handset turns the transmitter on. The handset connector plugs into a four-prong receptacle on top of the unit housing.

c. Microphone

The NMN6008A Microphone is supplied with a rubber covered coiled cord, which can be ex-

tended to about 5 ft., and a weatherproof connector. This palm type carbon microphone is provided with a push-to-talk button which turns on the transmitter. The microphone connector plugs into a four-prong receptacle located on top of the unit housing.

d. Top and Control Panel Kits

Various top and control panel kits are used with the different models of the "H" and "P" series "Handie-Talkie" radiophones. These kits include the top cover assembly with handset or microphone bracket, intercabling, ON-OFF switch, volume and squelch controls, antenna receptacle, push-to-talk relay and power connector. The kits used with microphone and speaker models also contain the speaker. Refer to the MODEL CHART in the front of this manual for a complete listing of these kits with corresponding applications.

e. Transmitter

The NTD6000AA Transmitter is a phase modulated, crystal controlled transmitter that operates on one specific frequency within the indicated band. The NTD6000AB Transmitter is the same as the NTD6000AA Transmitter except it operates on two specific frequencies. Both transmitters have a plate power input of 3 watts or less to the final amplifier.

Two frequency operation is accomplished by the addition of an oscillator circuit and appropriate switching facilities. All circuitry except the oscillators are common for both operating frequencies.

When the NTD6000A Series Transmitter is used without the NLD6040A Power Amplifier it develops a nominal output power of .8 watt.

Frequency stability for the NTD6000A Series Transmitter is maintained through the use of a particular crystal kit. When used in "H" Series "Handie-Talkie" applications, the NTD6000A Series Transmitter incorporates the components from the NLD6000A Crystal Kit, which are installed at the factory. When used in "P" Series "Handie-Talkie" applications, the transmitter incorporates the components from the NLD6001A Crystal Kit.

Frequency stability using the NLD6000A Crystal Kit is maintained to within .0025% of the assigned frequency over a temperature range of -30°C. to +60°C. Frequency stability using the

NLD6001A Crystal Kit is maintained to within .0005% of the assigned frequency over a temperature range of -30°C. to +60°C.

f. Transmitter Power Amplifier

The NLD6040A Power Amplifier, used with the NTD6000A Series Transmitter in "P" Series "Handie-Talkie" applications, incorporates a directly heated power amplifier tube (type 2E24) for an r-f power output of 3-5 watts.

When the NTD6000A Series Transmitter is used with the NLD6040A Power Amplifier, the NLD6001A Crystal Kit components are installed at the factory to maintain .0005% oscillator frequency stability over a temperature range of -30°C. to +60°C.

g. Receivers

Eight types of receivers are used in the 136-174 mc "H" and "P" Series "Handie-Talkie" radiophones. They are used as follows:

RCVR MODEL	NO. OF FREQ.	CHAN. SPAC.	AUDIO OUTPUT	USED IN
NRD1080AA	1	60 kc	3 mw	"H" Series models with handset
NRD1080AC	2			
NRD1080AB	1	30 kc	3 mw	"H" Series models with handset
NRD1080AD	2			
NRD1090AA	1	60 kc	300 mw	"H" and "P" Series models with speaker
NRD1090AC	2			
NRD1090AB	1	30 kc	300 mw	"H" and "P" Series models with speaker
NRD1090AD	2			

h. Power Supplies

(1) "H" Series Types

Three types of power supplies are used in various models of the "H" series.

NPN6021A Standard Power Pack with NLN6142A Battery Kit

NPN6022A Extra Duty Power Pack with NLN6143A Battery Kit
NPN6010A Nickel-Cadmium 6/12 V DC Power Supply with NLN6134A Battery Kit

All the power supplies are interchangeable without wiring modifications and have convenient "snap-on" fasteners for quick interchange.

The NPN6021A Standard Power Pack uses two 67-1/2 v "B" batteries, two 1-1/2 v "A" and two 6 v batteries. This power pack will provide approximately five 8 hour days of operation under normal operating conditions.

The NPN6022A Extra Duty Power Pack uses two 67-1/2 v "B" batteries, one 6 v battery and one 1-1/2 v "A" battery. The power pack will provide approximately ten 8 hour days of operation under normal operating conditions.

The NPN6010A Nickel-Cadmium - 6/12 V DC Power Supply uses a 6 volt nickel-cadmium battery as an internal source of power or a 6 or 12 volt vehicular battery as an external source of power. The input power is converted by transistor circuitry to the required voltages necessary for operation of the receiver and transmitter.

A plug and switch mounted on the power supply housing permit operation from an external 6 or 12 volt battery. The internal battery is placed on trickle charge when an external 12 volt battery is used. This plug and switch also permit charging the internal nickel-cadmium battery with a Motorola Model NLN6029A Battery Charger without removing the battery from the unit. Cable kits for use with the NLN6029A Battery Charger and external 6 or 12 volt batteries are listed in the accessories section of this manual.

When operating with its internal nickel-cadmium battery, the unit will provide approximately 8 hours of service before a recharge is required.

A nickel-cadmium battery is not required in the NPN6010A Power Pack when an external 6 or 12 volt vehicular battery is used as the source of power.

The NPN6012A AC Power Supply provides operating voltages from a 117 v a-c, 60 cycle source. This power supply is an optional accessory that can be used with any of the "H" Series

models of the "Handie-Talkie" radiophones. A 1/4 ampere fuse is provided in the input circuit. The power supply has an ON-OFF switch and a pilot lamp to indicate when the power is on.

(2) "P" Series Types

Two types of power supplies are used in various models of the "P" series:

- NPN6023A Extra Duty Power Pack with NLN6144A Battery Kit
- NPN6011A Nickel-Cadmium 6/12 V DC Power Supply

Both types are directly interchangeable without wiring modifications, and have convenient "snap-on" fasteners for quick interchange.

The NPN6023A Extra Duty Power Pack uses four 45 v "B" batteries, two 6 v batteries, and one 1-1/2 v "A" battery. This power pack provides approximately twelve 8 hour days of operation under normal operating conditions.

The NPN6011A Nickel-Cadmium - 6/12 V DC Power Supply uses two 6 volt nickel-cadmium batteries as an internal source of power and has the same provisions for external 6 or 12 volt operation and charging as previously described for the NPN6010A Nickel-Cadmium Power Supply.



INTERNAL-
EXTERNAL
SWITCH

PLUG FOR
CHARGER OR
EXTERNAL BATTERY
CABLE

Internal-External Switch Detail

The NPN6013A AC Power Supply provides an external source of power for the "P" Series models of the "Handie-Talkie" radiophones. This power supply is available as an optional accessory. Input power required is 117 volts, 60 cycles. A 3/4 ampere fuse is provided in the input circuit. The power supply has an ON-OFF switch and a pilot lamp to indicate when the power is on.

NOTE

"H" and "P" series power packs are not interchangeable. Accidental interchange has been prevented by mounting the power connector in a different manner in "H" and "P" series units. Refer to the intercabling diagrams for wiring details on the "H" series and "P" series power supplies.

i. Battery Kits

(1) The NLN6134A Battery Kit consists of one 6 volt nickel-cadmium rechargeable battery. The battery kit is used with the NPN6010A Power Pack to provide the internal power source. The battery will provide approximately 8 hours of service before a recharge is required. This battery can be recharged as many times as required by the use of the equipment. The nickel-cadmium battery is not susceptible to sulfation as are lead acid type batteries and can be stored either in a charged or uncharged condition.

(2) Two NLN6134A Battery Kits are used with the NPN6011A Power Pack to provide the internal power source. The two batteries will provide approximately 8 hours of service under normal operating conditions.

NOTE

Nickel-cadmium batteries are to be charged on the Motorola charger only. Other chargers may damage the batteries and invalidate the guarantee.

j. Crystals

The AN-1 Crystal is the frequency control element for the NTD6000A Series Transmitter used without the NLD6040A Power Amplifier. This crystal with its associated components (NLD6000A Crystal Kit), maintains frequency stability within .0025% over a temperature range of -30°C. to +60°C.

The VN-1 Crystal is the frequency control element for the NTD6000A Series Transmitter

used with the NLD6040A Power Amplifier. This crystal, with its associated components (NLD6001A Crystal Kit), maintains frequency stability within .0005% over a temperature range of -30°C. to +60°C.

IMPORTANT

Each VN-1 crystal is factory tested to determine its temperature characteristics, classified into one of three categories, and color coded accordingly; red, green or yellow. Associated with each type are specific components, which must match the type of crystal used by a particular transmitter chassis. A table is printed on the transmitter schematic diagram, which indicates the correct components to be used with a specific type of crystal. As shipped from the factory, the correct components are installed for the type of crystal used by a particular chassis. When replacing crystals, do not substitute a crystal with one having a different color code without changing the associated components.

When ordering transmitter replacement crystal, refer to the following table:

EQUIPMENT MODEL NUMBER	REPLACEMENT
H23 Series	AN-1 Crystal
P33 Series	NED6000A Crystal Kit

The AM-13 Crystal is the frequency control element for the receiver. Like the AN-1 and VN-1, this crystal is available for any frequency within the 136-174 mc range.

The AN-1, VN-1 and AM-13 are not part of the transmitter and receiver, but are separate items of the overall "Handie-Talkie" radiophone model. When ordering an individual transmitter or receiver chassis, crystals must be ordered separately and crystal type numbers and operating frequency must be specified.

k. Alignment Tool Kit

The NLN6127A Alignment Tool Kit consists of one (1) Motorola Part No. 66A847036, Alignment Tool for use when aligning the transmitter and receiver.

l. Carrying Strap

All models of the "H" and "P" series are supplied with an NLN6129A Carrying Strap. This

strap is adjustable in length and is equipped with a separate small strap which can be snapped to the main strap to hold the handset at shoulder level if desired.

4. PRE-OPERATIONAL NOTES

Use care when unpacking and handling the "Handie-Talkie" radiophone. Open the shipping carton and carefully remove all items. Check the contents to be sure that all items have been included.

Inspect the equipment thoroughly as soon as possible after delivery. If any part of the equipment has been damaged in transit, report the extent of damage to the transportation company immediately.

IMPORTANT

This equipment contains batteries. All batteries, wet or dry, have a finite shelf life. Extended storage of the equipment will reduce the operating performance due to reduction in battery voltage and life. Partially used dry batteries, if left standing for long periods, will leak electrolyte and may result in damage to the radio equipment. If equipment is to be stored for a long period of time, remove the batteries and store them in a cool place. Never store batteries or equipment containing batteries in a warm place as this accelerates the chemical action within the battery. More information on batteries appears in the section on battery replacement and charging.

The Motorola "Handie-Talkie" radiophone is shipped direct from the factory completely assembled, ready for use, except for the installation of the antenna.

5. OPERATION

a. To Turn On:

Remove handset (or microphone) from cradle. Turn the ON-OFF knob counterclockwise to ON and pull it up. This places the receiver in operation.

NOTE

All power supplies except the a-c power supplies turn on and off with the ON-OFF switch on the radiophone housing. To turn on a-c power supply on and off, always use the ON-OFF switch on the power supply housing.

b. To Adjust Audio Volume

Adjust volume control (marked V) until the desired volume is obtained from handset ear-piece or speaker.

c. To Adjust Squelch

Turn squelch knob (marked S) fully counter-clockwise. While no signal (noise) is being received, turn knob clockwise until the noise just cuts out (squelches). Do not turn control beyond this point or weak signals may be blocked out.

d. To Transmit

Hold the mouthpiece 1 to 2 inches from lips. Press the push-to-talk button in firmly and hold it. Speak slowly and clearly across the mouthpiece in a normal-to-loud voice. Release the button to listen. The receiver is rendered inoperative when the push-to-talk button is pressed, therefore, the button must be released at the end of a transmission to receive.

NOTE

Additional range may be obtained when the radiophone is placed on the hood or top of a car. This furnishes a good ground plane for the antenna.

e. To Change Frequency
(2-Frequency Models Only)

Place the channel selector switch in the CHANNEL 1 or 2 position to select the desired frequency. The channel selector switch is located on the top of the unit adjacent to the handset or microphone connector.

f. To Turn Off

The unit is automatically turned off when the handset is properly replaced in the cradle or when the microphone is replaced in the cradle face down. Placing the microphone in the cradle face up leaves the receiver on for continuous monitoring.

g. Storage

The Motorola "Handie-Talkie" radiophone should be put into operation as soon as possible after receipt. If this is impossible and it must be stored for long periods of time, remove the batteries before storage. Equipment that is stored should be removed from storage every 3 months and checked. That is, controls should be operated and relays cleaned by actuating the push-to-talk button several times. This keeps relay and switch contacts free of corrosion and dust. When removed from storage for use, this same procedure should be followed.

BATTERY REPLACEMENT AND CHARGING

1. BATTERY REPLACEMENT PROCEDURE

To replace all types of batteries, dry or nickel-cadmium type:

- a. Unsnap the spring snap at each end of the unit.
- b. Pull bottom section of radio (battery section) down and away from upper section.
- c. Batteries are now exposed. Replace with new batteries and reassemble.

Fast battery replacement can be accomplished by changing the entire power supply and replacing the batteries in the used supply at some later time. Additional power supplies can be purchased as separate accessories for fast changeover.

2. DRY BATTERIES

All batteries, dry and wet, have a finite shelf life. Storing them for long periods of time reduces their closed circuit voltage and operating life. In some cases, when stored too long, dry batteries may leak electrolyte after partial use and damage the radio. Therefore, if radio equipment is to be stored for long periods of time, remove the batteries and store separately in a cool place. Never store batteries in a warm place as heat increases their chemical action and shortens life.

Shelf life of a dry battery is approximately 6-8 months. Therefore, they should be put into use within 6 months after purchase.

A Motorola TEK-13A Battery Tester is recommended for measuring dry battery voltages in the power pack under simulated load conditions. The battery tester connector plugs directly into the power pack connector.

If the TEK-12A Battery Tester is not available, the batteries can also be tested at the battery terminals under transmit load conditions.

The batteries should be replaced when voltages under load conditions are below the following values.

"H" Series Dry Battery Power Pack
1.5 v supply voltage down to 1.0 v
6.0 v supply voltage down to 4.0 v
135 v supply voltage down to 90 v

"P" Series Dry Battery Power Pack
1.5 v supply voltage down to 1.0 v
6.0 v supply voltage down to 4.0 v
180 v supply voltage down to 120 v

IMPORTANT

BATTERY VOLTAGES AND CAPACITY DECREASE MARKEDLY DURING LOW TEMPERATURE PERIODS.

3. NICKEL-CADMIUM BATTERIES

a. General

The battery comprises 5 hermetically sealed cells which are series connected to provide a nominal 6 volt output. The cells are cased, and fitted with a cable and connector.

The voltage of a nickel-cadmium battery remains approximately constant under load until the battery approaches the discharged condition at this time, a marked decrease in this voltage occurs and the discharged condition (1.0 v per cell) is reached abruptly. These batteries should be recharged when the voltage under transmit load reaches 5.0 v.

b. Charging

The Motorola Model NLN6029A Battery Charger and NKN6052A or NKN6053A Cable Kits listed under ACCESSORIES at the front of this manual are recommended for charging these batteries. The use of other chargers will void the battery guarantee and may result in permanent damage to the batteries. Follow the charging instructions which accompany the charger.

c. Storage

The batteries may be stored at room temperature, in any state of charge without damage. These batteries are subject to self discharge

however, and should be recharged after extended storage.

d. Guarantee

(1) Limitations to Guarantee

The manufacturer will replace without additional cost during the first two years of service and at a replacement cost prorated on the basis of straight line depreciation during the next three years, all batteries which:

(a) Fail to deliver 75% (18-watt hours) of their rated service capacity at an 8-hour discharge rate.

(b) Develop leakage.

(2) Voiding of Guarantee

The guarantee becomes VOID if:

(a) Equipment other than that approved by the manufacturer is used to charge the batteries.

(b) Charging is done at temperatures exceeding 125°F without proper instructions from the manufacturer.

(c) Any of the seals located in the center of the individual cells are broken or show evidence of unauthorized tampering.

(d) Batteries are used in equipment or for services other than that for which they were intended.

(e) Maximum discharge rates are exceeded.

(3) Capacity Test:

(a) The battery shall first be completely discharged through a 12 ohm resistive load until its load voltage is less than 3 volts.

(b) It shall then be charged using the NLN6029A or NK129 chargers at a constant current of approximately 300 ma for 24 hours.

(c) It shall then be discharged at 68°F through a 12 ohm resistive load to its 5 volt discharge state.

(d) The service capacity shall then be determined using the following formula:

$SC = 3 \times N$
 where,
 SC = approximate service capacity in watt-hours.
 N = number of hours required to reach the 5 volt discharge state.

If at any time during the service period, the battery fails to deliver 18 watt-hours when its capacity is determined as specified above, consult your nearest Motorola Service Representative for further instructions.

4. BATTERY LIFE

Under operating conditions of 10% transmit, 10% receive at rated audio output and 80% receive standby, dry batteries will give approximately the following life:

- "H" Series
- NPN6021A - Standard Power Pack W/NLN6142A Batt. - five 8 hour working days separated by a 16 hour OFF period.
 - NPN6022A - Extra Duty Power Pack W/NLN6143A Batt. - ten 8 hour working days each separated by a 16 hour OFF period.

- "H" Series
- NPN6010A - Nickel-Cadmium Power Pack (with NLN6134A Batt. Kit) - one 8 hour working day before re-charging is necessary.

- "P" Series
- NPN6023A - Extra Duty Power Pack W/NLN6144A Batt. - twelve 8 hour working days, each separated by a 16 hour OFF period.
 - NPN6011A - Nickel-Cadmium Power Pack (with two NLN6134A Batt. Kits) - one 8 hour working day before re-charging is necessary.

Note that most actual transmit duty cycles are much smaller and approach 2% rather than 10%. Also in many types of operation, the unit is not kept turned on continuously. If this type of service is prevalent, battery life may be extended to many times those mentioned previously.

THEORY OF OPERATION

1. RECEIVER

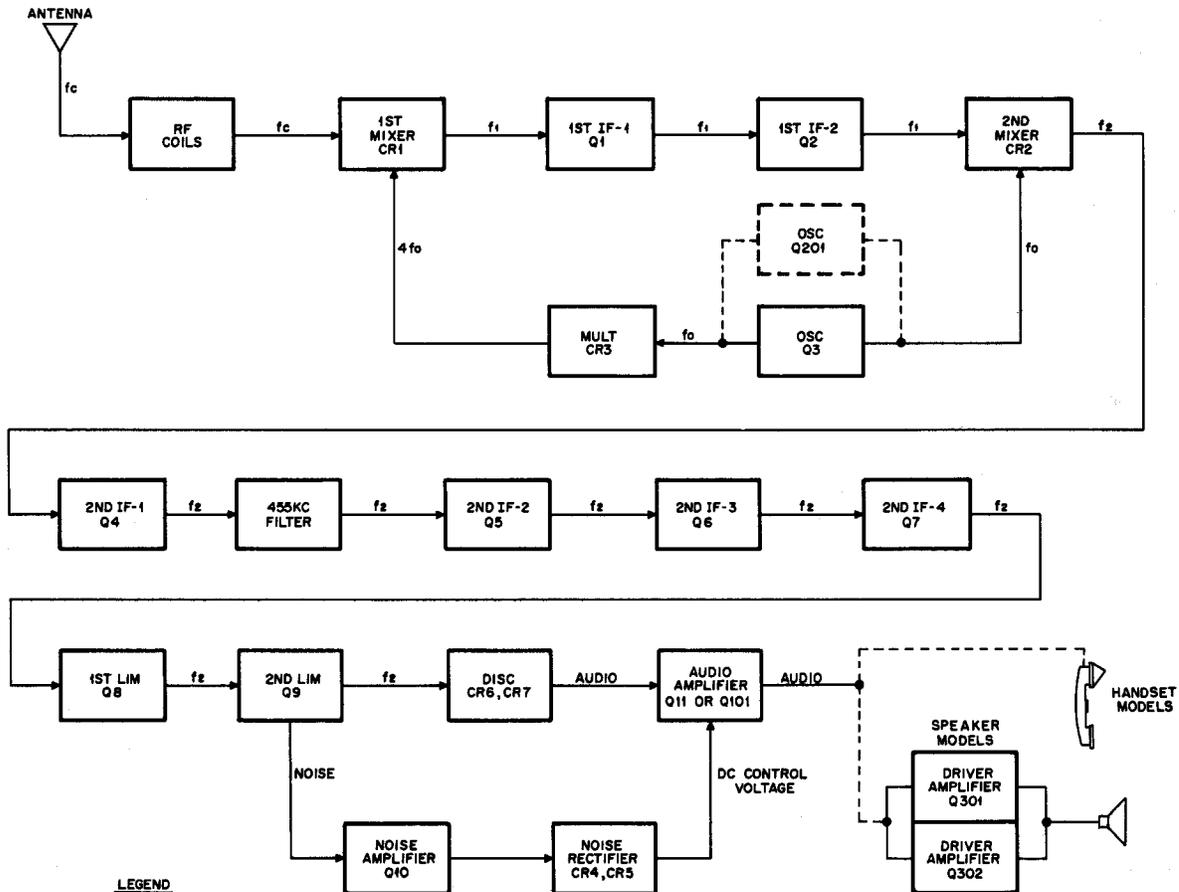
The receiver is a dual conversion unit using three r-f coils for selectivity, two germanium diode mixers, two high intermediate frequency amplifiers, four low intermediate frequency amplifiers, two limiters, a discriminator, an audio amplifier and a squelch circuit. Refer to the receiver block diagram.

The signal from the antenna is coupled to the first r-f coil. The signal passes through three r-f coils and into the first mixer.

The oscillator(s) used to provide the local oscillator injection to the first and second mixer is a third mode, series resonant, crystal con-

trolled type, using a Motorola Type AM-13 crystal. The fourth harmonic of the oscillator frequency is produced in the crystal multiplier and is fed to the first mixer through three selectivity coils to remove other oscillator harmonics.

The 27-35 mc signal produced in the first mixer is amplified in the first i-f amplifier stages and passes through an image filter. The filter network consists of three traps which are series resonant circuits tuned at the factory to provide maximum attenuation of the i-f image frequency. These traps can be tuned in the field to reject other frequencies, if there is no i-f image problem in the area that the unit is being operated. This network cannot be tuned to



LEGEND

- f_c = CARRIER FREQUENCY (136-174 MC).
 f_0 = CONTROL CRYSTAL FREQUENCY (27.1-34.7 MC).
 f_1 = 1ST INTERMEDIATE FREQUENCY (27.6-35.2 MC).
 f_2 = 2ND INTERMEDIATE FREQUENCY (455 KC).

$$f_0 = \frac{f_c - f_2}{5}$$

$$f_1 = f_c - 4f_0$$

DIAGRAM NO. 63C81005A47

Receiver Block Diagram

reject frequencies closer than one megacycle of the desired frequency without incurring degradation in the desired frequency sensitivity.

Following the image filter, the signal enters the second crystal mixer. The oscillator frequency is fed into the second mixer on the second i-f side.

The 455 kc signal produced in the second mixer is amplified in the second i-f amplifier stages that follow the mixer.

The 455 kc "Permakay" filter is placed in the circuit between the first and second i-f stages. This is a sealed in plastic filter which provides the necessary selectivity for the receiver.

The i-f stages are followed by two limiter stages and the output of the second limiter is coupled into the discriminator. The discriminator translates the variations of frequency of the i-f signal to an audio frequency signal.

This audio signal is coupled to a 3 milliwatt output audio amplifier. In the NRD1080A Series Receivers, this amplifier drives the handset earphone. In the NRD1090A Series Receivers, this amplifier drives a 300 milliwatt push-pull audio output stage which drives the loudspeaker. The push-pull amplifier is separately mounted with the loudspeaker in the top housing.

Squelch action is provided by taking audio noise produced at the supply voltage decoupling point of the second limiter, amplifying that

portion of the noise above the normal voice frequency range, rectifying this noise and applying it as bias to the base of the audio stage. When the receiver is not quieted, this bias cuts off the audio stage and eliminates the speaker noise.

A high pass audio filter at the input to the noise amplifier stage attenuates the normal voice frequencies so that voice frequencies appearing at the limiter decoupling point do not actuate the squelch circuitry.

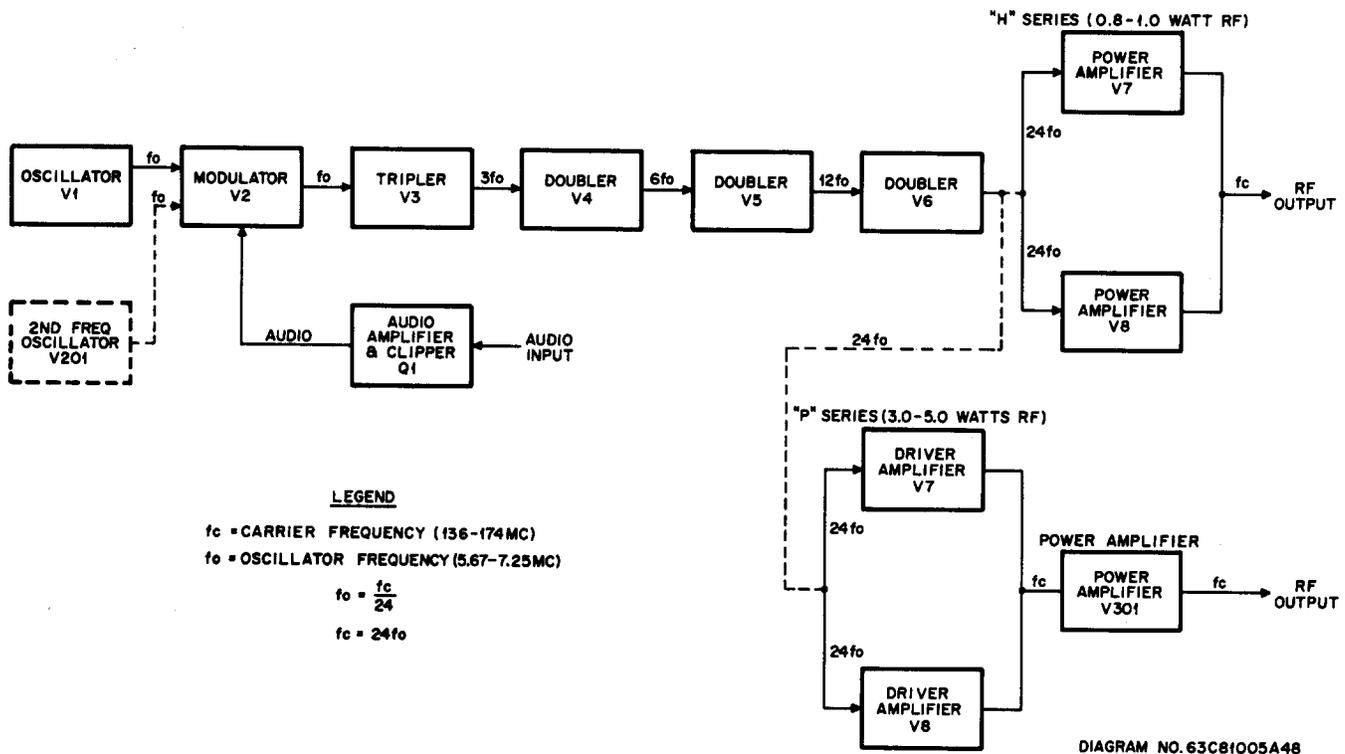
2. TRANSMITTER

The transmitter is a phase modulated, crystal controlled transmitter which operates on 1 or 2 specific frequencies within the indicated frequency band. Two frequency operation is effected

by using an additional oscillator circuit and appropriate switching arrangement. All circuitry except the oscillator is common for both operating frequencies.

The oscillator is a crystal controlled, modified Pierce type using a Motorola type VN-1 or AN-1 crystal. The output of the oscillator stage and the output of the audio "Instantaneous Deviation Control" circuitry are fed to the modulator stage.

The adjustable audio IDC circuit limits the maximum deviation obtainable in the modulator through a transistor amplifier and clipper circuit. This circuit permits consistent full deviation with normal voice levels impressed on the microphone, yet prevents overmodulation. The circuit also provides low distortion and a flat



Transmitter Block Diagram

63C81005A48-A

response from 300 to 3000 cycles per second.

In the modulator, the transconductance of the tube varies with the audio voltage impressed on the grid. This variation in transconductance results in a change in the phase angle of the r-f output voltage of the modulator tube.

Generally, units which use phase modulation are only capable of modulating with low distortion over a small phase angle. This necessitates the addition of multiplier stages to increase the frequency deviation up to the desired value. Refer to the transmitter block diagram.

The modulator is followed by four stages of frequency multiplication, namely a tripler, and three doublers. The output of the third doubler provides the required amount of frequency deviation and the amplitude of the r-f voltage is sufficient to drive the final amplifier in the "H" series equipment. In the "P" series equipment, the output of the last doubler is coupled into a driver stage which in turn drives the final amplifier to provide the desired r-f power output.

3. TRANSISTOR POWER SUPPLIES

a. NPN6010A Power Supply

The oscillator or switching circuit contains two transistors connected to primary windings of the power transformer. In 12 volt external operation, the transistors are connected across the full primary windings. The transistors are connected to tapped portions of the windings for 6 volt operation.

As battery voltage is applied, one transistor begins to conduct more heavily than the other. As this occurs, a voltage is induced in the feedback winding. The polarity of this voltage is such that the heavier conducting transistor is quickly driven to full conduction. The remaining transistor is quickly cut off. Current flows through the conducting transistor and the associated primary winding until the transformer core becomes saturated. When saturation is reached, there is no further change in flux den-

sity and voltage is no longer induced in the feedback winding. The energy stored in the field of the transformer collapses, inducing a voltage of opposite polarity across the feedback winding. The first conducting transistor is quickly cut off and the second transistor is driven into heavy conduction to repeat the previous operation. Current flows alternately and in opposite directions through each of the primary windings. Oscillations are self-sustaining as long as the d-c input is applied. The switching action is very rapid and the induced voltage approximates the ideal "square wave" pattern. Diode rectifier circuits are connected across the secondary windings to rectify the induced a-c voltages and supply the various d-c voltages required to operate the transmitter and receiver.

The INTERNAL-EXTERNAL power switch selects operation from the internal battery or an external 6 or 12 volt source, connected through an optional accessory item (NKN6040A Cable Kit). The cable plug is wired to automatically make the proper connections for 6 or 12 volt operation. The switch prevents insertion of the cable plug unless it is in the EXTERNAL position. It is not necessary to have the internal battery in place when operating from a 6 or 12 volt external source. If the battery is left in the unit when operating from a 12 volt external source it is automatically placed on trickle charge.

b. NPN6011A Power Supply

Operation of the oscillator or switching circuit is the same as that previously described for the NPN6010A Power Supply except that each half of the oscillator or switching circuit contains a pair of transistors connected in parallel. Operation from an external 6 or 12 volt battery is the same as that described for the NPN6010A Power Supply except that the NKN6041A Cable Kit (optional item) is used. Two internal batteries are used in the NPN6011A Power Supply to meet the higher current drain requirements of "P" Series models. Voltage regulation circuitry consisting of a Zener diode and a transistor is used to regulate the level of the filtered 6 volt output.

MAINTENANCE

1. TEST EQUIPMENT

All the required test equipment for aligning

and testing the radiophone is listed in the following TEST EQUIPMENT CHART. The listed items or their equivalents may be used.

TEST EQUIPMENT CHART

EQUIPMENT	USED FOR
DC voltmeter - Motorola DC Multimeter	DC voltage measurements DC current measurements Resistance measurements
AC Voltmeter - Motorola Transistorized AC Voltmeter or S1056A-9A or TU546 Series Test Set with TEK-7 Adapter Kit.	AC voltage measurements
FM signal generator - Motorola T1034C Signal Generator	Alignment of receiver r-f and 1st i-f stages. 20 db quieting sensitivity measurement
455 kc crystal-controlled oscillator Motorola S1056A-9A or TU546 Series Test Set with 455 kc crystal.	Alignment of receiver 2nd i-f, limiter and discrimin- ator stages
Audio oscillator - Motorola TEK-1A Transistorized Tone Generator (1000 cps) Frequency monitor - Motorola T1130A Series FM Station Monitor Oscilloscope - Motorola T1015A General Purpose or T1014B Precision Wide Band Oscilloscope or Motorola T1020A Frequency and De- viation Meter	Transmitter IDC adjustment
RF wattmeter or antenna and field strength meter	Transmitter and power am- plifier alignment
Tuning Tool - Motorola NLN6127A (supplied with radio set)	Adjusting tuning coil slugs

RECOMMENDED TEST EQUIPMENT



T1034C Signal Generator



S1059A Test Set



Transistorized
AC Voltmeter



TEK-7 Adapter Kit



TEK-1A Transistorized
Tone Generator



T1130A Series
FM Station Monitor

CE1260B CE2114 AEPD-2287-O (MC5322) AEPD-6901-O (MC7131) AEPD-6684-O (MC5293) AEPD-7707-O (MC7460)

RECOMMENDED TEST EQUIPMENT (CONTINUED)



DC Multimeter



T1020A Frequency and
Deviation Monitor



T1014B
Precision Wide Band
Oscilloscope

AEPD-7808-O (MC 7763)

CE1630C

AEPD-7846-O (MC 7794)

2. DISASSEMBLY



Figure 1. Battery Section Removed

a. Remove battery section by unsnapping two spring snaps at either end of unit. See Figure 1.

b. Pull battery section down and away from radio section.

c. Loosen (2) Dzus fasteners by turning 1/2 turn counterclockwise.

d. Remove protective bottom plate.

e. Remove wrap-around housing by lifting off and away from unit.

f. Loosen two screws and fold the receiver chassis out. See figure 2. The receiver is now ready for alignment or service. The top of transmitter chassis is also exposed.

g. Loosen two screws and fold the transmitter chassis out. See figure 3. The transmitter is now ready for alignment and service. The top cover is also completely accessible for servicing of the speaker kit, switches and controls, figure 4.



Figure 2. Radio Section Exposed

h. Loosen two screws holding blue Amphenol receptacle in place on battery pack and remove connector from its brackets. There is then about 6" of cable between the receptacle and the batteries which can be extended to plug into the radio section.

i. Plug the receptacle from the power supply into plug mounted on the housing kit to supply power to the unit.

NOTE

117 v a-c power supplies are available for direct attachment to the radiophone. These supplies can be used in cases requiring an extended amount of servicing time.

j. Remove handset or microphone from cradle and turn unit on.

k. Align per instructions appearing in SERVICE CHARTS AND DIAGRAMS section of manual.

l. After alignment or service, reassemble in reverse order.



Figure 3. Receiver in Service Position

3. TEST PROCEDURES

When a radiophone requires servicing, use the following procedures to localize the fault.

a. Check Batteries

The first step in localizing the trouble is to check the battery voltage(s) under load. Batteries should be replaced or recharged when their voltage under load reaches or falls below the levels specified in the BATTERY REPLACEMENT AND CHARGING section of this manual. Even though the radiophone may operate at lower voltages, its operation would be marginal and only for a short period.

NOTE

Only nickel-cadmium batteries are rechargeable. Dry batteries should be replaced when voltages are at or below the levels specified in the BATTERY REPLACEMENT AND CHARGING section.

b. Check Overall Operation

If the battery voltage(s) is sufficient, the next step is to check overall performance of the radiophone. The following checks may be used to evaluate overall performance.



Figure 4. Transmitter in Service Position

(1) Receiver 20 DB Quieting Sensitivity

The 20 db quieting sensitivity measurement can be used to determine whether the receiver has sufficient gain and all circuitry is functioning properly. This is a measurement of the r-f signal input necessary to reduce the noise output at the handset or speaker by 20 decibels. The measurement should be made in the absence of extraneous noise. The squelch control must be opened (turned completely counter-clockwise) to prevent the squelch circuitry from reducing the noise in the handset or speaker when no signal is present at the input of the receiver.

The actual measurement is made by adjusting the noise level at the speaker or handset with the volume control until a predetermined level is obtained with no signal applied to the receiver input. A signal is then applied to the input and increased in level until the noise voltage is reduced to 1/10th of the previous level. The level of r-f signal input required to accomplish this reduction is the receiver 20 db quieting sensitivity.

The Motorola Transistorized AC Voltmeter or equivalent can be used to measure the noise voltages at the handset or speaker and the Motorola Model T1034C FM Signal Generator can be used to supply a calibrated

r-f signal input. Adjust the volume control with no signal input for 0.14 volt noise at the speaker or 0.12 volt measured across a 125 ohm resistor connected between pin 4 of the handset receptacle and ground. The voltage may be measured across the handset but due to impedance variations more accurate results will be obtained by using the 125 ohm resistor. The quieting signal should be 0.7 microvolt or less if all circuitry is operating properly.

(2) Transmitter Operation

The operation of all transmitter stages except the modulator can be checked by measuring the r-f power output. This measurement can be made by connecting an r-f wattmeter and one of the dummy loads shown in the ACCESSORIES section to the antenna receptacle. The power output should be 0.8 watt for "H" series models and 3.0 watts for "P" series models.

4. RECEIVER SERVICING AND STAGE ANALYSIS

a. Test and Metering Points

A terminal location diagram is included in this manual to aid service personnel in rapid location of component terminations and metering points. This diagram illustrates the physical location of component terminations and metering points indicated on the receiver schematic diagram. Metering points for use in alignment are indicated on both diagrams as (M1) (M2) (M3) etc. Points indicated by (1) (2) (A) etc., on the receiver schematic diagram may be located by noting the nearest key component such as L1, L2, Q1, Q2, etc., locating this component on the terminal location diagram and selecting the corresponding number or letter in the immediate vicinity.

b. Servicing Procedure

If the 20 db quieting sensitivity check indicates faulty operation of the receiver, all d-c and a-c noise voltages shown on the receiver schematic diagram should be checked. Replacement of defective components or repair of printed circuits should be made where incorrect voltage or resistance measurements indicate faulty circuitry. A break in a printed circuit can be easily repaired by the addition of a jumper across the break. The serviceman is cautioned not to replace transistors before a thorough check is made. The transistor is a dependable component and is not subject to re-

placement as frequently as vacuum tubes. The transistor terminal voltages should be checked first. If these voltages are not reasonably close to the values indicated on the schematic diagram, the associated bias components should be checked. If all d-c voltages are correct, a signal should be traced through the circuit to locate any possible breaks in the signal path.

c. Stage Measurements

The following Receiver Stage Measurements Chart is included to assist in a detailed stage analysis. All measurements are made with a Motorola DC Multimeter, Motorola AC Voltmeter and a Motorola Model T1034C FM Signal Generator set to the carrier frequency and directly coupled to the antenna connector.

5. TRANSMITTER SERVICING

a. Low or No RF Power Output

If the r-f power output measurement indicates low or no output, the transmit relay should be checked to be sure that proper supply voltages are being connected to the transmitter. All d-c voltages indicated on the transmitter schematic diagram should be checked and circuitry corrected where necessary.

b. Improper Modulation

If the r-f power output measurement indicates proper output but the transmitter fails to modulate properly, check for audio modulating voltage at the grid of the modulator tube. If this voltage is not present, check the microphone or handset and the d-c voltages at the audio amplifier and clipper stage. If audio modulating voltage is present at the modulator grid, check the d-c voltages for the modulator stage.

6. NICKEL-CADMIUM--6/12 V POWER SUPPLY SERVICING

a. Batteries

Nickel-cadmium batteries are effectively lifetime rechargeable with no limit on the number of recharges. Long periods of non-use whether in a charged or discharged condition will not harm the batteries. A fully charged battery will be down to about 75% of its capacity after 1-1/2 months of storage and should be

RECEIVER STAGE MEASUREMENTS CHART

NOTE

All measurements are taken with a Motorola Model T1034C Signal Generator (or equivalent) set to the carrier frequency with the output coupled directly to the antenna connector.

MICROVOLTS INPUT	METER PROBE ON:	METER READING
Use Motorola DC Multimeter or equivalent.		
25	M4	0
500	Base of 2nd i-f -3	0
Use the Motorola AC Voltmeter or equivalent.		
1500	Base of 2nd i-f -1	0.02 v a-c
300	Filter input	0.05 v a-c
600	Filter output (base of 2nd i-f -2)	0.05 v a-c
20	Base of 2nd i-f -3	0.05 v a-c
1.2	Base of 2nd i-f -4	0.10 v a-c
0	Refer to the receiver schematic diagram for squelch and audio noise voltage measurements	

recharged before being put into use. If it is desired to keep batteries in storage at 100% capacity, it is recommended that they be charged continuously with the Motorola Model NLN6029A Battery Charger in the trickle charge condition. Always charge these batteries on a Motorola charger in accordance with instructions supplied with the charger. A receptacle and switch are provided on the power supply housing to permit charging of the batteries without removing them from the unit. The NKN6052A and NKN6053A Cable Kits listed in the ACCESSORIES section of this manual are provided with mating connectors for attachment to the receptacle and the battery charger. The switch must be placed in the EXT. position before insertion of the cable plug into the receptacle is possible and automatically makes the proper connections for charging.

b. Power Supply Circuitry

The output voltages indicated on the power supply schematic diagrams for both the NPN6010A Power Pack and the NPN6011A Power Pack should be checked for receive and transmit load conditions.

- (1) Check the power plug connections for good conductivity between jumpered pins.
- (2) If one voltage reading is low or zero (0) on receive, check the secondary circuit for an open lead or short in the transformer and adjoining components.
- (3) If all the voltage readings are low on receive.

(a) Check the feedback resistors for proper value and connection to the base and emitter circuits of the transistors.

(b) Disconnect the transformer secondary leads one at a time starting from the highest voltage and watch for a change in output. If a change occurs, check the disconnected secondary circuit for faulty components.

(4) If no voltage readings are obtained at the receiver when an external battery is used and the switch is in the EXT. position:

(a) Check for a blown fuse.

(b) Check for d-c continuity through the primary circuit by measuring the d-c voltage between emitter(s) and collector(s) of the transistors.

(c) Disconnect the transformer secondary circuits one at a time and check for restoration of voltages at the remaining secondary circuits.

NOTE

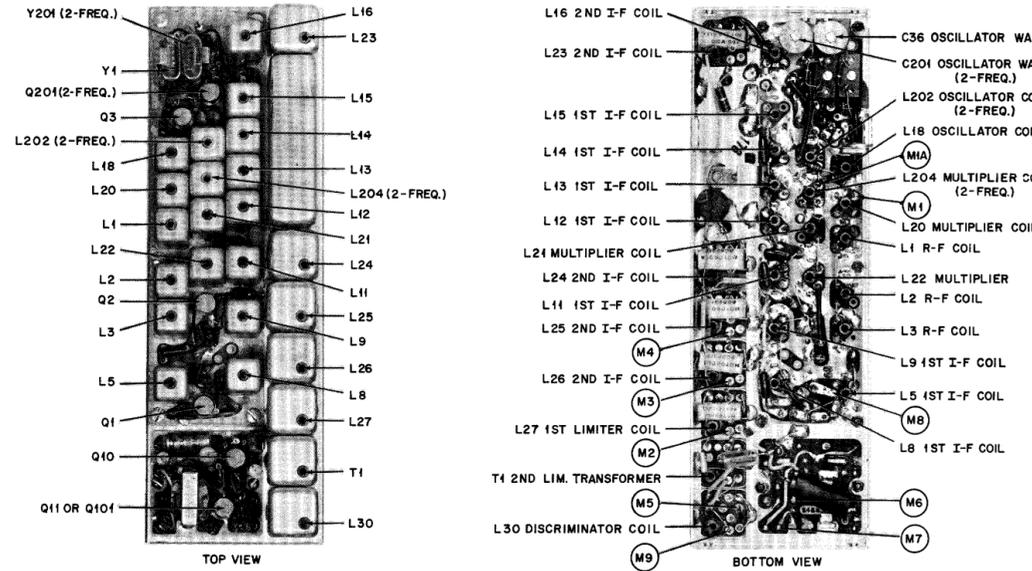
If the remaining secondary circuits resume normal operation, this is an indication that the disconnected secondary circuit is overloading the power supply and preventing oscillation. Check the disconnected secondary circuit and associated loads for defective components.

(5) If no voltage readings are obtained at the receiver when the internal batteries are in use (switch in INT. position), refer to the applicable power supply schematic diagram and trace the voltage from the batteries through the power supply to the receiver to locate the defective component.

(6) Receive voltages correct, but low on transmit:

(a) Check the relay contacts for continuity.

(b) Check the transistors.



TEST EQUIPMENT REQUIRED

1. DC Voltmeter - Motorola DC Multimeter or equivalent.
2. AC Voltmeter - Motorola Transistorized AC Voltmeter or equivalent.
3. 455 kc Crystal Controlled Generator - Motorola S1056A-9A Series or TU546 Portable Test Set used as 455 kc signal generator or equivalent. (Refer to test set instruction manual.)
4. FM Signal Generator - Motorola Model T1034C FM Signal Generator or equivalent.
5. Alignment tool - Motorola Part No. 66A847036, p/o NLN6127A Kit supplied with the radiophone.

CAUTION

Construction of the coils permits the slugs to pass through the coils. Therefore, an alignment peak is present at either end of the coil. When aligning the receiver, align on the peak which places the slug nearest the bottom of the coil form.

FREQUENCY CALCULATION

$$F_c = F_1 + 4F_o$$

Where:

F_c = Carrier frequency

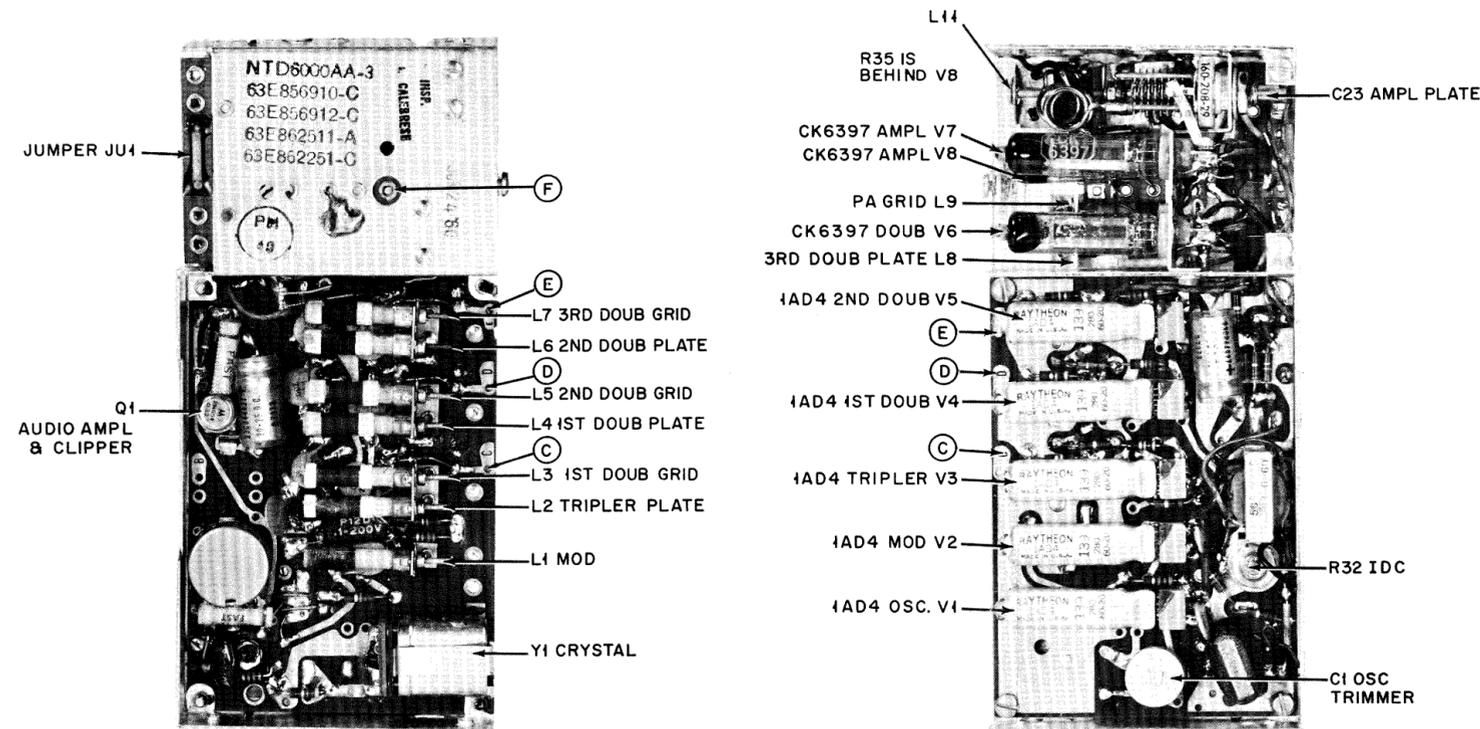
F_o = Oscillator frequency

F_1 = 1st i-f frequency

STEP	STAGE AND PROCEDURE	ADJUSTMENT	METER READING
1	IF AND 1ST LIMITER: See Note 1. Couple a 455 kc signal to the output of 2nd mixer diode CR2 (point 1, L16). Place the d-c probe on meter point (M2). Keep the signal below limiting and adjust coils L27, L26, L25, L24, and L23 for maximum meter reading. NOTE - Move the probe to meter points (M3) or (M4) if necessary to stay below limiting. With zero signal input the voltage at meter points M2, M3 and M4 is negative. With a strong limiting signal the transistor bias moves in the positive direction. Therefore, at the meter points, the voltage moves through zero to approximately +0.5 volt on full limiting. When the unit is fully aligned, the input to the 2nd limiter (at meter point (M2)) is in full limiting (+0.5 v) on noise with zero signal input.	Coils L27, L26, L25, L24 and L23	Maximum
2	2ND LIMITER AND DISCRIMINATOR: Set the volume control to maximum (fully clockwise) and the squelch control to minimum (fully counterclockwise). Position the tuning slug of the discriminator coil (L30) so that the end of the slug is about 1/8" out of the coil form. Place the d-c probe on meter point (M9) and adjust the 2nd limiter transformer T1 for maximum meter reading. Move the d-c probe to meter point (M5) and adjust the discriminator coil (L30) slug for a zero meter reading. (See Note 2) Remove the 455 kc signal.	T1 L30	Maximum Zero
3	OSCILLATOR(S): See Note 9		
	A Single Frequency Models-- Set the warp trimmer capacitor (C36) at approximately 1/2 maximum capacity (screwdriver slot in line with mounting terminals). Position the tuning slug of the oscillator coil (L18) so that the end of the slug is about 1/8" out of the coil form. Place the d-c probe with a 1 megohm resistor in series on meter point (M1) and adjust oscillator coil (L18) slug for a maximum meter indication on the first peak that is reached as the slug is moved into the coil. Move the d-c probe to meter point (M5). Transmit a carrier from a transmitter which this unit will normally receive and adjust C36 for a zero meter indication.	L18 C36	Maximum Zero
4	B Two Frequency Models-- Place the frequency selector switch in the F1 position and proceed as in Step 3A. Place the frequency selector switch in the F2 position, the d-c probe at meter point (M1A) and adjust C201 and L202 in the same manner. Place the frequency selector switch in the F1 or F2 position corresponding to the lower carrier frequency and proceed to Step 4.	L202 C201	Maximum Zero
	MULTIPLIERS:		
5	A Single Frequency Models-- Connect the d-c probe to meter point (M8). Adjust the slugs of coils L20, L21 and L22 for minimum meter indication. See Note 3.	L20, L21 and L22	Minimum
	B Two Frequency Models-- Place the frequency selector switch in the F1 position and proceed as in step 4A. Place the frequency selector switch in the F2 position and adjust the slug of coil L204 for minimum meter indication. Place the frequency selector switch in the F1 or F2 position corresponding to the lower carrier frequency and proceed to step 5.	L204	Minimum
6	RF & 1ST IF: See Note 4 & 5. Connect the signal generator to the antenna connector. Place the d-c probe on meter point (M5). Set the attenuator for 5000 microvolts and adjust the generator to the desired carrier frequency as indicated by a zero meter indication with the d-c probe at (M5). Place the d-c probe on meter point (M3) and adjust the slugs in coils L5, L8, L9, L11, L15, and L16 for a maximum meter indication. Adjust r-f coil slugs in L1, L2 and L3 for a maximum meter indication. Keep the input signal well below limiting when making these adjustments.	Coils L5, L8, L9, L11, L15, L16, L1, L2 and L3	Maximum
7	IMAGE TRAPS: See Note 6. Move the d-c probe to meter point (M5). Solder or clip a short lead from terminal 4 of L1 to terminal 4 of L8. Set the signal generator for a zero meter reading at the i-f image frequency (910 kc below the 1st i-f frequency). Move the d-c probe to meter point (M3) and adjust the slugs of coils L14, L13 and L12 in that order for a minimum meter indication. The signal generator level should be increased as needed to insure a true dip reading on the image frequency. NOTE - As the slugs of coils L14, L13 and L12 are adjusted for a dip indication, they may pass through a peak reading.	Coils L14, L13 and L12	Minimum
8	Move the d-c probe to meter point (M5). Reset the generator to the desired carrier frequency (zero meter indication). Move the d-c probe to meter point (M3) and adjust the slugs of coils L11, L15 and L16 for a maximum meter indication.	Coils L11, L15 and L16	Maximum
9	Connect the a-c voltmeter across the audio output terminals. Adjust the signal generator level to produce approximately 15 db of audio quieting. Re-tune coils L3 and L5 for maximum quieting (minimum meter indication).	Coils L3 and L5	Minimum
10	Place the d-c probe on meter point (M5). Set the volume control to maximum (fully clockwise) and the squelch control to minimum (fully counterclockwise). With zero signal input, observe the discriminator noise idle voltage. If the reading is greater than + 0.2 v but less than + 0.6 v, reset either L23 or L24 to bring the voltage to zero or within + 0.2 v of zero. See Note 7. This adjustment for noise balance should produce no appreciable change (less than 0.05 v) in the limiting level at meter point (M3). See Note 8.	Coils L23 and L24	+ 0.2 v d-c or less
11	Check the receiver sensitivity for 20 db quieting as described in the receiver servicing information.		

NOTES

1. The i-f, limiter and discriminator stages do not normally require alignment except after servicing these parts of the receiver. When alignment is necessary, detune i-f coils L23, L24, L25 and L26 by bringing the slugs to the bottom of the coil form. This will reduce the limiting level on noise and allow for alignment on signal.
2. Tuning of i-f coil L26, 1st limiter coil L27 and 2nd limiter transformer T1 affects the discriminator setting. Therefore, it is necessary to readjust discriminator coil L30 for zero meter indication whenever an adjustment has been made in any of these coils. Use a 455 kc crystal in the Portable Test Set oscillator for an accurate zero setting of the discriminator.
3. The voltage at meter point (M8) with the multipliers detuned will be approximately -0.24 v. When L20, L21, and L22 are tuned, this voltage will be reduced to approximately -0.17 v. Since the change is small, extreme care should be exercised or the sharp dip as the coil is tuned may not be seen.
4. Before proceeding with the following r-f alignment, position the tuning slugs of image trap coils L12, L13 and L14 1/2" in from the bottom of the coil forms.
5. When image trap coils L12, L13 and L14 are not aligned, a response occurs 910 kc below the desired frequency. Be careful when adjusting the signal generator to the carrier frequency to prevent an erroneous frequency setting.
6. If no image frequency interference is apparent, the image trap coils (L12, L13 and L14) should be left at the lowest frequency adjustment (slugs positioned 1/2" in from bottom of coil forms).
7. The correct coil to reset (L23 or L24) is the coil which has the greatest effect on the noise idle with the least amount of detuning required.
8. If initially the noise idle exceeds + 0.6 v., the alignment of the 455 kc i-f and 1st limiter stages should be repeated.
9. Oscillator coil L18 (and oscillator coil L202 in two frequency models) may also be used for frequency adjustment if a zero reading cannot be obtained with C36 (or C201 in two frequency models).



TEST EQUIPMENT REQUIRED

1. Alignment tool (Motorola Part No. 66A847036, p/o NLN6127A Alignment Tool Kit)
2. DC voltmeter -- Motorola DC Multimeter or equivalent.
3. RF wattmeter or antenna and field strength meter.
4. Power supply (preferably the power supply designed for the transmitter under test)
5. Housing kit and handset or microphone; included with radiophone.
6. Motorola Model T1130A Series FM Station Monitor.

FREQUENCY CALCULATION

$F_c = 24F_o$
 where:
 F_c = carrier frequency
 F_o = oscillator frequency

NOTE

R35 is adjusted at the factory for optimum output from the final amplifiers. In the event it is necessary to readjust R35, a 0-50 ma meter should be inserted in place of JU-1. R35 is then adjusted to give a reading of 28 ma input current. Replace JU1.

PRELIMINARY SET-UP FOR ALIGNMENT

1. Connect r-f wattmeter or antenna to antenna receptacle on housing.
2. When aligning a 2-frequency transmitter, align on the primary or higher of the two frequencies.

STEP	STAGE AND PROCEDURE	ADJUSTMENT	METER READING
1	Remove jumper JU1. When NLD6040A Power Amplifier is used also remove jumper JU301 from reverse side of chassis. In two-transmitter models remove jumpers in both transmitters and power amplifiers.		
2	<p>MODULATOR:</p> <p style="text-align: center;">NOTE IDC control R32 and modulator coil L1 have been set for proper modulation deviation at the factory. Do not change these adjustments unless a Motorola Model T1130A Series FM Station Monitor or equivalent is available to check deviation.</p> <p>Place d-c probe on pin 4 of V3. Key transmitter and adjust coil L1 for maximum reading. (When transmitter is completely aligned, L1 is re-adjusted for minimum distortion in Step 9.)</p>	Coil L1	Maximum
3	<p>TRIPLER: Place d-c probe on meter point (C). Key transmitter and adjust coils L2 and L3 for maximum reading. Two peaks will be observed when tuning L2 and L3. To insure proper alignment, turn the slugs completely counterclockwise (out). Key the transmitter and tune L2 clockwise for maximum reading on the second peak regardless of the amplitude of the first peak; then tune L3 clockwise for maximum. Repeat L2 and L3 for maximum. This circuit is tuned to 3 times the crystal frequency.</p>	Coils L2 and L3	Maximum
4	<p>1st DOUBLER: Place d-c probe on meter point (D). Key transmitter and adjust coils L4 and L5 for a maximum meter reading. This circuit is tuned to 6 times the crystal frequency.</p>	Coils L4 and L5	Maximum
5	<p>2nd DOUBLER: Place d-c probe on meter point (E). Key transmitter and adjust coils L6 and L7 for a maximum meter reading. This circuit is tuned to 12 times the crystal frequency.</p>	Coils L6 and L7	Maximum
6	<p>3rd DOUBLER: Place d-c probe on meter point (F). Key transmitter and adjust coils L8 and L9 for maximum reading. This circuit is tuned to 24 times the crystal frequency.</p>	Coils L8 and L9	Maximum
7	<p>POWER AMPLIFIER: (SEE NOTE). If your radiophone has a transmitter power amplifier proceed as outlined on Power Amplifier Alignment Chart. Otherwise proceed as follows: replace jumper JU1. "Key" transmitter and adjust C23 for maximum indication on the wattmeter or field strength meter.</p>	C23	Maximum
8	<p>OSCILLATOR: C1 is preset to the assigned frequency at the factory. Do not readjust C1 unless the crystal is replaced or the setting was accidentally changed. In the event it is necessary to readjust C1, set up the monitor for frequency measurement and adjust C1 for the proper frequency.</p> <p style="text-align: center;">----- TWO FREQUENCY TRANSMITTERS ONLY -----</p> <p>OSCILLATOR NO. 2: Use the same procedure as above, substituting C201 for C1.</p>	C1 C201	
9	<p>DEVIATION CHECK:</p> <p>See "IDC" ADJUSTMENT procedure on the reverse side of this chart.</p>	Coil L1 R32	Minimum distortion ±15 kc deviation (60 kc) or ±5 kc deviation (30 kc)
10	Repeat Steps 3, 4, 5, 6 and 7 to make sure all coils are on peak.		
11	TWO TRANSMITTER MODELS: Place frequency selector switch in position corresponding to 2nd transmitter and repeat previous steps in 2nd transmitter.		

"IDC" ADJUSTMENT (PREFERRED METHOD USING OSCILLOSCOPE)

1. INTRODUCTION

Accuracy of test equipment is of prime importance to any user of radio communications equipment; but of equal importance is a knowledge of the characteristics of the measuring equipment under various conditions. The Motorola Model T1130A Series FM Station Monitor is the leader in the field with respect to sensitivity, accuracy under conditions of variation in r-f signal level, line voltage, and other environmental conditions. In common with most other meters, however, they have the characteristic of responding differently to different wave shapes. Therefore, the use of most present-day deviation meters can lead to confusion and errors in deviation setting. If the pitfalls are unknown or disregarded.

The "ideal" deviation indicator would be one which would respond instantaneously to the peak value of the modulation deviation, regardless of waveform. The only device which meets all these requirements is an oscilloscope. It responds instantaneously, and it shows the peak value of any waveform, no matter how complex. Properly calibrated, an oscilloscope is the most accurate and reliable means for measuring and setting transmitter deviation.

The oscilloscope must be used in conjunction with a receiver which has a stable discriminator characteristic, since the oscilloscope displays the demodulated signal. In addition to the oscilloscope, a receiver and a means to accurately calibrate the system is required. The Motorola monitors fill these requirements, since they provide both a sensitive receiver with the proper discriminator characteristic and a reliable means of calibrating the oscilloscope. They have convenient terminals on the front panel for connection of the oscilloscope. Furthermore, the Motorola FM Station Monitor is provided with two modulation meter scales, 0-20 kc for wide-band systems, and 0-10 kc for split-channel systems.

Split-channel conversion kits are available for modification of older models, so that they too are provided with convenient oscilloscope terminals and can be more accurate measurement devices for such systems.

2. TEST EQUIPMENT REQUIRED

- Motorola Model T1130A Series FM Station Monitor (or equivalent).
- Motorola Model Transistorized AC Voltmeter (or equivalent).
- Motorola Model TEK-1A Transistorized Tone Generator, 1000 cps (or equivalent).
- Motorola Model T1015A General Purpose or T1014B Precision Wide Band Oscilloscope (or equivalent).

3. OSCILLOSCOPE CALIBRATION

The first step in the measurement of transmitter deviation is to calibrate the oscilloscope. This can be done by using the transmitter which is to be measured.

Proceed as follows:

- The oscilloscope should be connected to the monitor oscilloscope terminals, and the monitor controls should be set up in accordance with the monitor instruction manual.
- Turn the IDC control on the transmitter chassis to the full clockwise position.

c. Feed a 1000 cps test tone into the transmitter mike receptacle. Modulate the transmitter with this tone so adjusted that the deviation as read on the FM monitor deviation meter is 2 kc (6 kc in a wide-band system). An audio oscillator must be used for generation of this tone, since a sinusoidal waveform is very important. The Motorola TEK-1A Transistorized Tone Generator is excellent for this purpose.

d. Adjust the vertical gain of the oscilloscope so that the total recovered audio pattern occupies some convenient height, e.g., four small squares. (12 squares in a wide-band system). The split-channel indication is shown in figure 1.

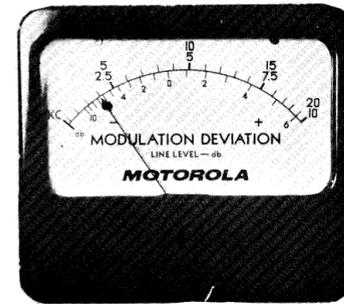
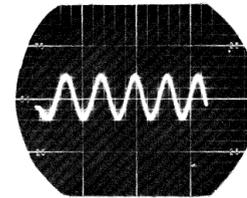


Figure 1.
Oscilloscope Calibration for
Split-Channel Transmitter



Having calibrated the oscilloscope, there is no further need for the modulation deviation meter and its reading should be ignored from this point on. It has already performed its important function of calibrating the oscilloscope.

With the oscilloscope calibrated as indicated, a recovered signal which occupies 10 squares (peak-to-peak) is equivalent to ± 5 kc deviation. For wide-band systems, a recovered signal occupying 30 squares (peak-to-peak) is equivalent to ± 15 kc deviation.

4. MEASUREMENT AND SETTING OF TRANSMITTER DEVIATION

Once the oscilloscope has been calibrated the transmitter deviation can be properly adjusted by the following method.

- Adjust the 1000 cps input signal to 1 volt. This should drive the IDC circuit into full clip. See figure 2.
- With this input signal level adjust the IDC control on the transmitter to provide a peak-to-peak recovered signal on the oscilloscope of 10 squares, which is equivalent to ± 5 kc deviation as shown in figure 2. A wide-band system should be adjusted for 30 squares (± 15 kc). If the waveform under the above conditions does not resemble the waveform shown in figure 2 adjust L1 until a symmetrical waveform is obtained. Re-adjust the IDC control.
- Reduce 1000 cps input to 0.25 volt. Essentially full deviation should still be observed on the oscilloscope. Less than full deviation may indicate a weak audio transistor or other lack of audio gain.

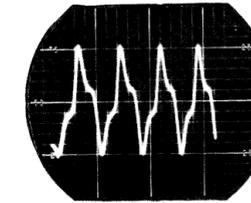


Figure 2.
5 KC Peak Deviation as seen on the Oscilloscope
(NOTE: Waveform is clipped fully)

5. EMERGENCY MEASUREMENT OF DEVIATION

If an audio oscillator is not available, a loud sustained whistle of approximately 1000 cycles can be used for a rough measurement of deviation. If this rough check indicates the need for resetting deviation, do so only under controlled conditions, using a 1000 cps tone as previously indicated. The calibration of the oscilloscope should always be performed with a steady controlled signal. Do not attempt to calibrate the oscilloscope with a sustained whistle as waveform distortion will prevent an accurate calibration.

6. OTHER MEANS FOR MEASUREMENT OF DEVIATION

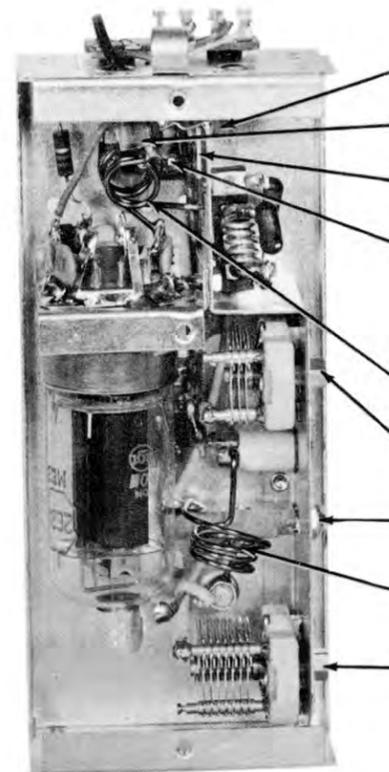
Another accurate means of measuring transmitter deviation is to use the Motorola T1021A Portable Frequency Meter and the Motorola S1058A or S1059A Portable Test Set (with deviation meter). These units, properly used, permit the accurate measurement and setting of transmitter deviation from a peak-reading meter which is unaffected by waveform. An oscilloscope is not required with these instruments. With these devices, the transmitter deviation can be measured accurately even with voice modulation.

7. MICROPHONE LEVELS

If the modulation level in the system still appears to be too low after setting deviation as indicated above, check the microphone.

The foregoing procedure will insure that the transmitter will comply with FCC requirements for maximum deviation.

The importance of the correct deviation setting can not be overemphasized. Optimum system performance demands accurate deviation setting, both from the standpoint that overdeviation will interfere with the user on the adjacent channel, and underdeviation may reduce system range.



- C 311 GRID DRIVE
- L 304 DRIVER COUPLER
- R 302 BIAS ADJUSTMENT
- METER POINT Ⓞ ACCESSIBLE THROUGH OPENING IN REVERSE SIDE OF CHASSIS.
- L 303
- C 304 P.A. PLATE TUNE
- L 301 ANT. COUPLER
- L 302
- C 303 ANT. LOAD

TEST EQUIPMENT REQUIRED

1. Alignment tool (Motorola Part No. 66A847036, p/o NLN6127A Alignment Tool Kit)
2. DC Voltmeter ————
DC Milliammeter ———— Motorola DC Multimeter or equivalent
3. RF wattmeter or antenna and field strength meter
4. Power supply (preferably the power supply designed for the transmitter under test)
5. Housing kit and handset or microphone; included with "Handie-Talkie" Radiophone
6. Motorola Model T1130A Series FM Station Monitor or equivalent

NOTE

R302 is adjusted at the factory to give optimum output from the final tube. In the event it is necessary to readjust R302, it should be set to give rated output but not to exceed 95 ma input current measured at JU301.

PRELIMINARY SET-UP FOR ALIGNMENT

1. Connect r-f wattmeter or antenna to antenna receptacle on housing.
2. When aligning a 2-frequency transmitter, align on the primary or higher of the two frequencies.

STEP	STAGE AND PROCEDURE	ADJUSTMENT	METER READING
1 thru 6	Follow steps 1 through 6 outlined in the transmitter alignment chart.		
7	Replace jumper JU1 in the transmitter.		
8	DRIVER AMPLIFIER: Place d-c probe on meter point Ⓞ. Key transmitter and adjust C23, L11 (driver) and C311 (power amplifier) for maximum reading. These circuits are tuned to 24 times crystal frequency.	C23, L11 and C311	Maximum
9	POWER AMPLIFIER: Observing polarity, place positive and negative milliammeter probes (0-100 ma scale) at d-c input jumper JU301 receptacle to measure plate and screen current of V301 power amplifier. Adjust C303 for minimum coupling (maximum capacity) with capacitor plates fully meshed. Turn output coupling coil L301 clockwise so as to decouple the wattmeter or antenna. Tune C304 for maximum power output.	C303, L301 and C304	C304 Maximum
10	OUTPUT CIRCUIT: CAUTION - When making the following adjustments, do not exceed 95 ma plate and screen current. Adjust C303 and L301 for maximum power output. If necessary re-adjust C304 for maximum power output. In the event the plate and screen current exceeds 95 ma, decouple L303 and L304 by moving L304 away from L303 until the plate and screen current drops to 95 ma. (SEE NOTE)	C303 and L301 C304 L304 (if necessary)	C303 Maximum Maximum 95 ma
11	Replace jumper JU301.		
12	Same as Step 8 in transmitter alignment.		
13	Same as Step 9 in transmitter alignment.		
14	Same as Step 10 in transmitter alignment.		
15	TWO-TRANSMITTER MODELS: Place frequency selector switch in position corresponding to 2nd transmitter and repeat previous steps in 2nd transmitter and power amplifier.		

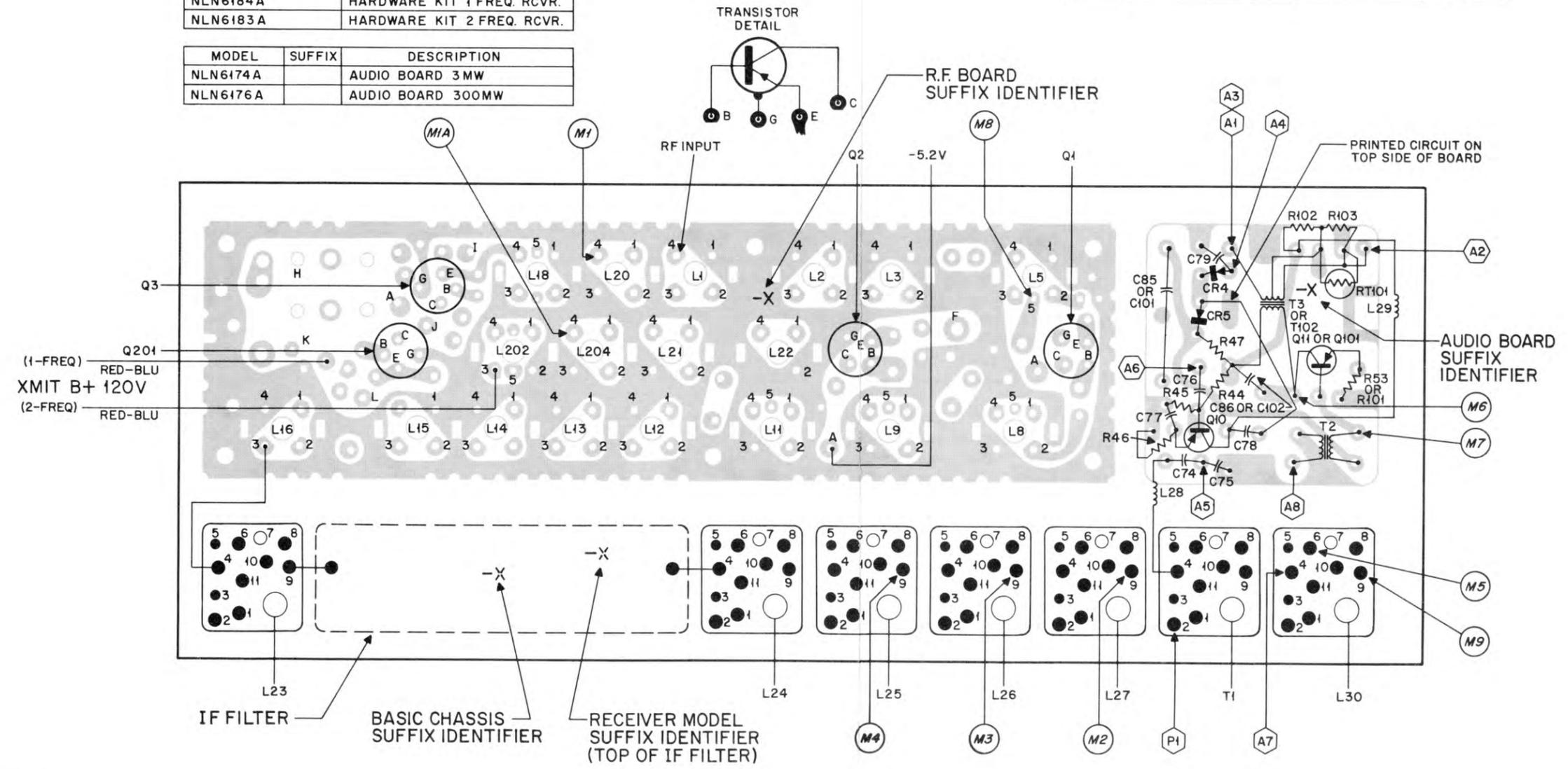
REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A			REFERENCE SYMBOLS AND METERING POINTS REVISED. PRINTED CIRCUIT CONNECTION ADDED TO TOP SIDE OF AUDIO BOARD.	Q10, Q11 AND Q101
B			RF CIRCUIT BOARD PLATING CHANGED	RF BOARD
C	NLD6100A-2 NLD6070A-5 NLD6110A-4 NLD6080A-5		RED-BLU LEAD ADDED	RF PANEL
D			NLN1009A REPLACED WITH NLN1009B	MODEL TABLE
E			MODEL TABLE REVISED	MODEL TABLE

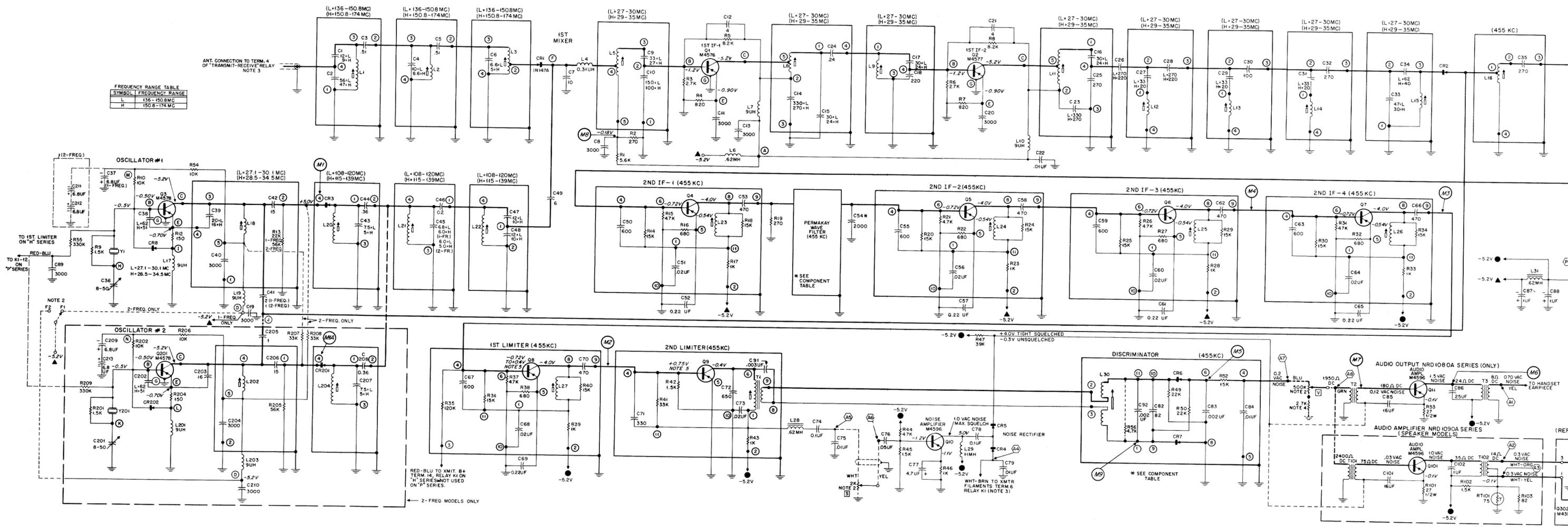
MODEL TABLE

MODEL	DESCRIPTION
NLD6100A	RF BOARD 136-150.8 MC 1 FREQ.
NLD6070A	RF BOARD 150.8-174 MC 1 FREQ.
NLD6110A	RF BOARD 136-150.8 MC 2 FREQ.
NLD6080A	RF BOARD 150.8-174 MC 2 FREQ.
NFN6000AW	IF FILTER 60KC
NFN6000AS	IF FILTER 30KC
NLN1009B	IF AND DISCRIMINATOR CHASSIS
NLN6184A	HARDWARE KIT 1 FREQ. RCVR.
NLN6183A	HARDWARE KIT 2 FREQ. RCVR.

MODEL	SUFFIX	DESCRIPTION
NLN6174A		AUDIO BOARD 3 MW
NLN6176A		AUDIO BOARD 300MW



136-174 MC Carrier Squelch "Handie-Talkie" Receiver Terminal Location Diagram Motorola No. EPD-6086-E



FREQUENCY RANGE TABLE

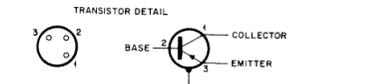
SYMBOL	FREQUENCY RANGE
L	136-150.8 MC
H	150.8-174 MC

MODEL TABLE OF RECEIVER CHASSIS (63E-474 MC)

MODEL SUFFIX	NO. OF AUDIO STAGES	FREQ. RANGE	CHANNEL SPACING
NRD1081AA	6	1 3 MW 136-150.8 MC	60 KC
NRD1082AA	8	1 3 MW 150.8-174 MC	60 KC
NRD1081AB	6	1 3 MW 136-150.8 MC	30 KC
NRD1082AB	8	1 3 MW 150.8-174 MC	30 KC
NRD1081AC	8	2 3 MW 136-150.8 MC	60 KC
NRD1082AC	9	2 3 MW 150.8-174 MC	60 KC
NRD1081AD	8	2 3 MW 136-150.8 MC	30 KC
NRD1082AD	9	2 3 MW 150.8-174 MC	30 KC
NRD1091AA	6	1 300 MW 136-150.8 MC	60 KC
NRD1092AA	8	1 300 MW 150.8-174 MC	60 KC
NRD1091AB	6	1 300 MW 136-150.8 MC	30 KC
NRD1092AB	8	1 300 MW 150.8-174 MC	30 KC
NRD1091AC	8	2 300 MW 136-150.8 MC	60 KC
NRD1092AC	9	2 300 MW 150.8-174 MC	60 KC
NRD1091AD	8	2 300 MW 136-150.8 MC	30 KC
NRD1092AD	9	2 300 MW 150.8-174 MC	30 KC

*** COMPONENT TABLE**

MODEL	SUFFIX	FILTER	C21	R58	C86
NRD1081AA		NF6000AW	OMIT	USED	USED
NRD1082AA		NF6000AW	OMIT	USED	USED
NRD1081AB		NF6000AS	USED	OMIT	USED
NRD1082AB		NF6000AS	USED	OMIT	USED
NRD1081AC		NF6000AW	OMIT	USED	USED
NRD1082AC		NF6000AW	OMIT	USED	USED
NRD1081AD		NF6000AS	USED	OMIT	USED
NRD1082AD		NF6000AS	USED	OMIT	USED
NRD1091AA		NF6000AW	OMIT	USED	OMIT
NRD1092AA		NF6000AW	OMIT	USED	OMIT
NRD1091AB		NF6000AS	USED	OMIT	OMIT
NRD1092AB		NF6000AS	USED	OMIT	OMIT
NRD1091AC		NF6000AW	OMIT	USED	OMIT
NRD1092AC		NF6000AW	OMIT	USED	OMIT
NRD1091AD		NF6000AS	USED	OMIT	OMIT
NRD1092AD		NF6000AS	USED	OMIT	OMIT



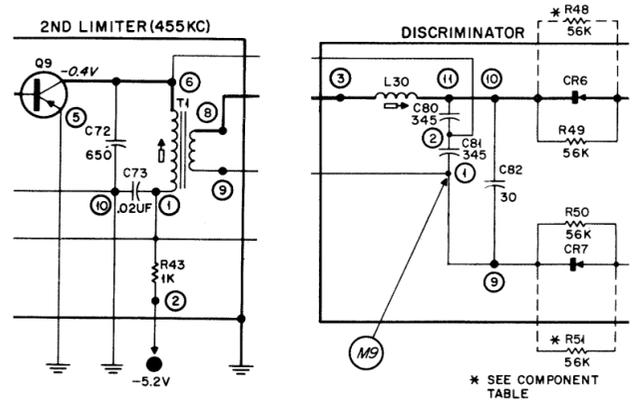
- NOTES:**
1. UNLESS OTHERWISE STATED: RESISTOR VALUES ARE IN OHMS, 5% TOL, 1/4 WATT. K=1000 OHMS. CAPACITOR VALUES ARE IN MICROMICROFARADS.
 2. [V] VOLUME CONTROL, [S] SQUELCH CONTROL AND F1-F2 SWITCH (2-FREQ MODELS) MOUNTED ON CONTROL PANEL. SEE INTERCABLE DIAGRAM.
 3. * TRANSMIT-RECEIVE RELAY MOUNTED ON HOUSING COVER.
 4. USED IN NRD1090A SERIES ONLY.
 5. AS THE LIMITER AND THE IF TRANSISTORS GO INTO LIMITING, THE BASE VOLTAGES WILL GO FROM THE NEGATIVE BIAS CONDITION TO THE POSITIVE BIAS VOLTAGES SHOWN. THE 2ND LIMITER BIAS VOLTAGE WITH FRONT END NOISE REMOVED (SHORTING M4) WILL BE -15V.
 6. a. DC VOLTAGE MEASUREMENTS: DC VOLTAGE MEASUREMENTS MADE WITH A MOTOROLA DC MULTIMETER (1 MEGOHM INPUT RESISTANCE). b. AC VOLTAGE MEASUREMENTS: AC NOISE VOLTAGE MEASUREMENTS MADE WITH A MOTOROLA AC VOLTMETER (1 MEGOHM INPUT IMPEDANCE ON MILLIVOLT RANGES, 10 MEGOHM INPUT AND [V] VOLUME CONTROL SET TO MAXIMUM (FULL CLOCKWISE ROTATION)).
 7. REFER TO TERMINAL LOCATION DIAGRAM FOR PHYSICAL LOCATION OF POINTS IDENTIFIED AS (A) (M) (N) (P) ETC.
 8. FREQUENCY CALCULATION: $F_c = F_1 + 4F_0$

DIAGRAM NO. 63E81005A41

PREVIOUS REVISIONS LISTED ON BACK OF THIS DIAGRAM
Receiver Schematic Diagram
Motorola No. 63E81005A41-N

REVISONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
K	NRD1081AA-3 NRD1082AA-5 NRD1081AB-3 NRD1082AB-5 NRD1081AC-5 NRD1082AC-6 NRD1081AD-5 NRD1082AD-6 NRD1091AA-3 NRD1092AA-5 NRD1091AB-3 NRD1092AB-5 NRD1091AC-5 NRD1092AC-6 NRD1091AD-5 NRD1092AD-6	C80, 81 C82 C92 CR6, 7 L30 R48, 51 R49, 50 R56 C91 T1	NLN1009A BASIC CHASSIS REPLACED WITH NLN1009B NLN6180A 2ND LIMITER REPLACED WITH NLN6247A NLN6181A DISCRIM. REPLACED WITH NLN6246A REMOVED (WAS 21K840913, 345 uuf) WAS 21K872060 30 uuf ADDED .002 uf WAS 48C847274 OR 48K863030 WAS 24K847912 REMOVED (WAS 6K129242, 56K) WAS 6K129242, 56K ADDED 4.7K ADDED .003 uf WAS 24A861128 CIRCUIT WAS AS SHOWN BELOW:	BASIC CHASSIS 2ND LIMITER DISCRIM. NONE 2ND LIMITER NONE	EPD-6086-D NONE NONE



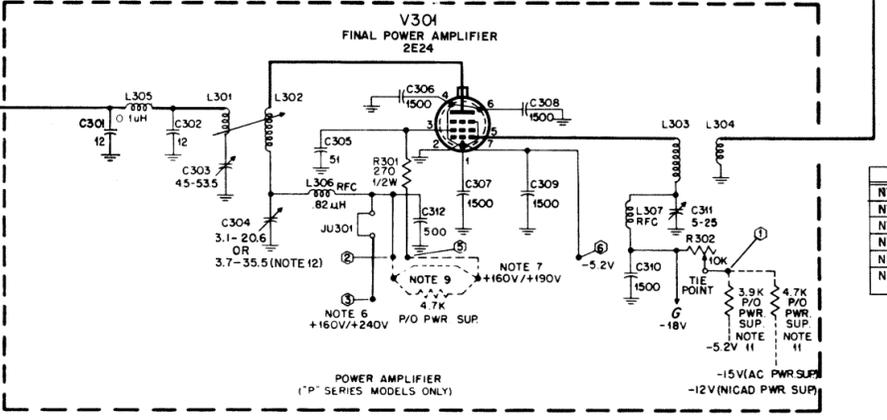
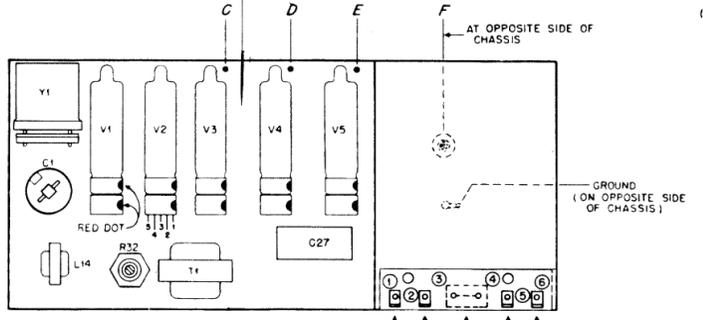
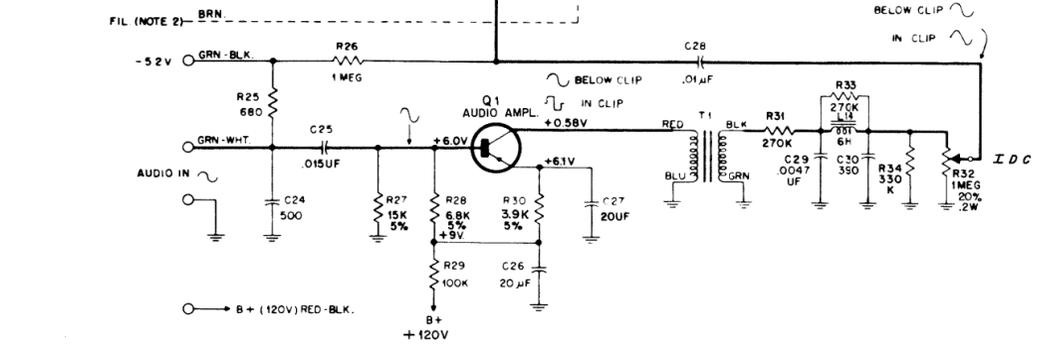
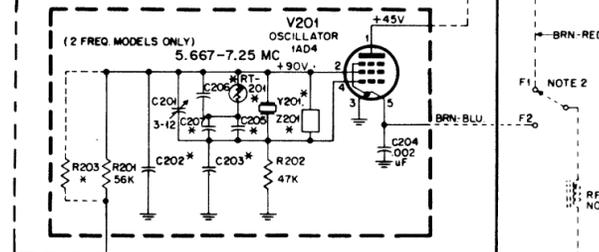
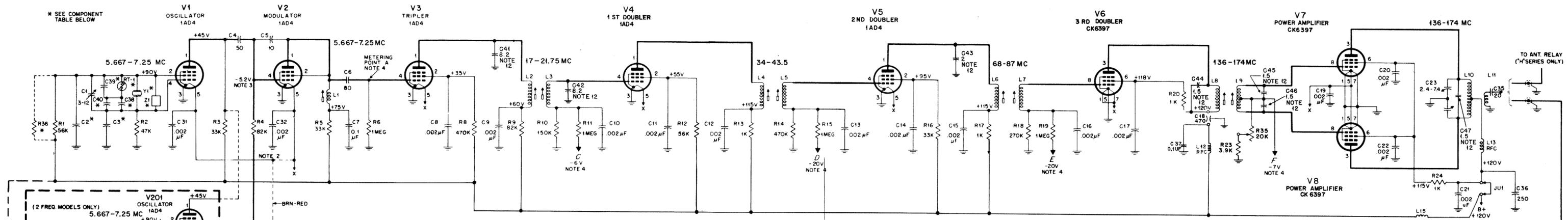
DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
K1	SAME AS ISSUE K		S1052A and S1051B DELETED	NOTE 6	NONE
L	NRD1081AA, AB-4 NRD1082AA, AB-6 NRD1081AC, AD-6 NRD1082AC, AD-7 NRD1091AA, AB-4 NRD1092AA, AB-6 NRD1091AC, AD-6 NRD1092AC, AD-7	R49, R50	WERE 6K128903, (39K)	DISCRIM.	EPD-6086-E
M	NRD1081AA-5 NRD1082AA-7 NRD1081AB-5 NRD1082AB-7 NRD1081AC-7 NRD1082AC-8 NRD1081AD-7 NRD1082AD-8 NRD1091AA-5 NRD1092AA-7 NRD1091AB-5 NRD1092AB-7 NRD1091AC-7 NRD1092AC-8 NRD1091AD-7 NRD1092AD-8	C37, C209, C211, C212, C213 C77 C87 C88	WERE 23K861460 6 uf +100-0%; 12 V WAS 23K844132 4 uf +200-0%; 4 V WERE 23A847071 +200-0%; 8 V	Q3, Q201 Q10 Q11	NONE
N	NRD1081AA-6 NRD1082AA-8 NRD1081AB-6 NRD1082AB-8 NRD1081AC-8 NRD1082AC-9 NRD1081AD-8 NRD1082AD-9 NRD1091AA-6 NRD1092AA-8 NRD1091AB-6 NRD1092AB-8 NRD1091AC-8 NRD1092AC-9 NRD1091AD-8 NRD1092AD-9	C52, 57, 61, 65, 69	WAS 8C82317B01 (0.1 uf)	2ND IF	NONE

PARTS LIST for Schematic Diagram 63E81005A41-N

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C1L	21K847058	CAPACITOR, fixed; uuf; unless otherwise stated
C1H	21K859642	12 ±10%; N150
C2L	21K863623	9 ±5%; 500 v; N150
C2H	21K859211	56 ±5%; N750
C3	21C82450B02	47 ±5%; 500 v; N330
C4	21C82450B02	.51 ±10%; 500 v
C4L	21K847056	10 ±5%; N150
C4H	21D82204B07	6.6 ±5%; 500 v
C5		same as C3
C6L		same as C4H
C6H	21K863466	5 ±5%; 500 v; N150
C7	21K847056	10 ±5%; 250 v; N150
C8	21C82187B16	3000 ±10%; 100 v
C9L	21D82355B08	33 ±5%; N330
C9H	21K840895	27 ±5%; 500 v
C10L	21K840047	150 ±5%; 500 v
C10H	21K831125	100 ±10%; 300 v; N750
C11		same as C8
C12	21K840850	4 ±.5 uuf; 500 v
C13		same as C8
C14L	21K874351	330 ±10%; 300 v
C14H	21K847085	270 ±10%; 300 v
C15L	21D82355B07	30 ±5%; N330
C15H	21D82355B03	24 ±5%; 500 v; N330
C16L		same as C15L
C16H		same as C15H
C17L		same as C15L
C17H		same as C15H
C18	21K847087	220 ±10%; 300 v
C19	21K858108	3000 ±25%; 250 v
C20		same as C8
C21		same as C12
C22	21K847064	.01 uf; GMV; 150 v
C23L		same as C14L
C23H		same as C14H
C24	21C82450B05	.24 ±10%; 500 v
C25		same as C14H
C26L		same as C14H
C26H		same as C18
C27L	21K855809	33 ±5%; N150
C27H	21K847081	20 ±10%; 250 v; N150
C28L		same as C14H
C28H		same as C18
C29L		same as C27H
C29H		same as C27H
C30		same as C10H
C31L		same as C27L
C31H		same as C27H
C32		same as C14H
C33L		same as C2H
C33H	21K831181	30 ±10%; 300 v; N150
C34L	21D82355B14	62 ±5%; N1500
C34H	21K847054	40 ±10%; 150 v; N150
C35		same as C14H
C36	20K867490	variable; 8-50
C37	23D82397D09	6.8 uf +40-20%; 10 v
C38L	21K852322	62 ±5%; 500 v
C38H	21D82355B13	51 ±5%; N1500
C39L	21D82204B19	20 ±5%; N1500
C39H	21K868383	16 ±5%; 1000 v; N1500
C40		same as C8
C41	21K847057 or 21K864518	2 ±.5 uuf; 250 v; N150 (1-freq.)
C42	21K847053	15 ±10%; 250 v; N150
C43L	21K863467	7.5 ±5%; N150
C43H	21K863466	5 ±5%; 500 v; N150
C44	21K842041	0.36 ±5%; 500 v
C45L	21D82355B04 or 21K864746	6.8 ±5%; N150 (1-freq.)
C45H	21K864746 or 21K863466	6 ±5%; 290 v; N150 (1-freq.)
C46	21K830200	0.2 ±5%; 500 v
C47L		same as C1L
C47H		same as C7
C48L		same as C1L
C48H		same as C7
C49		same as C6H
C50	21K851299	600 ±10%; 500 v
C51	8K863628	.02 ±10%; 100 v
C52	21B861478	0.22 uf ±2%; 3 v
C53	21K858114	470 ±10%; 150 v; N2200
C54	21K858102	2000 ±10%; 500 v
C55		same as C50
C56		same as C51
C57		same as C52

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C58		CAPACITOR, fixed; (cont'd)
C59		same as C53
C60		same as C50
C61		same as C51
C62		same as C52
C63		same as C53
C64		same as C50
C65		same as C51
C66		same as C52
C67		same as C53
C68		same as C50
C69		same as C51
C70		same as C52
C71	21K863629	330 ±10%; 600 v
C72	21K848236	650 ±5%; 300 v
C73		same as C51
C74	8C82317B01	0.1 ±10%; 100 v
C75	8K867617	.01 ±10%; 100 v
C76	8C82396B02	.05 ±5%; 200 v
C77	23D82397D05	4.7 uf +40-20%; 3 v
C78		same as C74
C79		same as C75
C80		NOT USED
C81		NOT USED
C82	21D82204B05	82 ±5%; 500 v; N2200
C83	21C831126	.002 uf; GMV; 300 v; K3300
C84		same as C75
C85	23C82601A10	16 uf +33-10%; 10 v
C86	8C82317B02	.25 ±10%; 100
C87	23D82397D07	1 uf +40-20%; 15 v
C88		same as C87
C89		same as C19
C91		same as C8
C92	21K859948	2000 ±5%; 500 v
C101		same as C85
C102		same as C52
C201		same as C36
C202L		same as C38L
C202H		same as C38H
C203L		same as C39L
C203H		same as C39H
C204		same as C19
C205	21K864518	1 ±10%; 500 v
C206		same as C42
C207L		same as C43L
C207H		same as C43H
C208		same as C44
C209		same as C37
C210		same as C19
C211		same as C37
C212		same as C37
C213		same as C37
CR1	48C859464	SEMI-CONDUCTOR DEVICE DIODE (NOTE 1) germanium
CR2		same as CR1
CR3	48C82420C03	silicon
CR4	48C855216	germanium
CR5		same as CR4
CR6	48C855216	germanium
CR7		same as CR6
CR8	48C82392B03	silicon
CR201		same as CR3
CR202		same as CR8
L1	24K847976	COIL, RF: 1st RF; coded ORG-BLU dot; does not include 76B82451B01 CORE, tuning
L2		same as L1, except 2nd RF
L3	24A82452B01	3rd RF; RF coded YEL-GRN dot; does not incl. 76B82451B01 CORE, tuning
L4	24K800484	choke; 0.31 uh
L5	24A82453B01	1st IF-1 input; coded YEL-BLU dot; does not incl. 76K847160 CORE, tuning
L6	24V80900A61	choke; 0.62 mh; coded BRN-ORG dot
L7	24C847920	choke; 9 uh
L8	24B82255C01	1st IF-1 output; coded RED-YEL; does not incl. 76K847160 CORE, tuning

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
L9	24K847964	COIL, RF: (cont'd) 1st IF-2 input; coded RED-BLK; does not incl. 76K847160 CORE, tuning
L10		same as L7
L11		same as L8; except 1st IF-2 output
L12L		same as L9; except 1st Image Trap
L12H	24K847908	1st Image Trap; coded BLU; does not incl. 76K847160 CORE, tuning
L13L		same as L9; except 2nd Image trap
L13H		same as L12H; except 2nd Image Trap
L14L		same as L9; except 3rd Image Trap
L14H		same as L12H; except 3rd Image Trap
L15	24K847938	2nd Mixer Input; coded BRN-VIO dot; does not incl. 76K847160 CORE, tuning
L16	24A847919	2nd Mixer Output; coded YEL dot; does not incl. 76K847159 CORE, tuning
L17		same as L7
L18		same as L12H; except Osc. 1-Freq.
L19		same as L7
L20	24K847973	1st Multiplier; coded ORG-BLK dot; does not incl. 76B82451B01 CORE, tuning
L21		same as L20; except 2nd multiplier
L22		same as L20; except multiplier output
L23	24B847911	IF; coded GRN dot, does not include 76B847159 2nd IF-1, CORE, tuning
L24		same as L23; except 2nd IF-2
L25		same as L23; except 2nd IF-3
L26		same as L23; except 2nd IF-4
L27		same as L23; except 1st limiter
L28		same as L6
L29	24K855725	choke; 11 mh
L30	24B82678C03	IF; Discriminator coded RED dot; does not incl. 76B847159 CORE, tuning
L31		same as L6
L201		same as L9
L202		same as L12H; except Osc. 2-Freq.
L203		same as L7
L204		same as L20; except 2-Freq.
LS301	50B893245	SPEAKER, P-M dynamic; 3.2 ohm input; 2-1/2"
Q1	48R134576	TRANSISTOR; (NOTE 1) P-N-P; type M4576
Q2	48R134577	P-N-P; type M4577
Q3	48R134578	P-N-P; type M4578
Q4	48A124388	P-N-P
Q5		same as Q4
Q6		same as Q4
Q7		same as Q4
Q8		same as Q4
Q9		same as Q4
Q10	48R134596	P-N-P; type M4596
Q11		same as Q10
Q101		same as Q10
Q201		same as Q3
Q301	48A124313	P-N-P; type M4313
Q302		same as Q301
R1	6K129433	RESISTOR, fixed; ±10%; 1/4 w; unless otherwise stated
R2	6K129752	5.6K
R3	6K128688	270
R4	6K129432	2.7K
R5	6K128686	820
R6		RESISTOR, fixed; (cont'd)
R7		same as R3
R8		same as R4
R9	6K127803	same as R5
R10	6K129225	1.5K
R11		10K
R12	6K129862	NOT USED
R13	6K128685	150
R14	or 6K129242	22K
R15	6K127805	56K (2-freq.)
R16	6K127804	15K
R17	6K128599	4.7K
R18	6K127802	680
R19		1K
R20	6R6432	same as R14
R21		270; 1/2 w
R22		same as R14
R23		same as R15
R24		same as R16
R25		same as R17
R26		same as R14
R27		same as R15
R28		same as R16
R29		same as R17
R30		same as R14
R31		same as R15
R32		same as R16
R33		same as R17
R34		same as R14
R35	6K128987	120K
R36		same as R14
R37		same as R15
R38		same as R16
R39		same as R17
R40		same as R14
R41	6K127807	33K
R42		same as R9
R43		same as R17
R44		same as R15
R45		same as R15
R46		same as R9
R47	6K128903	39K
R48		NOT USED
R49		same as R13
R50		same as R13
R51		NOT USED
R52		same as R14
R53	6R5683	27; 1/2 w
R54		same as R10
R55	6K129228	330K
R56	6K127804	4.7K
R101		same as R53
R102		same as R9
R103	6K129224	82
R201		same as R9
R202		same as R10
R203		NOT USED
R204		same as R12



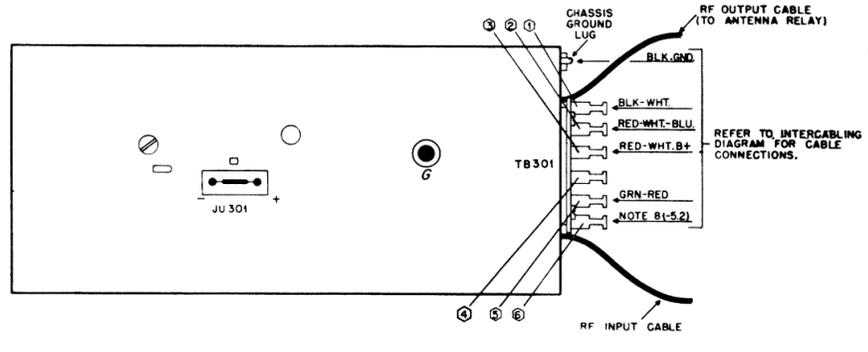
MODEL	SUFFIX	DESCRIPTION
NTD6010AA	2	XMTR. 1-FREQ. 136-150.8 MC
NTD6000AA	5	XMTR. 1-FREQ. 150.8-174 MC
NTD6010AB	1	XMTR. 2-FREQ. 136-150.8 MC
NTD6000AB	5	XMTR. 2-FREQ. 150.8-174 MC
NLD6020A	1	XMTR. POWER AMP. 136-150.8 MC
NLD6040A/NU143A	2	XMTR. POWER AMP. 150.8-174 MC

* COMPONENT TABLE

THE COMPONENTS LISTED IN THE FOLLOWING TABLE VARY ACCORDING TO THE TYPE OF CRYSTAL USED IN A PARTICULAR TRANSMITTER CHASSIS

COMPONENT	CRYSTAL TYPE	VALUE	PART NO.	COMPONENT	CRYSTAL TYPE	VALUE	PART NO.
C2 & C202	VN1 (RED CODED)	24UF ± 5%; N470; 500VDCW	21K868668	RT1 & RT201	VN1 (RED CODED)	100 OHM @ 25°C	68859701
	VN1 (GRN CODED)	30UF ± 5%; N470; 500VDCW	21K859697		VN1 (GRN CODED)	75 OHM @ 25°C	68859699
	VN1 (YEL CODED)	15UF ± 5%; NPO; 500VDCW	21K840846		VN1 (YEL CODED)	100 OHM @ 25°C	68859701
C3 & C203	VN1 (RED CODED)	20UF ± 5%; N150; 500VDCW	21K849334	C40 & C207	VN1 (RED CODED)	OMITTED	21K869487
	VN1 (GRN CODED)	20UF ± 5%; N150; 500VDCW	21K859695		VN1 (GRN CODED)	OMITTED	
	VN1 (YEL CODED)	20UF ± 5%; P100; 500VDCW	21K859698		VN1 (YEL CODED)	1.5UF ± 0.25UF; NPO; 500VDCW	
C38 & C205	VN1 (RED CODED)	8UF ± 5%; N150; 150VDCW	21K847054	R36 & R203	VN1 (RED CODED)	OMITTED	6K129145
	VN1 (GRN CODED)	8UF ± 5%; N150; 150VDCW	21K847743		VN1 (GRN CODED)	OMITTED	
	VN1 (YEL CODED)	8UF ± 5%; N150; 150VDCW	21K847743		VN1 (YEL CODED)	82K ± 10%; 1/4 W	
C39 & C206	VN1 (RED CODED)	6UF ± 5%; NPO; 500VDCW	21K840848	Z1 & Z201	VN1 (RED CODED)	TEMP. COMPENS. NETWORK	1B82711A01
	VN1 (GRN CODED)	6UF ± 5%; NPO; 500VDCW	21K840848		VN1 (GRN CODED)	OMITTED	
	VN1 (YEL CODED)	6UF ± 5%; NPO; 500VDCW	21K840848		VN1 (YEL CODED)	TEMP. COMPENS. NETWORK	

- NOTES:
- UNLESS OTHERWISE STATED ALL RESISTOR VALUES ARE IN OHMS, 1/4 WATT, ± 10% K; 1000 OHMS ALL CAPACITOR VALUES ARE IN MICROMICROFARADS
 - 1 FREQ MODELS - FIL VOLTAGE FOR V1 IS SUPPLIED VIA JUMPER TO POINT X 2 FREQ MODELS - FIL VOLTAGE FOR V1 & V201 IS SUPPLIED VIA FREQ SEL SWITCH ON HOUSING AND JUMPER TO POINT X IS OMITTED
 - ALL VOLTAGE READINGS REFERENCED TO CHASSIS GROUND.
 - READINGS TAKEN WITH MOTOROLA MODEL DC MULTIMETER & ARE NOMINAL.
 - RF CHOKES IS LOCATED IN TOP HOUSING AND IS USED ONLY IN TWO-FREQUENCY MODELS.
 - +160VDC WHEN USED WITH DRY BATTERY POWER SUPPLY. +240VDC WHEN USED WITH NICKEL-CADMIUM BATTERY AND 117VAC POWER SUPPLIES.
 - +190VDC WHEN USED WITH NICKEL-CADMIUM BATTERY AND 117VAC POWER SUPPLIES. +160VDC WITH DRY BATTERY SUPPLY.
 - "P" SERIES MODELS ONLY: ON ONE (1) SINGLE-FREQ. TRANSMITTER MODELS, FILAMENT LEAD TO POWER AMPLIFIER IS BRN. ON TWO (2) SINGLE-FREQ. TRANSMITTER MODELS, FILAMENT LEAD TO: #1 POWER AMPLIFIER IS BRN.-YEL. #2 POWER AMPLIFIER IS BRN.-GRN.
 - JUMPER CONNECTION IN DRY BATTERY POWER SUPPLIES. RESISTOR CONNECTION IN NICKEL-CADMIUM BATTERY AND 117VAC POWER SUPPLIES.
 - ALL TIE POINTS MARKED WITH A HEXAGON (◻) INDICATE POWER AND CONTROL CABLE CONNECTIONS TO POWER AMPLIFIER CHASSIS.
 - 8.2K RESISTOR P/O DRY BATTERY POWER SUPPLY. 10K RESISTOR P/O NICKEL-CADMIUM BATTERY AND 117VAC POWER SUPPLIES.
 - USED IN 136-150.8 MC RANGE ONLY.
 - FREQUENCY CALCULATION: $F_c = 24F_0$



PREVIOUS REVISIONS LISTED ON BACK OF THIS DIAGRAM

Transmitter & Power Amplifier Schematic Diagram

Motorola No. 63E856910-G

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
C	NTD6000AA-3 NTD6000AB-3	R12	WAS 120K	V4-2
D	NTD6000AA-3 NTD6000AB-3	C40	ADDED JUNCTIONS OF C1, C3 & C38 C39, RT1.	V1 OSC.
		C207	ADDED JUNCTIONS OF C201, C203 & C205, C206 & RT201	V201 OSC.
		Z1	ADDED BETWEEN V1-2 & V1-4	V1 OSC.
		Z201	ADDED BETWEEN V201-2 & V201-4	V201 OSC.
		R36	ADDED ACROSS R1	V1 OSC.
		R203	ADDED ACROSS R201	V201 OSC.
			COMPONENT TABLE CHANGE IN DIAGRAM	COMPONENT TABLE
D1	NTD6000AA-3 NTD6000AB-3	L10	WAS 24A847077	V7
		L11	WAS 24A847078	V8
E	NTD6000AA-4 NTD6000AB-4	L15	.62 UF COIL ADDED	V8
E1	NTD6010AA-1 NTD6010AB NLD6020A-1		ADDED 136-150.8 MC COMPONENTS AND NOTE 12	V3, V4, V5, V6, V7
F	NTD6000AA-4 NTD6010AA-1	L15	WAS 24K847940	V8
F1	NTD6010AA-1 NTD6000AA-4 NTD6010AB NTD6000AB-4 NLD6020A-1 NLD6040A-2		ADDED NOTE 13 ADDED FREQUENCIES AT MULTIPLIER AND OSCILLATOR STAGES	
F2	NTD6010AA-1 NTD6010AB	Q1	WAS 48R134596	AUDIO AMPLIFIER
F3	NTD6010AA-1 NTD6000AA-4 NTD6010AB NTD6000AB-4 NLD6020A-1 NLD6040A-2		S105A DELETED	NOTE 4
F4	NTD6000AA-4 NTD6010AA-1 NTD6000AB-4	L14	WAS 25D847527	PARTS LIST
G	NTD6000AA-5 NTD6010AA-2 NTD6010AB-1	R28	WAS 6K129237 6.8K	Q1 BASE

PARTS LIST for Schematic Diagram 63E856910-G

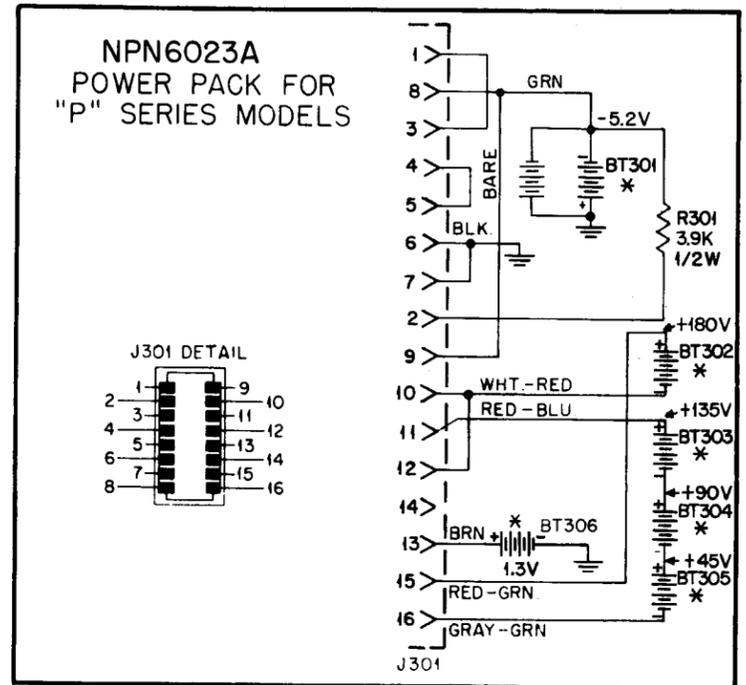
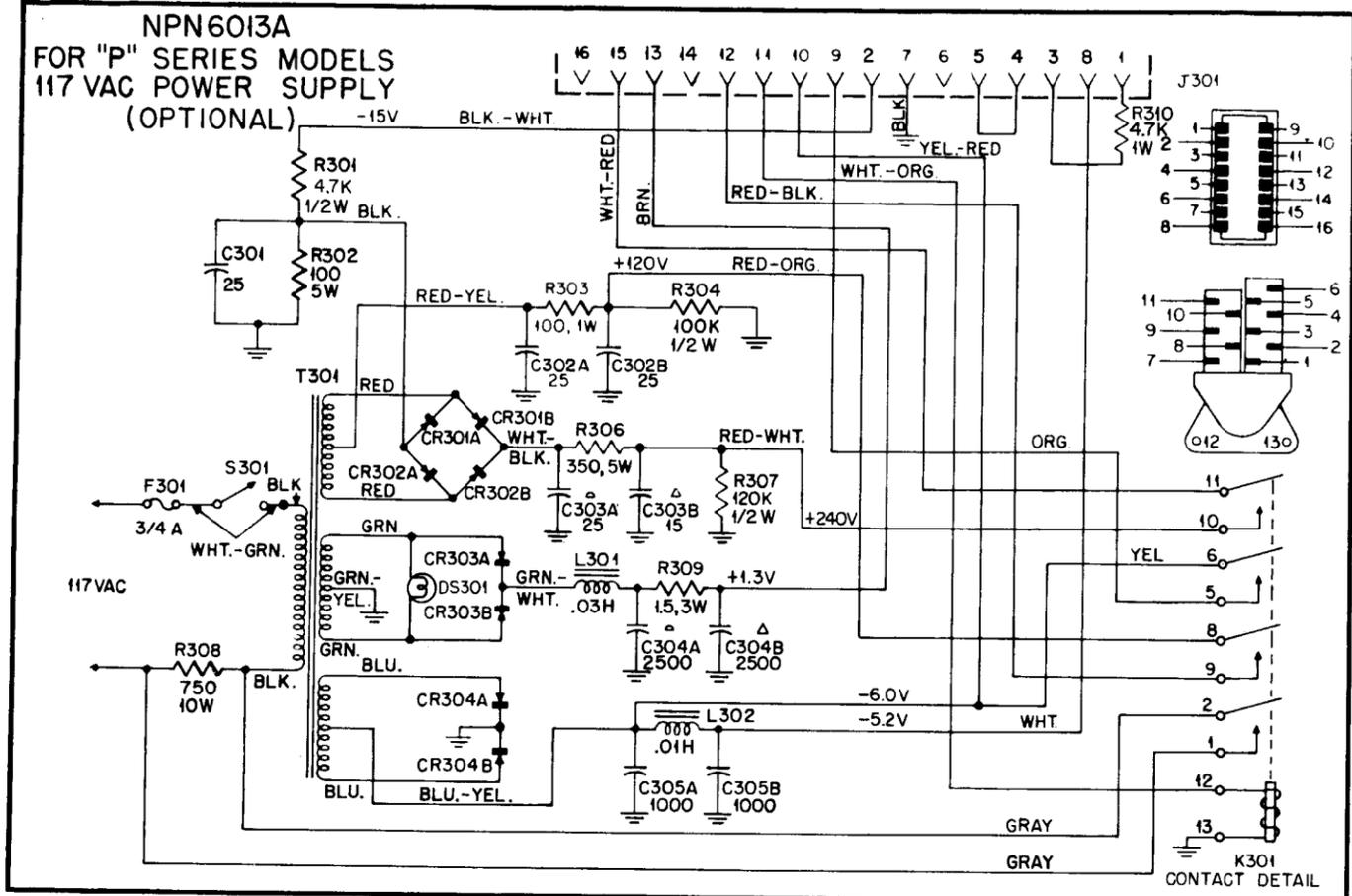
REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C1	20K848635	CAPACITOR, fixed; unless otherwise specified variable; air; 3 uuf min. to 12 uuf max. (refer to table in diagram)
C2		(refer to table in diagram)
C3		(refer to table in diagram)
C4	21K847055	ceramic; square; 50 uuf ±10%; 150 vdcw; N150
C5	21K847056	ceramic; square; 10 uuf ±5%; 250 vdcw; N150
C6	21K847770	ceramic; square; 80 uuf ±10%; 250 vdcw; N750
C7	8K844261	metallized paper; tubular; .1 uf ±20%; 200 vdcw
C8	21C831126	ceramic; square; .002 uf GMV; 300 vdcw; K3300
C9	21C855384	ceramic; disc; .002 uf ±15%; 250 vdcw
C10		same as C9
C11		same as C9
C12		same as C9
C13		same as C9
C14		same as C9
C15		same as C9
C16		same as C9
C17		same as C8
C18	21B821474	ceramic; feed-thru; 470 uuf ±20%; 500 vdcw
C19		same as C8
C20		same as C8
C21		same as C8
C22		same as C8
C23	19B847063	variable; air; 2.4 uuf min. to 7.4 uuf max.
C24	21K847065	ceramic; square; 500 uuf GMV; 250 vdcw; K1200
C25	8K861259	mylar; tubular; .015 uf ±10%; 400 vdcw
C26	23C855013 or 23B844927	electrolytic; tubular; 20 uf +100-10%; 25 vdcw
C27		same as C26
C28	21K847064	ceramic; square; .01 uf GMV; 150 vdcw; K6000
C29	8K847106	mylar; tubular; .0047 uf ±20%; 400 vdcw
C30	21K848158	molded silver mica; 390 uuf ±5%; 500 vdcw
C31		same as C9
C32		same as C9
C33		NOT USED
C34		same as C9
C35	21K847081	ceramic; square; 20 uuf ±10%; 250 vdcw; N150
C36	21A112247	molded silver mica; 250 uuf ±10%; 850 vdcw
C37		same as C7
C38		(refer to table in diagram)
C39		(refer to table in diagram)
C40		(refer to table in diagram)
C41	21K847873	8.2 uuf ±.5 uuf; 500 v
C42		same as C41
C43	21K847057	2 uuf ±.5 uuf; 250 v
C44	21K77267	1.5 uuf ±20%; 500 v; BRN-GRN-WHT
C45		same as C44
C46		same as C44
C47		same as C44

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C201	20K850615	CAPACITOR, (cont'd) variable; air; 3 uuf min. to 12 uuf max. (refer to table in diagram)
C202		(refer to table in diagram)
C203		(refer to table in diagram)
C204		same as C8
C205		(refer to table in diagram)
C206		(refer to table in diagram)
C207		(refer to table in diagram)
C301	21R120549	ceramic; tubular; 12 uuf ±10%; 500 vdcw
C302		same as C301
C303	19K847767	variable; air; 4.5 uuf min. to 53.5 uuf max.
C304	19K863265 or 19K850503	variable; air; 3.7 uuf min. to 35.5 uuf max. (136-150.8 mc)
C305	21D840044	variable; air; 3.1 uuf min. to 20.6 uuf max. (150.8-174 mc)
C306	21B800801	dipped silver mica; 51 uuf ±10%; 500 vdcw
C307		ceramic; disc; 1500 uuf GMV +100% max; 500 vdcw
C308		same as C306
C309		same as C306
C310		same as C306
C311	20K848235	variable; air; 5 uuf min. to 25 uuf max.
C312	21K881081	molded silver mica; 500 uuf ±10%; 500 vdcw
JU1	1V848041	JUMPER ASSEMBLY: rectangular bakelite wafer board with 2 male contacts; jumpered
JU301		same as JU1
L1	24A483211	COIL, RF: Modulator Plate; coded GREEN dot; does not include the following components which must be ordered separately: 1V474439 Ferrule, Washer and Core Assembly: consisting of: 1V474450 Ferrule and Washer Assembly 46A474257 CORE, adjustable tuning; coded YEL dot
L2	24B848001	Tripler Plate; coded BLACK dot; does not include the following components which must be ordered separately: 1V881153 Ferrule, Washer and Core Assembly: consisting of: 1V474450 Ferrule and Washer Assembly: 46A881152 CORE, adjustable tuning; coded ORANGE dot
L3		same as L2 except 1st Doubler Grid
L4	24K848005	1st Doubler Plate; coded GRN-YEL dot; does not include the following components which must be ordered separately: 1V474439 Ferrule, Washer and Core Assembly: consisting of: 1V474450 Ferrule and Washer Assembly: 46A474257 CORE, adjustable tuning; coded YEL dot

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
L5		COIL, (cont'd) same as L4 except 2nd Doubler Grid
L6	24K848598	2nd Doubler Plate; coded GRN-GRN dot; does not include the following components which must be ordered separately: 1V891025 Ferrule, Washer and Core Assembly; consisting of: 1V474450 Ferrule and Washer Assembly 46A881152 CORE, adjustable tuning; coded ORG dot
L7		same as L6 except 3rd Doubler Grid
L8	24K891041	3rd Doubler Plate; coded RED-WHT dots; does not include the following components which must be ordered separately: 1V891025 Ferrule, Washer and Core Assembly: consisting of: 1V474450 Ferrule and Washer Assembly 46A891044 CORE, adjustable tuning; coded WHT dot
L9	24A848061	PA Grid; does not include the following components which must be ordered separately: 1V891025 Ferrule, Washer and Core Assembly: consisting of: 1V474450 Ferrule and Washer Assembly 46A891044 CORE, adjustable tuning; coded WHT dot
L10	24A82111B01	PA Plate
L11	24A82112B01	Coupling Loop
L12	24A890687	Choke
L13		same as L12
L14	25C82867C02	AF; choke; 6 henries at 3 kc
L15	24V80900A61	choke; 0.62 mh; BRN-ORG
L301	1V854216	Coupling Loop
L302	24A854207	PA Plate
L303	24A854205	PA Grid
L304	24A854206	Link
L305	24A801714	Choke; .1 uh
L306	24B840512	Choke; .82 uh; coded BLK-YEL dot
L307		same as L12
Q1	48R134596	TRANSISTOR: type P-N-P
R1	6K128684	RESISTOR, fixed; carbon; ±10%; 1/4 w; ins; unless otherwise stated
R2	6K128902	56K
R3	6K127807	47K
R4	6K129145	same as R1
R5		82K
R6	6K129013	same as R3
R7		1 meg
R8	6K129148	NOT USED
R9		470K
R10	6K129146	same as R4
R11		150K
R12	6K129242	same as R6
R13	6K127802	56K 1K

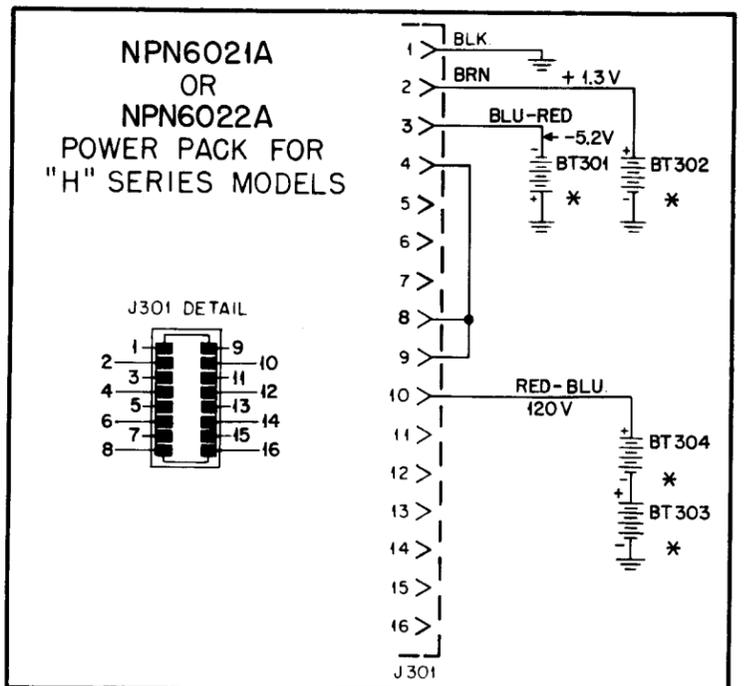
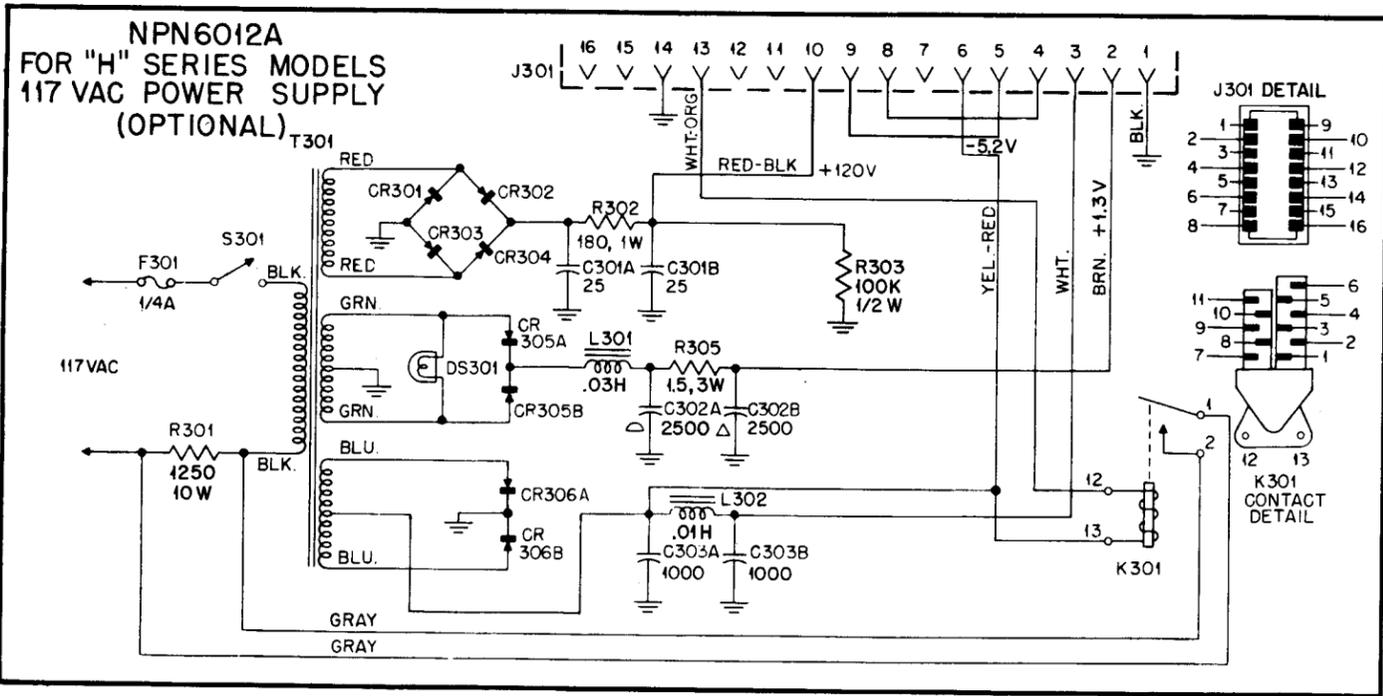
REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
R14		RESISTOR, (cont'd)
R15		same as R8
R16		same as R6
R17		same as R3
R18	6K129227	same as R13
R19		270K
R20		same as R6
R21		same as R13
R22		NOT USED
R23	6R5659	3.9K; 1/2 w
R24		same as R13
R25	6K128599	680 ohm
R26		same as R6
R27	6K129236	15K ±5%
R28	6R129819	3.9K ±5%
R29	6K129226	100K
R30	6K129238	5.1K ±5%
R31		same as R18
R32	18K847062	variable; carbon; 1 meg ±20%; .2 w
R33		same as R18
R34	6K129228	330K ±5%
R35	18K867137	variable; 20K ±20%; 1/2 w; linear
R36		(refer to table in diagram)
R201		same as R1
R202		same as R2
R203		(refer to table in diagram)
R301	6R6432	270 ohm; 1/2 w
R302	18K864068	variable; 10K ±20%; 1/8 w; linear
RT1		THERMISTOR: (refer to table in diagram)
RT2		(refer to table in diagram)
T1	25B837249	TRANSFORMER, AF: input; 10K primary to 250K; coded RED, BLU; secondary at 2 ma dc; coded BLK, GRN
TB301	31A867441	BOARD, terminal: 6 solder lug terminals
V1	195T206A01	TUBE, electron; type 1AD4
V2		same as V1
V3		same as V1
V4		same as V1
V5		same as V1
V6	195T241A01	electron; type 6397
V7		same as V6
V8		same as V6
V201		same as V1
V301	197T101A01	electron; type 2E24
XV1	9A845451	SOCKET, tube: female; 5 contact; sub-miniature; rectangular molded bakelite base; chassis mounted
XV2		same as XV1
XV3		same as XV1
XV4		same as XV1
XV5		same as XV1
XV6	9A804942	female; 8 contact; sub-miniature; round molded mica filled phenolic base; chassis mounted
XV7		same as XV6
XV8		same as XV6
XV201	9C837218	female; 5 contact; sub-miniature; rectangular molded mica filled phenolic base; chassis mounted

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
XV301	9A6771	SOCKET, (cont'd) female; 8 contact; round brown bakelite wafer base; saddle mounting
XY1	1V848012	SOCKET, crystal: female; 2 contact; rectangular bakelite wafer base; chassis mounted
XY201		female; 2 contact; rectangular bakelite wafer base; chassis mounted; consists of the following parts: 64A481910 PLATE, insulator; top; 1 required 64A481911 PLATE, insulator; bottom; 1 required 39A474229 CONTACT; 2 required 5S771 RIVET; .088 x 3/16"; 1 required
Z1		FILTER: (refer to table in diagram)
Z201		(refer to table in diagram)
NON-REFERENCED ITEMS		
	1V859709	Transmitter RF & Oscillator Printed Circuit Assembly; used in Model NTD6000AA only
	1V859711	Transmitter RF & Oscillator Printed Circuit Assembly; used in Model NTD6000AB only
	1V859712	Transmitter 2nd Oscillator Printed Circuit Assembly; used in Model NTD6000AB only
CRYSTAL		
NOTE		
Crystals are part of the Radio Set Model. When ordering a Transmitter Chassis only, crystals must be ordered separately.		
When ordering a crystal, the transmitter operating frequency and the crystal frequency must be specified.		
Y1	AN-1 or VN-1	CRYSTAL UNIT, quartz; transmitter oscillator (for use in "H" Series models) (for use in "P" Series models)
IMPORTANT		
If a VN-1 replacement crystal is needed, do not specify Type VN-1 Crystal. The NED6000A Crystal Conversion Kit must be ordered. This kit consists of a Type VN-1 Crystal (coded RED or GREEN) together with suitable oscillator circuit components to match the crystal characteristics for maximum frequency stability. Instructions for usage and installation of the replacement crystal are included in the kit. Read the instructions before installing the replacement crystal.		



* BATTERY KITS

BATTERY KIT	USED WITH
NLN6142A	NPN6021A
NLN6143A	NPN6022A
NLN6144A	NPN6023A



MODEL TABLE

MODEL	DESCRIPTION
NPN6012A	117 VAC POWER SUPPLY FOR "H" SERIES "HANDIE-TALKIE" RADIOPHONES
NPN6013A	117 VAC POWER SUPPLY FOR "P" SERIES "HANDIE-TALKIE" RADIOPHONES
NPN6021A	POWER PACK FOR "H" SERIES "HANDIE-TALKIE" RADIOPHONES (STANDARD)
NPN6022A	POWER PACK FOR "H" SERIES "HANDIE-TALKIE" RADIOPHONES (EXTRA-DUTY)
NPN6023A	POWER PACK FOR "P" SERIES "HANDIE-TALKIE" RADIOPHONES

DIAGRAM NO. 63E81005A44

PREVIOUS REVISIONS LISTED
ON BACK OF THIS DIAGRAM

NPN6020A Series Dry Battery Power Packs
And Optional 117 V AC Power Supplies
Schematic Diagram
Motorola No. 63E81005A44-O3

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1	NPN6013A	S301	WAS 40A11589	PARTS LIST
O2	NPN6012A	S301	WAS 40A11589	PARTS LIST
O3	NPN6013A		ADDED 1V80713A34 AND 1V80717A16	PARTS LIST

PARTS LIST for Schematic Diagram 63E81005A44-O3

NPN6012A AC Power Supply

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C301	23K821735	<u>CAPACITOR, fixed:</u> 3 section; consists of: 25 uf +50-10%; 250 v
C301A		25 uf +50-10%; 250 v
C301B		25 uf +50-10%;
C301C		NOT CONNECTED
C302	23D82125B04	2 section; consists of: 2500 uf +100-10%; 15 v
C302A		2500 uf +100-10%; 15 v
C302B		2500 uf +100-10%; 15 v
C303	23K834325	2 section; consists of: 1000 uf +100-10%; 15 v
CR301	48B802669	<u>RECTIFIER, metallic: selenium</u> 8 plate
CR302		same as CR301
CR303		same as CR301
CR304		same as CR301
CR305	48C800957	4 plate; series consists of: 2 plate section
CR305A		2 plate section
CR305B		2 plate section
CR306		same as CR305
DS301	65A84419	<u>LAMP, incandescent:</u> 12-16 v; 2 amp. single contact
F301	65R20987	<u>FUSE, cartridge:</u> 1/4 amp; 250 v
J301	9K848291	<u>CONNECTOR, receptacle:</u> female; 16 contact
K301	80K831612	<u>RELAY, armature:</u> dual stack; contact arrangement; 1st stack, 1 form "A" and 1 form "C"; 2nd stack, 3 form "A", 19 ohm coil; does not include 15K848892 COVER, relay or 7A811735 BRACKET, relay
L301	25B811355	<u>REACTOR:</u> filter; .03 h
L302	25B832466	filter; .01 h
R301	17K824568	<u>RESISTOR, fixed: unless otherwise stated:</u> 1250 ±10%; 10 w
R302	6R6390	180 ±10%; 1 w
R303	6R6031	100K ±10%; 1/2 w
R304		NOT USED
R305	17C82291B08	1.5 ±5%; 3 w
S301	1V80714A17	<u>SWITCH, slide:</u> spst
T301	25D82213B01	<u>TRANSFORMER, power:</u> consists of the following windings: pri. #1: BLK, BLK 100 v; d-c res. 18.40 pri. #2: RED, RED 118 v; d-c res. 133 sec. #1: GRN, GRN with GRN-YEL tap; 8.8 v; d-c res. 0.55 sec. #2: BLU, BLU with BLU-YEL tap; 12.6 v; d-c res. 2.23
XDS301	60A890181	<u>LAMPHOLDER:</u> single contact; incl. RED LENS
XF301	9B865564	<u>FUSEHOLDER:</u> extractor post type

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
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NPN6013A AC Power Supply

C301	23K850516	<u>CAPACITOR, fixed:</u> 25 uf +100-10%; 50 v
C302	23K821735	3 section; consists of: 25 uf +50-10%; 250 v
C302A		25 uf +50-10%; 250 v
C302B		25 uf +50-10%; 250 v
C302C		NOT CONNECTED
C303	23K474081	2 section; consists of: 25 uf +50-10%; 450 v
C303A		15 uf +50-10%; 400 v
C303B		15 uf +50-10%; 400 v
C304	23D82125B04	2 section; consists of: 2500 uf +100-10%; 15 v
C304A		2500 uf +100-10%; 15 v
C304B		2500 uf +100-10%; 15 v
C305	23K834325	2 section; consists of: 1000 uf +100-10%; 15 v
C305A		1000 uf +100-10%; 15 v
C305B		1000 uf +100-10%; 15 v
CR301	48K868931	<u>RECTIFIER, metallic: selenium;</u> 16 plate; series consists of: 8 plate section
CR301A		8 plate section
CR301B		8 plate section
CR302		same as CR301
CR303	48C800957	4 plate; series consists of: 2 plate section
CR303A		2 plate section
CR303B		2 plate section
CR304		same as CR303
DS301	65A84419	<u>LAMP, incandescent:</u> 12-16 v; 2 amp.
F301	65K898635	<u>FUSE, cartridge:</u> 3/4 amp; 250 v
J301	9K848291	<u>CONNECTOR, receptacle:</u> female; 16 contact
K301	80K831612	<u>RELAY, armature:</u> dual stack; contact arrangement; 1st stack, 1 form "A" and 1 form "C"; 2nd stack, 3 form "A" 19 ohm coil; does not include 15K848892 COVER, relay or 7A811735 BRACKET, relay
L301	25B811355	<u>REACTOR:</u> filter; .03 h
L302	25B832466	filter; .01 h
R301	6R6080	<u>RESISTOR, fixed: unless otherwise stated:</u> 4.7K ±10%; 1/2 w
R302	17K831332	100 ±10%; 5 w
R303	6R6415	100 ±10%; 1 w
R304	6R6031	100K ±10%; 1/2 w
R305		NOT USED
R306	17K833841	350 ±10%; 5 w
R307	6R5631	120K ±10%; 1/2 w
R308	17K847346	750 ±5%; 10 w
R309	17K82291B08	1.5 ±5%; 3 w
R310	6R5576	4.7K ±10%; 1 w
S301	1V80714A17	<u>SWITCH ASSY, slide:</u> spst
T301	25D82214B01	<u>TRANSFORMER, power:</u> consists of the following windings: pri. #1: BLK, BLK; 100 v; d-c res. 7.8; pri. #2: RED, RED with RED-YEL tap.; 346 v; d-c res. 122 sec. #1: GRN, GRN with GRN-YEL tap; 8.3 v; d-c res. 0.5 sec. #2: BLU, BLU with BLU-YEL tap; 12.4 v; d-c res. 0.7
XDS301	60A890181	<u>LAMPHOLDER:</u> single contact; incl. RED LENS

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
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NPN6021A Battery Power Supply (Standard)

NPN6022A Battery Power Supply (Extra-Duty)

XF301	9B865564	<u>FUSEHOLDER:</u> extractor post type
NON-REFERENCED ITEMS		
	1V80713A34 1V80717A16	HOUSING BOTTOM COVER ASSY. MOUNTING BOARD ASSY., rectifier: mounting for CR1 thru 15, R1

NPN6021A Battery Power Supply (Standard)

NPN6022A Battery Power Supply (Extra-Duty)

J301	9K848291	<u>CONNECTOR, receptacle:</u> female; 16 contact
NON-REFERENCED ITEMS		
	31A482474 28A847765 28K12249	STRIP, "B" battery term.; 2 req'd. PLUG, battery (6 v) 2 contact PLUG, battery (1-1/2 v) 2 contact

NPN6023A Battery Power Supply

NPN6021A Power Pack

NPN6022A Power Pack

J301	9K848291	<u>CONNECTOR, receptacle:</u> female; 16 contact
R301	6R5679	<u>RESISTOR, fixed:</u> 3.9K ±10%; 1/2 w
NON-REFERENCED ITEMS		
	28A800970 28A847765 28K12249	PLUG, battery, (45 v) 3 contact; 4 req'd. PLUG, battery, (6 v) 2 contact; 2 req'd. PLUG, battery (1-1/2 v) 2 contact

NLN6142A Battery Kit (for NPN6021A Power Pack)

NLN6143A Battery Kit (for NPN6022A Power Pack)

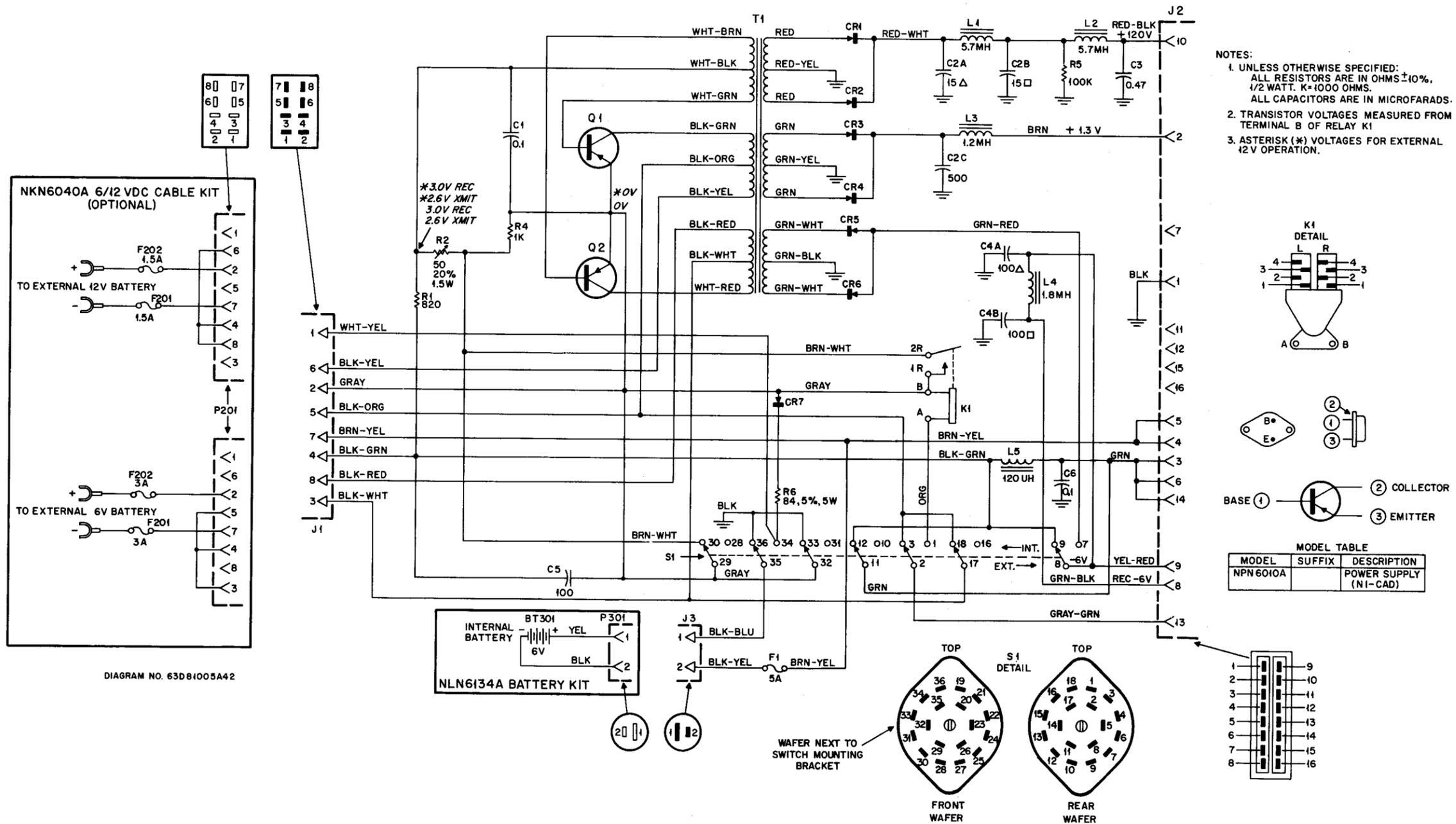
BT301	60B848432 or60T847888	<u>BATTERY, dry:</u> 6 v; 2 req'd.; used only on NLN6142A
BT302	60B852116	6 v; used only on NLN6143A
BT303	or60B82104C01 60T847252 or60B852117	1-1/2 v; 2 req'd.; used only on NLN6142A
BT304		1-1/2 v; used only on NLN6143A
		67-1/2 v; used only on NLN6142A
		same as BT303

NLN6144A Battery Kit (for NPN6023A Power Pack)

NPN6021A Power Pack

NPN6022A Power Pack

BT301	60T847888	<u>BATTERY, dry:</u> 6 v; 2 req'd.
BT302	60C82145C01	45 v
BT303	48A800451	45 v
BT304		same as BT303
BT305		same as BT303
BT306	60A480415	1-1/2 v



PREVIOUS REVISIONS LISTED
ON BACK OF THIS DIAGRAM

Model NPN6010A Power Supply
Schematic Diagram
Motorola No. 63D81005A42-O3

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1	NPN6010A	C6	WAS C1	NEAR L5
O2	NPN6010A	Q1, Q2	WAS 48R134572	PARTS LIST
		P201	WAS 9A893290	
O3	NPN6010A		ADDED 1V80713A87	

PARTS LIST for Diagram 63D81005A42-O3

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C1	8C82317B01	<u>CAPACITOR, fixed:</u> 0.1 uf ±10%; 100 v
C2	23D82003C01	3 section; consists of: Δ 15 uf +100-10%; 250 v □ 15 uf +100-10%; 250 v 500 uf +100-10%; 10 v
C2A		
C2B		
C2C		
C3	8K863994	0.47 uf ±10%; 200 v
C4	23K851495	2 section; consists of: Δ 100 uf +100-10%; 25 v □ 100 uf +100-10%; 25 v
C4A		
C4B		
C5	23C82601A09	100 uf +150-10%; 25 v
C6		same as C1
CR1	48C82095C02	<u>CRYSTAL UNIT, rectifying:</u> <u>(NOTE 1)</u> silicon
CR2		same as CR1
CR3	48C82095C01	silicon
CR4		same as CR3
CR5		same as CR3
CR6		same as CR3
CR7		same as CR3
F1	65R122345	<u>FUSE, cartridge:</u> 5 a; 32 v; 5/8" x 1/4"
J1	28A881246 (See Note)	<u>CONNECTOR, receptacle:</u> fem; 8 cont; polarized; rectangular <u>NOTE</u> For replacement, order 1V80713A85 BRACKET ASSEMBLY, switch mounting (includes J1, XF1)
J2	9K848291 (See Note)	fem; 16 cont; polarized; rectangular <u>NOTE</u> For replacement, order 1V848431 CABLE CLAMP & RECEPTACLE ASSEMBLY
J3	28A812540	male; 2 cont; polarized; round
K1	80K848533	<u>RELAY, armature</u> 2 stack, arranged as follows: left stack, 2 form "A"; right stack, 2 form "A"; <u>NOTE:</u> Does not include 1V80713A83 COVER ASSEMBLY (includes R2), nor 7A811735 BRACKET (for cover)
L1	24K847941	<u>REACTOR: power filter;</u> 5.7 mh; coded BRN, YEL
L2		same as L1
L3	24A855728	1.2 mh; does not include 7A858175 BRACKET, retainer
L4	24C82190C01	1.8 mh
L5	24A848627	<u>CHOKE:</u> 120 uh
Q1	48A124331	<u>TRANSISTOR: p-n-p: (NOTE 1)</u> germanium; does not include 14K865875 INSULATOR (2 req'd)
Q2		same as Q1
R1	6R6269	<u>RESISTOR, fixed: unless otherwise stated</u> 820 ±10%; 1/2 w
R2	18R851358	variable: 50 ±20%; 1.5 w; linear
R3		NOT USED
R4	6R6229	1K ±10%; 1/2 w
R5	6R6031	100K ±10%; 1/2 w
R6	17C82291B12	84 ±5%; 5 w
S1	40C82105C01	<u>SWITCH, rotary:</u> 2 position; 2 sections; each section 6 pole, non-shorting; does not include 36A55361 KNOB, control: lever type

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
T1	1V80713A81	<u>TRANSFORMER, power:</u> transistor controlled; includes the following windings: pri. 1: WHT-BRN, WHT-GRN with WHT-BLK tap pri. 2: BLK-GRN, BLK-YEL with BLK-ORG tap; pri. 3: BLK-RED, WHT-RED with BLK-WHT tap sec. 1: RED, RED with RED-YEL tap sec. 2: GRN, GRN with GRN-YEL tap sec. 3: GRN-WHT, GRN-WHT with GRN-BLK tap
XF1		<u>FUSEHOLDER:</u> consists of: 42K81973 CLIP, fuse: 2 req'd
NON-REFERENCED ITEMS		
	1V80713A80	MOUNTING BOARD ASSEMBLY, rectifier: mounting for CR1 to CR6
	1V80713A87	HOUSING BOTTOM COVER ASSY.: incl. 1V80713A89 DOOR, access

NKN6040A Cable Kit (6/12 V)

F201	65R890033 (12 volt) or 65R20404 (6 volt)	<u>FUSE, cartridge:</u> 1-1/2 a; 250 v; 1-1/4" x 1/4" 3 a; 250 v; 1-1/4" x 1/4"
F202		same as F201
P201	1V80715A25	<u>CONNECTOR, plug:</u> assy. incl: 9A82459C01 fem; 8 cont; incl shell and cable clamp 55A82461C01 HANDLE, conn shell
XF201	9K848616	<u>FUSEHOLDER:</u> "in-line" type; for 1-1/4" x 1/4" fuse consists of: 14A82882A01 BODY 14A82883A01 CAP; 42A82884A01 CLIP: 2 req'd; 41A82885A01 SPRING same as XF201
XF202		

NLN6134A Battery Kit

BT301	60D848921	<u>BATTERY, rechargeable:</u> nickel-cadmium; 6 v
P301	9A865701	<u>CONNECTOR, plug:</u> fem; 2 cont; polarized; round

NOTE:

1. Replacement transistors or crystal units (diodes) must be ordered by Motorola part number only for optimum performance.

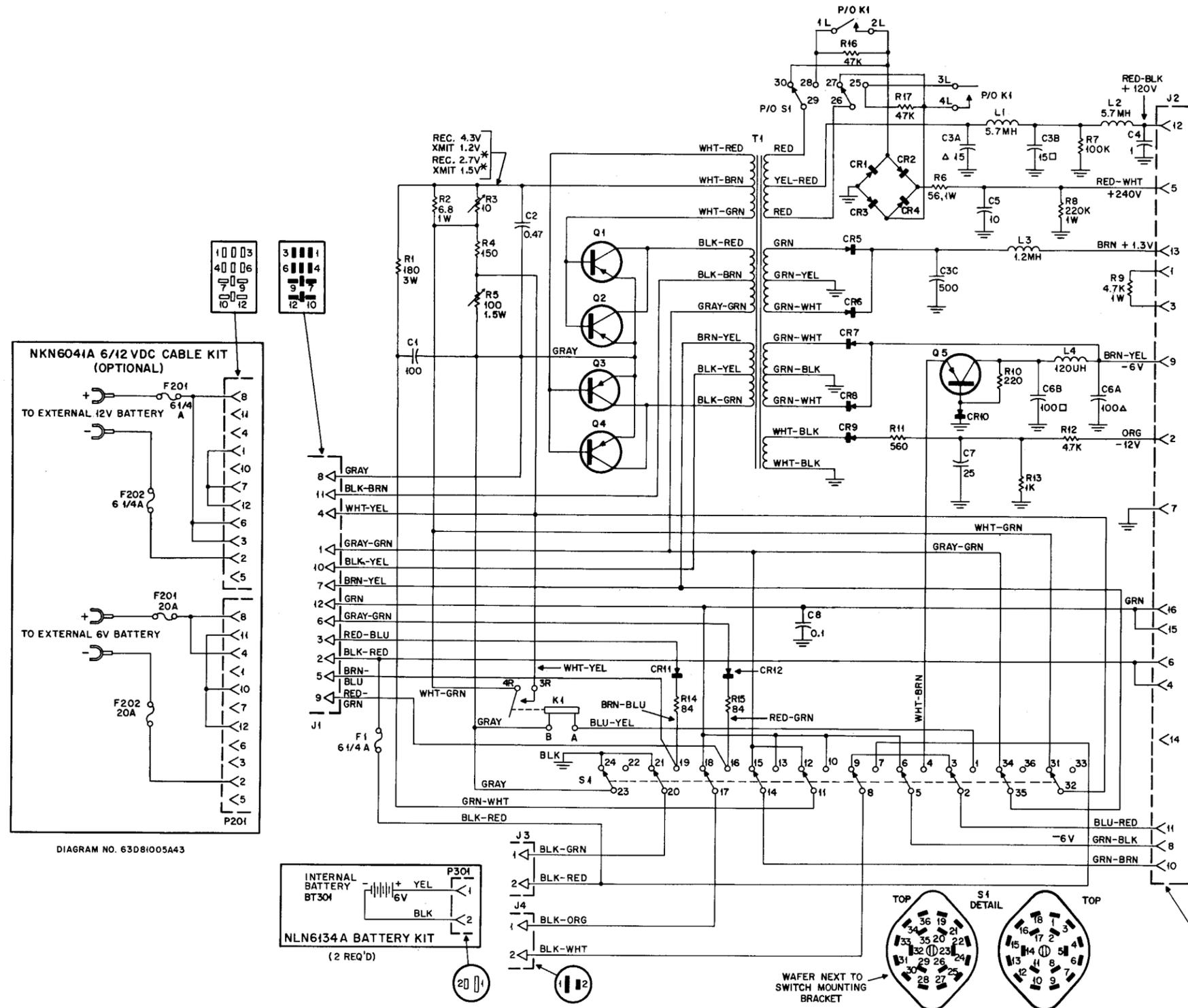
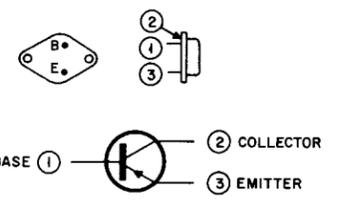
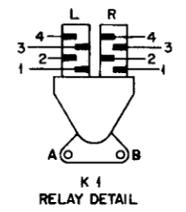


DIAGRAM NO. 63D81005A43

- NOTES:
- UNLESS OTHERWISE SPECIFIED:
ALL RESISTORS ARE IN OHMS ±10%,
1/2 WATT. K=1000 OHMS.
ALL CAPACITORS ARE IN MICROFARADS
 - TRANSISTOR VOLTAGES MEASURED FROM
TERMINAL B OF RELAY K1.
 - ASTERISK (*) VOLTAGES FOR EXTERNAL
12V OPERATION.
 - INTERNAL-EXTERNAL SWITCH S1 SHOWN
IN INTERNAL POSITION.



MODEL TABLE

MODEL	SUFFIX	DESCRIPTION
NPN6011A	1	6/12 VDC TRANSISTOR POWER SUPPLY FOR "P" SERIES

PREVIOUS REVISIONS LISTED
ON BACK OF THIS DIAGRAM

Model NPN6011A Power Supply
Schematic Diagram
Motorola No. 63D81005A43-A

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1	NPN6011A	R11	WAS 6R6326	PARTS LIST
O2	NPN6011A	C1	WAS 23C82077C01	PARTS LIST
		P201	WAS 9A893290	
O3	NPN6011A		ADDED 1V80713A75	PARTS LIST
A	NPN6011A-1	R13	WAS 6R2089, 1.8K	J2-2

PARTS LIST for Schematic Diagram 63D81005A43-A

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		<u>CAPACITOR, fixed:</u>
C1	23C82601A09	100 uf +150-10%; 35 v
C2	8K863994	0.47 uf ±10%; 200 v
C3	23D82003C01	3 section; consists of:
C3A		△ 15 uf +100-10%; 250 v
C3B		□ 15 uf +100-10%; 250 v
C3C		500 uf +100-10%; 10 v
C4	8K863306	1 uf ±10%; 200 v
C5	23K851655	10 uf +50-10%; 475 v
C6	23K851495	2 section; consists of:
C6A		△ 100 uf +100-10%; 25 v
C6B		□ 100 uf +100-10%; 25 v
C7	23K850516	25 uf +100-10%; 50 v
C8	8C82317B01	0.1 uf ±10%; 100 v
		<u>SEMI-CONDUCTOR DEVICE, DIODE</u>
CR1	48C82095C02	silicon
CR2		same as CR1
CR3		same as CR1
CR4		same as CR1
CR5	48C82095C01	silicon
CR6		same as CR5
CR7		same as CR5
CR8		same as CR5
CR9		same as CR5
CR10	48C82256C01	silicon
CR11		same as CR5
CR12		same as CR5
		<u>FUSE, cartridge:</u>
F1	65B475247	6-1/4 a; 32 v
		<u>CONNECTOR, receptacle:</u>
J1	28A483376	male; 12 contact
J2	1V848288	female; 16 contact; assy.
J3	28A812540	male; 2 contact
J4		same as J3
		<u>RELAY, armature:</u>
K1	80K848533	2 stack, arranged as follows: left stack, 2 form "A" right stack, 2 form "A"; coil d-c res. 50 ohms does not include 15A811737 COVER or 7A811735 BRACKET, cover and bracket must be ordered separately
		<u>REACTOR: power filter:</u>
L1	24K847941	5.7 mh; coded BRN, YEL
L2		same as L1
L3	24A855728	1.2 mh; does not include 7A858175 BRACKET, retainer
L4	24A848627	120 uh
		<u>TRANSISTOR: (NOTE 1)</u>
Q1	48A124331	P-N-P; does not include 14K865875 INSULATOR
Q2		same as Q1
Q3		same as Q1
Q4		same as Q1
Q5	48C124246	P-N-P; does not include 14K865875 INSULATOR
		<u>RESISTOR, fixed: ±10%; 1/2 w;</u> unless otherwise stated
R1	17C82291B13	180; 3 w
R2	17K861289	ww; 6.8 ±5%; 1 w
R3	18K851494	variable; 10 ±20%; 1.5 w
R4	6R6373	150
R5	18C82035B02	variable; 100 ±20%; 1.5 w
R6	6R2037	56; 1 w
R7	6R6031	100K
R8	6R5574	220K; 1 w
R9	6R5576	4.7K; 1 w
R10	6R6270	220

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
R11	6R6291	RESISTOR, fixed: (cont'd)
R12	6R6080	560
R13	6R6229	4.7K
R14	17C82291B12	1K
R15		ww; 84 ±5%; 5 w
R16	6R6048	same as R14
R17		47K
		same as R16
S1	40C82105C01	<u>SWITCH, rotary:</u> 2 position; 2 sections; each section 6 pole, non-shorting; does not include 36A55361 KNOB
T1	1V80713A69	<u>TRANSFORMER, power:</u> assy. consists of the following windings: pri 1: BLK-RED, GRAY-GRN with BLK-BRN tap. pri 2: BRN-YEL, BLK-GRN with BLK-YEL tap. pri 3: WHT-RED, WHT-GRN with WHT-BRN tap. sec. 1: RED, RED with YEL-RED tap. sec. 2: WHT-BLK, WHT-BLK sec. 3: GRN-WHT, GRN-WHT with GRN-BLK tap. sec. 4: GRN, GRN with GRN-YEL tap.
XF1	9K865564	<u>FUSEHOLDER:</u> extractor post type
XQ1	9D82673A01	<u>SOCKET, transistor:</u> female; 2 contact
XQ2		same as XQ1
XQ3		same as XQ1
XQ4		same as XQ1
XQ5		same as XQ1
NON-REFERENCED ITEMS		
	1V80713A75	HOUSING BOTTOM COVER ASSY.

NKN6041A CABLE KIT (6/12 v)

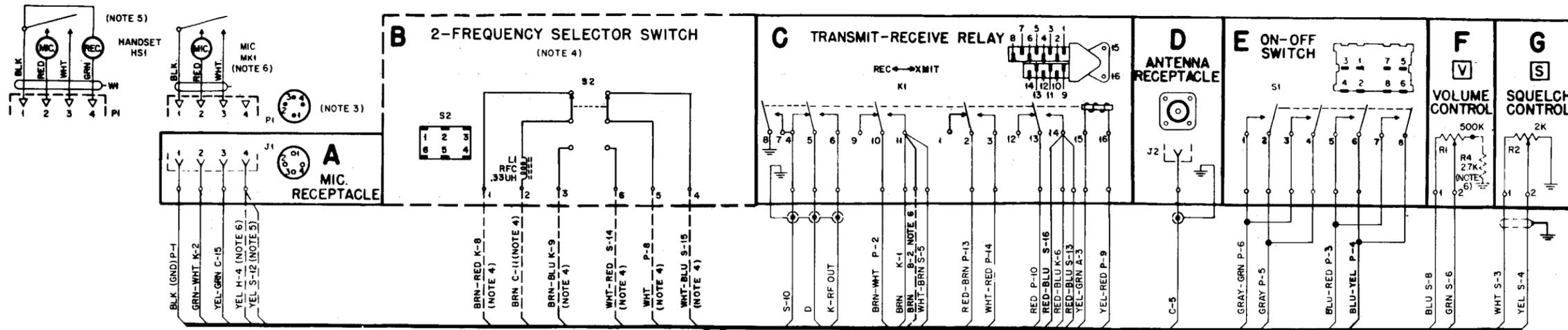
F201, F202	65B475247 or 65R4637	<u>FUSE, cartridge:</u> 6-1/4 a; 32 v; (12 volt only) 20 a; 32 v; (6 volt only)
P201	1V80715A26	<u>CONNECTOR, plug:</u> assy. incl 9A82460C01 fem; 12 cont; incl shell and cable clamp 55A82461C01 HANDLE, conn shell
XF201		<u>FUSEHOLDER:</u> includes: 14A82882A01 BODY, 14A82883A01 CAP 42A82884A01 CLIP, 2 req'd. 41A82885A01 SPRING
XF202		same as XF201

NLN6134A BATTERY KIT

BT301	60D848921	<u>BATTERY, rechargeable:</u> nickel-cadmium; 6 volt
P301	9A865701	<u>CONNECTOR, plug:</u> female; 2 contact

NOTE:

- 1 Replacement transistors or crystal units (diodes) must be ordered by Motorola part number only for optimum performance.



PARTS LIST for Intercabling Diagram 63D81005A46-D

NCN6021A Control Panel (1-Freq.) Speaker Model
 NCN6022A Control Panel (2-Freq.) Speaker Model
 NCN6025A Control Panel (1-Freq.) Handset Model
 NGN6012A Top Panel (1-Freq.) Handset Model
 NGN6013A Top Panel (2-Freq.) Handset Model

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
J1	1V80715A83	<u>CONNECTOR, receptacle:</u> female; 4 contact; potted
J2	9A85615	
J3	28B847027	
K1	8K858174	<u>RELAY, telephone type:</u> dual stack; contact arrangement; 1st stack, 2-form "C", 2nd stack, 1-form "A" and 2-form "C"; coil res. 50 ohms
L1	24K854314	<u>COIL, r-f:</u> choke; .33 uh (2-freq only)
R1	18C847060	<u>RESISTOR:</u> variable; 500K ±20%; .3 w variable; 2K ±20%; .2 w NOT USED fixed; 2.7K ±10%; 1/4 w (used only in NCN6021A, NCN6022A)
R2	18K847061	
R3		
R4	6K128688	
S1	1V854327	<u>SWITCH,</u> assy; includes: 1V851776 SWITCH ASSY. includes: 40B82406C01 SWITCH, interlock: snap action; 4-contact 7B851773 BRACKET, switch 43K850806 BUSHING, shaft 41A847097 SPRING, tension 41A847112 SPRING, switch 47A851213 SHAFT, switch 14A847096 BOARD, switch 3S122897 SCREW, lock: 4-40 1/4" 2 req'd. 4K848991 WASHER, insulating 3S2969 SCREW, machine: 4-40 x 3/16" also includes 36A851214 KNOB, switch; 3S120621 SCREW, machine: 4-40 x 1/4"
S2	40B82668C01	toggle: SPDT (2-freq. only)
NON-REFERENCED ITEMS		
	32A864813	GASKET, microphone receptacle
	2K850796	NUT, seal
	36B82288B01	KNOB, control: plain; 2 req'd.
	13B82068C01	GRILLE, speaker (NCN6021A, NCN6022A)
	32A82177C01	GASKET, diaphragm (NCN6021A, NCN6022A)
	32A847519	GASKET, speaker; 2 req'd. (NCN6021A, NCN6022A)
	42B847537	CLIP, microphone (NCN6021A, NCN6022A)
	32A847539	GASKET, microphone clip (NCN6021A, NCN6022A)
	55B847559	HANDLE, carrying (NCN6021A, NCN6022A)
	32A848936	GASKET, handle
	1V848554	HANDSET CRADLE ASSY. (NGN6012A, NGN6013A, NCN6025A)
	7B847008	BRACKET, handset: spring (NGN6012A, NGN6013A, NCN6025A)
	15C82636A12	HOUSING, control panel (NCN6021A and NCN6025A)
	15C82636A13	HOUSING, control panel (NCN6022A)
	15C82636A10	HOUSING, top panel (NGN6012A)
	15C82636A11	HOUSING, top panel (NGN6013A)

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
NMN6007A Handset		
HS1	50C847025	<u>HANDSET:</u> receiver cartridge impedance 125 ohms; transmitter cartridge impedance 25 ohms
P1		<u>CONNECTOR, plug:</u> p/o 30D82565B05 CORD, coiled;
W1	1V848171	<u>CORD, handset:</u> assy.; includes: 30D82565B05 CORD, coiled; tinsel; 4 conductor; includes male; 4 contact connector plug 29A800038 LUG, terminal: 4 used 42A85648 CLAMP, ground
NMN6008A Microphone		
MK1	50D82040C01	<u>MICROPHONE, palm type:</u> includes: 30D82565B04 CORD, microphone: coiled; with 4 contact connector; 12" length supplied 59K865086 CARTRIDGE, microphone 40K865087 SWITCH, push-to-talk 41K865088 SPRING, cable relief 38K865089 BUTTON, switch 15A82041C01 COVER, front 15A82041C02 COVER, back
P1		<u>CONNECTOR, plug:</u> p/o 30D82565B04 CORD, micro- phone
NAD6120A Antenna (136-150.8 mc)		
NAD6121A Antenna (150.8-162 mc)		
NAD6122A Antenna (162-174 mc)		
	1V80717A10 (136-150.8 mc)	ANTENNA ROD ASSY, includes: 47K863264 ROD, antenna; 20-1/4"lg 43A847577 BALL, antenna
	or 1V858453 (150.8-162 mc)	ANTENNA ROD ASSY, includes: 47B847894 ROD, antenna; 18-1/4"lg 43A847577 BALL, antenna
	or 1V858454 (162-174 mc)	ANTENNA ROD ASSY, includes: 47K847895 ROD, antenna; 17-1/4"lg 43A847577 BALL, antenna
	14A844065	INSULATOR, antenna; nylon threaded
	41A844061	SPRING, antenna
	4A822404	WASHER: 2 req'd
	45490516	WASHER: 1/4"-.106"-.030"
	14A844245	INSULATOR, antenna
	28A844066	CONNECTOR, plug: male; single contact
	42A482075	RING, "O"
	3S3860	SCREW, set: 4-40 x 1/8"
NAB6081A Antenna (25-30 mc)		
NAB6082A Antenna (30-36 mc)		
NAB6083A Antenna (36-42 mc)		
NAB6084A Antenna (42-48 mc)		
NAB6085A Antenna (48-54 mc)		
	24K848321	<u>COIL, RF:</u> loading; used for 25-30 mc
	or 24B850760	loading; used for 30-36 and 36-42 mc
	or 24B850759	loading; used for 42-48 and 48-54 mc
	24A848318	coupling loop
	1V852599	CONNECTOR, plug: male; single contact
	47B483170	ROD, antenna
	14A847610	INSULATOR, coil mounting
	1V848319	STUD AND BUSHING ASSY.
	76K838176	CORE, tuning: coded VIOLET
	41K838646	SPRING, core tension
	14B82026C01	INSULATOR, antenna base
	38A847677	BUTTON, plug

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	1V850761	<u>COIL, RF:</u> (cont'd) INSULATOR and SWITCHING TAB ASSY. (used only in 30-54 mc) SPRING, contact: (used only in 30-54 mc)
	41A848154	
NLN6129A Kit, Carrying Strap		
	42C82554D01	STRAP, shoulder and handset; includes: 42C82554D02 STRAP, shoulder 42K483337 STRAP, handset
NHN6033A Housing Sleeve & Hdwe. Kit ("H" Series 1-Freq. Xmtr., 1-Freq. Rcvr.)		
NHN6034A Housing Sleeve & Hdwe. Kit ("H" Series 2-Freq. Xmtr., 1-Freq. Rcvr.)		
	1V80711A45	HOUSING SLEEVE ASSY. (center section of housing) Riveted incl: 15C82029C01 SLEEVE, housing 55A847016 STRIKE: 2 req'd. 4A834582 WASHER, fibre: 4 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 2 req'd. 46K847022 STUD, oval head: 7/16" long 46K847023 STUD, oval head: 1/2" long 47A102105 PIN, cross: 2 req'd. RECEIVER PIVOTING BRACKET & FASTENER ASSY. (Riveted) incl: 7A847014 BRACKET, fastener mtg. 64K858066 PLATE, pivoting 4K858060 WASHER, nylon 41B102109 FASTENER, spring 4K840914 WASHER, spring SCREW, captive: 4 used on NHN6033A and 2 used on NHN6034A
	1V847676	SCREW, captive: 2 req'd. used on NHN6034A
	3A847626	WASHER, shoulder: 2 req'd.
	3K858062	WASHER, fibre: 2 req'd.
	4A831369	WASHER, nylon: 2 req'd.
	4K51143	BRACKET, receiver hold-down
	4K858061	SPACER, insulator
	7A847024	
	43A82232B02	
Miscellaneous Mechanical Parts		
	1V80713A35	BATTERY CASE ASSY. (Riveted) p/o NPN6021A incl: 15C82061C01 CASE, battery 32A847042 GASKET, catch: 2 req'd 41A845494 SPRING, hold-down 55A847015 CATCH: 2 req'd. BATTERY CASE ASSY. (Riveted) p/o NPN6010A incl: 15C82047C01 CASE, battery 55A847015 CATCH: 2 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 4 req'd. 32A848478 GASKET, bracket 7A848464 BRACKET, chassis hold-down; "U" shaped 7A848466 BRACKET, chassis hold-down; "L" shaped 7A82052C01 BRACKET, strike 1V80713A89 EXTERNAL DOOR ASSY. incl. 15A82131C01 DOOR, hinged 46A82051C01 STUD, locking 4C82418B05 WASHER, nylon 55A82050C01 STRIKE
	1V80713A88	

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	75A82089C01 1V80713A42	32A82053C01 GASKET, door BUMPER, rubber BATTERY CASE ASSY. (Riveted) p/o NPN6022A incl: 15C82062C01 CASE, battery 55A847015 CATCH: 2 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 4 req'd.

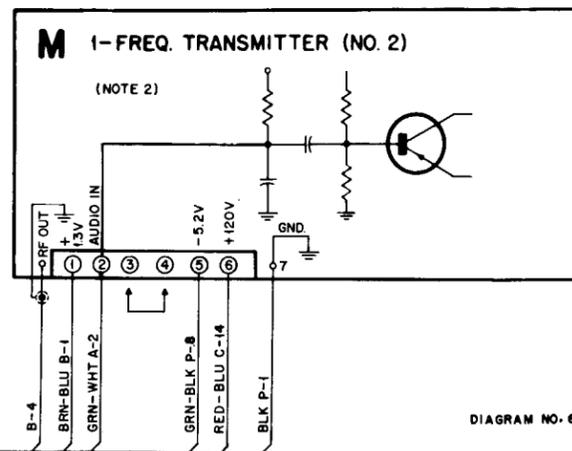
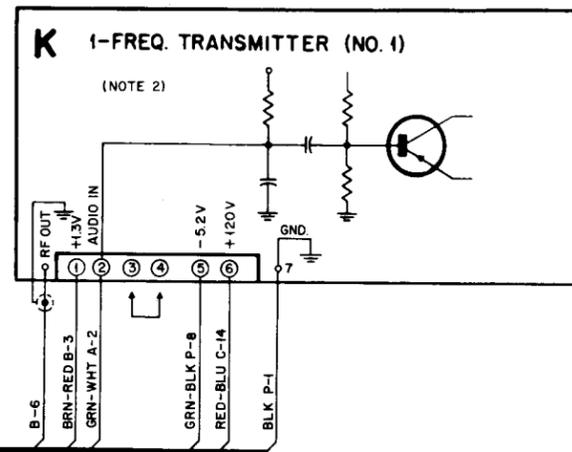
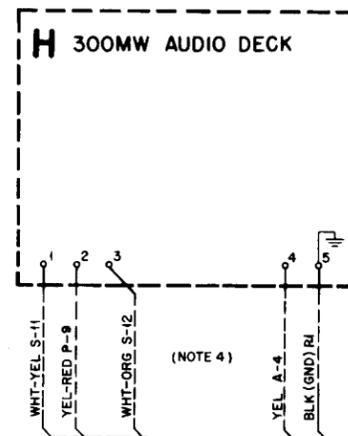
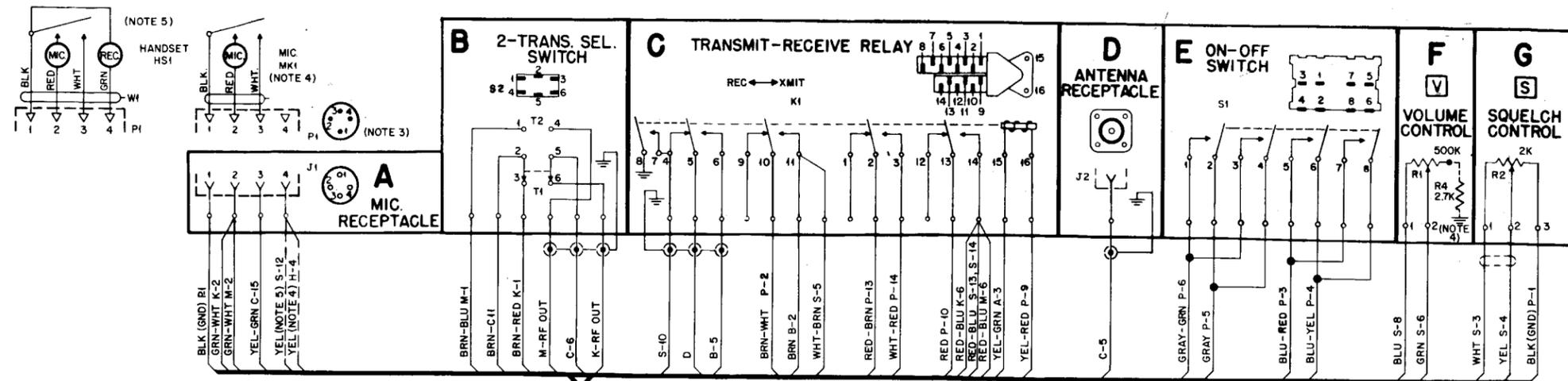
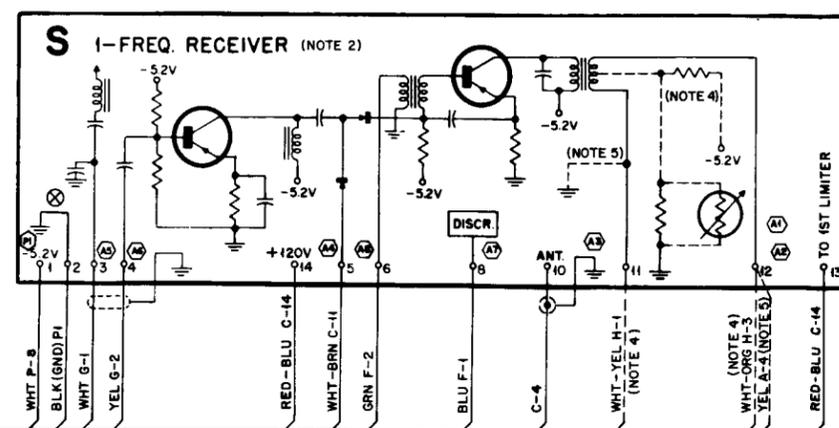
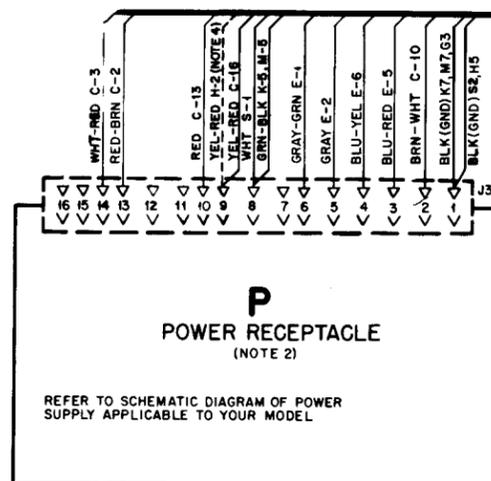


DIAGRAM NO. 63D81005A49

- NOTES:
1. TRUNK LEADS ARE LABELED AT EACH TERMINATION WITH THEIR COLOR CODES AND DESTINATIONS.
 2. REFER TO THE APPLICABLE SCHEMATIC DIAGRAM FOR DETAILS ON CHASSIS CONNECTIONS.
 3. MICROPHONE CONNECTORS ARE VIEWED FROM PIN SIDE.
 4. SPEAKER MODELS ONLY.
 5. HANDSET MODELS ONLY.



"H" Series "Handie-Talkie" Radiophone
W/Two 1-Freq. Transmitters
Intercabling Diagram
Motorola No. 63D81005A49-D

PARTS LIST for Intercabling Diagram 63D81005A49-D

NGN6014A Top Panel (Handset Model)
NCN6023A Control Panel (Speaker Model)

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
J1 J2 J3	1V80715A83 9A85615 28B847027	<u>CONNECTOR, receptacle:</u> female: 4 contact; potted female; single contact; coaxial type male; 16 contact
K1	80K858174	<u>RELAY, telephone type:</u> dual stack; contact arrangement; 1 st. stack, 2 form "C"; 2nd. stack, 1 form "A" and 2 form "C"; coil res. 50 ohms
R1 R2 R3 R4	18C847060 18K847061 6K128688	<u>RESISTOR:</u> variable; 500K ±20%; .3 w variable; 2K ±20%; .2 w NOT USED fixed; 2.7K ±10%; 1/4 w (NCN6023A)
S1	1V854327	<u>SWITCH,</u> assy: includes 1V851776 SWITCH ASSY includes; 40B82406C01 SWITCH, interlock: snap action; 4 contact 7B851773 BRACKET, switch 43K850806 BUSHING, shaft 41A847097 SPRING, tension 41A847112 SPRING, switch 47A851213 SHAFT, switch 14A847096 BOARD, switch; 3S122897 SCREW, lock: 4-40 x 1/4"; 2 req'd 4K848991 WASHER, insulating 3S2969 SCREW, machine: 4-40 x 3/16" 1V854327 also includes 36A851214 KNOB, switch; 3S120621 SCREW, machine: 4-40 x 1/4" toggle: dpdt
S2	40A80246	

NON-REFERENCED ITEMS

32A864813 2K850796 36B82288B01 13B82068C01 32A82177C01 32A847519	GASKET, microphone receptacle NUT, seal KNOB, control: plain; 2 req'd GRILLE, speaker (NCN6023A) GASKET, diaphragm (NCN6023A) GASKET, speaker; 2 req'd (NCN6023A)
42B847537 32A847539	CLIP, microphone (NCN6023A) GASKET, microphone clip (NCN6023A)
55B847559 32A848936 1V848554 7B847008	HANDLE, carrying (NCN6023A) GASKET, handle HANDSET CRADLE ASSY (NGN6014A) BRACKET, handset: spring (NGN6014A)
15C82636A11 15C82636A13	HOUSING, top panel (NGN6014A) HOUSING, control panel (NCN6023A)

NMN6007A Handset

HS1	50C847025	<u>HANDSET:</u> receiver cartridge impedance 125 ohms; transmitter cartridge impedance 25 ohms
P1		<u>CONNECTOR, plug:</u> p/o 30D82565B05 CORD, coiled
W1	1V848171	<u>CORD, handset:</u> assy: includes; 30D82565B05 CORD, coiled: tinsel; 4 conductor; includes male; 4 contact connector plug 29A800038 LUG, terminal: 4 used 42A85648 CLAMP, ground

NMN6008A Microphone

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
MK1	50D82040C01	<u>MICROPHONE, palm type:</u> includes; 30D82565B04 CORD, microphone: coiled; with 4 contact connector; 12" length supplied 59K865086 CARTRIDGE, microphone 40K865087 SWITCH, push-to-talk 41K865088 SPRING, cable relief 38K865089 BUTTON, switch 15A82041C01 COVER, front 15A82041C02 COVER, back
P1		<u>CONNECTOR, plug:</u> p/o 30D82565B04 CORD, microphone

NAD6120A Antenna (136-150.8 mc)
NAD6121A Antenna (150.8-162 mc)
NAD6122A Antenna (162-174 mc)

1V80717A10 (136-150.8 mc)	ANTENNA ROD ASSY, includes: 47K863264 ROD, antenna: 20-1/4" lg 43A847577 BALL, antenna
or 1V858453 (150.8-162 mc)	ANTENNA ROD ASSY, includes: 47B847894 ROD, antenna: 18-1/4" lg 43A847577 BALL, antenna
or 1V858454 (162-174 mc)	ANTENNA ROD ASSY, includes: 47K847895 ROD, antenna: 17-1/4" lg 43A847577 BALL, antenna
14A844065 41A844061 4A822404 4S490516 14A844245 28A844066	INSULATOR, antenna; nylon; threaded SPRING, antenna WASHER: 2 req'd WASHER: 1/4"-1.106"-.030" INSULATOR, antenna CONNECTOR, plug: male; single contact
42A482075 3S3860	RING, "O" SCREW, set: 4-40 x 1/8"

NAB6081A Antenna (25-30 mc)
NAB6082A Antenna (30-36 mc)
NAB6083A Antenna (36-42 mc)
NAB6084A Antenna (42-48 mc)
NAB6085A Antenna (48-54 mc)

24K848321 or 24B850760 or 24B850759 24A848318 1V852599	<u>COIL, RF:</u> loading; used for 25-30 mc loading; used for 30-36 and 36-42 mc loading; used for 42-48 and 48-54 mc coupling loop CONNECTOR, plug: male; single contact
47B483170 14A847610 1V848319 76K838176 41K838646 14B82026C01 38A847677 1V850761	ROD, antenna INSULATOR, coil mounting STUD AND BUSHING ASSY CORE, tuning: coded VIOLET SPRING, core tension INSULATOR, antenna base BUTTON, plug INSULATOR and SWITCHING TAB ASSY (used only in 30-54 mc)
41A848154	SPRING, contact: (used only in 30-54 mc)

NLN6129A Kit, Carrying Strap

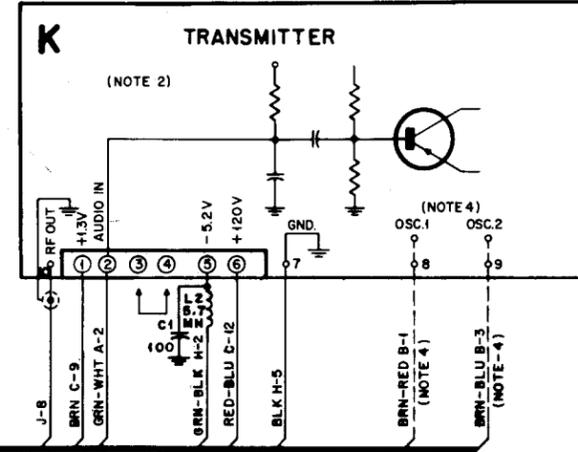
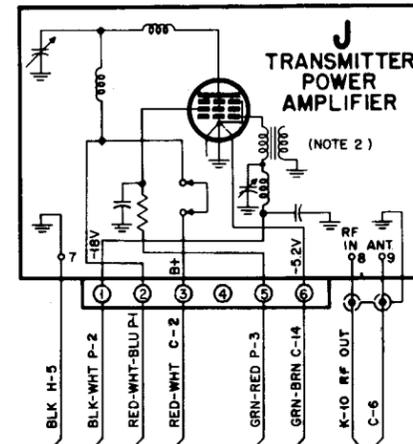
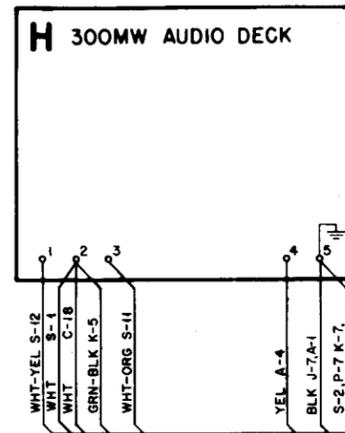
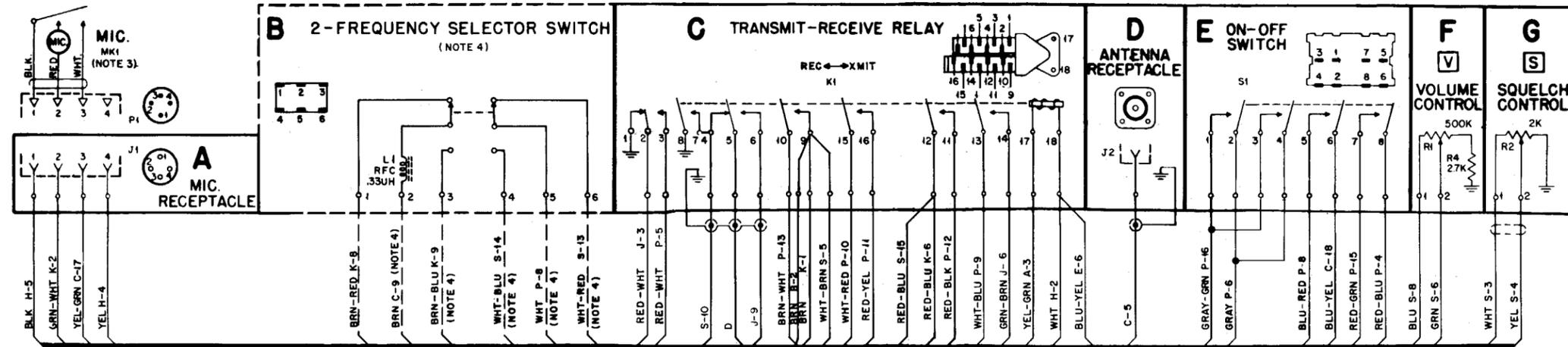
42C82554D01	STRAP, shoulder and handset; includes: 42C82554D02 STRAP, shoulder 42K483337 STRAP, handset
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NHN6035A Housing Sleeve & Hdwe. Kit
("H" Series Two 1-Freq. Xmtrs., 1-Freq. Rcvr.)

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	1V80711A46	HOUSING SLEEVE ASSY. (center section of housing) Riveted incl: 15C82029C02 SLEEVE, housing 4A834582 WASHER, fibre: 4 req'd. 42A847020 FASTENER, strap: 2 req'd. 55A847016 STRIKE: 2 req'd. 32A847042 GASKET, catch: 2 req'd. 46K847022 STUD, oval head: 7/16" long 46K847023 STUD, oval head: 1/2" long 47A102105 PIN, cross: 2 req'd. RECEIVER PIVOTING BRACKET & FASTENER ASSY. (Riveted) incl: 7A849009 BRACKET, fastener mtg. 64K858066 PLATE, pivoting 4K858060 WASHER, nylon 41B102109 FASTENER, spring 4K840914 WASHER, spring SCREW, captive: 6 req'd. WASHER, shoulder: 2 req'd. WASHER, fibre: 2 req'd. WASHER, nylon: 4 req'd. BRACKET, rcvr. hold-down SPACER, insulator BRACKET, xmtr. mounting: left-hand BRACKET, xmtr. mounting: right-hand BRACKET, xmtr. pivoting: right-hand BRACKET, xmtr. pivoting: left-hand
	1V849040	
	3A847626 4A831369 4K51143 4K858061 7A849010 43A82232B01 7A847597	
	7A847595	
	7A847631	
	7A847632	

Miscellaneous Mechanical Parts

1V80713A42	BATTERY CASE ASSY. (Riveted) p/o NPN6022A incl: 15C82062C01 CASE, battery 55A847015 CATCH: 2 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 4 req'd. BATTERY CASE ASSY. (Riveted) p/o NPN6021A incl: 15C82061C01 CASE, battery 32A847042 GASKET, catch: 2 req'd. 41A845494 SPRING, hold-down 55A847015 CATCH: 2 req'd. BATTERY CASE ASSY. (Riveted) p/o NPN6010A incl: 15C82047C01 CASE, battery 55A847015 CATCH: 2 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 4 req'd. 32A848478 GASKET, bracket 7A848464 BRACKET, hold-down: "U" shaped 7A848466 BRACKET, hold-down: "L" shaped 7A82052C01 BRACKET, strike 1V80713A89 EXTERNAL DOOR ASSY. incl: 15A82131C01 DOOR, hinged 46A82051C01 STUD, locking 4C82418B05 WASHER, nylon 55A82050C01 STRIKE 32A82053C01 GASKET, door BUMPER, rubber
1V80713A35	
1V80713A88	
75A82089C01	



- NOTES:
 1. TRUNK LEADS ARE LABELED AT EACH TERMINATION WITH THEIR COLOR CODES AND DESTINATIONS.
 2. REFER TO THE APPLICABLE SCHEMATIC DIAGRAM FOR DETAILS ON CHASSIS CONNECTIONS.
 3. MICROPHONE CONNECTORS ARE VIEWED FROM PIN SIDE.
 4. TWO FREQUENCY MODELS ONLY

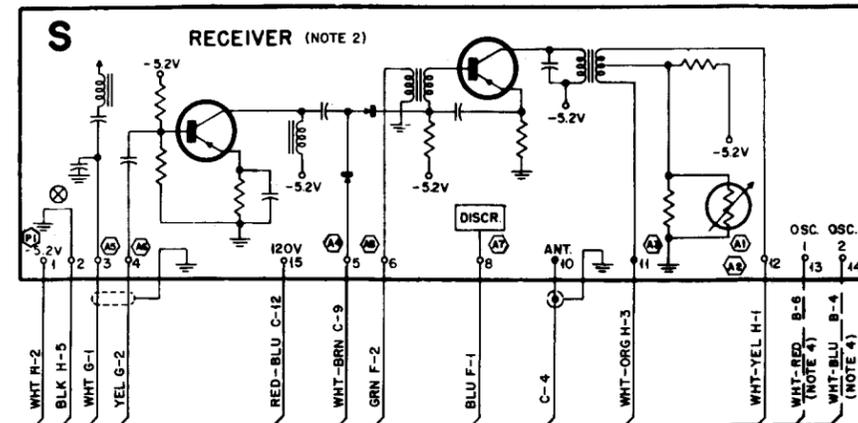
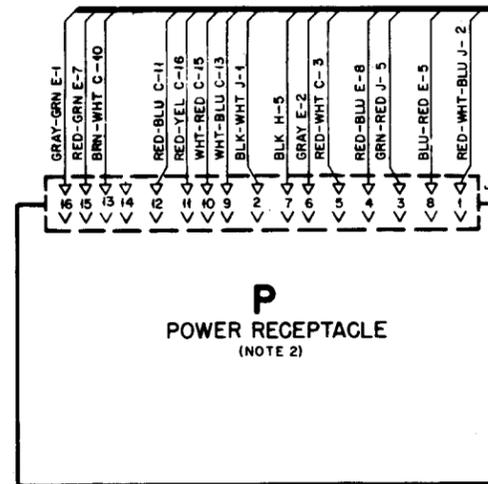


DIAGRAM NO. 63D81005A03

"P" Series "Handie-Talkie" Radiophones
 W/1 or 2-Freq. Receiver and
 One 1 or 2-Freq. Transmitter
 Intercabling Diagram
 Motorola No. 63D81005A03-D

PARTS LIST for Intercabling Diagram 63D81005A03-D

NCN6026A Control Panel (1-Freq.)
NCN6027A Control Panel (2-Freq.)

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C1	23K864897	<u>CAPACITOR, fixed:</u> 100 uf +100-0%; 10 v
J1	1V80715A83	<u>CONNECTOR, receptacle:</u> female; 4 contact; potted female; single contact; coaxial type male; 16 contact
J2	9A85615	
J3	28B847027	
K1	80D82178C01	<u>RELAY, telephone type:</u> dual stack; contact arrangement; 1st stack, 4-form "A"; 2nd stack, 1-form "A" and 2-form "C"; coil res. 50 ohms
L1	24K854314	<u>COIL, r-f:</u> choke; .33 uh (2-freq. only) choke; 5.7 mh
L2	24K847941	
R1	18C847060	<u>RESISTOR:</u> variable; 500K ±20%; .3 w variable; 2K ±20%; .2 w NOT USED fixed; 2.7K ±10%; 1/4 w
R2	18K847061	
R3		
R4	6K128688	
S1	1V854327	<u>SWITCH:</u> assy.; includes: 1V851776 SWITCH ASSY. includes; 40B82406C01 SWITCH, interlock; snap action; 4-contact 7B851773 BRACKET, switch 43K850806 BUSHING, shaft 41A847097 SPRING, tension 41A847112 SPRING, switch 47A851213 SHAFT, switch 14A847096 BOARD, switch 3S122897 SCREW, lock: 4-40 x 1/4" 2 req'd. 4K848991 WASHER, insulating 3S2969 SCREW, machining: 4-40 x 3/16" also includes 36A861214 KNOB, switch; 3S120621 SCREW, machine; 4-40 x 1/4"
S2	40B82668C01	toggle; SPDT (2-freq. only)
NON-REFERENCED ITEMS		
	32A864813	GASKET, microphone receptacle
	2K850796	NUT, seal
	36B82288B01	KNOB, control: plain; 2 req'd.
	13B82068C01	GRILLE, speaker
	32A82177C01	GASKET, diaphragm
	32A847519	GASKET, speaker
	42B847537	CLIP, microphone
	32A847539	GASKET; microphone clip
	55B847559	HANDLE, carrying
	32A848936	GASKET, handle
	32A848074	GASKET, antenna receptacle
	32A482067	GASKET, antenna receptacle
	2A82262B01	NUT, seal: used on S2
	15C82636A12	HOUSING, control panel (NCN6026A)
	15C82636A13	HOUSING, control panel (NCN6027A)

NMN6008A Microphone

MK1	50D82040C01	<u>MICROPHONE, palm type:</u> includes: 30D82565B04 CORD, microphone: coiled; with 4 contact arrangement; 12" length supplied 59K865086 CARTRIDGE, microphone 40K865087 SWITCH, push-to-talk
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REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
P1		<u>MICROPHONE (cont'd)</u> 41K865088 SPRING, cable relief 38K865089 BUTTON, switch 15A82041C01 COVER, front 15A82041C02 COVER, back <u>CONNECTOR, plug:</u> p/o 30D82565B04 CORD, micro- phone

NAD6120A Antenna (136-150.8 mc)
NAD6121A Antenna (150.8-162 mc)
NAD6122A Antenna (162-174 mc)

	1V80717A10 (136-150.8 mc)	ANTENNA ROD ASSY. includes: 47K863264 ROD, antenna: 20-1/4"lg 43A847577 BALL, antenna
	or 1V858453 (150.8-162 mc)	ANTENNA ROD ASSY. includes: 47B847894 ROD, antenna: 18-1/4"lg 43A847577 BALL, antenna
	or 1V858454 (162-174 mc)	ANTENNA ROD ASSY. includes: 47K847895 ROD, antenna: 17-1/4"lg 43A847577 BALL, antenna
	14A844065 41A844061 4A822404 4S490516	INSULATOR, ant.: nylon; threaded SPRING, antenna WASHER: 2 req'd WASHER: 1/4"- .106"- .030"
	14A844245 28A844066	INSULATOR, antenna CONNECTOR, plug: male; single contact
	42A482075 3S3860	RING, "O" SCREW, set: 4-40 x 1/8"

NAB6081A Antenna (25-30 mc)
NAB6082A Antenna (30-36 mc)
NAB6083A Antenna (36-42 mc)
NAB6084A Antenna (42-48 mc)
NAB6085A Antenna (48-54 mc)

	24K848321 or 24B850760 or 24B850759 24A848318 1V852599	<u>COIL, RF:</u> loading; used for 25-30 mc loading; used for 30-36 and 36-42 mc loading; used for 42-48 and 48-54 mc coupling loop CONNECTOR, plug: male single contact
	47B483170 14A847610 1V848319 76K838176 41K838646 14B82026C01 38A847677 1V850761	ROD, antenna INSULATOR, coil mounting STUD AND BUSHING ASSY. CORE, tuning: coded VIOLET SPRING, core tension INSULATOR, antenna base BUTTON, plug INSULATOR and SWITCHING TAB ASSY. (used only in 30-54 mc) SPRING, contact: (used only in 30-54 mc)

NLN6129A Kit, Carrying Strap

	42C82554D01	STRAP, shoulder and handset, includes: 42C82554D02 STRAP, shoulder 42K483337 STRAP, handset
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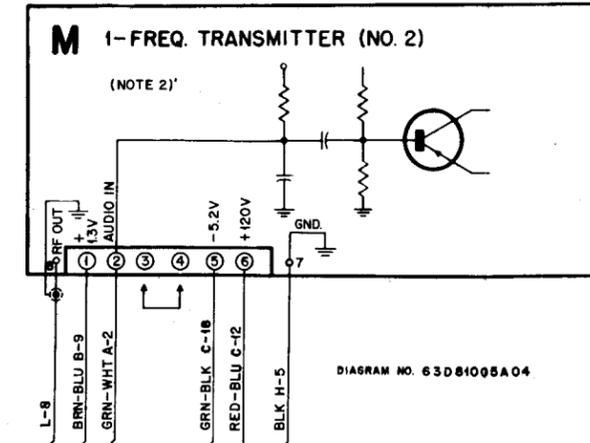
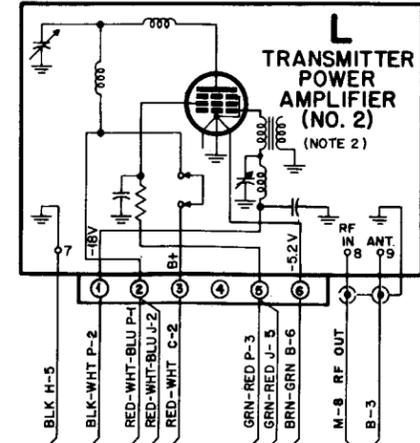
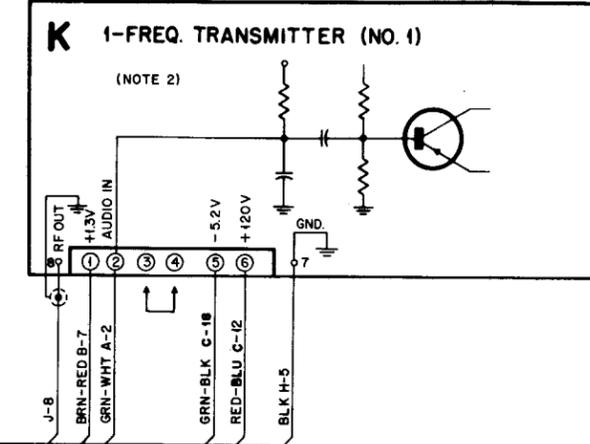
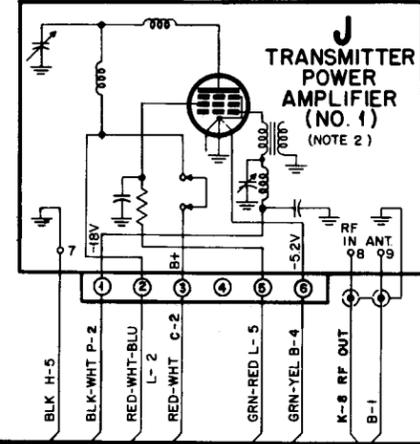
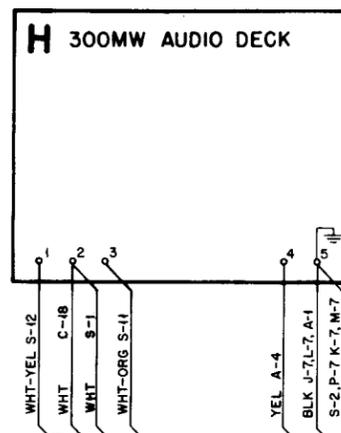
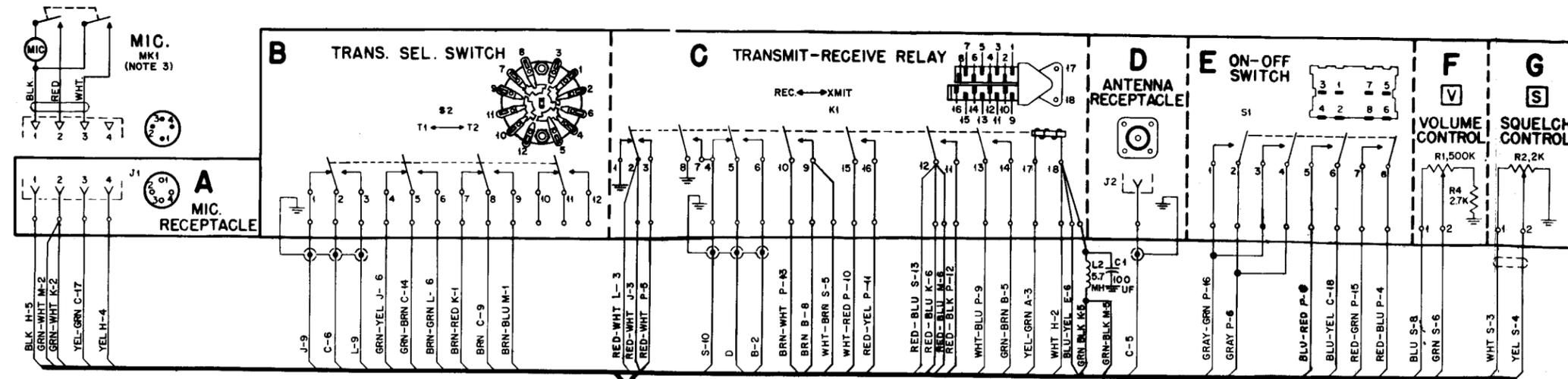
NHN6037A Housing Sleeve & Hdwe. Kit
("P" Series 1-Freq. Xmtr., 1-Freq. Rcvr.)
NHN6038A Housing Sleeve & Hdwe. Kit
("P" Series 2-Freq. Xmtr., 1-Freq. Rcvr.)

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	1V80711A46	HOUSING SLEEVE ASSY. (center section of housing) Riveted incl: 15C82029C02 SLEEVE, housing 55A847016 STRIKE; 2 req'd. 4A834582 WASHER, fibre: 4 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 2 req'd. 46K847022 STUD, oval head: 7/16" long 46K847023 STUD, oval head: 1/2" long 47A102105 PIN, cross: 2 req'd. RECEIVER PIVOTING BRACKET & FASTENER ASSY. (Riveted) incl: 7A847014 BRACKET, fastener mtg. 64K858066 PLATE, pivoting 4K858060 WASHER, nylon 41B102109 FASTENER, spring 4K840914 WASHER, spring SCREW, captive: 6 used on NHN6037A and 4 used on NHN6038A SCREW, captive: 2 used on NHN6038A
	1V847676	WASHER, shoulder: 2 req'd. WASHER, fibre: 2 req'd. WASHER, nylon: 4 req'd. BRACKET, housing mtg. (left-hand) 2 req'd. BRACKET, housing mtg. (right-hand) 2 req'd. BRACKET, receiver hold-down SPACER, insulator
	3A847626	
	3K858062	
	4A831369 4K51143 4K858061 7A847556	
	7A847557	
	7A847024 43A82232B02	

Miscellaneous Mechanical Parts

	1V80713A76	BATTERY CASE ASSY. (Riveted) p/o NPN6011A incl: 15D82260C01 CASE, battery 55A847015 CATCH: 2 req'd. 7A847618 BRACKET, catch: 2 req'd. 42A847020 FASTENER: strap; 2 req'd. 32A847042 GASKET, catch: 4 req'd. 7A848481 BRACKET, chassis mtg: 2 req'd. 2K849431 NUT, clinch: #4-40; 2 req'd. 7A82052C01 BRACKET, strike 41B102109 FASTENER, spring: 2 req'd. 1V80713A89 EXTERNAL DOOR ASSY. (Riveted) incl: 15A82131C01 DOOR, hinged 46A82051C01 STUD, locking 4C82418B05 WASHER, nylon 55A82050C01 STRIKE 32A82053C01 GASKET, door BUMPER, rubber BATTERY CASE ASSY. (Riveted) p/o NPN6023A incl: 15D82063C01 CASE, battery 55A847015 CATCH: 2 req'd. 7A847618 BRACKET, catch: 2 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 4 req'd. 2K849431 NUT, clinch: #4-40; 2 req'd. 41B102109 FASTENER, spring: 2 req'd.
	75A82089C01 1V80713A45	

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	1V80713A47	BATTERY CASE COVER ASSY. p/o NPN6023A incl: 15D82039C01 COVER, battery case 46K855697 STUD, oval head; 2 req'd. 47A102105 PIN, cross: 2 req'd.



NOTES:
 1. TRUNK LEADS ARE LABELED AT EACH TERMINATION WITH THEIR COLOR CODES AND DESTINATIONS.
 2. REFER TO THE APPLICABLE SCHEMATIC DIAGRAM FOR DETAILS ON CHASSIS CONNECTIONS.
 3. MICROPHONE CONNECTORS ARE VIEWED FROM PIN SIDE.

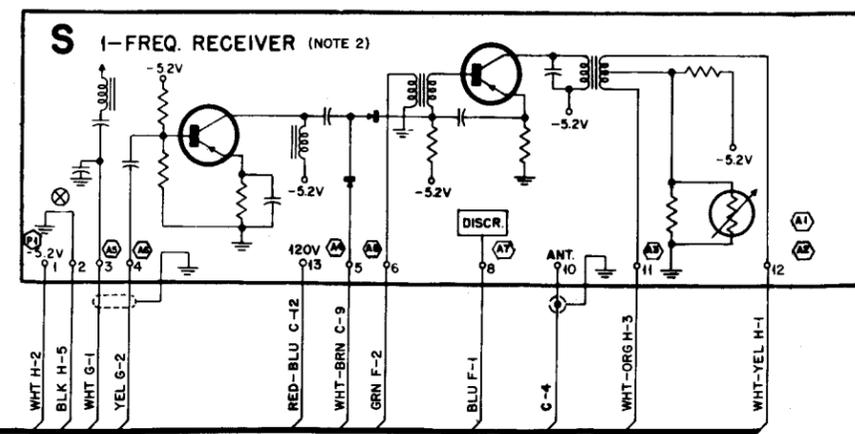
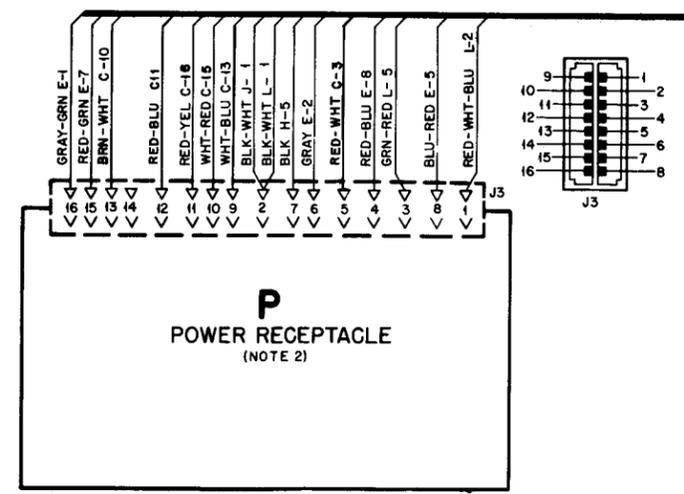


DIAGRAM NO. 63D81005A04

"P" Series "Handie-Talkie" Radiophones
 W/Two 1-Freq. Transmitters
 Intercabling Diagram
 Motorola No. 63D81005A04-E

PARTS LIST for Intercabling Diagram 63D81005A04-E

NCN6028A Control Panel

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
C1	23K864897	<u>CAPACITOR, fixed:</u> 100 uf +100-0%; 10 v
J1	1V80715A83	<u>CONNECTOR, receptacle:</u> female; 4 contact; potted
J2	9A85615	
J3	28B847027	
K1	80D82178C01	<u>RELAY, telephone type:</u> dual stack; contact arrangement; 1st stack, 4-form "A"; 2nd stack, 1-form "A" and 2-form "C"; coil res. 50 ohms
L1	24K847941	<u>COIL, r-f:</u> NOT USED
L2		choke; 5.7 mh
R1	18C847060	<u>RESISTOR:</u> variable; 500K ±20%; .3 w variable; 2K ±20%; .2 w NOT USED fixed: 2.7K ±10%; 1/4 w
R2	18K847061	
R3	NOT USED	
R4	6K128688	
S1	1V854327	<u>SWITCH:</u> assy.; includes: 1V851776 SWITCH ASSY. includes: 40B82406C01 SWITCH, interlock: snap action; 4-contact 7B851773 BRACKET, switch 43K850806 BUSHING, shaft 41A847097 SPRING, tension 41A847112 SPRING, switch 47A851213 SHAFT, switch 14A847096 BOARD, switch 3S122897 SCREW, lock: 4-40 x 1/4"; 2 req'd. 4K848991 WASHER, insulating 3S2969 SCREW, machine: 4-40 x 3/16" 1V854327 also includes 36A851214 KNOB, switch; 3S120621 SCREW, machine 4-40 x 1/4"
S2	40C848349	rotary: 4-pole; 2-position, non- shorting

NON-REFERENCED ITEMS

32A864813	GASKET, microphone receptacle
2K850796	NUT, seal
36B82288B01	KNOB, control: plain; 2 req'd.
36B82288B02	KNOB, control: (black dot)
13B82068C01	GRILLE, speaker
32A82177C01	GASKET, diaphragm
32A847519	GASKET, speaker
42B847537	CLIP, microphone
32A847539	GASKET, microphone clip
55B847559	HANDLE, carrying
32A848936	GASKET, handle
15C82636A14	HOUSING, control panel

NMN6008A Microphone

MK1	50D82040C01	<u>MICROPHONE, palm type:</u> includes: 30D82565B04 CORD, microphone: coiled; with 4 contact connector; 12" length supplied 59K865086 CARTRIDGE, microphone 40K865087 SWITCH, push-to-talk 41K865088 SPRING, cable relief 38K865089 BUTTON, switch 15A82041C01 COVER, front 15A82041C02 COVER, back
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REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
P1		<u>CONNECTOR, plug:</u> p/o 30D82565B04 CORD, micro- phone

NAB6081A Antenna (25-30 mc)
NAB6082A Antenna (30-36 mc)
NAB6083A Antenna (36-42 mc)
NAB6084A Antenna (42-48 mc)
NAB6085A Antenna (48-54 mc)

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	24K848321 or 24B850760 or 24B850759 24A848318 1V852599	<u>COIL, RF:</u> loading; used for 25-30 mc loading; used for 30-36 and 36-42 mc loading; used for 42-48 and 48-54 mc coupling loop CONNECTOR, plug: male; single contact
	47B483170 14A847610 1V848319 76K838176 41K838646 14B82026C01 38A847677 1V850761 41A848154	ROD, antenna INSULATOR, coil mounting STUD AND BUSHING ASSY. CORE, tuning: coded VIOLET SPRING, core tension INSULATOR, antenna base BUTTON, plug INSULATOR and SWITCHING TAB ASSY. (used only in 30-54 mc) SPRING, contact: (used only in 30-54 mc)

NAD6120A Antenna (136-150.8 mc)
NAD6121A Antenna (150.8-162 mc)
NAD6122A Antenna (162-174 mc)

	1V80717A10 (136-150.8 mc) or 1V858453 (150.8-162 mc) or 1V858454 (162-174 mc) 14A844065 41A844061 4A822404 4S490516 14A844245 28A844066 42A482075 3S3860	ANTENNA ROD ASSY. includes: 47K863264 ROD, antenna: 20-1/4" lg 43A847577 BALL, antenna ANTENNA ROD ASSY. includes: 47B847894 ROD, antenna: 18-1/4" lg 43A847577 BALL, antenna ANTENNA ROD ASSY. includes: 47K847895 ROD, antenna: 17-1/4" lg 43A847577 BALL, antenna INSULATOR, antenna: nylon; threaded SPRING, antenna WASHER: 2 req'd WASHER: 1/4"-1.106"-.030" INSULATOR, antenna CONNECTOR, plug: male; single contact RING, "O" SCREW, set: 4-40 x 1/8"
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NLN6129A Kit, Carrying Strap

	42C82554D01	STRAP, shoulder and handset; includes: 42C82554D02 STRAP, shoulder 42K483337 STRAP, handset
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NHN6039A Housing Sleeve & Hdwe. Kit
("P" Series Two 1-Freq. Xmtrs., 1-Freq. Rcvr.)

	1V80711A47	HOUSING SLEEVE ASSY. (center section of housing) Riveted incl: 15C82029C03 SLEEVE, housing 55A847016 STRIKE: 2 req'd. 4A834582 WASHER, fibre: 4 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 2 req'd. 46K847022 STUD, oval head: 7/16" long 46K847023 STUD, oval head: 1/2" long 46A481929 PIN, cross: 2 req'd.
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REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
	1V849040	RECEIVER PIVOTING BRACKET & FASTENER ASSY. (Riveted) incl: 7A849009 BRACKET, fastener mtg. 64K858066 PLATE, pivoting 4K858060 WASHER, nylon 41B102109 FASTENER, spring 4K840914 WASHER, spring SCREW, captive: 10 req'd. WASHER, shoulder: 2 req'd. WASHER, fibre: 2 req'd. WASHER, nylon: 8 req'd. BRACKET, housing mtg. (left-hand) 4 req'd. BRACKET, housing mtg. (right-hand) 4 req'd. BRACKET, receiver hold-down CLAMP, cable CLAMP, cable: 5/16" wide x 13/16" long 43A82232B01 64A847633 64K847634 64A848153 4A861822
	3A847626 4A831369 4K51143 4K858061 7A847556 7A847557 7A849010 42K13135 42A848624	

Miscellaneous Mechanical Parts

	1V80713A76	BATTERY CASE ASSY. (Riveted) p/o NPN6011A incl: 15D82260C01 CASE, battery 55A847015 CATCH: 2 req'd. 7A847618 BRACKET, catch: 2 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 4 req'd. 7A848481 BRACKET, chassis mtg; 2 req'd. 2K849431 NUT, clinch: #4-40; 2 req'd. 7A82052C01 BRACKET, strike 41B102109 FASTENER, spring: 2 req'd. 1V80713A89 EXTERNAL DOOR ASSY. (Riveted) incl: 15A82131C01 DOOR, hinged 46A82051C01 STUD, locking 4C82418B05 WASHER, nylon 55A82050C01 STRIKE 32A82053C01 GASKET, door BUMPER, rubber
	75A82089C01 1V80713A45	BATTERY CASE ASSY. (Riveted) p/o NPN6023A incl: 15D82063C01 CASE, battery 55A847015 CATCH: 2 req'd. 7A847618 BRACKET, catch: 2 req'd. 42A847020 FASTENER, strap: 2 req'd. 32A847042 GASKET, catch: 4 req'd. 2K849431 NUT, clinch: #4-40; 2 req'd. 41B102109 FASTENER, spring: 2 req'd. BATTERY CASE COVER ASSY. p/o NPN6023A incl: 15D82039C01 COVER, battery case 46K855697 STUD, oval head: 2 req'd. 47A102105 PIN, cross: 2 req'd.
	1V80713A47	

END OF DOCUMENT