PERSONAL RADIOTELEPHONE

CQP7662

403-432 MHz

Storno

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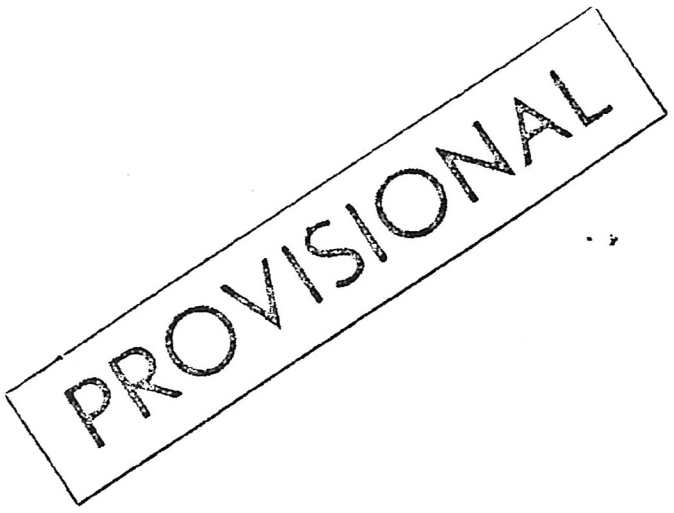
CQP7662

403-432 MHz



Service Coordination.

Date: 09.87.
Edition: 1

61.439-E1

CQP7662

PROVISIONAL

TECHNICAL MANUAL

Storno

CQP766X

SPECIFICATIONS

GENERAL

FREQUENCY RANGE: 403-512MHz

BANDSPLITS:
403-432MHz
440-470MHz
470-500MHz
490-512MHz

POWER SUPPLY: Rechargeable
Nickel-Cadmium Battery or Primary Battery

BATTERY VOLTAGE
Nominal: 7.5Vdc
Range: 6 to 9Vdc

TEMPERATURE RANGE
Operating: −30°C to +60°C
Storage: −40°C to +85°C

DIMENSIONS (H × W × D)
Less Battery: 3.87" × 2.94" × 1.18" (98.29 × 74.67 × 29.97mm)
With Light-Capacity Battery: 6.13" × 2.94" × 1.18" (155.70 × 74.67 × 29.97mm)
With Medium-Capacity Battery: 7.01" × 2.94" × 1.18" (178.05 × 74.67 × 29.97mm)
With High-Capacity Battery (or Primary Battery): 7.77" × 2.94" × 1.18" (197.35 × 74.67 × 29.97mm)

WEIGHT (NON-KEYPAD)
Less Battery: 10.93oz. (310g)
With Light-Capacity Battery: 17.06oz. (484g)
With Medium-Capacity Battery: 22.24oz. (631g)
With High-Capacity Battery: 23.79oz. (675g)

WEIGHT (KEYPAD)
Less Battery: 11.31oz. (321g)
With Light-Capacity Battery: 17.44oz. (495g)
With Medium-Capacity Battery: 22.63oz. (642g)
With High-Capacity Battery: 24.18oz. (686g)

TRANSMITTER

RF OUTPUT OUTPUT:
Low-Power Models: 1-2 Watts
High-Power Models: 2-5 Watts

FREQUENCY STABILITY ±.0005% (±.0002% option)
(−30°C to +60°C; +25°C Ref.):

MODULATION: Type 16F3
(±5kHz for 100% MODULATION @1000Hz)

FM HUM AND NOISE (COMPANION RECEIVER): −45dB

SPURIOUS EMISSION (CONDUCTED AND RADIATED)
1.0W −67dBC
2W −70dBC
5.0W −74dBC

AUDIO DISTORTION: 3% Maximum

AUDIO FREQUENCY RESPONSE: (6dB/OCTAVE PRE-EMPHASIS; 300-3000Hz) +1, −3dB

MAXIMUM FREQUENCY SEPARATION: (NO DEGRADATION) Full Bandsplit

RECEIVER

SENSITIVITY
20dBQ: 0.4uV
12dBS: 0.3uV
Squelch (Programmable): 0.2uV

USABLE BANDWIDTH: ±5kHz Minimum

SELECTIVITY
Adjacent channel: −75dB
Fourth channel: −80dB

INTERMODULATION: −75dB

FREQUENCY STABILITY ±.0005% (±.0002% optional)
(−30°C to +60°C; +25°C Ref.):

AUDIO SPL (AT 30cm WITH 90dB
RATED AUDIO): (Non-Submersible)

RATED AUDIO OUTPUT: 500mW (At less than 5% distortion)

CHANNEL SPACING: 25KHz

MAXIMUM FREQUENCY SEPARATION: (NO DEGRADATION) Full Bandsplit

CHAPTER
CHAPITRE
KAPITEL

2

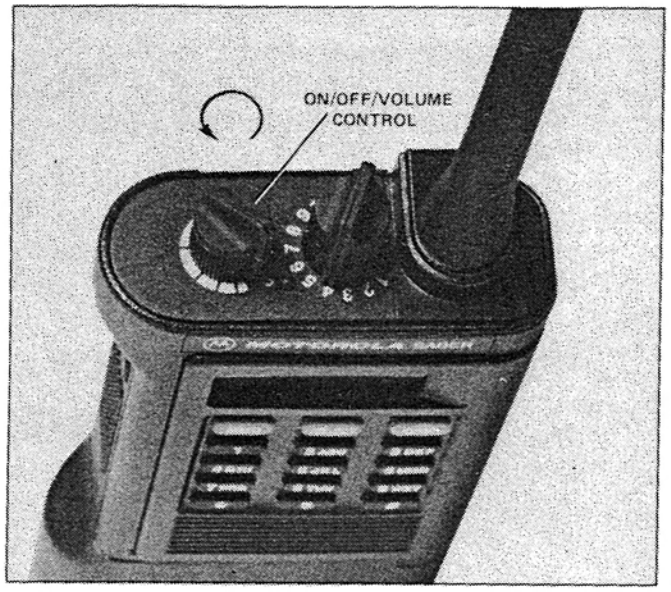
Storno

DISASSEMBLY/REASSEMBLY PROCEDURES

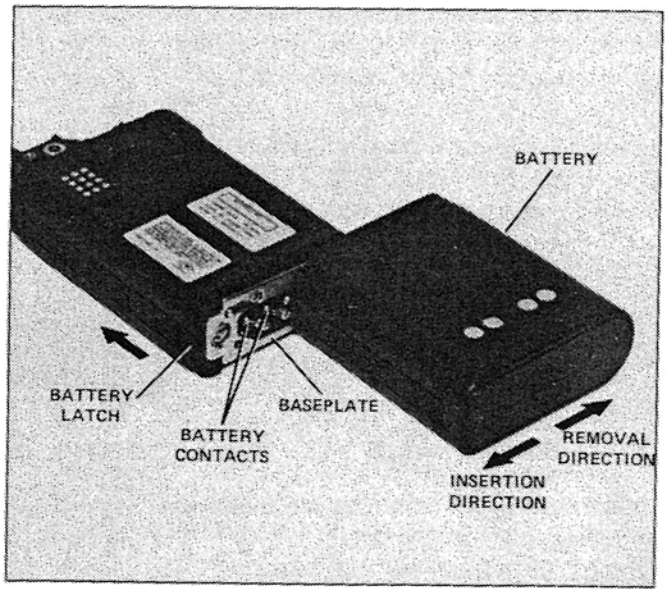
CQP7000

1. DISASSEMBLY

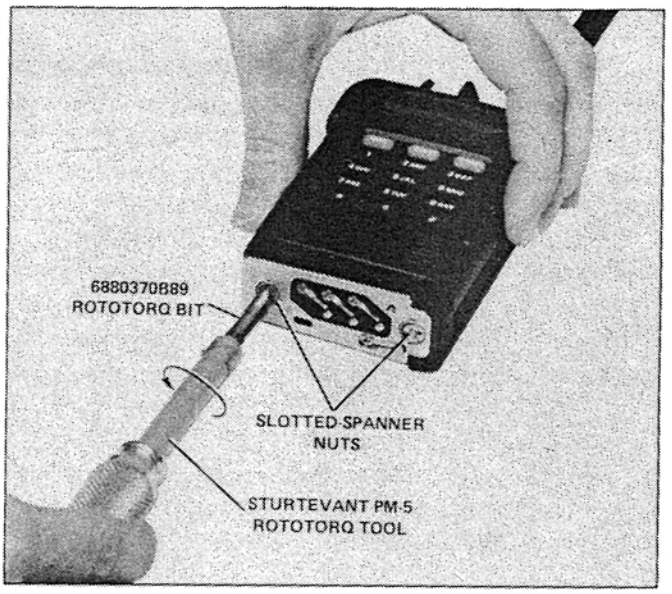
a. **Turn off the radio** by rotating the on/off/volume control knob fully counterclockwise until you hear a click.



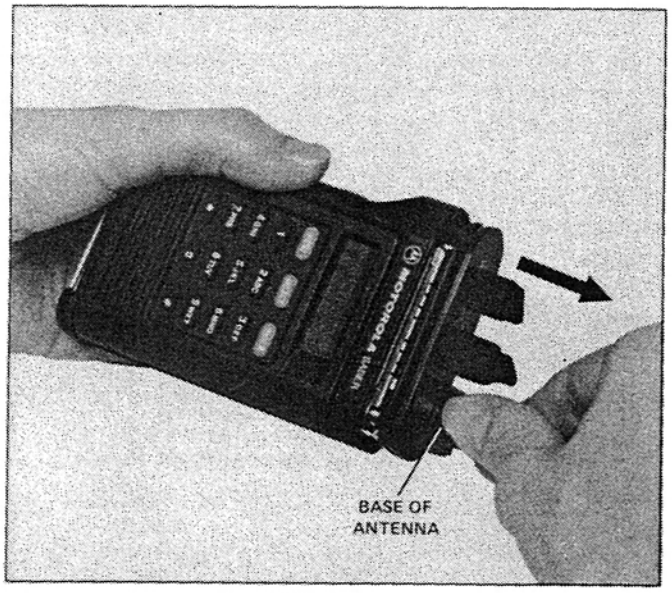
b. **Remove the battery** from the baseplate on the bottom of the radio housing by pushing the spring-loaded battery latch toward the top of the radio, and sliding the battery away from the latch until it clears the baseplate.



c. **Loosen the two slotted-spanner nuts** on the bottom of the radio using Rototorq bit tool No. 6880370B89. When loosened, the slotted-spanner nuts are captive and will spin freely without separating from the baseplate.



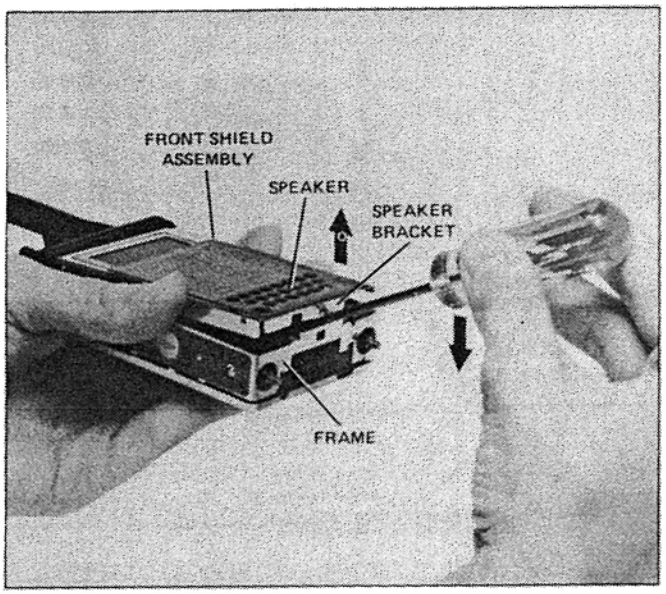
d. **Remove the frame assembly** from the radio housing by grasping the antenna at its base and pulling it gently upward. *Do not depress the PTT switch during removal and do not push on the slotted-spanner nuts to lift the frame assembly.*



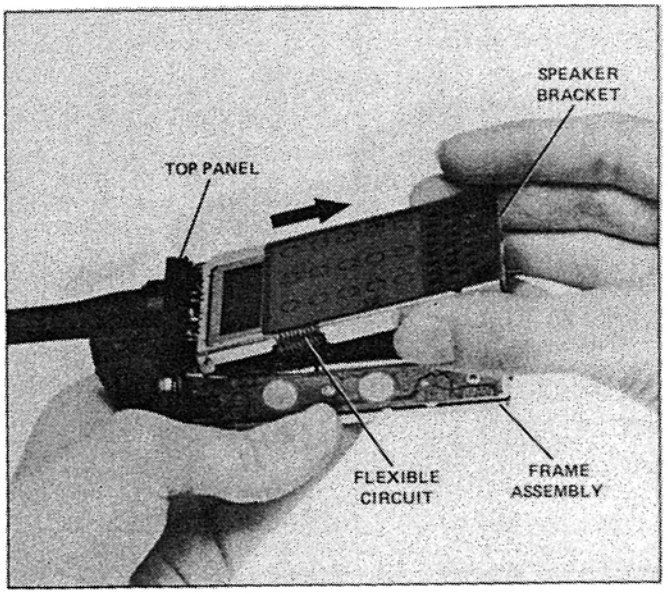
CAUTION

Refer to "SERVICING MAJOR SUBASSEMBLIES" (Section 2) and the appropriate exploded view diagrams at the back of this manual before attempting further disassembly or repair.

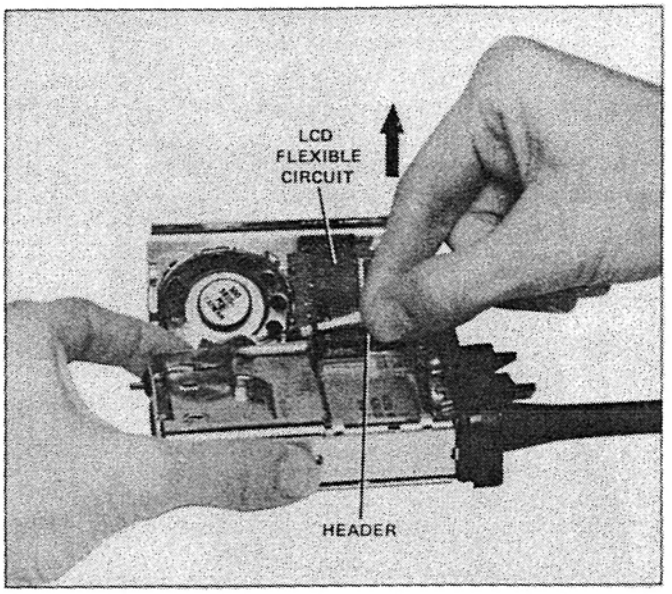
e. With the speaker facing upward, **remove the speaker bracket assembly** by inserting a thin screwdriver blade between the frame and the bottom of the speaker bracket, and prying gently upward on the speaker bracket until it is disengaged from the frame.



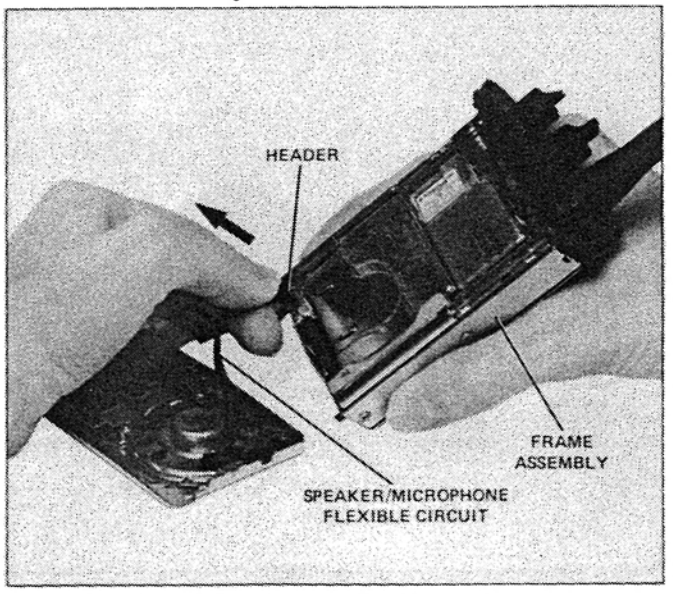
f. **Lift the speaker bracket assembly** away from the bottom of the frame assembly, then pull it out from under the plastic top panel. Be careful not to pull against the flexible circuits connecting the speaker bracket to the frame assembly.



g. **Disconnect the LCD interconnect flexible circuit** from the frame assembly by pulling the header straight out and away from the main printed circuit board.



h. **Disconnect the speaker/microphone flexible circuit** from the frame assembly by pulling the connector straight out and away from the main printed circuit board.



2. SERVICING MAJOR SUBASSEMBLIES

a. Baseplate

- All repairs to the baseplate assembly can, and should, be made with the radio chassis inside the radio.
- After the slotted-spanner nuts are loosened, the baseplate is held in place by the power contact screws.
- The retainers holding the slotted-spanner nuts in place are not reusable. Replacement of the retainers requires special insertion procedures; refer to the instruction sheet provided with the slotted-spanner nut kit.
- The "o-ring" portions of the elastomer seal must be fully seated on the threaded bushings before the baseplate is reassembled (the bushings are part of the housing assembly).

b. Housing Assembly

- The housing assembly includes many parts that are not replaceable or repairable.
- The insulator on the universal connector can, and should, be replaced if the old insulator has been torn. When replacing the insulator take care to keep it out of the main seal o-ring's seating area.
- The PTT lever can be replaced by prying out the old part with a soft plastic tool. The plastic housing around the lever may be damaged if a harder tool is used.

c. Control Top Panel

- The control top panel is fastened to the frame by the on/off/volume and frequency switches, and two self-tapping screws; it should be removed from the frame only if absolutely necessary. If repair is required, always start the screws into the control top panel by hand before tightening them with a torque wrench; this will help avoid cross-threading and stripping of the plastic panel.
- The on/off/volume and frequency knobs are 2-part kits; each kit consists of a knob and an insert. Once an insert is removed, it cannot be used again; therefore, remove an insert only if the on/off/volume control or frequency switch must be replaced, or if the control top must be removed from the frame.
- The number of frequency switch positions can be changed by removing the frequency knob and insert, and aligning the top tab on the detent washer with the number on the escutcheon that is equal to the desired number of frequency positions minus three. For example, a 12-position frequency switch would have the top tab aligned with the "9" on the escutcheon. A new frequency knob and insert must be used each time this change is made.

d. LCD/Speaker Bracket Assembly

- The LCD assembly can be replaced, but the instructions on the replacement kit's instruction sheet must be strictly followed.
- The microphone boot must be properly oriented and seated in the speaker bracket **before** the microphone is pressed into place.

e. Backshield Assembly

- Before removing the backshield, ensure that all static safeguards are in place.
- For best results, loosen/tighten all four screws lightly before loosening/tightening any single screw completely.
- The backshield screws are held captive in the shield after being loosened.

f. Circuit Boards and Modules

- All modules plug into sockets on the main circuit board.
- Some modules are fastened to the main board and frame with screws; remove these screws before attempting to unplug a module. **Never** substitute any screw.
- Several of the modules are designed to be removed with a standard DIP extractor tool (OK-1 or equivalent). Always use the extractor tool when removing these modules to avoid damaging their leads.
- Some modules have guide pins to assist in insertion or removal. Pressure may be applied to these guide pins to aid removal of a module if, and only if, it is distributed evenly over all guide pins on the module. *Applying all the force to a single guide pin will cause severe damage to the module.*
- Before reinserting any module, always check its leads for damage. Gently straighten any leads that may be bent; replace any modules with severely damaged leads.
- Before reinserting reference oscillator U301 into the main circuit board, be certain that its squared (pin 1) corner is correctly oriented per the main circuit board component layout diagram.
- When removing the main circuit board from the frame assembly, do the following:
  1. Remove the back shield assembly.
  2. Unplug the PTT/controls flexible circuit.
  3. Remove power amplifier module U202.
  4. Remove the two main compression connector screws.
  5. Lift the board at the bottom and pull out from under the control top panel.
- The rf and ground contacts at the top of the main circuit board are exposed when the board is removed from the frame. Special care must be taken to avoid accidental damage to these contacts.

g. Frame Assembly

- The tapped tabs on the frame can be stripped if excessive screw tightening torques are used (see Torque Specifications table). The frame is not repairable.
- If you must lift or remove the PTT/controls flex circuit for any reason, do not readhere it to the frame; the flex must be replaced.

3. REASSEMBLY

Reassemble the radio in the reverse order of disassembly, referring to "SERVICING MAJOR SUBASSEMBLIES" (Section 2) and making certain:

- that the speaker/microphone connector (and the LCD interconnect header on SABER II and III radios) is correctly aligned so that no twisting or pinching of the flexible circuit occurs when the speaker bracket is reattached to the frame assembly.
- that the two extended tabs at the top of the speaker bracket are properly inserted into the slots between the frame and the control top panel.
- *that the PTT switch and monitor button are not depressed while the frame is being inserted into the housing.*
- to tighten all hardware loosened or removed during disassembly per the torque specifications listed in the Torque Specifications table. Use the recommended torque driver (Sturtevant – PM5 Rototorq Tool or equivalent).
- that there is no foreign material on the main O-ring or stud seals.
- to properly orient the completed frame assembly before inserting it into the radio housing.

TORQUE SPECIFICATIONS

APPLICATION	TORQUE (IN. LBS.)	TORQUE (N-M)	TORQUE BIT NO.
Antenna Bushing Spanner Nut	20	2.27	6680370B90
Back Shield to Frame Screws	2.5	.28	6680321B78
Bottom Connector to Frame Screws	2.5	.28	6680321B78
Frequency Switch Spanner Nut	8	.91	6680370B88
All Module Screws	2.5	.28	6680321B78
Slotted-Spanner Nut (Baseplate)	4	.45	6680370B89
Top Panel to Frame Screws	2	.23	6680321B78
Volume Pot Spanner Nut	8	.91	6680370B88

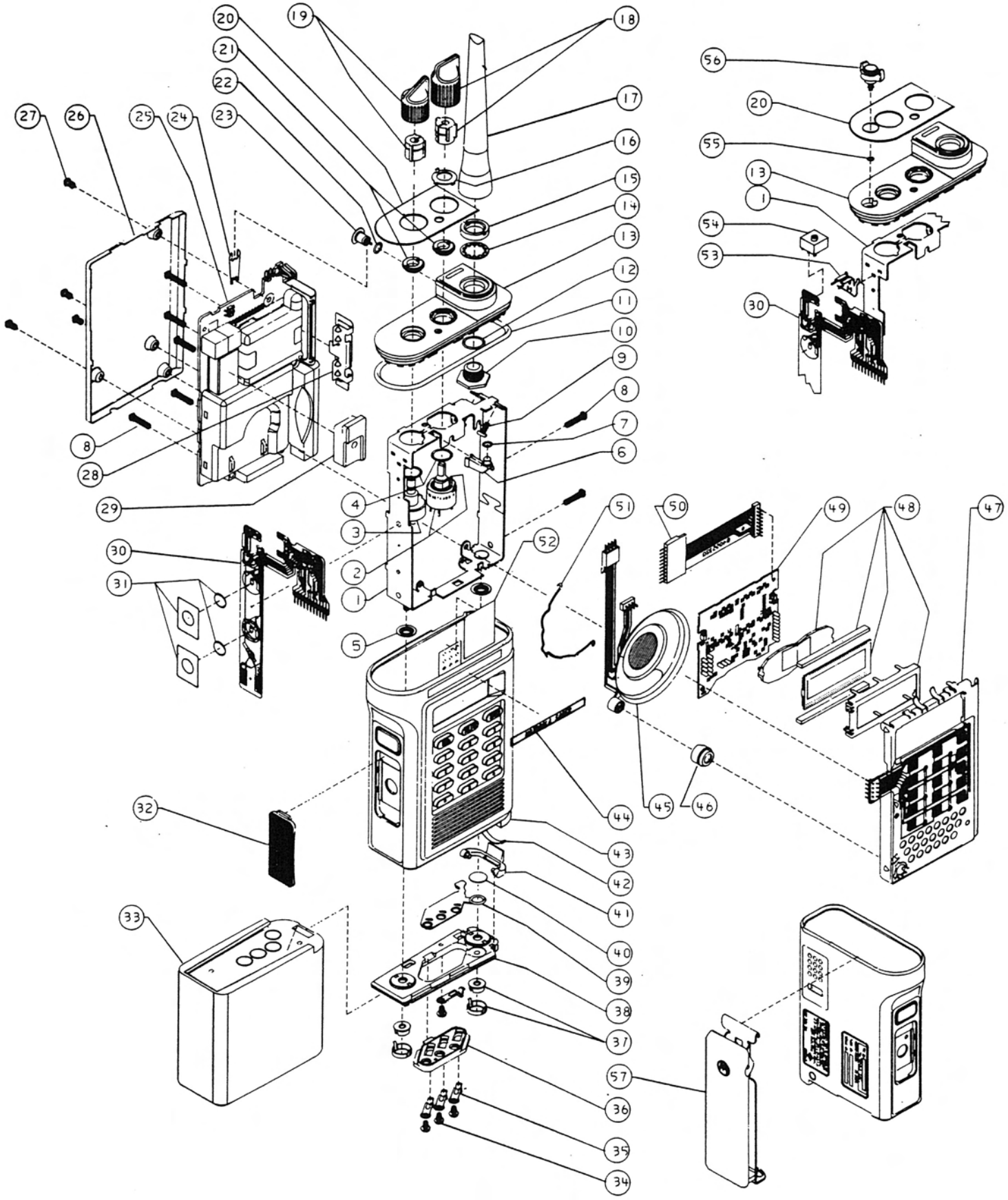
CAUTION

Inspect the frame stud seals and the top panel O-ring and replace if any damage exists.

CHAPTER
CHAPITRE
KAPITEL

3

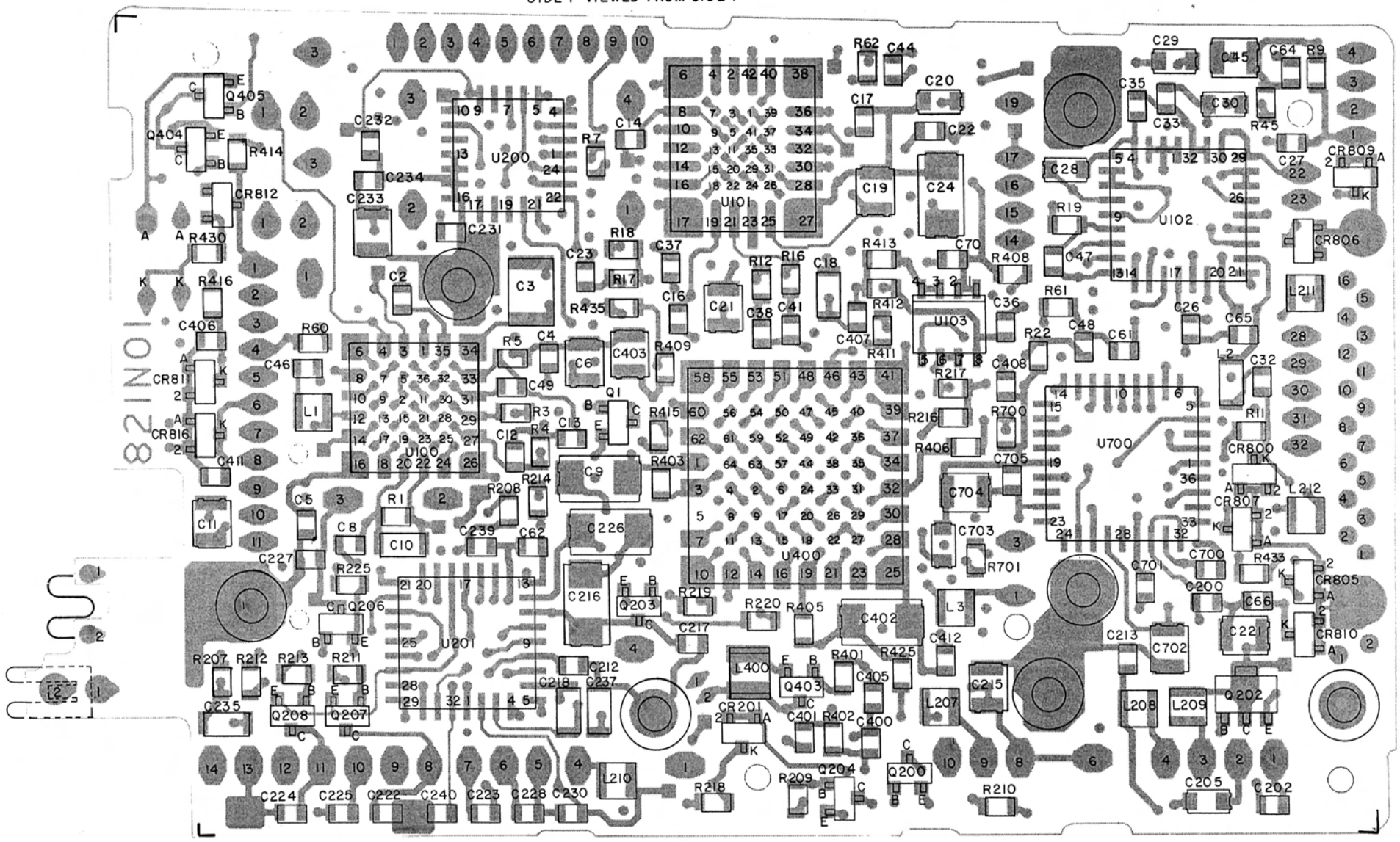
Storno



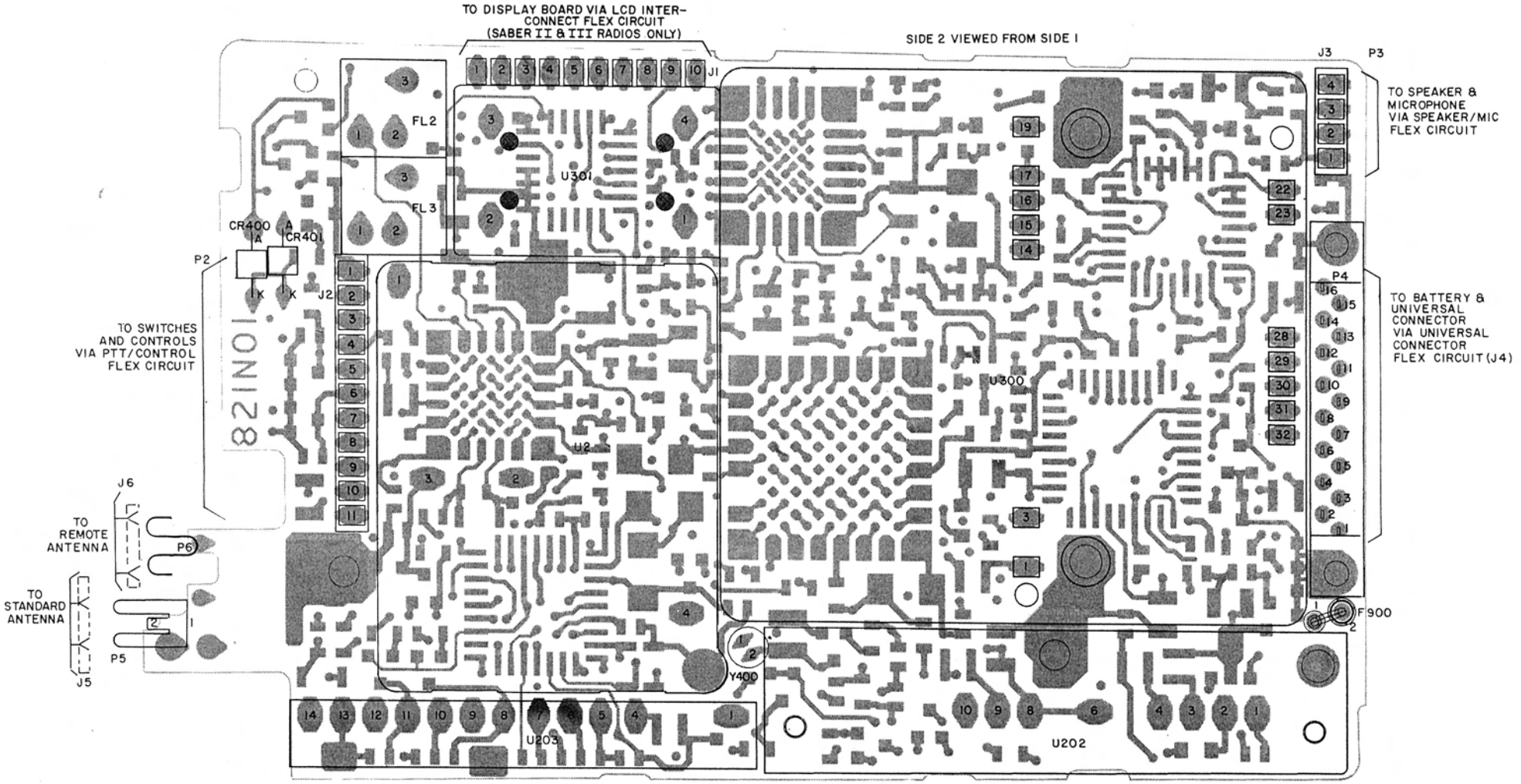
CQP7xxx EXPLODED VIEW
M405.394

ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	RPX4695A	ASSEMBLY, Frame Stud (includes item 5)
2	RPX4689A	KIT, Frequency Switch (S823) (includes item 4)
3	RPX4690A	KIT, On/Off Switch (S800)/Volume Control (R800) (includes item 4)
4	3205082E68	GASKET, O-Ring (2 req'd) (part of items 2 and 3)
5	3205422Q01	SEAL, Stud (2 req'd) (part of item 1)
6	6105436Q01	LIGHTPIPE, LED
7	3205082E59	GASKET, O-Ring
8	0300138542	SCREW, Module, Ph Pan Hd; 2-56 × 3/8" (7 req'd)
9	0305381L02	SCREW, Top Panel; 2-32 (2 req'd)
10	RPX4693A	KIT, Antenna Bushing (includes item 12)
11	3205082E60	GASKET, O-Ring (part of item 13)
12	3205082E58	GASKET, O-Ring (part of item 10)
13	RPX4692A	KIT, Control Top Panel (includes item 11)
14	0400138731	LOCKWASHER, Internal Tooth
15	0205765L02	NUT, Antenna Bushing
16	0405781Q01	WASHER, Detent
17	NAE6431A	ANTENNA, UHF Helical (403-432MHz)
	or NAE6432A	ANTENNA, UHF Helical (440-470MHz)
	or NAE6434A	ANTENNA, UHF Helical (470-512MHz)
	or NAE6440A	ANTENNA, UHF Whip (403-512MHz)
18	RPX4699A	KIT, Frequency Knob
19	RPX4698A	KIT, On/Off/Volume Knob
20	1305622Q01	ESCUTCHEON, 12-Frequency
	or 1305622Q11	ESCUTCHEON, 12-Frequency Emergency
21	0205916P01	NUT, Spanner (2 req'd)
22	3205082E61	GASKET, O-Ring (part of item 23)
23	RPX4691A	KIT, RF Connector (includes items 22, 24)
24	4205852N01	CONTACT, Ground, RF (part of item 23)
25	NLD8160A	ASSEMBLY, Main PC Board
26	NTN4647A	ASSEMBLY, Back Shield (includes item 27)
27	0305706Q01	SCREW, Captive (4 req'd) (part of item 26)
28	4205577Q01	CLIP, Ground
29	1405387R01	BOOT, Oscillator
30	RPX4700A	KIT, PTT/Controls Flex (includes item 31)
	or RPX4701A	KIT, PTT/Controls Flex Assembly (includes items 2, 3, 31)
31	RPX4694A	KIT, Contact Snapdome (S803, 805) (2 req'd) (part of item 30)
32	4505022P01	LEVER, PTT (part of item 43)
33	NTN4592A	BATTERY, 500mAh
	or NTN4593A	BATTERY, 900mAh
	or NTN4594A	BATTERY, 1250mAh
	or NTN4537A	BATTERY, FM, 500mAh
	or NTN4538A	BATTERY, FM, 900mAh
	or NTN4539A	BATTERY, FM, 1250mAh
34	0305706Q02	SCREW, Baseplate, Ph Pan Hd; 2-56 × 3/32" (4 req'd) (part of item 43)
35	3905453Q01	CONTACT, Power (4 req'd) (part of item 43)
36	4205437Q01	RETAINER, Baseplate (part of item 43)
37	RPX4696A	KIT, Slotted Spanner Nut (2 req'd) (part of item 43)
38	6405847N01	BASEPLATE (part of item 43)
39	3205701Q01	SEAL, Elastomer (part of item 43)
40	3205472M01	SEAL, Vacuum Port (part of item 43)
41	5505333Q01	LATCH, Battery (part of item 43)
42	4105775Q01	SPRING, Latch (part of item 43)
43	NHN6392A	ASSEMBLY, Housing, (includes items 32, 34 thru 42, and 44)
44	3305183R02	LABEL, Nameplate,
45	0105958M24	ASSEMBLY, Speaker/Microphone Flex,
46	1405490Q01	BOOT, Microphone
47	RPX4702A	ASSEMBLY, LCD/Speaker Bracket
48	RPX4703A	KIT, LCD Assembly (part of item 49)
49	8460999A34	ASSEMBLY, 8K Display PC Board, (includes item 48)
50	8405532Q01	FLEX CIRCUIT, LCD Interconnect
51	4205604Q01	RETAINER, Speaker
52	1405182M03	INSULATOR, Universal Connector
53	0705319R01	BRACKET, Switch (optional)
54	4005221R01	SWITCH, Dual-Function (S801) (optional)
55	3205082E68	GASKET, O-Ring (optional)
56	3605548R01	KNOB, Push-Only
	or 3605317R01	KNOB, Push and Rotate
	or 3605586R01	KNOB, Rotate-Only
57	NTN4741A	ASSEMBLY, Belt Clip

SIDE 1 VIEWED FROM SIDE 1



COMPONENT LAYOUT FOR CQP766X MAIN BOARD CEPF-17451-0
D404.804
PAGE 1/2



LI-CEPF-17451-O

COMPONENT LAYOUT FOR CQP766X MAIN BOARD
D404.804
PAGE 2/2

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed: uF ± 20%; 25V unless stated
C1	-----	Not Used
C2	2160521A15	1500pF ± 5%
C3	2160521K45	0.47 ± 20%
C4	2160521G37	0.1 + 80 – 20%
C5	2160521A11	680pF
C6	2362998B68	4.7; 10V
C7	-----	Not Used
C8	2160521G37	0.1 + 80 – 20%
C9	2362998B73	10; 16V
C10	2160521D37	0.1 ± 10%
C11	2362998B64	2.2; 20V
C12	2160520C18	510pF ± 5%
C13	2160521E25	.01
C14	2160521G37	0.1 + 80 – 20%
C15	-----	Not Used
C16	2160520F15	39pF ± 5%
C17	2160521G37	0.1 + 80 – 20%
C18	2160521H41	.22 + 80 – 20%
C19	2362998B16	3.3 ± 10%; 16V
C20	2362998B59	1; 16V
C21	2362998B68	4.7; 10V
C22	2160521G37	0.1 + 80 – 20%
C23	2160521A19	3300pF ± 5%
C24	2362998B69	4.7; 20V
C25	-----	Not Used
C26	2160521A21	4700pF ± 5%
C27	2160521A32	.039 ± 5%
C28 thru 30	2362998B59	1; 16V
C31	-----	Not Used
C32	2160521A32	.039 ± 5%
C33	2160521G37	0.1 + 80 – 20%
C34	-----	Not Used
C35 thru 37	2160521G37	0.1 + 80 – 20%
C38	2160521E25	.01
C39, 40	-----	Not Used
C41	2160520C01	100pF ± 5%; 50V
C42, 43	-----	Not Used
C44	2160521G37	0.1 + 80 – 20%
C45	2362998B16	3.3 ± 10%; 16V
C46	2160520C01	100pF ± 5%; 50V
C47	2160521E25	.01
C48	2160521A25	.01
C49 thru 60	-----	Not Used
C61	2160521A25	.01
C62	2160521A32	.039 ± 5%
C63	-----	Not Used
C64 thru 66	2160520G01	100pF ± 5%; NPO
C67 thru 69	-----	Not Used
C70	2160521E28	.018
C200	2160520G01	100pF ± 5%
C201	-----	Not Used
C202	2160521E28	0.18
C203, 204	-----	Not Used
C205	2362998B05	.47 ± 10%
C206 thru 211	-----	Not Used
C212, 213	2160521E28	.018
C214	-----	Not Used
C215	2362998B16	3.3 ± 1-%; 16V
C216	2362998B73	10; 16V
C217	2160520G01	100pF ± 5%
C218	2160521F33	.047
C219, 220	-----	Not Used
C221	2362998B68	4.7; 10V
C222	2160521A19	3300pF ± 5%
C223	2160520G01	100pF ± 5%; NPO
C224	2160521A19	3300pF ± 5%
C225	2160520G01	100pF ± 5%; NPO
C226	2362998B73	10; 16V
C227	2160521A11	680pF
C228	2160520G01	100pF ± 5%
C229	-----	Not Used
C230 thru 232	2160520G01	100pF ± 5%
C233	2362998B16	3.3 ± 10%; 16V
C234	2160520G01	100pF ± 5%
C235	2160521H41	0.22 + 80 – 20%
C236	-----	Not Used
C237	2160521H41	0.22 + 80 – 20%
C238	-----	Not Used
C239, 240	2160520G01	100pF ± 5%; NPO
C400, 401	2160520B10	24pF ± 5%; 50V; NPO
C402	2362998B73	10pF; 16V
C403	2362998B68	4.7; 10V
C404	-----	Not Used
C405	2160521E25	.01
C406	2160520C01	100pF ± 5%; 50V
C407, 408	2160521A19	3300pF ± 5%; 50V
C409, 410	-----	Not Used
C411	2160520C01	100pF ± 5%; 50V
C412	2160521G37	0.1 + 80 – 20%
C700, 701	2160521G37	0.1 + 80 – 20%
C702	2362998B16	3.3 ± 10%; 16V
C703	2362998B05	.47 ± 10%
C704	2362998B68	4.7; 10V
C705	2160521G37	0.1 + 80 – 20%
		DIODE: See Note I
CR200	-----	Not Used
CR201	4805129M05	SOT
CR400	4805729G22	LED, Red
		FUSE:
F900	6205214E02	5 Amp
		FILTER:
FL1	-----	Not Used
FL2	9105685Q02	Ceramic; 450kHz; 20kHz BW
FL3	9105685Q03	Ceramic; 450kHz; 15kHz BW
		JACK:
J1	0905287C05	Socket, Printed Circuit (LCD Interconnect) (10 req'd)
J2	0905287C05	Socket, Printed Circuit (PTT/Controls Flex) (11 req'd)
J3	0905287C05	Socket, Printed Circuit (Speaker/Mic Connector) (4 req'd)
		COIL, RF: unless stated
L1	2405452C57	750nH ± 5%
L2	2462575A05	Choke; 4.7uH
L3	2405452C49	360nH ± 5%
L200 thru 206	-----	Not Used
L207 thru 212	2405452C49	360nH ± 5%
L400	2462585A40	33uH
		PLUG:
P1 thru 3	-----	Not Used
P4	2805520Q01	Connector
P5	3905446Q03	Contact, Antenna
P6	3905446Q03	Contact, RF Wireform
P7 thru 9	-----	Not Used
		TRANSISTOR: See Note II
Q1	4805128M16	PNP; SOT-23
Q2	4805128M27	PNP; SOT-89
Q200	4805128M44	NPN; SOT-23
Q201	-----	Not Used
Q202	4805128M27	PNP; SOT-89
Q203	4805128M16	PNP; SOT-23; MMBT3906
Q204	4805218N13	PNP; SOT; MMBTA63
Q205	-----	Not Used
Q206	4805128M16	PNP; SOT-23
Q207, 208	4805128M29	PNP; SOT-23
Q400 thru 402	-----	Not Used
Q403	4805218N03	NPN; SOT-23; MMBR 901
Q404	-----	Not Used
Q405	4805128M44	NPN; SOT-23
		RESISTOR, Fixed: Ω = 5%; ⅛W unless stated
R1	0660078B05	150k
R2	-----	Not Used
R3	0660076E77	15k ± 1%
R4	0660078T24	12k
R5	0660078T01	10k
R6	-----	Not Used
R7	0660078J80	49.9k ± 1%
R8	-----	Not Used
R9	0660076A64	4300
R10	-----	Not Used

CQP766X MAIN BOARD
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R11	0660076A64	4300
R12	0660076A49	1k
R13 thru 15	-----	Not Used
R16	0660078L01	100k
R17	0660076E73	10k ± 1%
R18	0660076E89	47k ± 1%
R19	0660076A49	1k
R20, 21	-----	Not Used
R22	0660078L08	118k ± 1%
R23 thru 44	-----	Not Used
R45	0660076A29	150
R46 thru 59	-----	Not Used
R60	0660076A29	150
R61	0660076E85	33k ± 1%
R62	0660076B01	100k
R200 thru 206	-----	Not Used
R207	0660078J35	21k ± 1%
R206	0660078G58	3.32k ± 1%
R209	0660076A48	910
R210	0660078J80	49.9k ± 1%
R211	0660076A75	12k
R212	0660078G33	2k ± 1%
R213	0660076A75	12k
R214	0660076B01	100k
R215	-----	Not Used
R216, 217	0660076A73	10k
R218	0660079H02	7.5k ± 1%
R219	0660076A80	20k
R220	0660076B01	100k
R221 thru 224	-----	Not Used
R225	0660076A73	10k
R400	-----	Not Used
R401	0660076A65	4.7k ± 10%
R402	0660076H49	10M ± 10%
R403	0660076B01	100k
R404	-----	Not Used
R405	0660076B01	100k
R406	0660076A73	10k
R407	-----	Not Used
R408	0660076B01	100k
R409	0660076A29	150k
R410	-----	Not Used
R411	0660076A80	20k
R412, 413	0660078L01	100k ± 1%
R414 thru 416	0660076B01	100k
R417 thru 424	-----	Not Used
R425	0660076A73	10k
R426 thru 429	-----	Not Used
R430	0660076A29	150
R431, 432	-----	Not Used
R433	0660076A21	68
R434	-----	Not Used
R435	0660076A49	1k
R700	0660078J80	49.9k ± 1%

R701	0660076A49	1k
R800	RPX4690A	Potentiometer, Kit, On/Off/Volume (includes S800)
R801	0660076B08	200k
R802	0660076A93	68k
R803	-----	Not Used
R804	0660076A85	33k
R805	0660076A49	1k
		SWITCH:
S800	RPX4690A	Kit, On/Off/Volume) (includes R800)
S801	4005221R01	Dual Function, Emergency (optional)
S802	-----	Not Used
S803	RPX4694A	Kit, Contact Snapdome, PTT
S804	RPX4694A	Kit, Contact Snapdome, Option (optional)
S805	RPX4694A	Kit, Contact Snapdome, Monitor
S806 thru 822	-----	Not Used
S823	RPX4689A	Kit, Frequency
		CIRCUIT MODULE: See Note I
U1	-----	Not Used
U2	NLE9431A	Filter/Amp/Mixer (403-432MHz)
	or NLE9432A	Filter/Amp/Mixer (440-470MHz)
	or NLE9433A	Filter/Amp/Mixer (470-500MHz)
	or NLE9434A	Filter/Amp/Mixer (490-512MHz)
U100	0105953N02	IC, I-F
U101	0105952N99	IC, Audio Filter, CMOS
U102	0105953N04	IC, Audio, Bipolar
U103	5160870A16	IC, Regulator
U200	0105953N05	IC, Digital/Analog Converter, CMOS
U201	0105953N06	Transmit Automatic Level Control
U202	NLE9471A	5W Power Amplifier (403-432MHz)
	or NLE9472A	5W Power Amplifier (440-470MHz)
	or NLE9473A	5W Power Amplifier (470-500MHz)
	or NLE9474A	5W Power Amplifier (490-512MHz)
	or NLE9483A	2W Power Amplifier (440-470MHz)
U300	NLE9461A	Synthesizer (403-432MHz)
	or NLE9462A	Synthesizer (440-470MHz)
	or NLE9463A	Synthesizer (470-500MHz)
	or NLE9464A	Synthesizer (490-512MHz)
U301	5105706L84	Oscillator, Reference; 16.8MHz
U40(	0105953N16	Microcomputer, MC68HC11; Binary
U700	0105953N11	Signal Filter, Phase 1, CMOS
		DIODE: See Note I
VR800	4805129M35	Zener, 5.6V
VR801 thru 804	-----	Not Used
VR805 thru 807	4805129M35	Zener, 5.6V

VR808	-----	Not Used
VR809 thru 812	4805129M35	Zener, 5.6V
VR813 thru 815	-----	Not Used
VR816	4805129M35	Zener, 5.6V
		CRYSTAL: See Note II
Y400	4805664G32	7.3728MHz
NONREFERENCED ITEMS		
	0905287C05	SOCKET, Printed Circuit (for all modules) (51 req'd)

NOTES:

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

II. When ordering crystal units, specify carrier frequency, crystal frequency, crystal type number, and Motorola part number.

SCHEMATIC AND CIRCUIT BOARD NOTES

1. Unless otherwise stated, resistances are in ohms (k = 1000), capacitances less than 1 are in microfarads, and capacitances 1 or greater are in picofarads.

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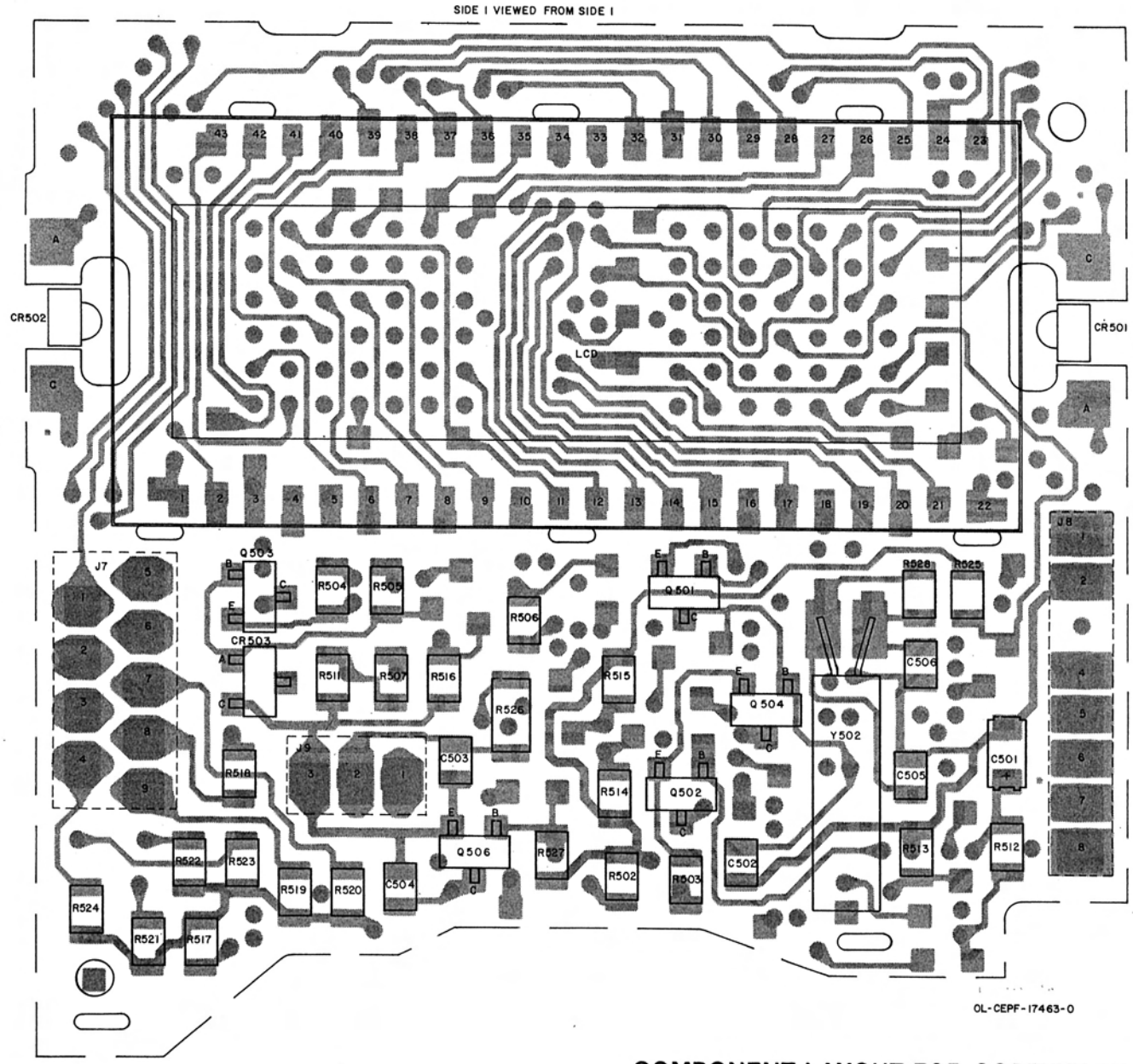
Storno



COMPONENT LAYOUT FOR CQP7XXX 8K DISPLAY BOARD
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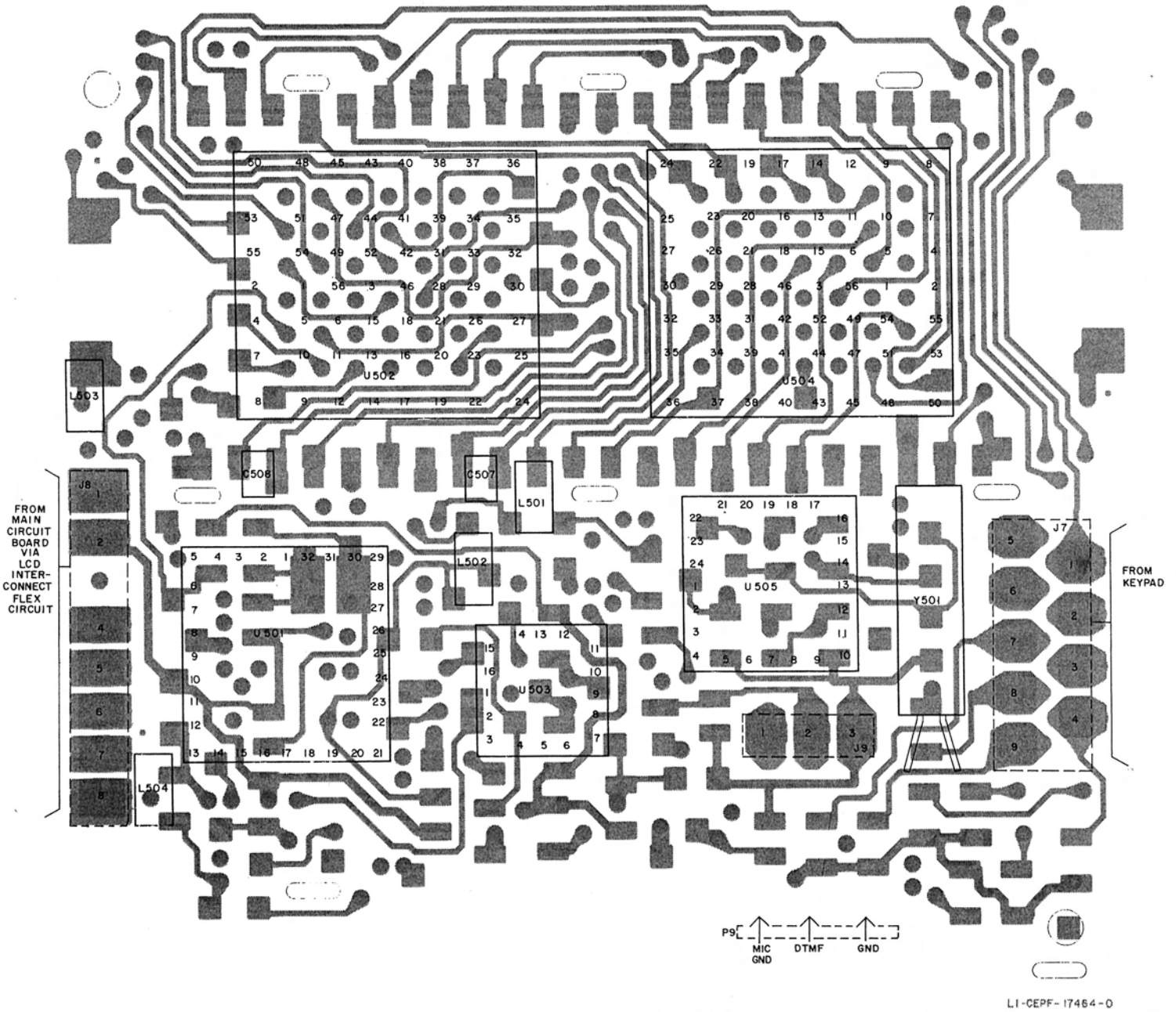
SIDE 2 VIEWED FROM SIDE 2



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COMPONENT LAYOUT FOR CQP7XXX 8K DISPLAY BOARD
D404.820´
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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed: pF ± 5%; 50V unless stated
C501	2362998B59	1uF ± 10%; 20V
C502	2160521C32	.039uF ± 10%; 25V
C503	2160520C12	300
C504	2160520B12	30
C505, 506	2160520B10	24
C507, 508	2160520C12	300
		DIODE: See Note I
CR501, 502	4805729G27	LED, Yellow
CR503	4805129M06	Dual; SOT-23
		JACK:
J7	0905287C05	Socket, Printed Circuit (Keypad Switch) (9 req'd)
J8	0905287C05	Socket, Printed Circuit (LCD Interconnect) (8 req'd)
J9	0905287C05	Socket, Printed Circuit (Speaker/Mic) (3 req'd)
		COIL, RF: unless stated
L501 thru 503	2462575A07	Choke, 10uH
L504	2462575A09	Choke, 0.56uH
		TRANSISTOR: See Note I
Q501	4805128M29	PNP; BCX18 (LH)
Q502 thru 504	4805128M12	NPN; BCW60B (RH)
Q505	-----	Not Used
Q506	4805128M12	NPN; BCW60B (RH)
		RESISTOR, Fixed: Ω ± 5%; ⅛W unless stated
R501	-----	Not Used
R502	0660076A90	51k
R503	0660076A56	2k
R504	0660076A09	22
R505	0660076A69	6.8k
R506	0660076A83	27k
R508 thru 510	-----	Not Used
R511, 512	0660076A49	1k
R513 thru 515	0660076A90	51k
R516	0660076F08	200k ± 1%
R517 thru 525	0660076A90	51k
R526	0611024A99	120k
R527	0660076A83	27k
R528	0660076H49	10M ± 10%
		CIRCUIT MODULE: See Note I
U501	0105953N12	EEPROM; 8k × 8
U502	0105953N07	Microcomputer, HCMOS
U503	0105953N09	Shift Register, CMOS
U504	0105953N10	LCD Driver
U505	0105953N18	Tone Encoder
		CRYSTAL: See Note II
Y501	4805664G40	3.579545MHz
Y502	4805664G39	3.6864MHz

NOTES:

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

II. When ordering crystal units, specify carrier frequency, crystal frequency, crystal type number, and Motorola part number.

CQP7XXX K8 DISPLAY BOARD
PARTS LIST
X404.821

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5

Storno

NMN6128A, COILED CORD

REMOTE SPEAKER MICROPHONE

1. DESCRIPTION

The Model NMN6128A Remote Speaker Microphone includes a speaker, a microphone, a push-to-talk (PTT) switch and associated circuitry. A cable, terminated with a special plug, is provided for attaching to the universal connector on the portable radio.

When the remote speaker microphone is attached to the radio, the speaker in the radio is disabled, and receiver audio is connected to the accessory speaker. Similarly, the accessory microphone is connected to the transmitter, and the accessory PTT switch can now control the PTT function in the radio. The radio microphone and PTT switch are still operational, but you can listen to the radio only through the accessory speaker.

NOTE

Observe safety information in the radio operating instructions.

2. INSTALLING THE MICROPHONE

a. Remove the antenna from the radio; unscrew the antenna in the counterclockwise direction.

b. Insert the tab on the microphone's accessory connector (item 25) into the slot in the radio's universal connector.

c. Pivot the accessory connector toward the radio until its contacts mate with those on the universal connector, and its mounting screw lines up with the universal connector's threaded hole. Then, start the mounting screw in the hole.

d. Slide the accessory bracket (item 26) down over the radio's antenna bushing nut.

e. Insert the antenna adapter (item 4) into the threaded hole in the antenna bushing nut, and tighten it firmly (recommended torque is 10 in. lb.).

f. Firmly tighten the accessory connector's mounting screw (recommended torque is 4 in. lb.).

g. Replace the antenna by screwing it into the adapter.

3. OPERATION

a. While listening to the accessory speaker, turn the radio on and operate it as explained in the operating instructions supplied with the radio.

b. The microphone will perform best if it is worn as shown in Figure 1. ,

4. HANDLING PRECAUTIONS

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions.

a. Prior to and while servicing a remote speaker microphone, particularly after moving within the service area, momentarily place both hands on a bare metal, earth-grounded surface. This will discharge any static charge which may have accumulated on the person doing the service.

NOTE

Wearing a conductive wrist strap will minimize static buildup during servicing.

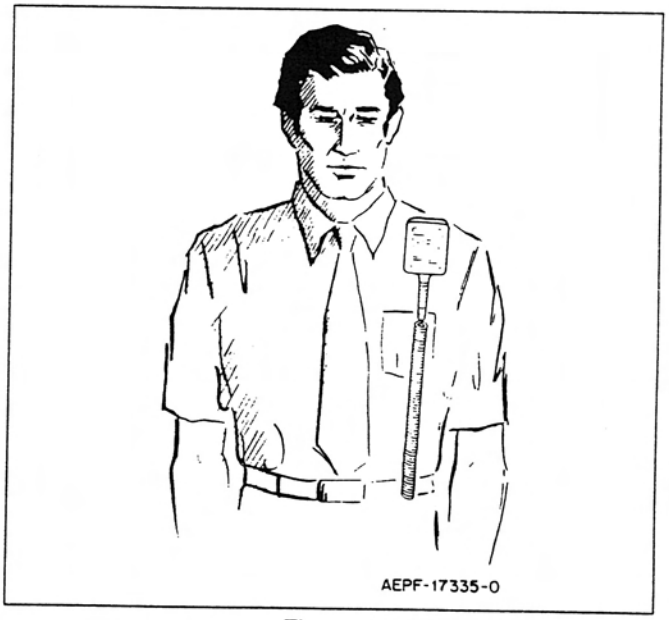


Figure 1.

WARNING

When wearing a conductive wrist strap, be careful near high voltage sources. The good ground provided by the wrist strap will also increase the danger of lethal shock from accidentally touching high voltage sources.

b. Whenever possible, avoid touching any electrically conductive part of the unit with your hands.

c. When servicing a unit, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) because they contribute to static buildup.

d. All electrically powered test equipment should be grounded. Apply the ground lead from the test equipment to the unit before connecting the test probe. Similarly, disconnect the test probe prior to removing the ground lead.

e. If the microphone cartridge is removed from the unit, place it on a conductive surface, such as a sheet of aluminum foil which is connected to ground through 100k ohms of resistance.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil at the same time as other electrical circuits.

f. When soldering, be sure the soldering iron is grounded.

g. Prior to replacing circuit components or touching the microphone cartridge, be sure to discharge any static buildup. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch the microphone cartridge and associated wiring.

h. The units shipped from the factory are packaged in a conductive material. Any units being transported from one area to another should be wrapped in a similar material. **NEVER USE NONCONDUCTIVE MATERIAL** for packaging these units.

i. Replacement microphone cartridges should also be kept in conductive packaging until they are placed in the unit.

5. MAINTENANCE

Refer to the schematic diagram, the exploded view, and the parts lists. Every part in the microphone is identified and illustrated for assistance in removal and replacement.

If disassembly of the remote speaker microphone is required, do not reassemble it without doing the following (numbers in parentheses refer to item numbers in the exploded view):

- Remove the O-ring (14) from the cover assembly (8).
- Inspect the seal areas around the housing (1) and the cover (8) for foreign material which might prevent the O-ring from sealing properly.
- Inspect O-ring (14) and both cover screw O-rings (10). If any of these are split, cracked, or damaged in any way, discard and replace them.
- If the main printed circuit board (3) is removed, remove the speaker spacer (19) and inspect the membrane of the seal pad (20) for tears or holes. If the membrane is damaged, remove it, being careful to remove all old adhesive, and replace it with a new seal pad.

NOTE

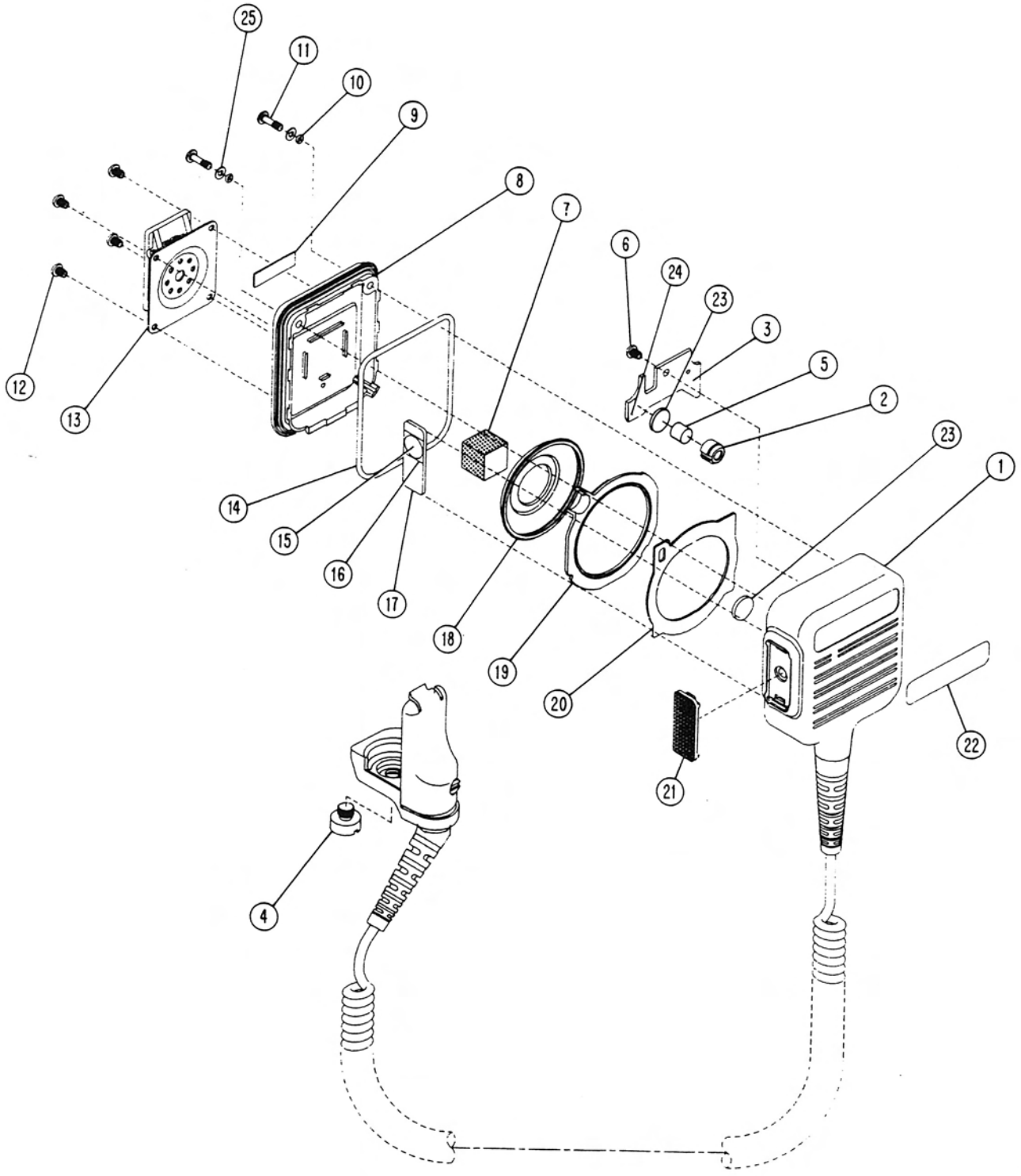
When replacing the seal pad (20), it is critical that the small seal pad opening be aligned with the microphone port in the housing.

- Tighten all hardware loosened or removed during disassembly per the values listed in the Torque Specifications table.

TORQUE SPECIFICATIONS

APPLICATION	TORQUE (IN. LBS.)
Back Cover Screws	6
PC Board Screws	4
Pocket Clip Screw	4
Antenna Adapter	10
Accessory Connector Mounting Screw	4

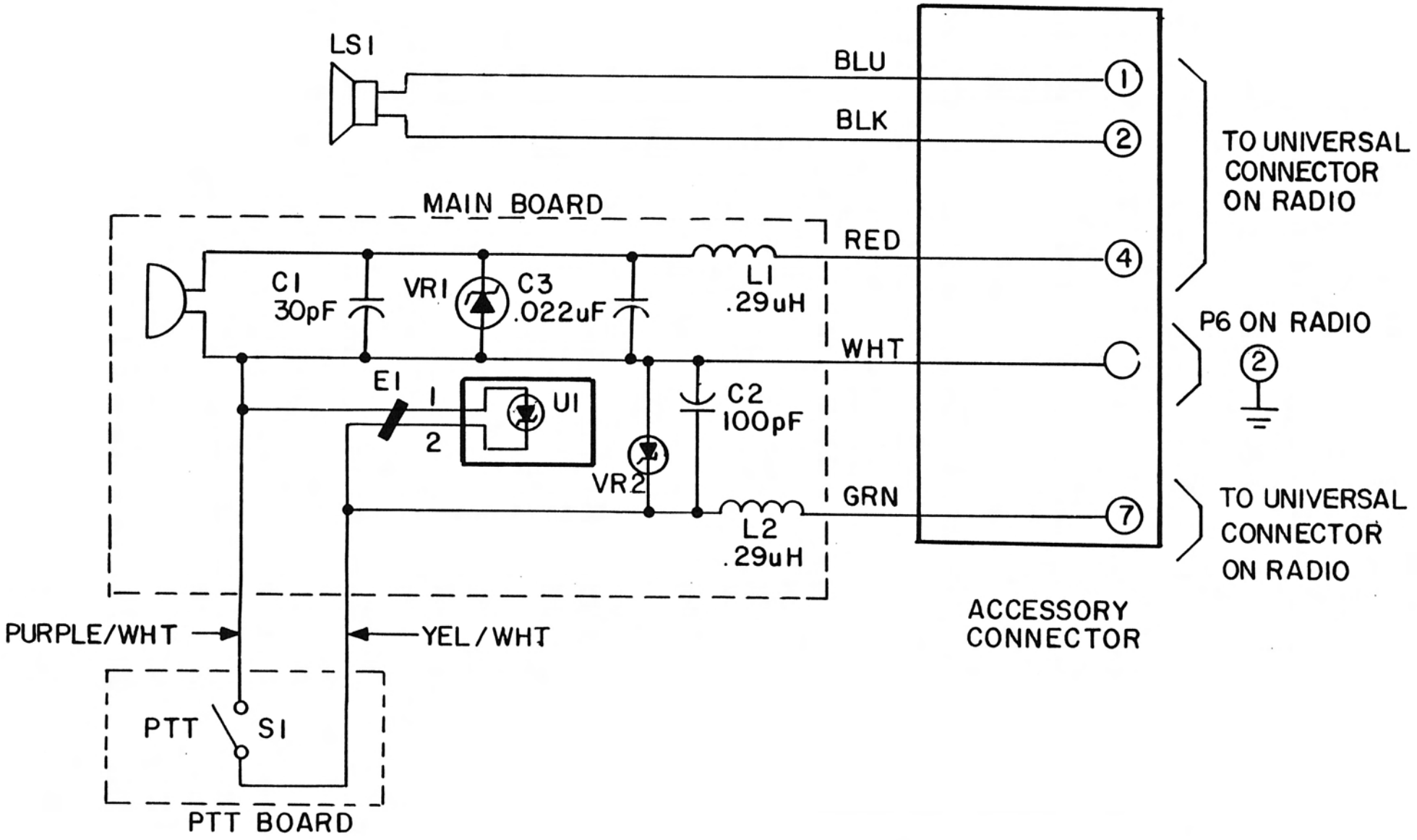
If necessary, the external surfaces of the remote speaker microphone may be cleaned with a 0.5% solution of mild dishwashing detergent in water (one teaspoon of detergent in a gallon of water).



NMN6128A REMOTE SPEAKER MICROPHONE
EXPLODED VIEW
M405.395

ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	-----	ASSEMBLY, Housing/Cord (not field repairable)
2	1405490Q01	BOOT, Microphone
3	See Note	PRINTED CIRCUIT BOARD, Main
4	4305270S01	ADAPTER, Antenna
5	5005227J02	MICROPHONE (MK1)
6	0305433H01	SCREW, Tapping; #4-20 × .32"
7	7582154D33	PAD, Speaker
8	-----	ASSEMBLY, Cover (not field repairable)
9	3305216K22	LABEL, Kit Number
10	3205082E03	GASKET, O-Ring (2 req'd)
11	0382210E19	SCREW, Cover-Captive; #4-40 (2 req'd)
12	0300139982	SCREW, Machine, Phil Bin; #2-56 × .188 (4 req'd)
13	0105959N54	ASSEMBLY, Belt Clip
14	3205082E63	GASKET, O-Ring
15	3905834K05	DOME, PTT (S1)
16	3205264L06	SEAL, PTT
17	See Note	PRINTED CIRCUIT BOARD, PTT
18	5005910P03	SPEAKER (LS1)
19	4305407R01	SPACER, Speaker
20	3205190R01	PAD, Seal
21	4505211R01	LEVER, PTT
22	3305269R01	LABEL, Nameplate
23	7505136L03	PAD, Latch (2 req'd)
24	See Note	PRINTED CIRCUIT BOARD, Flexible
25	0405465C01	WASHER, Plastic (2 req'd)

NOTE: Refer to Electrical Parts List for part number and description.



NMN6128A REMOTE SPEAKER MICROPHONE
D404.807

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR: Fixed: pF ± 5%; 63V unless stated
C1	2105454G47	30; N150
C2	2182877B55	100
C3	2184008H19	.022uF
		CORE:
E1	7605530M01	Ferrite Bead
		COIL, RF: unless stated
L1, 2	2482723H28	Choke, .29uH
		SPEAKER:
LS1	5005910P03	1¾"
		MICROPHONE:
MK1	5005227J02	Microphone
		SWITCH:
S1	3905834K05	Dome, PTT
		CIRCUIT MODULE: See Note I
U1	5105469E47	IC, Voltage Reference Diode 1.235V; Type LM285-Z1.2
		DIODE: See Note I
VR1, 2	4883461E26	Zener, 23.8V
NONREFERENCED ITEMS		
	8405213S01	PCB, Flexible
	8405296R01	PRINTED CIRCUIT BOARD, PTT
	8405297R01	PRINTED CIRCUIT BOARD, Main

NOTE:

I. For optimum performance, order replacement diodes, and circuit modules by Motorola part number only.

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6

Storno

NMN6129A

PUBLIC SAFETY SPEAKER MICROPHONE

1. DESCRIPTION

The Model NMN6129A Public Safety Speaker Microphone (PSSM) includes a speaker, a microphone, a push-to-talk (PTT) switch, a high/low volume switch, and associated circuitry. A cable, terminated with a special accessory connector, connects the speaker microphone to the universal connector on portable radios.
In order for the PSSM to operate properly, a removable antenna, designed for the desired frequency band, must be ordered separately and installed in the PSSM.

When the PSSM's accessory connector is connected to the radio's universal connector, the speaker and antenna in the radio are disabled, and the speaker and antenna in the PSSM are enabled. The radio's PTT switch and internal microphone still operate normally. If the PSSM's PTT switch is used to activate the radio's transmitter, the PSSM's microphone must also be used; if the radio's PTT switch is used, the radio's microphone must be used as well. In either case, the radio can be listened to only through the remote speaker.

A high/low volume switch, S2, allows the user to monitor the audio at a low volume level, then to immediately switch to a high volume level without resetting the volume control on the radio. This feature especially useful when the radio is worn on the belt and the speaker microphone is on the lapel shoulder, as shown in Figure 1.

NOTE

Observe safety information in the radio operating instructions.

Figure 1.

2. INSTALLING THE MICROPHONE

a. Remove the antenna from the radio; unscrew the antenna in the counterclockwise direction.

b. Insert the tab on the microphone's accessory connector (part of item 1) into the slot in the radio's universal connector.

c. Pivot the accessory connector toward the radio until its contacts mate with those on the universal connector, and its mounting screw lines up with the universal connector's threaded hole. Then, start the mounting screw in the hole.

d. Slide the accessory bracket (part of item 1) down over the radio's antenna bushing nut.

e. Insert the button-head screw (item 32) into the threaded hole in the antenna bushing nut, and tighten it firmly (recommended torque is 10 in. lb.).

f. Firmly tighten the accessory connector's mounting screw (recommended torque is 4 in. lb.).

3. OPERATION

a. Turn the radio on and operate it as explained in the operating instructions supplied with the radio. Listen to the radio through the speaker microphone's speaker.

b. Set the "high-low" switch on the speaker microphone to the "low" position to monitor audio at a low volume; for a high volume level, set the switch to the "high" position.

c. The microphone will perform best if it is worn with the antenna above the shoulder as shown in Figure 1.

4. HANDLING PRECAUTIONS

To avoid damage to circuits, observe the following handling, shipping, and servicing precautions:

a. Prior to and while servicing a public safety speaker microphone, particularly after moving within the service area, momentarily place both hands on a bare metal, earth-grounded surface. This will discharge any static charge which your body may have accumulated.

CAUTION

Wearing a conductive wrist strap will minimize static buildup during servicing.

WARNING

When wearing a conductive wrist strap, be careful near high-voltage sources. The good ground provided by the wrist strap will also increase the danger of lethal shock from accidentally touching high-voltage sources.

b. Whenever possible, avoid touching any electrically conductive part of the unit with your hands.

c. Because they contribute to static buildup, avoid carpeted areas, dry environments, and certain types of clothing (silk, nylon, etc.) when servicing a unit.

d. All electrically-powered test equipment should be grounded. Connect the ground lead from the test equipment to the unit before connecting the test probe. Similarly, disconnect the test probe prior to removing the ground lead.

e. If the microphone cartridge is removed from the unit, place it on a conductive surface, such as a sheet of aluminum foil, which is connected to ground through 100k ohms of resistance.

WARNING

If the aluminum foil is connected directly to ground, be cautious of possible electrical shock from contacting the foil and other electrical circuits at the same time.

f. When soldering, be sure the soldering iron is grounded.

g. Prior to replacing circuit components or touching the microphone cartridge, be sure to discharge any static buildup. Since voltage differences can exist across the human body, it is recommended that only one hand be used if it is necessary to touch the microphone cartridge and associated wiring.

h. Replacement microphone cartridges should be kept in conductive packaging until they are placed in the unit.

5. MAINTENANCE

Refer to the schematic diagram, the exploded view, and the parts lists. Every part in the speaker microphone is identified and illustrated for assistance in removal and replacement.

If disassembly of the public safety speaker microphone is required, do not reassemble it without doing the following (numbers in parentheses refer to item numbers in the exploded view):

- Remove the O-ring (22) from the cover assembly (16).
- Inspect the seal areas around the housing (1) and the cover (16) for foreign material which might prevent the O-ring from sealing properly.
- Inspect O-ring (22) and both cover screw O-rings (18). If any of these are split, cracked, or damaged in any way, discard and replace them.
- If the main printed circuit board (14) is removed, remove the speaker spacer (27) and inspect the membrane of the seal pad (29) for tears or holes. If the membrane is damaged, remove it, being careful to remove all old adhesive, and replace it with a new seal pad.

NOTE

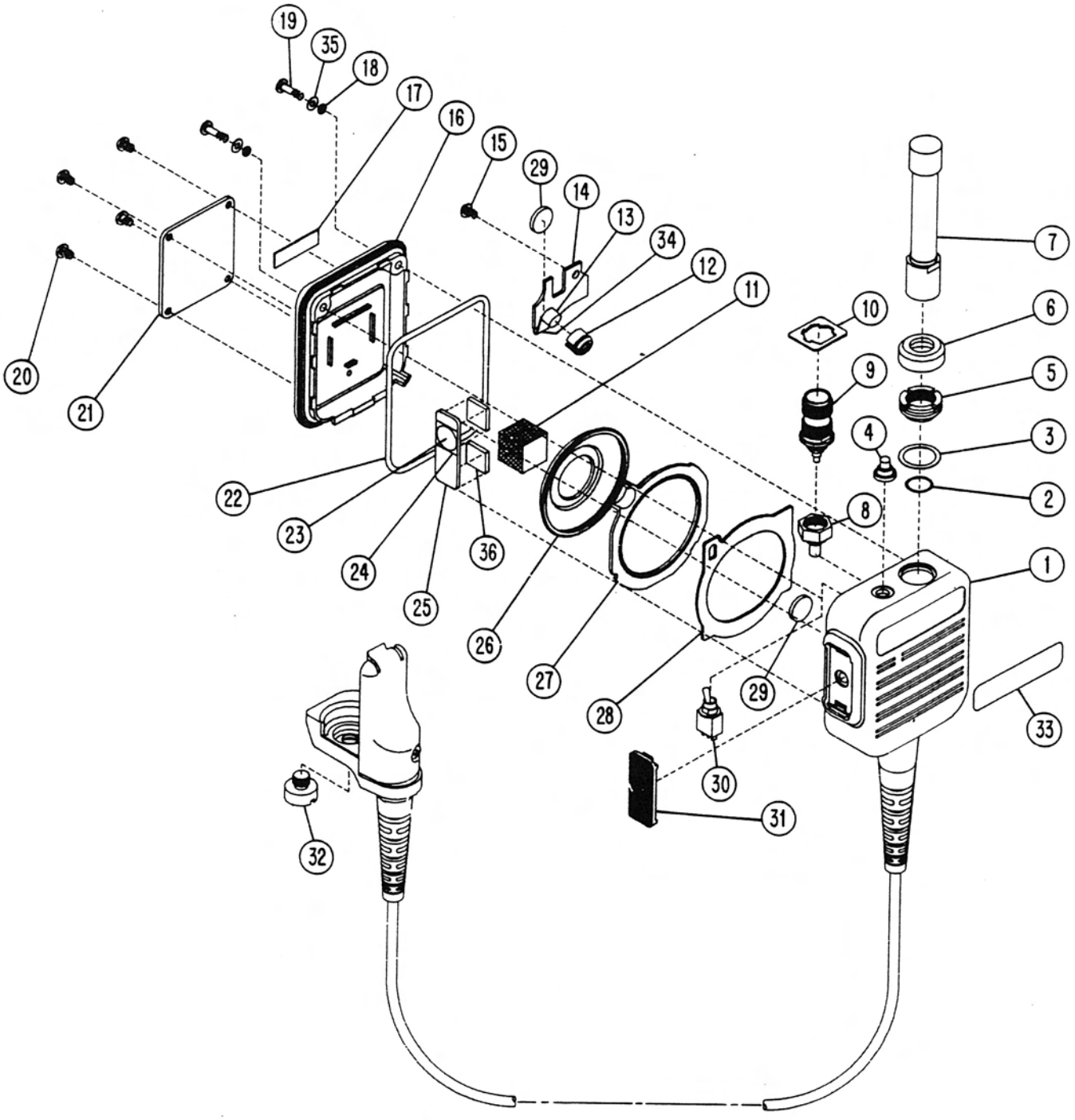
When replacing the seal pad (29), it is critical that the small seal pad opening be aligned with the microphone port in the housing.

- Tighten all hardware loosened or removed during disassembly per the values listed in the Torque Specifications table. Use the recommended torque driver (Sturtevant PM-5 Rototorq Tool or equivalent).

TORQUE SPECIFICATIONS

APPLICATION	TORQUE (IN. LBS.)	TORQUE (N-M)	TORQUE BIT NO.
Cover Screws	6	.68	6680321B78
PC Board Screw	4	.45	6680321B78
Velcro Pad Screws	4	.45	6680321B78
Toggle Switch Boot	3	.34	6680370B99
RF Connector Nut	20	2.27	6680371B01
Button-Head Screw	10	1.13	6680371B02
Accessory Connector Mounting Screw	4	.45	6680321B78

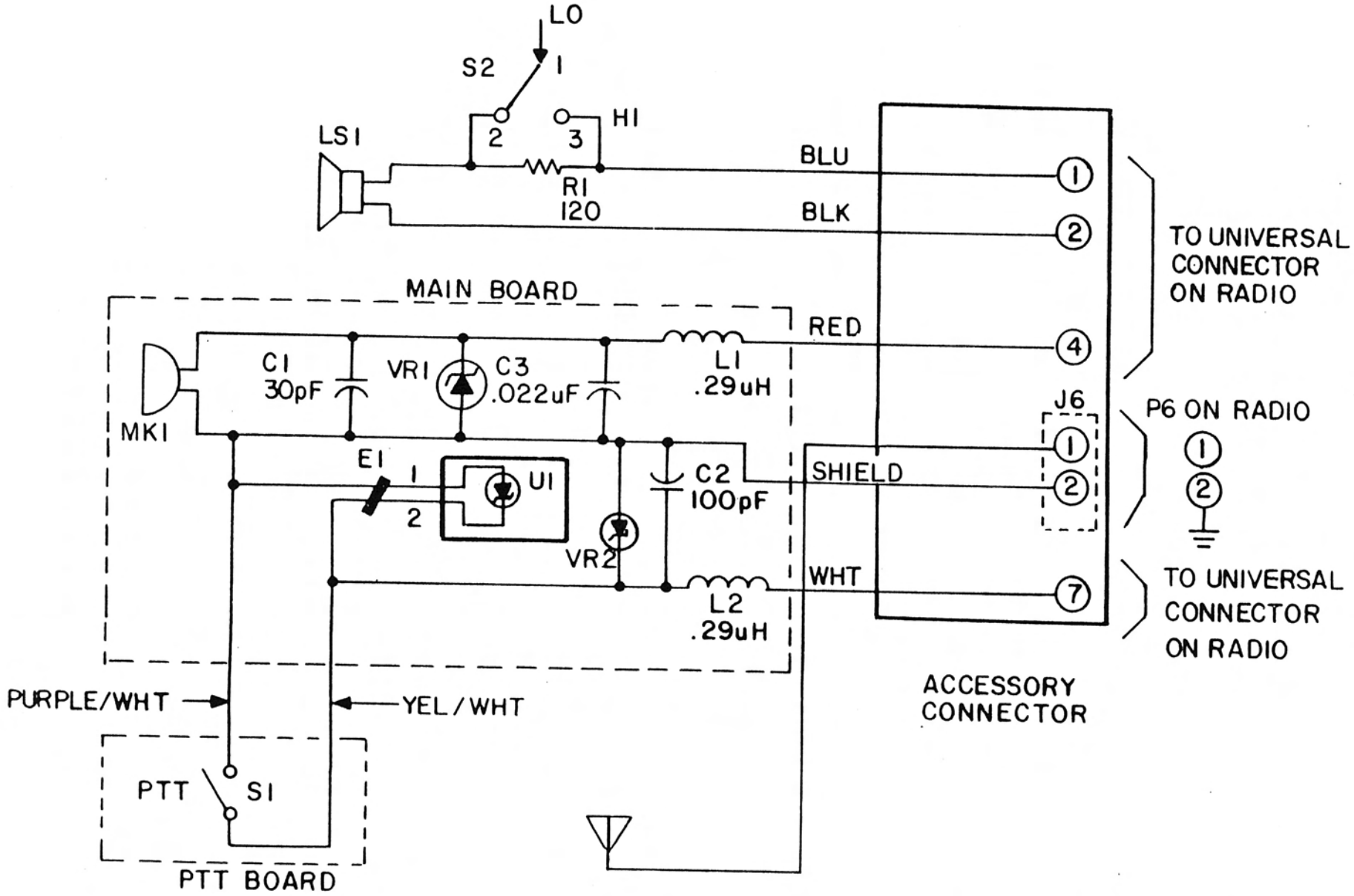
If necessary, the external surfaces of the remote speaker microphone may be cleaned with a 0.5% solution of mild dishwashing detergent in water (one teaspoon of detergent in a gallon of water).



NMN6129A PUBLIC SAFETY SPEAKER MICROPHONE
EXPLODED VIEW
M405.396

ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	-----	ASSEMBLY, Housing/Cord (not field repairable)
2	3205082E69	GASKET, O-Ring
3	0405465C02	WASHER, Plastic
4	0205791P01	NUT, Toggle Seal
5	0205326S01	NUT, Antenna
6	3205325S01	SEAL, Washer
7	See Note	ANTENNA (must be ordered separately)
8	0205541C01	NUT, Special
9	See Note	CONNECTOR, RF
10	0405327S01	WASHER, Bearing
11	7582154D33	PAD, Speaker
12	1405490Q01	BOOT, Microphone
13	See Note	MICROPHONE (MK1)
14	See Note	PRINTED CIRCUIT BOARD, Main
15	0300139047	SCREW, Cutting
16	-----	ASSEMBLY, Cover (not field repairable)
17	3305216K21	LABEL, Kit Number
18	3205082E03	GASKET, O-Ring (2 req'd)
19	0382210E19	SCREW, Cover-Captive; #4-40 (2 req'd)
20	0300139939	SCREW, Pad Retainer (4 req'd)
21	7505385P01	PAD, Hook
22	3205082E63	GASKET, O-Ring
23	See Note	DOME, PTT (S1)
24	3205264L06	SEAL, PTT
25	See Note	PRINTED CIRCUIT BOARD, PTT
26	See Note	SPEAKER (LS1)
27	4305407R01	SPACER, Speaker
28	3205190R01	PAD, Seal
29	7505136L03	PAD, Silicon Sponge (2 req'd)
30	See Note	SWITCH, Toggle (S2)
31	4505211R01	LEVER, PTT
32	0305329S01	SCREW, Button Head
33	3305269R01	LABEL, Nameplate
34	See Note	PRINTED CIRCUIT, Flexible
35	0405465C01	WASHER, Plastic
36	1405424D04	INSULATOR (2 req'd)

NOTE: Refer to Electrical Parts List for part number and description.



NMN6129A PUBLIC SAFETY SPEAKER MICROPHONE
D404.809

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR: Fixed: pF ± 5%; 63V unless stated
C1	2105454G47	30; N150
C2	2182877B55	100
C3	2184008H19	.022uF
		CORE:
E1	7605530M01	Ferrite Bead
		COIL, RF: unless stated
L1, 2	2482723H28	Choke, .29uH
		SPEAKER:
LS1	5005910P03	1¾"
		MICROPHONE:
MK1	5005227J02	Microphone
		RESISTOR, Fixed: Ω ± 5%; ¼W unless stated
R1	0611009C27	120
		SWITCH:
S1	3905834K05	Dome, PTT
S2	4005680K04	Toggle
		CIRCUIT MODULE: See Note I
U1	5105469E48	IC, Voltage Reference, 2.5V; Type LM285-Z2.5
		DIODE: See Note I
VR1, 2	4883461E26	Zener, 23.8V

NONREFERENCED ITEMS		
	NAE6131A	ANTENNA, Helical (400-440MHz) (See Note II)
	or NAE6132A	ANTENNA, Helical (440-470MHz) (See Note II)
	or NAE6133A	ANTENNA, Helical (470-512MHz) (See Note II)
	or NAE6212A	ANTENNA, Helical (403-520MHz) (See Note II)
	0905261B01	CONNECTOR, RF
	8405213S01	PRINTED CIRCUIT, Flexible
	8405296R01	PRINTED CIRCUIT BOARD, PTT
	8405352S01	PRINTED CIRCUIT BOARD, Main

NOTE:

I. For optimum performance, order replacement diodes, and circuit modules by Motorola part number only.

II. The antenna is not part of the speaker microphone kit; it must be ordered separately.

PARTS LIST FOR NMN6129A
X404.810
PAGE 1/1

CHAPTER
CHAPITRE
KAPITEL

7

Storno

SLOW CHARGER NTN4786A
ZLN6415A

NTN4734A - NTN4786A

SINGLE-UNIT RAPID-CHARGE BATTERY CHARGERS

1. INTRODUCTION

The Model NTN4734A (115Vac) and NTN4786A (220Vac) Single-Unit Rapid-Charge Battery Chargers are accessory items for the SABER Series "Handie-Talkie" Portable Radios using rechargeable nickel-cadmium batteries. The chargers are approved for use with the following rapid-charge batteries:

- NTN4537A, and NTN4592A Light-Capacity
- NTN4819A, and NTN4820A Medium-Light-Capacity
- NTN4538A, NTN4593A, NTN4657A, and NTN4671A Medium-Capacity
- NTN4539A, and NTN4594A High-Capacity
- NTN4595A, NTN4596A, and NTN4992A Ultra-High-Capacity

WARNING

DO NOT DISCARD BATTERIES IN FIRE; THEY MAY EXPLODE.

2. SPECIFICATIONS

INPUT POWER: 115Vac, 220Vac, 240Vac; 50/60Hz
SIZE: 6.5″ × 7.75″ × 3.5″
WEIGHT: (Charger With Cord) 4.0 lbs.
RAPID CHARGE TIME: Approximately 1 hour
OPERATING TEMPERATURE RANGE: 0°C - 50°C
RAPID-CHARGE TEMPERATURE WINDOW: 10°C - 40°C

3. DESCRIPTION

The single-unit rapid chargers are constant-current devices which provide two different charge rates: a one-hour rate, and a 16-hour rate. A rapid-charge nickel-cadmium battery is charged initially at the one-hour rate, after which the charging rate automatically reduces to the 16-hour rate. The battery may be left in the battery charger indefinitely without any resultant harm.

The NTN4734A Charger operates from a 115Vac 50/60Hz power source, whereas the NTN4786A Charger operates from a 220Vac 50/60Hz power source. A line voltage selector (placement of ac fuse F1 and receptacle) at the bottom of the unit permits either charger to operate from a 115Vac, a 220Vac, or a 240Vac power source. The only difference between the two chargers is the placement of the ac fuse (F1) and receptacle, and the ac plug.

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

- This manual contains important safety and operating instructions.
- Before using battery charger, read all instructions and cautionary markings on (1) battery charger, (2) battery, and (3) radio using battery.
- **WARNING** – To reduce risk of injury, charge only Motorola nickel-cadmium type rechargeable batteries listed. Other types of batteries may burst, causing personal injury and damage.
- Do not expose charger to rain or snow.
- Use of an attachment not recommended or sold by Motorola may result in a risk of fire, electric shock, or injury to persons.
- To reduce risk of damage to electric plug and cord, pull by plug rather than cord when disconnecting charger.
- Make sure cord is located so that it will not be stepped on, tripped over, or otherwise subjected to damage or stress.
- An extension cord should not be used unless absolutely necessary. Use of improper extension cord could result in a risk of fire and electric shock. If extension cord must be used, make sure:
  (1) That pins on plug of extension cord are same number, size, and shape as those on plug on charger;
  (2) That extension cord is properly wired and in good electrical condition; and
  (3) The cord size is 18AWG for lengths up to 100ft., and 16AWG for lengths up to 150 ft.
- Do not operate charger with damaged cord or plug - replace them immediately.
- Do not operate charger if it has received a sharp blow, been dropped, or otherwise damaged in any way; take it to a qualified serviceman.
- Do not disassemble charger; take it to a qualified serviceman when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
- To reduce risk of electric shock, unplug charger from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.

4. OPERATION

After a period of use, a battery normally requires approximately one hour of rapid charging. The radio should be turned off while attached to a battery being recharged. Place the charger in operation as follows:

a. Make sure that the line voltage selector (fuse F1 and receptacle) is placed in the proper position to accept either 115Vac, 220Vac, or 240Vac as applicable. If the desired Vac is not displayed in the receptacle's window, refer to the exploded view at the back of this manual, and:

(1) Remove the fuse drawer (item 22) from the ac connector (item 2).

(2) Remove the voltage selector insert (item 21) from the fuse drawer.

(3) Replace the voltage selector insert in the fuse drawer with the desired Vac showing through the fuse drawer's slotted window.

(4) Replace the fuse drawer in the ac connector.

b. Connect the ac cord (jack J1 end) to the battery charger.

c. Connect the ac cord (plug P1 end) to the proper ac receptacle. The battery charger performs a self test, which is evidenced first by all four LEDs in the display simultaneously turning on and off, and then by each of the four LEDs in sequence (yellow, orange, red, green) turning on and off.

d. Insert the battery, with or without the radio attached, into the charger compartment and seat it firmly to assure that proper contact has been made. Again, each of the LEDs turns on and off, then the red **Charging** LED turns on to indicate that the battery is being rapid charged.

NOTE

(1) If the yellow **Stand-By** LED illuminates instead of the red LED, the battery is either too hot or too cold to be rapid-charged. Refer to "Circuit Description" for details.

(2) If the orange LED flashes, a problem exists with the battery. **TRY RESEATING THE BATTERY.** Refer to "Circuit Description" for details.

e. Allow approximately one hour for batteries to charge.

NOTE

When a rapid-charge battery reaches full charge, the red **Charging** LED turns off and the green **Complete** LED turns on.

5. IN CASE OF TROUBLE

Before requesting service, refer to the following table for possible remedies.

WARNING

USE ONLY MOTOROLA NICKEL-CADMIUM (NI-CD) BATTERIES WITH THIS CHARGER.

Condition (Refer to Figure 1 for LED location)	Remedy
Red **Charging** LED does not light when battery is inserted in pocket	• Check battery and charger contacts for dirt, grease, or foreign material. Wipe with a soft cloth.
Orange LED flashes.	• Try reseating battery. • If a light-capacity battery with a radio attached is being charged and the radio is turned on, turn the radio off, then reseat battery. • Check battery and charger contacts for dirt, grease, or foreign material. Wipe with a soft cloth. • Try another battery. If problem goes away, the problem is with the first battery.
Yellow **Stand-By** LED lights	• Battery is either too hot or too cold to be rapid charged.
No LEDs light	• Make sure charger is plugged in. • Check to see if charger has a fuse. • Check to see if fuse is blown.

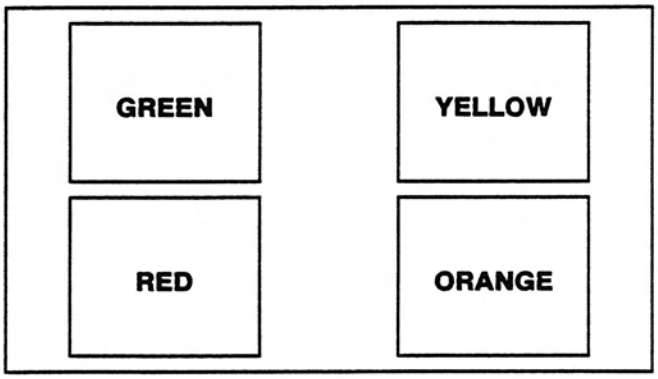


Figure 1. Front Panel LED Locations

6. CIRCUIT DESCRIPTION

(Refer to the schematic diagram)

a. General

The mechanical placement of fuse F1 and its receptacle select the primary windings of transformer T1 for the 115Vac, 220Vac, or 240Vac input source. Operating B+ is developed from a step-down transformer (T1), with a fused primary and a fused secondary, driving a conventional full-wave bridge rectifier (CR1-CR4). B+ is applied to the display board LEDs, to charging circuit transistors

Q1, Q3, and Q15, and to a 5-volt regulator (U1), which provides power to the microcomputer (U3).

All of the timing, monitoring, and sensing of the circuits is performed by the microcomputer (U3). Upon power-up, with no battery inserted, the microcomputer performs a self check of its read-only memory (ROM), random-access memory (RAM), and timer. Next, the microcomputer momentarily turns on all four LEDs via U3, pins 33 thru 36. Then, the microcomputer momentarily turns on each LED in the sequence: yellow, orange, red, and green. Completing the self check with no problems encountered, the microcomputer turns all the LEDs off.

After the microcomputer self check has been completed, the microcomputer monitors the capacity coding resistor (RC) RC IN line (U3, pin 23), and the thermistor (RT) TEMP IN line (U3, pin 24) for battery indications. When a battery is inserted, the microcomputer again momentarily turns on each LED in the sequence: yellow, orange, red, and green.

Next, U3 checks the RC and RT in the battery to determine charging conditions. If the value of the battery's RC is abnormal (see Table 1), the microcomputer senses a problem and, via U3, pin 36, keys the orange LED to flash on and off. If the RC value is normal, the microcomputer proceeds to monitor the battery's temperature.

Table 1. Normal RC Values

RC VALUE	BATTERY TYPE
2.4kΩ	NTN4537A, NTN4592A
5.1kΩ	NTN4538A, NTN4593A, NTN4657A, NTN4671A
10kΩ	NTN4539A, NTN4594A
18kΩ	NTN4595A, NTN4596A, NTN4992A
33kΩ	NTN4819A, NTN4820A

If the battery temperature is outside the temperature window (below 10°C (3.33Vdc on the RT contact) or above 40°C (1.87Vdc on the RT contact), the microcomputer lights the yellow **Stand-By** LED and waits for the battery's temperature to fall within the temperature window. Once this occurs, the microcomputer turns off the yellow LED (if turned on at all) and turns on the charging circuits; these circuits condition the battery by charging it at 600mA for 30 seconds. At the end of 30 seconds, the microcomputer checks the battery voltage via the VCHG IN line at U3, pin 22. The voltage should be between 7Vdc and 11Vdc. If the voltage is outside this range, the microcomputer senses the battery problem and indicates it by flashing the orange LED (RESEAT/REPLACE THE BATTERY).

b. Charging Circuits

Following the power-up, microcomputer self check, battery installation, and normal battery RC, RT, and voltage checks, rapid charging begins. There are four rapid-charge rates as indicated by the battery RC (see Table 2).

Table 2. Charge Rates

BATTERY TYPE	CHARGE RATE (mA)	
	RAPID	TRICKLE
NTN4537A, NTN4592A	600	50
NTN4819A, NTN4820A	780	65
NTN4538A, NTN4593A, NTN4657A, NTN4671A	1080	90
NTN4539A, NTN4594A	1500	125
NTN4595A, NTN4596A, NTN4992A	1500	150

The signal at pin 5 of op amp U2B (voltage drop across resistor R6) is amplified by U2B. The op amp's output (pin 7), sensed by the microcomputer on the CURRENT IN line (U3, pin 21), is used by the microcomputer to select the resistance (R23 thru R33) required to achieve the proper voltage level at the input (pin 3) of op amp U2A. The resultant output at U2A, pin 1, drives transistor Q7, which drives transistors Q3 and Q1.

The microcomputer, via a high at U3, pin 29, turns on switching transistor Q8, achieving a lower emitter resistance at Q7 for the rapid-charge condition. At the same time U3, pin 34, goes high to turn on a display board driver transistor, which illuminates the red **Charging** LED. As the battery rapid charges, the microcomputer monitors the current (U3, pin 21) every 30 seconds and makes adjustments (selection of resistors R23 thru R33) as necessary to maintain constant charging current.

The microcomputer monitors the battery voltage on the VCHG IN line (U3, pin 22). Should this voltage approach 11Vdc, the microcomputer will cut back the charging current and maintain a constant voltage charge.

Every three minutes, the microcomputer stops the charging current and checks the temperature of the battery via the TEMP IN line (U3, pin 24). As the battery reaches full charge in the rapid-charge mode, the battery temperature rises. When the rate of increase within the three minutes exceeds 1.6°C (80mV), U3, pin 29, goes low, Q8 turns off, and the charger switches to the trickle-charge mode. At the same time, U3, pin 34, goes low to turn off the red **Charging** LED, and U3, pin 35, goes high to turn on a driver transistor and the green **Complete** LED. In any temperature environment, should the battery temperature reach 45°C, the charger will switch to the trickle-charge mode.

In the trickle-charge (**Complete**) mode, as in the rapid-charge mode, the microcomputer monitors the charging current and makes the necessary adjustments every 30 seconds. The trickle current charge rates are shown in Table 2.

Whenever a high- or ultra-high-capacity battery is installed, transistors Q17 and Q15 are turned on, via a logical high from U3, pin 32. Q17 and Q15 pull charging current from transistor Q1 through parallel resistors R47 and R60.

c. Reset Circuit

Integrated circuit U5 is a "watchdog" timer. At least once every second, a positive signal from U3, pin 31, is received at U5, pin 2. This signal keeps Q18 from resetting the microcomputer. If a problem occurs in the microcomputer, such as the microcomputer's internal timer ceasing to function correctly, the microcomputer stops sending the signal at U3, pin 31. As a result, the following sequence occurs: U5, pin 3, goes low, turning off Q19. This turns on Q18, which resets the microcomputer. When the microcomputer is reset, Q14 is turned on, pulling U5, pin 2, low, and resetting the U5 timer. Resetting the timer causes U5, pin 3, to go high, which turns on Q19, turns off Q18, and pulls the microcomputer out of reset via U3, pin 2.

d. Interrupt Circuit

Transistor Q4 is normally turned on. But, if the battery is removed, or if "contact bounce" occurs, the voltage at the collector of Q1 goes high, which turns off Q4 and pulls U3, pin 3, low. This low signal interrupts U3's internal processor and keys the microcomputer to check the battery's RC and RT. If the interrupt was just contact bounce, then the microprocessor will continue its normal function. If the interrupt was a removed battery, the microcomputer blanks the display. If the battery is open, the microcomputer senses a problem and, via U3, pin 36, keys the orange LED to flash on and off.

7. MAINTENANCE

a. Fuse

If the charger does not operate, check fuses F1 and F2, and replace if necessary. If the replaced fuse "blows," check for short circuits in the transformer, charger circuits, and transistor Q1.

b. Contacts

If the red **Charging** LED does not turn on with a radio or battery inserted into the pocket, check the contacts of the battery or charger for dirt, grease, or other foreign materials. Clean the contacts, if necessary, with a soft cloth.

CAUTION

THE FOLLOWING MAINTENANCE PROCEDURES SHOULD ONLY BE PERFORMED BY QUALIFIED SERVICE PERSONNEL:

c. Voltage Measurements

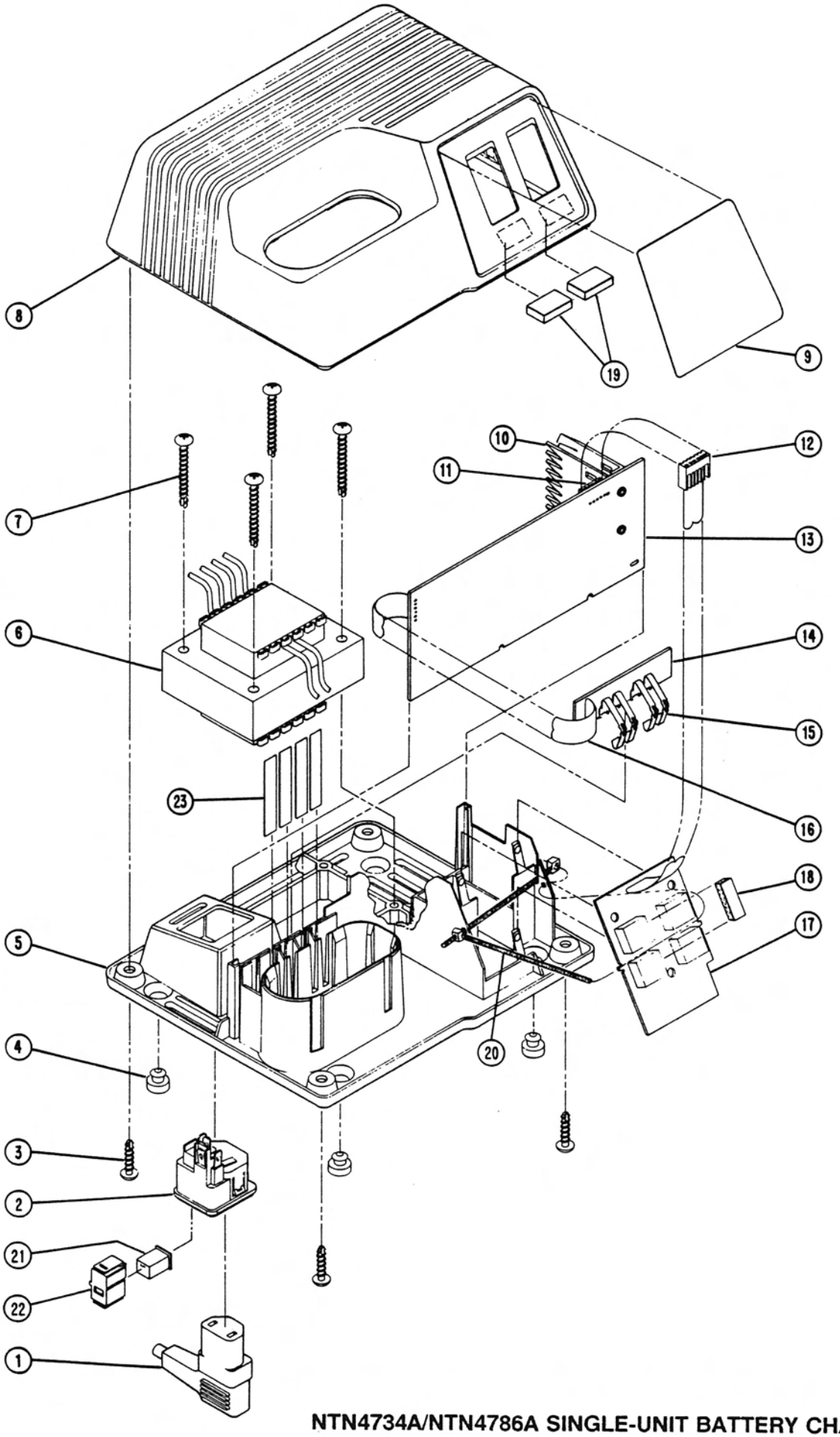
The dc voltage measurements table below lists the voltage levels that should be present with varying batteries and operating conditions.

DC VOLTAGE MEASUREMENTS

BATTERY TYPE	BATTERY CONDITION	PIN	B+	Q1		Q7		Q15		U2			U3							CHARGING CURRENT (mA)
				B	C*	B	E	E	B	5	6	7	2	21	22*	23	24**	29	40	
NO BATTERY			17.0	17.0	8.1	0.2	0	17.0	17.0	0	0	0	4.8	0	2.8	4.9	4.9	0	4.9	0
NTN4537A, NTN4592A	RAPID CHARGE		15.5	14.8	10.2	0.7	0.1	15.5	15.5	.32	.32	1.9	4.8	1.94	3.5	0.5	2.7	3.4	4.9	600
NTN4537A, NTN4592A	CHARGE COMPLETE		16.7	16.2	9.1	1.0	0.4	16.7	16.7	.03	.03	0.1	4.8	0.14	3.1	0.2	2.5	0	4.9	50
NTN4538A, NTN4593A, NTN4657A, NTN4671A	RAPID CHARGE		14.7	14.0	10.7	0.8	0.2	14.7	14.7	.64	.64	3.5	4.8	3.55	3.7	1.0	2.8	3.4	4.9	1080
NTN4538A, NTN4593A, NTN4657A, NTN4671A	CHARGE COMPLETE		16.7	16.1	8.7	1.0	0.4	16.7	16.7	.05	.05	0.3	4.8	0.29	3.0	2.8	2.6	0	4.9	90
NTN4539A,NTN4594A	RAPID CHARGE		14.0	13.4	10.5	0.8	0.2	11.1	10.3	.90	.90	5.0	4.8	4.93	3.6	1.6	2.9	3.4	4.9	1500
NTN4539A,NTN4594A	CHARGE COMPLETE		16.6	16.0	8.9	1.0	0.4	16.6	16.6	.07	.07	0.4	4.8	0.36	2.9	0.9	2.6	0	4.9	125

NOTES:

1. ALL VOLTAGES REFERENCED TO CHARGER GROUND.
2. VOLTAGES AT PIN DESIGNATED * WILL VARY WITH THE VOLTAGE OF THE BATTERY.
3. VOLTAGES AT PIN DESIGNATED ** WILL VARY WITH THE TEMPERATURE OF THE BATTERY.

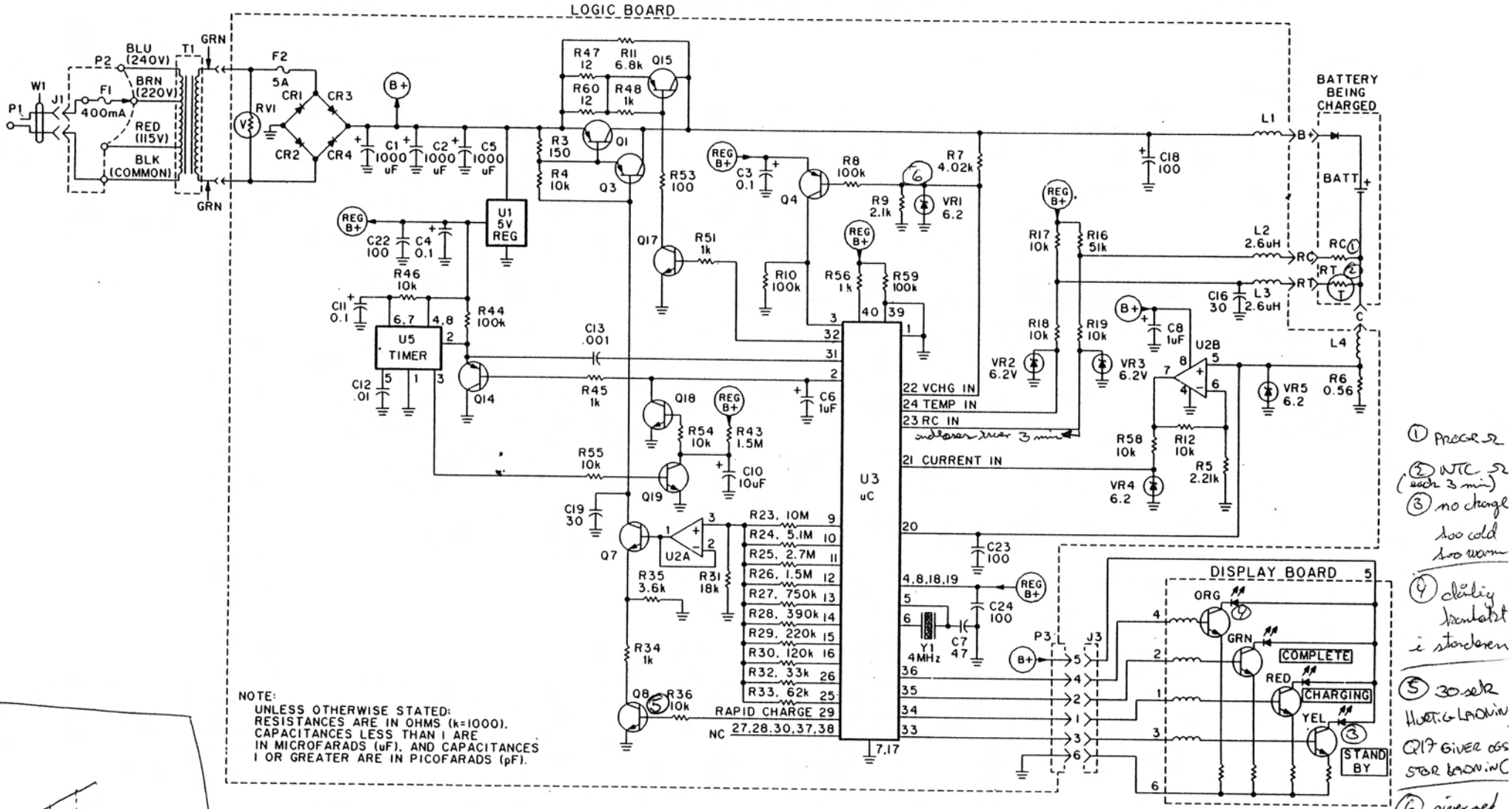


NTN4734A/NTN4786A SINGLE-UNIT BATTERY CHARGERS
EXPLODED VIEW
M405.399

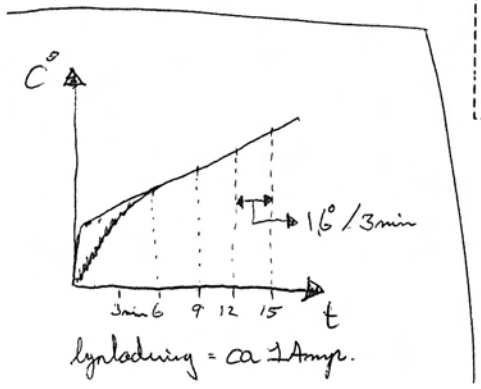
ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	See Note	CORD, Line
2	See Note	CONNECTOR, AC
3	0305199R02	SCREW, Cutting, Phil Pan Hd; #10-16 × .625" (4 req'd)
4	7505870R01	FOOT (4 req'd)
5	1505556Q01	BASE
6	See Note	TRANSFORMER (T1)
7	0305199R01	SCREW, Cutting, Phil Pan Hd; #10-16 × 1.625" (4 req'd)
8	1505557Q01	HOUSING
9	1305679Q01	ESCUTCHEON
10	-----	HEAT SINK (part of item 13)
11	-----	CONNECTOR, Header, 6-Position (part of item 13)
12	-----	CONNECTOR, 6-Position (part of item 17)
13	See Note	ASSEMBLY, Logic Board (includes items 10, 11, 14, 15, and 16)
14	-----	PRINTED CIRCUIT BOARD, Contact (part of item 13)
15	-----	CONTACT, (4 req'd) (part of item 13)
16	-----	CABLE, Flexible (part of item 13)
17	See Note	ASSEMBLY, Display Board (includes item 12)
18	7505083E08	PAD
19	7505641N03	PAD (2 req'd)
20	4210217A26	TIE WRAP (2 req'd)
21	-----	INSERT, Voltage (part of item 22)
22	2805245S01	DRAWER, Fuse (includes item 21)
23	1405209L09	INSULATOR (4 req'd)

NOTE: Refer to Electrical Parts List for part number and description.

30 Sek. lynladning

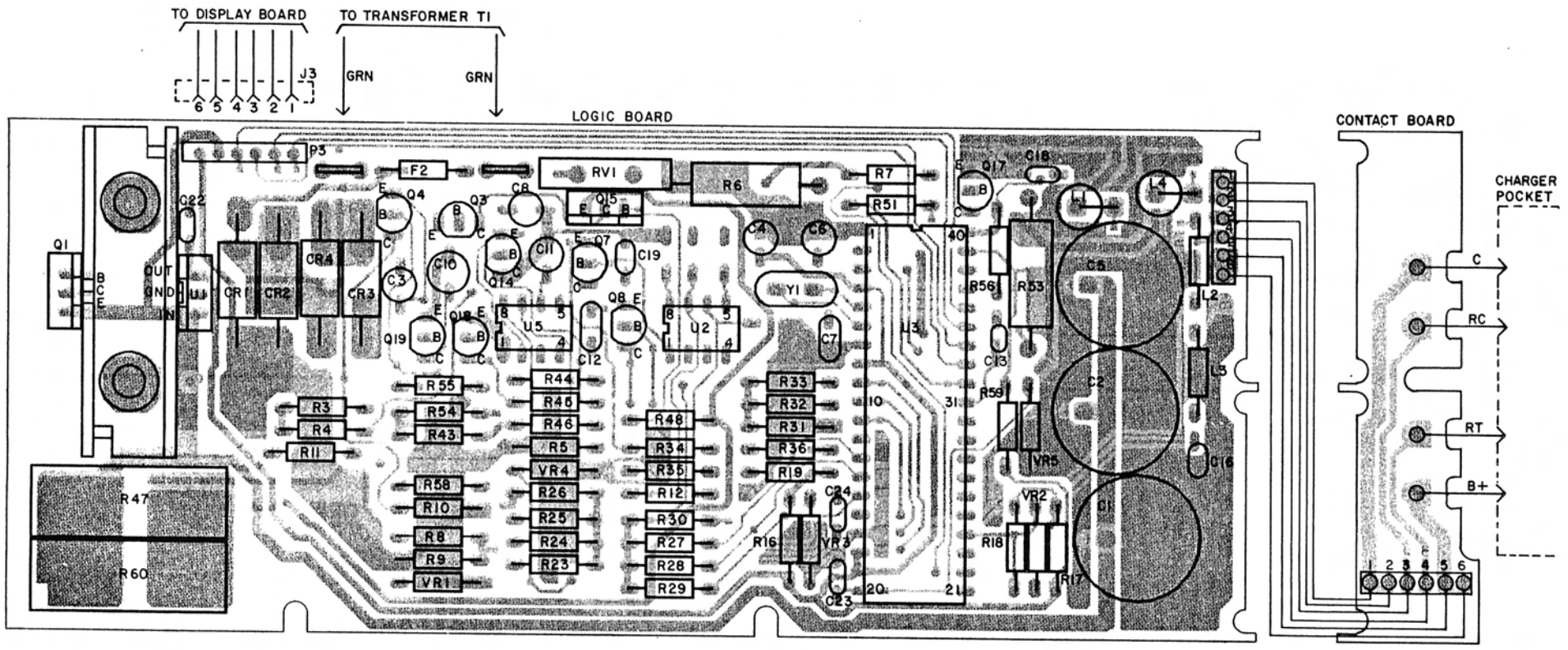


① Proces →
② NTC → (each 3 min)
③ no charge too cold too warm
④ dårlig kontakt i stikdåsen
⑤ 30 sek Hurtig ladning Q17 giver også start ladning
⑥ giver ref til IC'en, når opnået U_{batt} er nået



DER LYNLADES TIL BATT. HAR EN 1,6° TEMP↑ / PR 3min

NTN4734A/NTN4786A SINGLE-UNIT BATTERY CHARGERS
D404.816



COMPONENT LAYOUT FOR NTN4734A/NTN4786A
SINGLE-UNIT BATTERY CHARGERS
D404.817

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed: uF ± 20%; 35V unless stated
C1, 2	2360561H19	1000
C3, 4	2383441B20	0.1
C5	2360561H19	1000
C6	2383441B15	1
C7	2105529B11	47pF ± 5%; N150
C8	2383441B15	1
C9	-----	Not Used
C10	2305499G16	10 ± 10%; 16V
C11	2383441B20	0.1
C12	2105457G14	.01 + 30 – 80%; 63V
C13	2105457G09	1000pF; 63V
C14, 15	-----	Not Used
C16	2105454G47	30pF ± 5%; 63V; N150
C17	-----	Not Used
C18	2105455G12	100pF ± 10%; 63V; N750
C19	2105454G47	30pF ± 5%; 63V; N150
C20, 21	-----	Not Used
C22 thru 24	2105455G12	100pF ± 10%; 63V; N750
		DIODE: See Note I
CR1 thru 4	4882525G19	Silicon, 3A; 50PIV
		FUSE:
F1	6505700Q04	400mA
F2	6505214E02	5 Amp
		COIL, RF: unless stated
L1	2483977B02	Choke
L2, 3	2482723H19	2.6uH
L4	2483977B02	Choke
		TRANSISTOR:
Q1	4800869807	PNP; type M9807
Q2	-----	Not Used
Q3, 4	4800869643	PNP; type M9643
Q5, 6	-----	Not Used
Q7, 8	4800869642	NPN; type M9642
Q9 thru 13	-----	Not Used
Q14	4800869643	PNP; type M9643
Q15	4800869807	PNP; type M9807
Q16	-----	Not Used
Q17	4800869706	NPN; type M9706
Q18, 19	4800869642	NPN; type M9642
		RESISTOR, Fixed: Ω ± 5%; ¼W unless stated
R1, 2	-----	Not Used
R3	0611009C29	150
R4	0611009C73	10k
R5	0610621C28	2.21k ± 1%
R6	1782036G18	.56; 2W
R7	0610621C53	4.02k ± 1%
R8	0611009C97	100k
R9	0610621C26	2.1k ± 1%
R10	0611009C97	100k
R11	0611009C69	6.8k
R12	0610621C91	10k ± 1%
R13 thru 15	-----	Not Used
R16	0611009C90	51k
R17	0610621C91	10k ± 1%
R18, 19	0611009C73	10k
R20 thru 22	-----	Not Used
R23	0610164K58	10M
R24	0610164K51	5.1M
R25	0610164K44	2.7M
R26	0610164K38	1.5M
R27	0611009B19	750k
R28	0611009D12	390k
R29	0611009D06	220k
R30	0611009C99	120k
R31	0611009C79	18k
R32	0611009C85	33k
R33	0611009C92	62k
R34	0611009C49	1k
R35	0611009C62	3.6k
R36	0611009C73	10k
R37 thru 42	-----	Not Used
R43	0610164K38	1.5M
R44	0611009C97	100k
R45	0611009C49	1k
R46	0611009C73	10k
R47	1705261K15	12 ± 10%; 5W
R48	0611009C49	1k
R49, 50	-----	Not Used
R51	0611009C49	1k
R52	-----	Not Used
R53	1705530L07	100 ± 10%; 2W
R54, 55	0611009C73	10k
R56	0611009C49	1k
R57	-----	Not Used
R58	0611009C73	10k
R59	0611009C97	100k
R60	1705261K15	12 ± 10%; 5W
		VARISTOR:
RV1	0605220M01	35V
		TRANSFORMER:
T1	2505578Q01	Transformer
		CIRCUIT MODULE: See Note I
U1	5184320A47	5V Regulator
U2	5105469E40	Dual Op Amp
U3	5105849Q01	Microcomputer
U4	-----	Not Used
U5	5184320A35	555 Timer
		DIODE: See Note I
VR1 thru 5	4811034G13	Zener, 6.2V
		CRYSTAL:
Y1	4805664G25	4MHz

NONREFERENCED ITEMS		
	2805546Q02	CONNECTOR, AC
	3005204R01	CORD, Line (115Vac 50/60Hz)
	3005204R03	CORD, Line (220/240Vac 50/60Hz)
	0105959M91	ASSEMBLY, Logic Board
	8460999A40	ASSEMBLY, Display Board

NOTES:

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

CHAPTER
CHAPITRE
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NTN4668A - NTN4796A - NTN4797A - NTN4922A

MULTI-UNIT RAPID-CHARGE BATTERY CHARGERS

1. INTRODUCTION

WARNING

Do not discard batteries in fire; they may explode.

a. NTN4796A and NTN4797A Chargers

The NTN4796A (110Vac) and NTN4797A (220-240Vac) Multi-Unit Rapid-Charge Battery Chargers are accessory items for "Handie-Talkie" Portable Radios using rechargeable nickel-cadmium batteries. These chargers are approved for use with the following rapid-charge batteries:

BATTERY NUMBER	CAPACITY
NTN4537A, NTN4592A	Light
NTN4819A, NTN4820A	Medium-Light
NTN4538A, NTN4593A, NTN4657A, NTN4671A, NTN5155A, NTN5156A	Medium
NTN4539A, NTN4594A	High
NTN4595A, NTN4596A, NTN4992A	Ultra-High

b. NTN4668A and NTN4922A Chargers

The NTN4668A (110Vac) and NTN4922A (220-240Vac) Multi-Unit Rapid Charge Battery Chargers are accessory items for "Handie-Talkie" Portable Radios using rechargeable nickel-cadmium batteries. These chargers are approved for use with the following rapid- and standard-charge batteries:

BATTERY NUMBER	CHARGE TYPE	CAPACITY
NTN4583A, NTN4867A	Rapid	Light
NTN4564A, NTN4584A, NTN4822A, NTN4823A, NTN4871A	Rapid	Medium
NTN4585A, NTN4586A, NTN4824A, NTN4825A	Rapid	High
NTN4563A, NTN4868A	Standard	Medium
NTN4588A, NTN4869A	Standard	High

2. SPECIFICATIONS

INPUT VOLTAGE: 110Vac, 220-240Vac; 50/60Hz
SIZE: 17.6" × 12.0" × 5.5" (45cm × 31cm × 14cm)
WEIGHT: 8 lbs, 14 oz. (4 kg)
RAPID CHARGE RATE: Approximately 1 hour
OPERATING TEMPERATURE RANGE: 0°C - 50°C
RAPID-CHARGE TEMPERATURE WINDOW: 10°C - 40°C

IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

- This manual contains important safety and operating instructions.
- Before using battery charger, read all instructions and cautionary markings on (1) battery charger, (2) battery, and (3) radio using battery.
- **WARNING** – To reduce risk of injury, charge only Motorola nickel-cadmium type rechargeable batteries listed. Other types of batteries may burst, causing personal injury and damage.
- Do not expose charger to rain or snow.
- Use of an attachment not recommended or sold by Motorola may result in a risk of fire, electric shock, or injury to persons.
- To reduce risk of damage to electric plug and cord, pull by plug rather than cord when disconnecting charger.
- Make sure cord is located so that it will not be stepped on, tripped over, or otherwise subjected to damage or stress.
- An extension cord should not be used unless absolutely necessary. Use of improper extension cord could result in a risk of fire and electric shock. If extension cord must be used, make sure:
  (1) That pins on plug of extension cord are same number, size, and shape as those on plug on charger;
  (2) That extension cord is properly wired and in good electrical condition; and
  (3) The cord size is 18AWG for lengths up to 100ft., and 16AWG for lengths up to 150 ft.
- Do not operate charger with damaged cord or plug - replace them immediately.
- Do not operate charger if it has received a sharp blow, been dropped, or otherwise damaged in any way; take it to a qualified serviceman.
- Do not disassemble charger; take it to a qualified serviceman when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
- To reduce risk of electric shock, unplug charger from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.

3. DESCRIPTION

The multi-unit rapid chargers are constant-current devices which can charge up to six nickel-cadmium batteries simultaneously. Each charging pocket provides two different charge rates: a one-hour rate, and a 16-hour rate. A rapid-charge nickel-cadmium battery is charged initially at the one-hour rate, after which the charging rate is automatically reduced to the 16-hour rate; a standard-charge battery charges only at the 16-hour rate. The battery may be left in the battery charger indefinitely without any resultant harm.

The NTN4796A and NTN4668A chargers require a 110Vac, 50/60Hz power source, whereas the NTN4797A and NTN4922A chargers utilize a 220-240Vac, 50/60Hz power source. A line voltage selector switch at the bottom of the charger selects which power source voltage will be used. The appropriate ac power cord is provided with the charger.

4. OPERATION

After a period of use, a battery normally requires approximately one hour of rapid charging. The radio should be turned off while attached to a battery being recharged. Place the charger in operation as follows:

a. Connect the ac power cord to the battery charger.

b. Plug the ac line cord into the proper ac receptacle. The battery charger performs a self test: pocket 1's three LEDs are simultaneously turned on, then off, followed, in numerical order, by the LEDs of pockets 2 through 6.

NOTE

Make certain that the ac power cord's plug is completely inserted into the charger socket and a good electrical connection is made.

c. Insert the battery, with or without the radio attached, into a vacant charger pocket and seat it firmly to ensure that proper contact has been made. The pocket's three LEDs turn on and off, then the red **CHARGING** LED turns on to indicate that the battery is being rapid-charged.

NOTE

1. If the yellow **STAND-BY** LED lights instead of the red LED, the battery is either too hot or too cold to be rapid-charged. Refer to "Circuit Description" for details.
2. If both the red **CHARGING** LED and the yellow **STAND-BY** LED light at the same time, the battery is being trickle-charged. Refer to "Circuit Description" for details.

d. Allow approximately one hour for batteries to charge.

NOTE

When a rapid charge battery reaches full charge, the red **CHARGING** LED turns off, and the green **COMPLETE** LED turns on.

5. IN CASE OF TROUBLE

Before requesting service, refer to the following table for possible remedies.

WARNING

USE ONLY MOTOROLA NICKEL-CADMIUM (NI-CD) BATTERIES WITH THIS CHARGER.

CONDITION	REMEDY
Red **CHARGING** LED does not light when battery is inserted in pocket.	• Check battery contacts for dirt, grease, or foreign material. Wipe with a soft cloth.
Red **CHARGING** LED flashes.	• Try reseating the battery. • Check battery contacts for dirt, grease, or foreign material. Wipe with a soft cloth. • Try another battery. If problem goes away, the problem is with the first battery.
Yellow **STAND-BY** LED lights.	• Battery is either too hot or too cold to be rapid-charged.
No LEDs light.	• Make sure charger is plugged in. • Check to see if charger has a fuse. • Check to see if fuse is blown.

6. CIRCUIT DESCRIPTION

(Refer to the schematic diagrams)

a. Power Supply

The position of the line voltage selector switch on the bottom of the power supply determines the input source voltage (110Vac or 220-240Vac). Operating B+ (12.5Vdc for NTN4796A and NTN4797A chargers, or 16Vdc for NTN4668A and NTN4922A chargers) is developed within the power supply and fed to the main circuit board via plug P1. The power supply's output voltage (B+) is determined by the position of a jumper on the side of the power supply. On the main circuit board, B+ is distributed to LED boards 1 and 2, to charging circuit transistors Q5, Q7, Q9, Q11, Q13, and Q15, to ICs U18 and U23, and to 5-volt regulator U13. The 5-volt regulator provides regulated +5Vdc to the microcomputer (U15) and all other ICs.

b. Microcomputer and Display Circuits

All of the timing, monitoring, and sensing of the circuits is performed by the microcomputer (U15). Upon power-up, with no battery inserted, the microcomputer performs a self-check of its erasable programmable read-only memory (EPROM), random-access memory (RAM), and internal timer.

Next, the microcomputer tests the display circuitry by turning all three LEDs for each pocket on and off in numerical order, starting with pocket 1. To control the display, the microcomputer sends pocket display data via the PA0

through PA5, and PA7 lines (U15, pins 33 through 38, and 40) to hex D flip-flop ICs U4 through U6 as follows:

POCKET	DATA LINES	IC	PINS IN	PINS OUT	LEDs
1	PA0-2,7	U4	1,3,4,6	2,5,7	1-3
2	PA3-5,7	U4	1,11,13,14	10,12,15	4-6
3	PA0-2,7	U5	1,3,4,6	2,5,7	7-9
4	PA3-5,7	U5	1,11,13,14	10,12,15	10-12
5	PA0-2,7	U6	1,3,4,6	2,5,7	13-15
6	PA3-5,7	U6	1,11,13,14	10,12,15	16-18

At the same time, the microcomputer selects the pocket displays to be changed by sending positive-going clock pulses via the PB5 through PB7 lines (U15, pins 30 through 32) to the clock inputs (pin 9) of ICs U4 through U6. These ICs multiplex and latch the display data from the microcomputer, and send control signals to the appropriate LEDs via lamp drivers in ICs U1 through U3. A logic high output from one of the flip-flops will turn an LED on; a logic low will turn the LED off.

If the microcomputer fails its self-check, all LEDs will light simultaneously and will remain lit until the charger is reset by removing ac power. If the self-check is completed without any problems being encountered, the microcomputer turns all LEDs off; the LEDs will remain off until a battery is inserted into one of the pockets.

c. Monitoring and Sensing Circuits

Before any batteries can be charged, the microcomputer (U15) must first determine the charger type (NTN4796A/NTN4797A or NTN4668A/NTN4922A) by checking the value of B+. This is accomplished by applying B+ across voltage divider network R142 and R143, and feeding the network's output to the pin 4 input of multiplexer U22. The microcomputer selects this input by sending its binary address, via control lines PB0 through PB2, to pins 9 through 11 of U22. U22 outputs this voltage, via the PD2 line (U22, pin 3), to the AN2 input (pin 22) of U15. This voltage (see Tables 3 and 4) is then used by the microcomputer to set up its internal charging parameters.

Following charging parameter setup, the microcomputer monitors the PD0 through PD3 lines (U15, pins 21 through 24) from multiplexers U21 through U24 to monitor battery type, temperature, voltage, and current. Using these four multiplexers, the PD0 through PD3 lines are able to report the battery parameters of all six pockets.

The microcomputer searches for the presence of a battery in any of the pockets by continually monitoring their battery type and temperature values, cycling through the pockets in ascending order. The microcomputer selects the pocket to be sensed by sending the desired pocket's binary address (0 through 5), via control lines PB0 through PB2, to pins 9 through 11 of all four multiplexers.

When the presence of a battery in a pocket is indicated by a valid capacity resistor (RC) value (see Table 1), and a thermistor (RT) value between 10° (3.33Vdc on the RT contact) and 40° Celsius (1.87Vdc on the RT contact) is detected, the pocket's charge cycle will begin.

Table 1. Normal RC Values

BATTERY TYPE	RC VALUE
NTN4537A, NTN4592A	2.4kΩ
NTN4585A, NTN4586A, NTN4588A, NTN4824A, NTN4825A, NTN4869A	3.3kΩ
NTN4538A, NTN4593A, NTN4657A, NTN4671A, NTN5155A, NTN5156A	5.1kΩ
NTN4564A, NTN4584A, NTN4822A, NTN4823A, NTN4563A, NTN4868A NTN4871A	5.6kΩ
NTN4539A, NTN4594A	10kΩ
NTN4583A, NTN4595A, NTN4596A, NTN4867A, NTN4992A	18kΩ
NTN4819A, NTN4820A	33kΩ

If the RC value is not valid, the red **CHARGING** LED will flash. *If the thermistor is neither shorted nor open but its value is not within the rapid-charging window*, the yellow **STAND-BY** LED will light and no charging will occur. When the battery temperature is within the prescribed window, the yellow LED will turn off and the red LED will light, and the normal charging cycle will begin. If the thermistor is shorted, the red LED will flash; if the thermistor is open, the battery will first be pre-charged as described under "Charging Circuits," then it will be trickle-charged, and both red and yellow LEDs will light.

d. Charging Circuits

Following the power-up, microcomputer self check, battery installation, and normal battery RC, RT, and voltage checks, rapid charging begins. There are several different rapid-charge rates as determined by the battery RC (see Table 2).

Table 2. Charge Rates

BATTERY TYPE	CHARGE RATE (mA)	
	RAPID	TRICKLE
NTN4563A, NTN4868A	---	50
NTN4588A, NTN4869A	---	90
NTN4583A, NTN4867A	300	25
NTN4537A, NTN4564A, NTN4584A, NTN4592A, NTN4822A, NTN4823A, NTN4871A	600	50
NTN4819A, NTN4820A	780	65
NTN4585A, NTN4586A, NTN4824A, NTN4825A	840	90
NTN4538A, NTN4593A, NTN4657A, NTN4671A, NTN5155A, NTN5156A	1080	90
NTN4539A, NTN4594A	1500	125
NTN4595A, NTN4596A, NTN4992A	1500	150

The microcomputer first precharges the battery at 600mA for 30 seconds. The microcomputer selects the pocket to be charged by sending that pocket's address, via the PB0 through PB2 lines, to triple "AND" gates U17A through U17C. At the same time, a high pulse is sent over the PC7 line to U17 to enable the gates. The resulting address is fed over the A1 through A3 lines to binary-to-octal decoder U16. U16 then sends a clock pulse, via one of the Q1 through Q6 lines, to the hex D flip-flop IC (U7 through U12) for the desired pocket.

Charging current is set and latched by sending a six-bit word from U15, pins 9 through 14, via the PC0 through PC5 lines, to pins 3, 4, 6, 11, 13, and 14 of hex D flip-flop ICs U7 through U12, and setting the PA7 line (U15, pin 40) high. The six-bit word is determined by the value of the battery's RC. At the flip-flop IC of the selected pocket, the clock pulse (Q1 through Q6) from U16 latches the six-bit word; the flip-flop IC's six output lines (Q0 through Q5) select a resistive network which determines the charge rate. If the charge current is not within specified limits (see Table 2), the microcomputer will stop charging current to the pocket, and will indicate a pocket fault condition by lighting all three of the pocket's LEDs.

At the end of the 30-second precharge, the battery voltage is read. If the voltage reading falls between 7Vdc and 11Vdc (for NTN4796A and NTN4797A chargers) or 9Vdc and 15Vdc (for NTN4668A and NTN4922A chargers), the charger switches to the rapid-charge mode. If the voltage is outside of this range, the charger signals a battery problem by flashing the red **CHARGING** LED.

Every three minutes, the microcomputer stops the charging current and checks the temperature of the battery. As the battery reaches full charge in the rapid-charge mode, the battery temperature rises. When the battery temperature reaches 45°C, or the rate of increase within the three minutes exceeds 1.6°C (80mV), the charger switches to the trickle-charge mode, turning off the red **CHARGING** LED, and turning on the green **COMPLETE** LED.

e. Reset Circuit

Integrated circuit U14 is a "watchdog" timer. At least once every second, a positive signal from U15, pin 28 (PB3 line), is received at U14, pin 2. This signal keeps Q1 from resetting the microcomputer. If a problem occurs in the microcomputer, such as the microcomputer's internal timer's ceasing to function correctly, the microcomputer stops sending the signal at U15, pin 28. As a result, the following sequence occurs: U14, pin 3, goes low, turning off Q2. This turns on Q1, which resets the microcomputer. When the microcomputer is reset, Q3 is turned on, pulling U14, pin 2, low, and resetting the U14 timer. Resetting the timer causes U14, pin 3, to go high, which turns on Q2, turns off Q1, and pulls the microcomputer out of reset via U15, pin 2.

f. Shutdown Circuit

The charger also contains a shutdown circuit which the microcomputer controls via the PA6 line (U15, pin 39). During normal operation, a logic high appears at pin 39 which keeps Q17 turned on. If the microcomputer senses current flow when current should not be flowing, it outputs a logic low on pin 39, turning off Q17, and pulling pin 1 of P1 high. This triggers an SCR within the power supply which ceases to send power to the main circuit board. AC power must be removed from the power supply to reset the unit.

7. MAINTENANCE

a. Fuse

If the charger does not operate, check the fuse, and replace if necessary. If the replaced fuse "blows," check for shorts in the power supply output, charger circuits, and 5-volt regulator U13.

b. Contacts

If the red **CHARGING** LED does not turn on with a radio or battery inserted into the pocket, check the contacts of the battery or charger for dirt, grease, or other foreign materials. Clean the contacts with a soft cloth, if necessary.

CAUTION

The following maintenance procedures should only be performed by qualified service personnel:

c. DC Voltage Measurements

The following dc voltage measurements tables list typical voltage levels that should be present with varying chargers, batteries, and operating conditions. Measurements shown are for pocket 1.

Table 3. NTN4796A and NTN4797A DC Voltages

BATTERY AND CONDITION / PIN	B+	U22	Q7		Q8		U8						U18			U15						P1	U1			CHARGING CURRENT (mA)
		4	B	C*	B	E	2	5	7	10	12	15	1	3	9	2	21	22*	23	24**	29	1	16	15	14	
NO BATTERY	12.7	3.7	12.7	8.8	0	0	0	0	0	0	0	0	0	0	0	5.0	0	2.5	4.90	4.9	4.8	0	11.2	11.2	11.2	0
RAPID CHARGE NTN4537A, NTN4592A	12.7	3.7	12.0	9.6	2.2	1.5	5.0	0	0	5.0	5.0	0	1.70	0.36	0.36	5.0	1.70	2.8	0.60	2.7	4.8	0	11.2	0.7	11.2	600
CHARGE COMPLETE NTN4537A, NTN4592A	12.7	3.7	12.0	9.0	0.9	0.2	5.0	5.0	0	0	0	0	0.16	0.04	0.04	5.0	0.16	2.6	0.28	0.5	4.8	0	11.2	11.2	0.7	50
RAPID CHARGE NTN4819A, NTN4820A	12.7	3.7	12.0	9.8	3.0	2.3	0	0	0	0	0	5	2.30	0.50	0.50	5.0	2.3	2.8	2.30	2.8	4.8	0	11.2	0.7	11.2	780
CHARGE COMPLETE NTN4819A, NTN4820A	12.7	3.7	12.0	9.2	1.0	0.2	0	0	5.0	0	0	0	0.24	0.05	0.05	5.0	0.24	2.6	1.90	0.5	4.8	0	11.2	11.2	0.7	65
RAPID CHARGE NTN4538A, NTN4593A, NTN4657A, NTN4671A, NTN5155A, NTN5156A	12.7	3.7	12.0	10.0	4.0	3.3	5.0	0	0	5.0	0	5.0	3.00	0.64	0.64	5.0	3.0	2.9	1.10	2.8	4.8	0	11.2	0.7	11.2	1080
CHARGE COMPLETE NTN4538A, NTN4593A, NTN4657A, NTN4671A, NTN5155A, NTN5156A	12.7	3.7	12.0	9.2	1.0	0.3	5.0	0	5.0	0	0	0	0.27	0.06	0.06	5.0	0.27	2.6	0.45	0.5	4.8	0	11.2	11.2	0.7	90
RAPID CHARGE NTN4539A, NTN4594A	12.7	3.7	12.0	10.4	6.2	5.4	0	0	5.0	5.0	5.0	5.0	4.20	0.90	0.90	5.0	4.20	3.0	1.60	2.9	4.8	0	11.2	0.7	11.2	1500
CHARGE COMPLETE NTN4539A, NTN4594A	12.7	3.7	12.0	9.0	1.0	0.3	0	5.0	5.0	0	0	0	0.32	0.07	0.07	5.0	0.32	2.6	0.88	0.5	4.8	0	11.2	11.2	0.7	125
RAPID CHARGE NTN4595A, NTN4596A, NTN4992A	12.7	3.7	12.0	10.4	6.2	5.4	0	0	5.0	5.0	5.0	5.0	4.20	0.90	0.90	5.0	4.20	3.0	2.00	2.9	4.8	0	11.2	0.7	11.2	1500
CHARGE COMPLETE NTN4595A, NTN4596A, NTN4992A	12.7	3.7	12.0	9.0	1.0	0.3	5.0	5.0	5.0	0	0	0	0.37	0.08	0.08	5.0	0.37	2.6	1.36	0.6	4.8	0	11.2	11.2	0.7	150

NOTES:

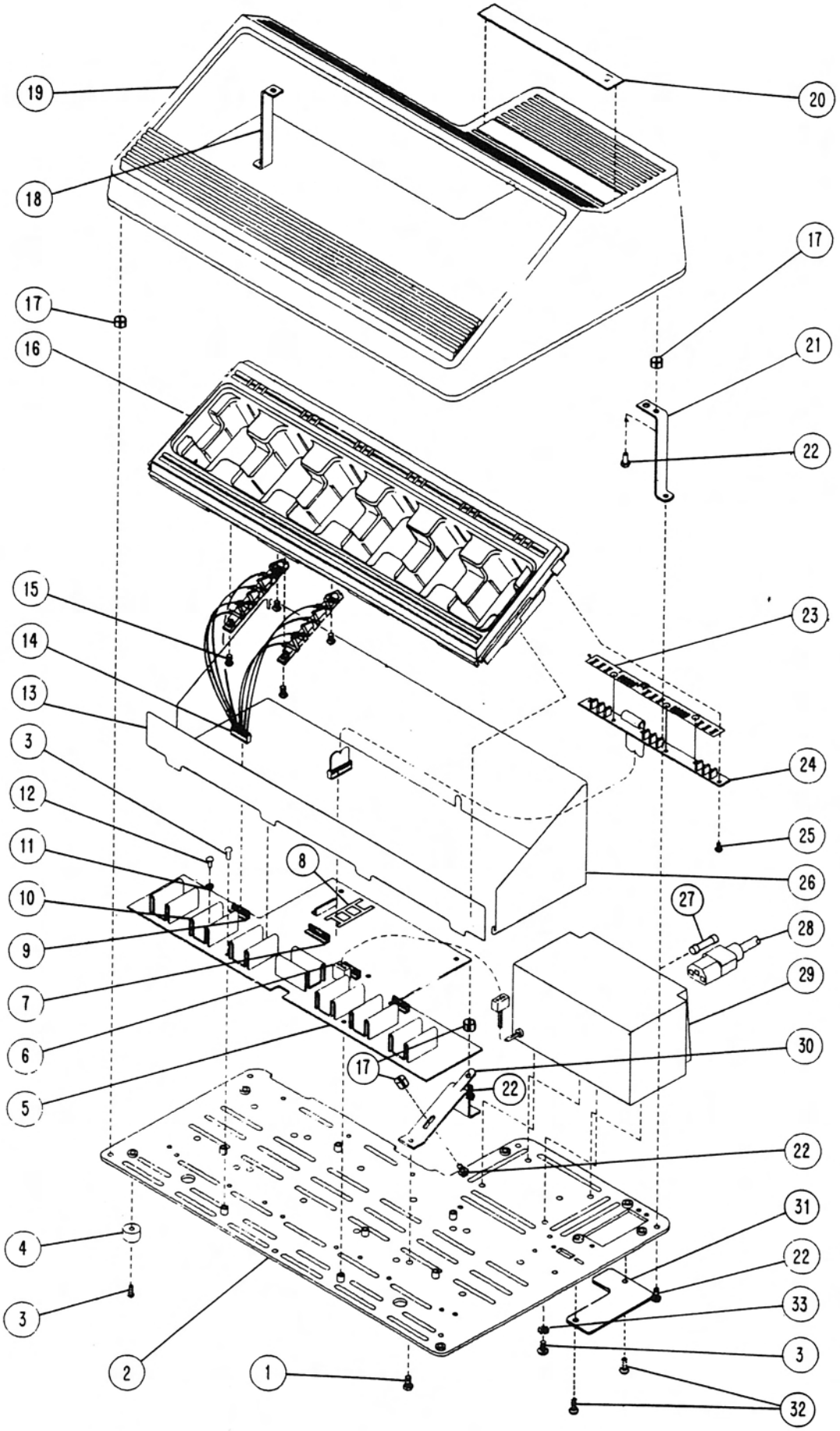
1. ALL VOLTAGES REFERENCED TO CHARGER GROUND.
2. VOLTAGES DESIGNATED * WILL VARY WITH THE VOLTAGE OF THE BATTERY; BATTERY VOLTAGE FOR THIS TABLE IS 9VDC.
3. VOLTAGES DESIGNATED ** WILL VARY WITH THE TEMPERATURE OF THE BATTERY. FOR THIS TABLE, RAPID-CHARGE RT = 10KΩ AND CHARGE COMPLETE RT = 1KΩ.

Table 4. NTN4668A and NTN4922A DC Voltages

BATTERY AND CONDITION / PIN	B+	U22	Q7		Q8		U8						U18			U18						P1	U1			CHARGING CURRENT (mA)
		4	B	C*	B	E	2	5	7	10	12	15	1	3	9	2	21	22*	23	24**	29	1	16	15	14	
NO BATTERY	16.0	4.7	16.0	10.9	0	0	0	0	0	0	0	0	0	0	0	5.0	0	3.1	4.9	4.9	4.8	0	14.7	14.7	14.7	0
RAPID CHARGE NTN4867A, NTN4583A	16.0	4.7	15.3	12.2	1.5	0.8	5.0	5.0	0	5.0	0	0	0.84	0.18	0.18	5.0	0.84	3.5	1.4	2.6	4.8	0	14.7	0.7	14.7	300
CHARGE COMPLETE NTN4867A, NTN4583A	16.0	4.7	15.3	12.0	0.8	0.08	0	5.0	0	0	0	0	0.12	0.03	0.03	5.0	0.12	3.4	1.3	0.5	4.8	0	14.7	14.7	0.7	25
RAPID CHARGE NTN4564A, NTN4584A, NTN4822A, NTN4823A, NTN4871A	16.0	4.7	15.3	12.4	2.2	1.5	5.0	0	0	5.0	5.0	0	1.70	0.36	0.36	5.0	1.70	3.6	0.8	2.7	4.8	0	14.7	0.7	14.7	600
CHARGE COMPLETE NTN4564A, NTN4584A, NTN4822A, NTN4823A, NTN4871A	16.0	4.7	15.3	12.0	0.9	0.2	5.0	5.0	0	0	0	0	0.16	0.04	0.04	5.0	0.16	3.4	0.5	0.5	4.8	0	14.7	14.7	0.7	50
RAPID CHARGE NTN4585A, NTN4586A NTN4824A, NTN4825A	16.0	4.7	15.3	12.5	3.2	2.5	5.0	0	0	0	0	5.0	2.40	0.51	0.51	5.0	2.40	3.6	0.8	2.8	4.8	0	14.7	0.7	14.7	840
CHARGE COMPLETE NTN4585A, NTN4586A NTN4824A, NTN4825A	16.0	4.7	15.3	12.0	1.0	0.3	5.0	0	5.0	0	0	0	0.27	0.06	0.06	5.0	0.27	3.4	0.4	0.5	4.8	0	14.7	14.7	0.7	90
STANDARD CHARGE NTN4563A, NTN4868A	16.0	4.7	15.3	12.0	0.9	0.2	5.0	5.0	0	0	0	0	0.16	0.04	0.04	5.0	0.16	3.4	0.5	4.9	4.8	0	0.7	0.7	14.7	50
STANDARD CHARGE NTN4588A, NTN4869A	16.0	4.7	15.3	12.0	1.0	0.3	5.0	0	5.0	0	0	0	0.27	0.06	0.06	5.0	0.27	3.4	0.4	4.9	4.8	0	0.7	0.7	14.7	90

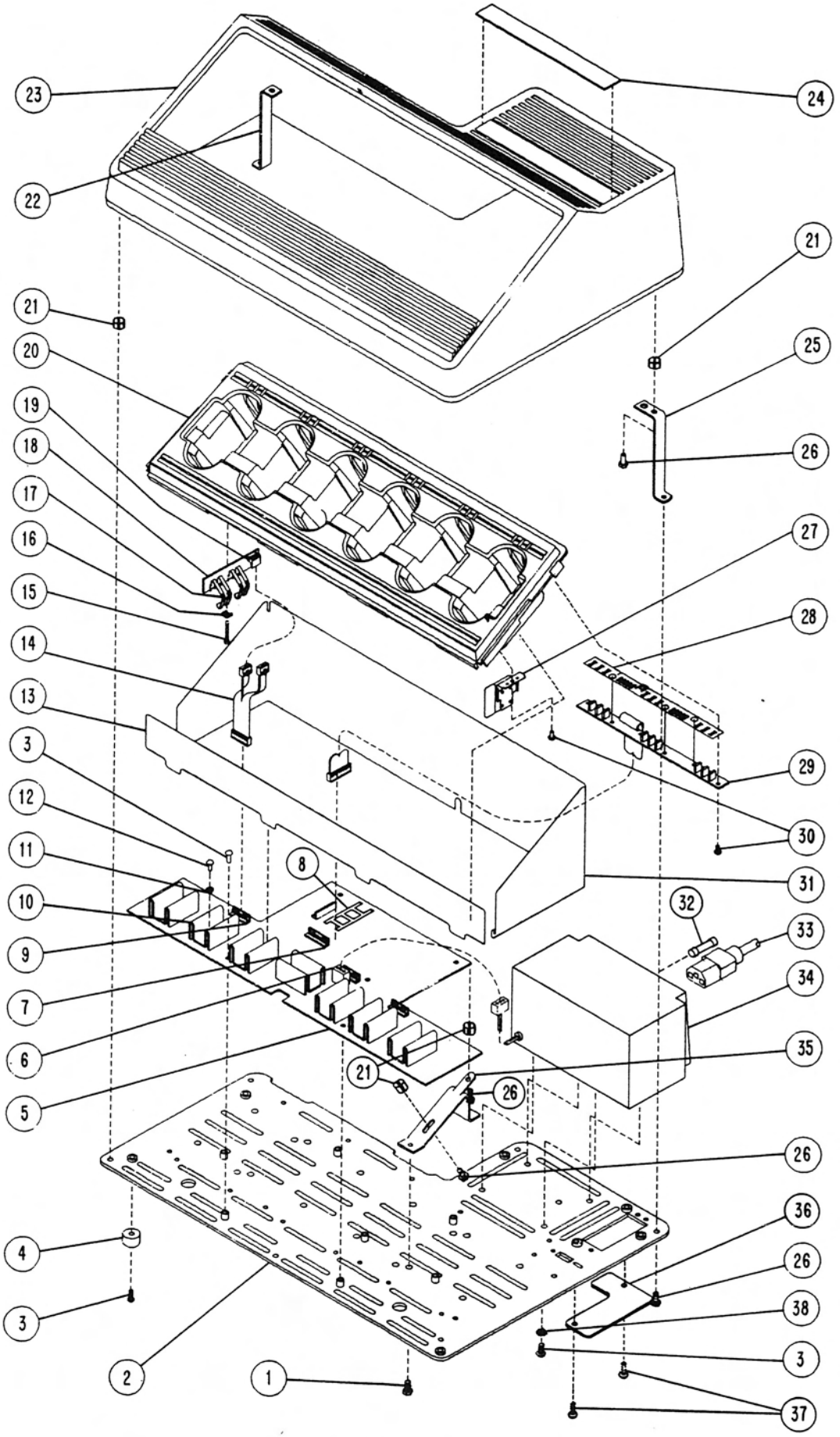
NOTES:

1. ALL VOLTAGES REFERENCED TO CHARGER GROUND.
2. VOLTAGES DESIGNATED * WILL VARY WITH THE VOLTAGE OF THE BATTERY; BATTERY VOLTAGE FOR THIS TABLE IS 12VDC.
3. VOLTAGES DESIGNATED ** WILL VARY WITH THE TEMPERATURE OF THE BATTERY. FOR THIS TABLE, RAPID-CHARGE RT = 10KΩ AND CHARGE COMPLETE RT = 1KΩ.



NTN4668A/NTN4922A MULTI-UNIT BATTERY CHARGERS
EXPLODED VIEW
M405.397

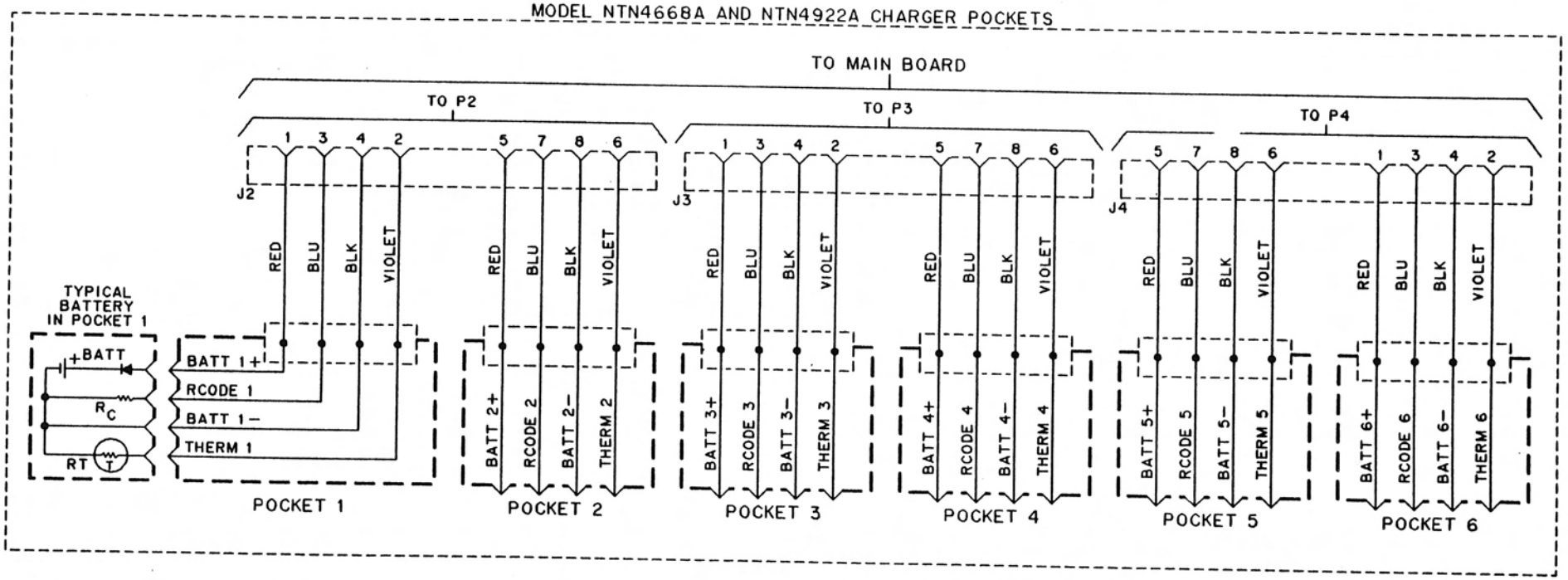
ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	0300129890	SCREW, Machine; 10-32 × .375″ (4 req'd)
2	0105952P82	ASSEMBLY, Baseplate
3	0300121057	SCREW, Machine; 6-32 × .375″ (16 req'd)
4	7505413D01	BUMPER, Rubber (5 req'd)
5	See Note	ASSEMBLY, Main PCB (includes items 6 thru 12)
6	See Note	CONNECTOR, 3-Position (P1) (part of item 5)
7	See Note	CONNECTOR, 10-Position (P5, 6) (2 req'd) (part of item 5)
8	See Note	SOCKET, IC (part of item 5)
9	See Note	CONNECTOR, 8-Position (P2 thru 4) (3 req'd) (part of item 5)
10	2605239R01	HEAT SINK, 5-Watt (7 req'd) (part of item 5)
11	0410057A13	WASHER, Shoulder, Plastic (7 req'd) (part of item 5)
12	0300002951	SCREW, Machine; 4-40 × .250″ (7 req'd) (part of item 5)
13	2605541L02	SHIELD, Thermal
14	See Note	ASSEMBLY, Cable (includes J2 thru 4) (3 req'd)
15	0300139982	SCREW, Machine; 2-56 × 5/32″ (12 req'd)
16	1505411R01	HOUSING, Pocket
17	4205722C02	CLIP, Fastener (10 req'd)
18	0705466Q01	BRACKET, Charger Housing
19	1505277L02	HOUSING, Multi-Unit Charger
20	3305543L06	NAMEPLATE, Charger
21	0705193L01	BRACKET, Cover, Tin-Plated (2 req'd)
22	0300131632	SCREW, Tapping; 8-32 × .375″ (13 req'd)
23	2605407S01	SHIELD, Static (2 req'd)
24	See Note	PRINTED CIRCUIT BOARD, LED (2 req'd)
25	0300135922	SCREW, Tapping; 4-24 × .25″ (6 req'd)
26	2605238R01	SHIELD, Thermal
27	See Note	FUSE, Power Supply
28	See Note	CORD, AC Power (110Vac or 220Vac)
29	See Note	POWER SUPPLY, Switch Mode, 120-Watt
30	0705169L01	BRACKET, Pocket (2 req'd)
31	6405636L03	COVER, Switch
32	0300002941	SCREW, Machine; 6-32 × .25″ (2 req'd)
33	0400007666	WASHER, External Tooth; #6 (4 req'd)



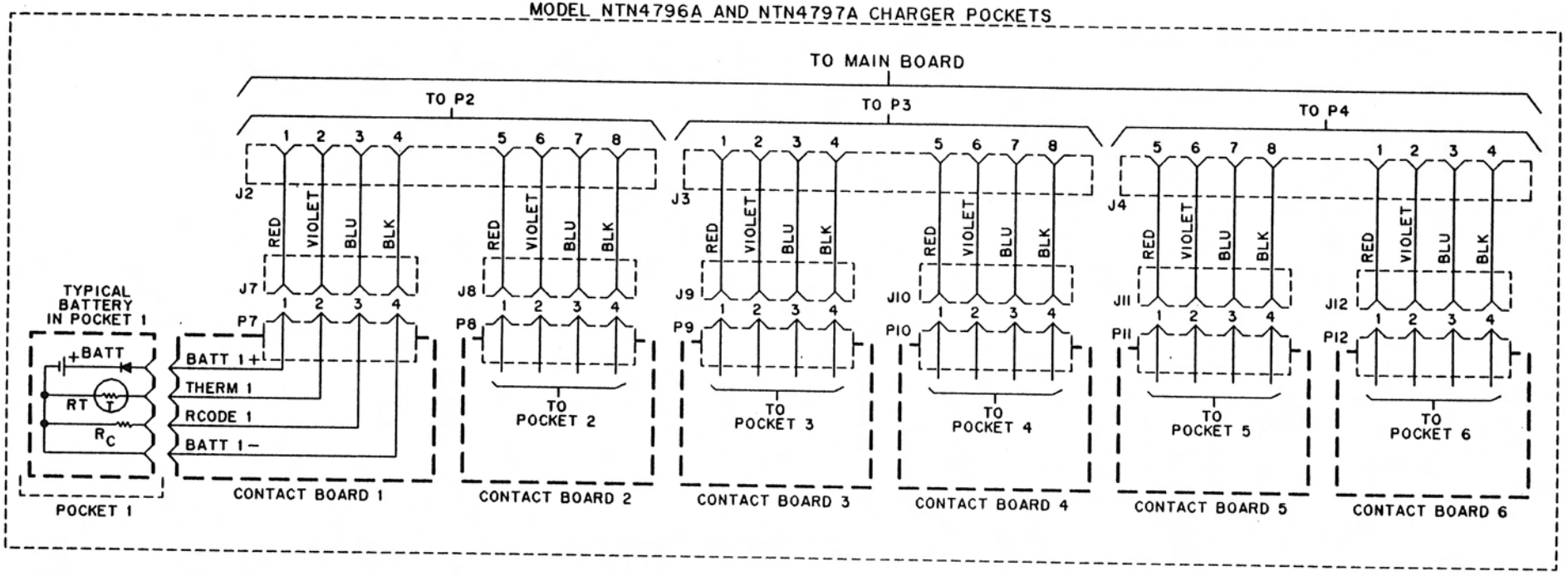
NTN4796A/NTN4797A MULTI-UNIT BATTERY CHARGERS
EXPLODED VIEW
M405.398

ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	0300129890	SCREW, Machine; 10-32 × .375" (4 req'd)
2	0105952P82	ASSEMBLY, Baseplate
3	0300121057	SCREW, Machine; 6-32 × .375" (16 req'd)
4	7505413D01	BUMPER, Rubber (5 req'd)
5	See Note	ASSEMBLY, Main PCB (includes items 6 thru 12)
6	See Note	CONNECTOR, 3-Position (P1) (part of item 5)
7	See Note	CONNECTOR, 10-Position (P5, 6) (2 req'd) (part of item 5)
8	See Note	SOCKET, IC (part of item 5)
9	See Note	CONNECTOR, 8-Position (P2 thru 4) (3 req'd) (part of item 5)
10	2605239R01	HEAT SINK, 5-Watt (7 req'd) (part of item 5)
11	0410057A13	WASHER, Shoulder, Plastic (7 req'd) (part of item 5)
12	0300002951	SCREW, Machine; 4-40 × .250" (7 req'd) (part of item 5)
13	2605541L02	SHIELD, Thermal
14	See Note	ASSEMBLY, Cable (includes J2 thru 4, J7 thru 11) (3 req'd)
15	0300140396	SCREW, Tapping; 4-24 × .875" (6 req'd)
16	4205378S01	BRACKET, Contact (6 req'd)
17	See Note	CONTACT (24 req'd)
18	See Note	PRINTED CIRCUIT BOARD, Contact (6 req'd)
19	See Note	CONNECTOR, Header, Right-Angle, 4-Position (P7 thru 11) (6 req'd)
20	1505196R01	HOUSING, Pocket
21	4205722C02	CLIP, Fastener (10 req'd)
22	0705466Q01	BRACKET, Charger Housing
23	1505277L02	HOUSING, Multi-Unit Charger
24	3305543L06	NAMEPLATE, Charger
25	0705193L01	BRACKET, Cover, Tin-Plated (2 req'd)
26	0300131632	SCREW, Tapping; 8-32 × .375" (13 req'd)
27	0105955H89	ASSEMBLY, Kicker (6 req'd)
28	2605407S01	SHIELD, Static (2 req'd)
29	See Note	PRINTED CIRCUIT BOARD, LED (2 req'd)
30	0300135922	SCREW, Tapping; 4-24 × .25" (12 req'd)
31	2605238R01	SHIELD, Thermal
32	See Note	FUSE, Power Supply
33	See Note	CORD, AC Power (110Vac or 220Vac)
34	See Note	POWER SUPPLY, Switch Mode, 120-Watt
35	0705169L01	BRACKET, Pocket (2 req'd)
36	6405636L03	COVER, Switch
37	0300002941	SCREW, Machine; 6-32 × .25" (2 req'd)
38	0400007666	WASHER, External Tooth, #6 (4 req'd)

NOTE: Refer to Electrical Parts List for part number and description.



NTN4668A/NTN4922A CHARGER POCKETS
D404.811



NTN4796A/NTN4797A CHARGER POCKETS
D404.812

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, Fixed: uF ± 10%; 63V unless stated
C1	2383441B20	0.1 ± 20%; 35V
C2	2305499G16	10; 16V
C3	2105457G14	.01 + 30 – 80%
C4	2383441B20	0.1 ± 20%; 35V
C5	2305499G16	10; 16V
C6	2105529B11	47pF ± 5%; N150
C7, 8	2383441B15	1 ± 20%; 35V
C9	2105457G09	1000pF
C10 thru 14	2105455G12	100pF; N750
C15	-----	Not Used
C16 thru 22	2105455G12	100pF; N750
C23, 24	-----	Not Used
C25	2383441B20	0.1 ± 20%; 35V
C26 thru 41	2105455G12	100pF; N750
		COIL, RF: unless stated
L1	2483977B02	Choke
L2, 3	2482723H39	2.6uH
L4, 5	2483977B02	Choke
L6, 7	2482723H39	2.6uH
L8, 9	2483977B02	Choke
L10, 11	2482723H39	2.6uH
L12, 13	2483977B02	Choke
L14, 15	2482723H39	2.6uH
L16, 17	2483977B02	Choke
L18, 19	2482723H39	2.6uH
L20, 21	2483977B02	Choke
L22, 23	2482723H39	2.6uH
L24	2483977B02	Choke
		PLUG:
P1	0905367R01	Connector, 3-Position
P2 thru 4	2805350R03	Connector, 8-Position
P5, 6	2805350R04	Connector, 10-Position
P7 thru 11	2805350R01	Connector, Header, Right-Angle, 4-Position
		TRANSISTOR: See Note I
Q1, 2	4800869642	NPN; type M9642
Q3	4800869643	PNP; type M9643
Q4	-----	Not Used
Q5	4800869807	PNP; type M9807
Q6	4800869642	NPN; type M9642
Q7	4800869807	PNP; type M9807
Q8	4800869642	NPN; type M9642
Q9	4800869807	PNP; type M9807
Q10	4800869642	NPN; type M9642
Q11	4800869807	PNP; type M9807
Q12	4800869642	NPN; type M9642
Q13	4800869807	PNP; type M9807
Q14	4800869642	NPN; type M9642
Q15	4800869807	PNP; type M9807
Q16, 17	4800869642	NPN; type M9642
		RESISTOR, Fixed: Ω ± 5%; ¼W unless stated
R1 thru 18	-----	Not Used
R19	0610164K38	1.5M
R20, 21	0611009C73	10k
R22	0611009C97	100k
R23	0611009C49	1k
R24	0611009C73	10k
R25 thru 30	-----	Not Used
R31	0610621C82	8.06k ± 1%
R32	0610621C28	2.21k ± 1%
R33	0611009C49	1k
R34	0611009D21	910k
R35	0611009D13	430k
R36	0611009D07	240k
R37	0611009C95	82k
R38	0611009C91	56k
R39	0611009C82	24k
R40	0611009C60	3k
R41	0611009C69	6.8k
R42	0611009C49	1k
R43	0611009C34	240
R44	0610621C91	10k ± 1%
R45	0610621C53	4.02k ± 1%
R46	0610621C91	10k ± 1%
R47	0611009C90	51k
R48	1782036G18	.56; 2W
R49	0611009D21	910k
R50	0611009D13	430k
R51	0611009D07	240k
R52	0611009C95	82k
R53	0611009C91	56k
R54	0611009C82	24k
R55	0611009C60	3k
R56	0611009C49	1k
R57	0611009C69	6.8k
R58	0611009C34	240
R59	0610621C91	10k ± 1%
R60	0610621C53	4.02k ± 1%
R61	0610621C91	10k ± 1%
R62	0611009C90	51k
R63	1782036G18	.56; 2W
R64	0611009D21	910k
R65	0611009D13	430k
R66	0611009D07	240k
R67	0611009C95	82k
R68	0611009C91	56k
R69	0611009C82	24k
R70	0611009C60	3k
R71	0611009C49	1k
R72	0611009C69	6.8k
R73	0611009C34	240
R74	0610621C91	10k ± 1%
R75	0610621C53	4.02k ± 1%
R76	0610621C91	10k ± 1%
R77	0611009C90	51k
R78	1782036G18	.56; 2W
R79	0611009D21	910k
R80	0611009D13	430k
R81	0611009D07	240k
R82	0611009C95	82k
R83	0611009C91	56k
R84	0611009C82	24k
R85	0611009C60	3k
R86	0611009C49	1k
R87	0611009C69	6.8k
R88	0611009C34	240
R89	0610621C91	10k ± 1%
R90	0610621C53	4.02k ± 1%
R91	0610621C91	10k ± 1%
R92	0611009C90	51k
R93	1782036G18	.56; 2W
R94	0611009D21	910k
R95	0611009D13	430k
R96	0611009D07	240k
R97	0611009C95	82k
R98	0611009C91	56k
R99	0611009C82	24k
R100	0611009C60	3k
R101	0611009C49	1k
R102	0611009C69	6.8k
R103	0611009C34	240
R104	0610621C91	10k ± 1%
R105	0610621C53	4.02k ± 1%
R106	0610621C91	10k ± 1%
R107	0611009C90	51k
R108	1782036G18	.56; 2W
R109	0611009D21	910k
R110	0611009D13	430k
R111	0611009D07	240k
R112	0611009C95	82k
R113	0611009C91	56k
R114	0611009C82	24k
R115	0611009C60	3k
R116	0611009C49	1k
R117	0611009C69	6.8k
R118	0611009C34	240
R119	0610621C91	10k ± 1%
R120	0610621C53	4.02k ± 1%
R121	0610621C91	10k ± 1%
R122	0611009C90	51k
R123	1782036G18	.56; 2W
R124, 125	0611009C73	10k
R126	0611009C49	1k
R127, 128	0611009C73	10k
R129	0611009C49	1k
R130, 131	0611009C73	10k
R132	0611009C49	1k
R133, 134	0611009C73	10k
R135	0611009C49	1k
R136, 137	0611009C73	10k

PARTS LIST FOR MAIN BOARD
MULTI-UNIT BATTERY CHARGERS
X404.815
PAGE 1/2

R138	0611009C49	1k
R139, 140	0611009C73	10k
R141	0611009C49	1k
R142	0611009C82	24k
R143	0611009C73	10k
R144	-----	Not Used
R145	0611009C97	100k
R146 thru 151	0611009C33	220
R152	0611009C97	100k
R153	0611009C66	5.1k
R154	0611009C49	1k
R155	0611009C73	10k
R156	0611009C81	22k
		CIRCUIT MODULE: See Note I
U1 thru 3	5183629M93	IC, Peripheral Driver Array; MC1413
U4 thru 12	5184887K70	IC, Hex D Flip-Flop; MC14174
U13	5184320A47	IC, 5V Regulator; MC7805
U14	5184320A35	IC, Timing; NE555
U15	0105956P09	IC, Microcomputer; MC68705R3
U16	5105461G32	IC, Binary-to-Octal Decoder; MC14028
U17	5184887K75	IC, Quad 2-Input "AND" Gate; MC14081
U18	5184561L75	IC, Quad Low-Power Op Amp; MC34074
U19 thru 22	5105461G33	IC, 8-Channel Analog Mux/Demux; MC14051
U23	5184561L75	IC, Quad Low-Power Op Amp; MC34074
		DIODE: See Note I
VR1 thru 27	4811034G13	Zener, 6.2V
		CRYSTAL:
Y1	4805664G25	4MHz
NONREFERENCED ITEMS		
	0905035J12	SOCKET, IC
	2505237R01	POWER SUPPLY, Switch Mode, 120-Watt (includes J1)
	3005351R01	ASSEMBLY, Cable (includes J2 thru 4, J7 thru 11) (for NTN4796A and NTN4797A Chargers)
	3060665A04	CORD, Power; 110Vac (for NTN4796A and NTN4668A Chargers)
	or 3060665A05	CORD, Power; 220Vac (for NTN4797A and NTN4922A Chargers)
	3905560Q05	CONTACT (for NTN4796A and NTN4797A Chargers)
	6505700Q07	FUSE, Slo-Blo; 3-Amp, 250V
	0105952P81	ASSEMBLY, Main PCB
	8405236R01	PRINTED CIRCUIT BOARD, Contact (for NTN4796A and NTN4797A Chargers)
	8405366R01	PRINTED CIRCUIT BOARD, LED (includes J5, 6)
	0105955N09	ASSEMBLY, Contact (includes J2 thru 4) (for NTN4668A and NTN4922A Chargers)

NOTES:

1. For optimum performance, order replacement diodes, transistors, and circuit modules by Motorola part number only.

GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

Resistors(R)

- Resistor
- Resistor with fixed tap
- Variable resistor
- Resistor with movable tap (Potentiometer).
- Varistor (voltage-dependent resistor) (VDR)
- Temperature-dependent resistor with negative temperature coefficient (NTC)
- Light-emitting diode (photosensitive resistor)
- Temperature dependent resistor with positive temperature-coefficient. (PTC)
- Resistor with preset adjustment

Capacitors(C)

- Capacitor
- Variable capacitor
- Trimmer capacitor
- Feedthrough capacitor
- Electrolytic capacitor polarized
- Polarized capacitor general
- Electrolytic capacitor non-polarized

Coils(L)

- RF coil, air core
- Coupled RF coils, air core
- RF coil with adjustable core
- Coil with tap.
- Helical-coil.

Transformers(T)

- Transformer with iron core
- Transformer with adjustable RF cores

Diodes(D)

- Diode
- Bridge rectifier
- Series-connected stabilizer diodes within one case
- Light-emitting diode
- Zener diode (unidirectional)
- Zener diode (bidirectional)
- Tunnel diode
- Backward diode
- Varactor diode
- Controlled rectifier, PNPN (N-thyristor)
- Controlled rectifier, NPNP (P-thyristor)
- Zener diode-programable.

Transistors(Q)

- Transistor, PNP
- Transistor, NPN
- Light-sensitive transistor PNP
- Unipolar transistor with N-type base

Junction Field Effect Transistors (JFET)

- N-channel JFET (DRAIN, GATE, SOURCE)
- P-channel JFET
- N-channel dual gate JFET (DRAIN, GATE2 (SUBSTR.), GATE, SOURCE)
- P-channel dual gate JFET

Insulated Gate Field Effect Transistors (IGFET or MOS)

- N-channel IGFET (MOS) (DRAIN, GATE, SUBSTR., SOURCE)
- P-channel IGFET (MOS)
- N-channel dual gate IGFET (MOS) (DRAIN, GATE1, GATE2, SOURCE)
- P-channel dual gate IGFET (MOS)

Integrated Circuits(U)

Several integrated circuits contained within one case are designated by one common number followed by an identifying letter (a, b, c, etc.). Thus, circuits U1A, U1B and U1C are contained within one case.

Gates

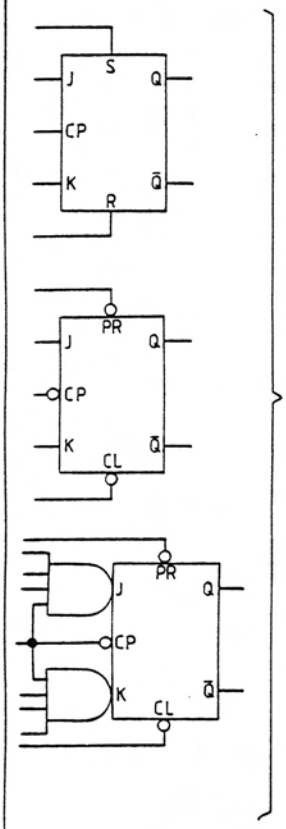
- AND gate.
- OR gate.
- NAND gate.
- NOR gate.
- Exclusive OR gate.
- Wired OR (combined OR outputs) (presentation at top is used in detailed diagrams; presentation below is used in functional diagrams) (VCC, OUTPUT, OUTP.)

GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

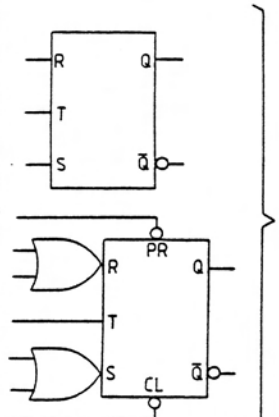
Flip-flops

Abbreviations used:

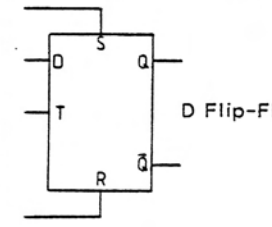
S =Set
R =Reset
CP=Clock pulse
PR=Preset
CL=Clear
T =Toggle



J-K Flip-Flops

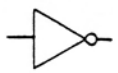


R-S Flip-Flops

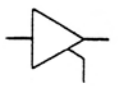


D Flip-Flop

Inverters

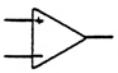


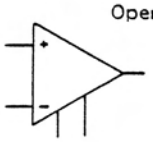
Inverter



Three-state driver

Operational Amplifiers





Operational amplifiers.

Relays(K)

Single-coil relay

Dual-coil relay

Polarized relay

Slow-acting relay

Slow-release relay

Relay with change-over contacts

Contacts

Open contact (make)

Closed contact (break)

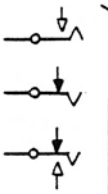
Change-over contact

Change-over contact centre off

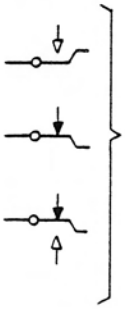
Make-before-break

Switches and Keys(S)

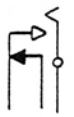
On/Off switch



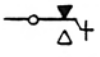
Locking keys or switches: push on, push off



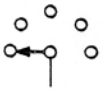
Non-Locking self-releasing keys or switches



Make-before-break



Locking mutually releasing keys or switches (In row of push-buttons etc.)



Rotary switch.

ON/OFF switch electrically controlled.
(Not a relay)

Lamps(V)

Indicator Lamp.

Neon Lamp

Fuses and Cut-outs(F)

Fuse

Circuit breaker

Batteries(B)

Battery one cell

Battery multi cell

Feedthrough Filters(Z)

Feedthrough filter

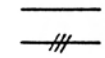
Ferrite Beads(FB)

Ferrite bead

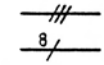
Crystals(Y)

Crystal

Cables and Wires(W)

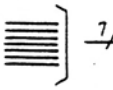


Usual conductor.



Three conductors

Eight conductors.



Shift from multiple-line to single-line presentation.

Screened cable.

Coaxial cable.

GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

Connectors(J and P)


Female (socket) connector.


Male (plug) connector

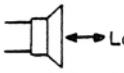

Multi-wire connector.


Coaxial plug.


Coaxial socket.

Loudspeakers(LS)


Loudspeaker.


Loudspeaker-Microphone.

Telephones(TEL)


Telephone.


Single headphone.
(Earphone).


Double headphone.

Microphones(M)


Microphone.

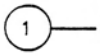
Meters etc.


Indicating instrument.

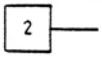

Balancing instrument.
(Galvanometer).


Basic letters
see DESIGN STANDARD
10.02.3.1 section 12.

Test Points



DC test point.



AC test point.

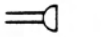
Replaceable Connections(W)

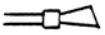

Cross-field connection.
(jumper).


Strap.

Miscellaneous

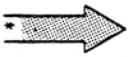

Antenna


Buzzer.


Horn.


Directional Coupler.

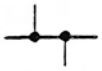

Circulator.

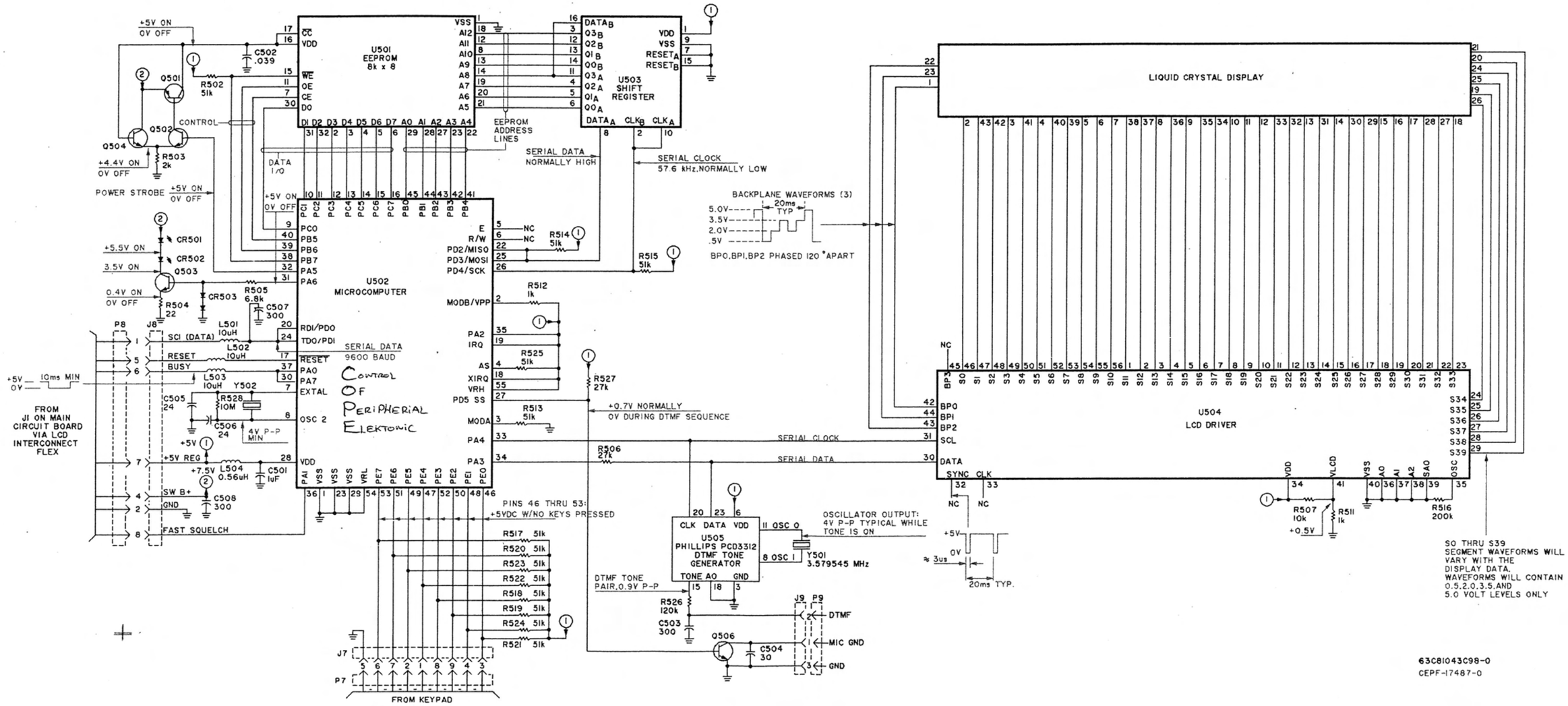

Multiconductor bus
(used in logic diagrams)
* = Identifying bus label
e.g. DATA, ADDRESS....


Chassis or frame
connection

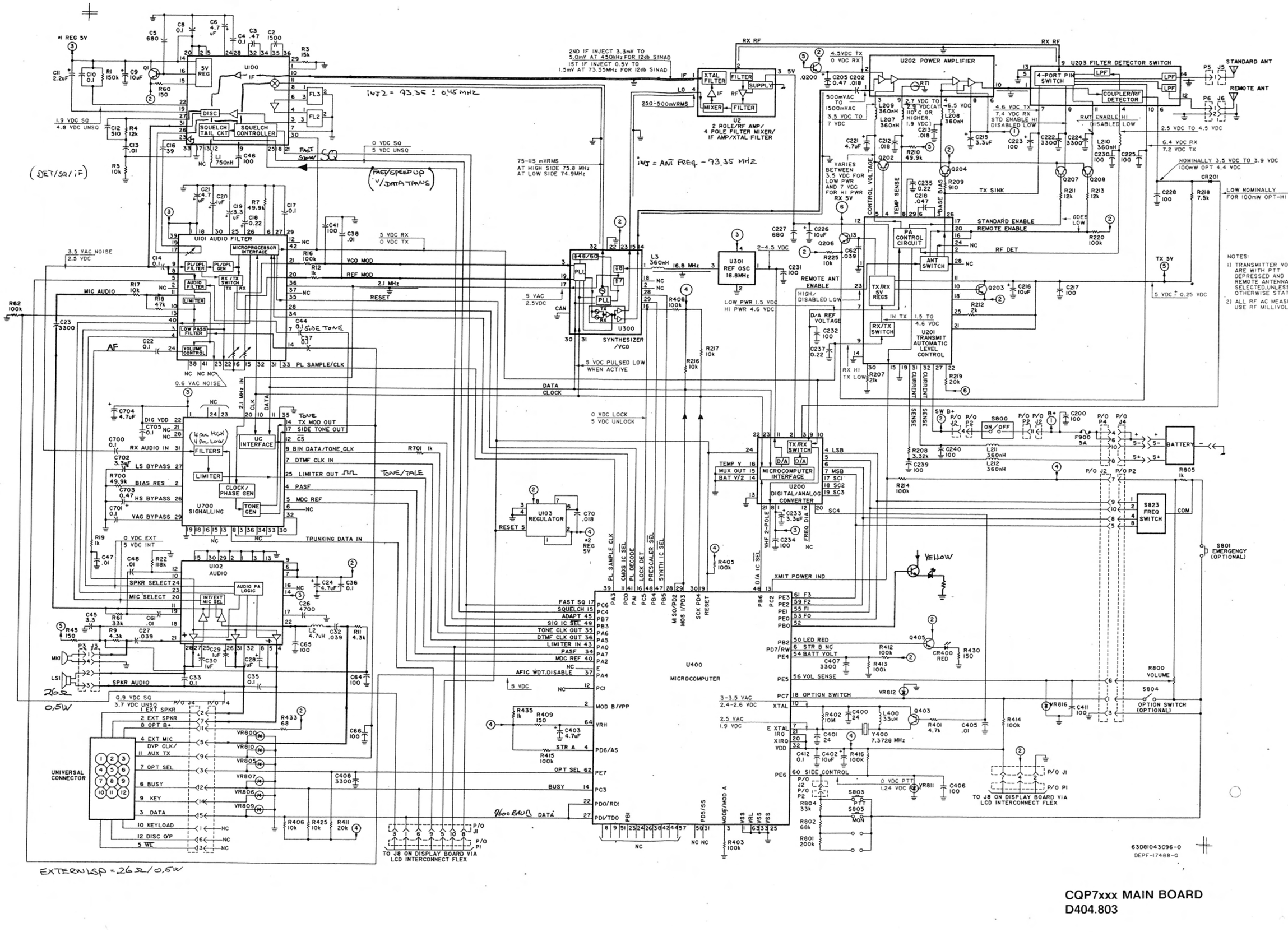

Grouping of leads.


Crossing of wires.

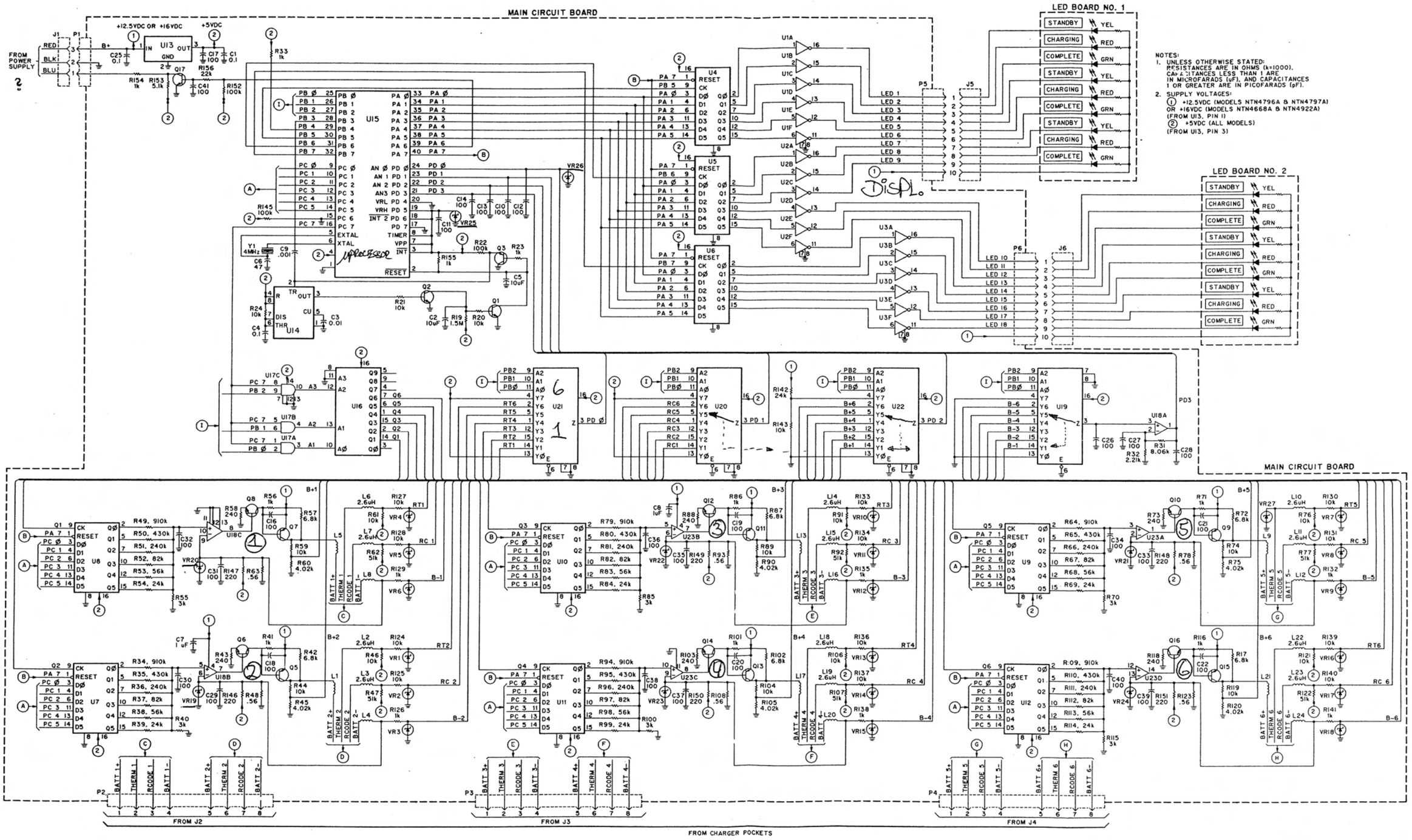

Junction of connected wires



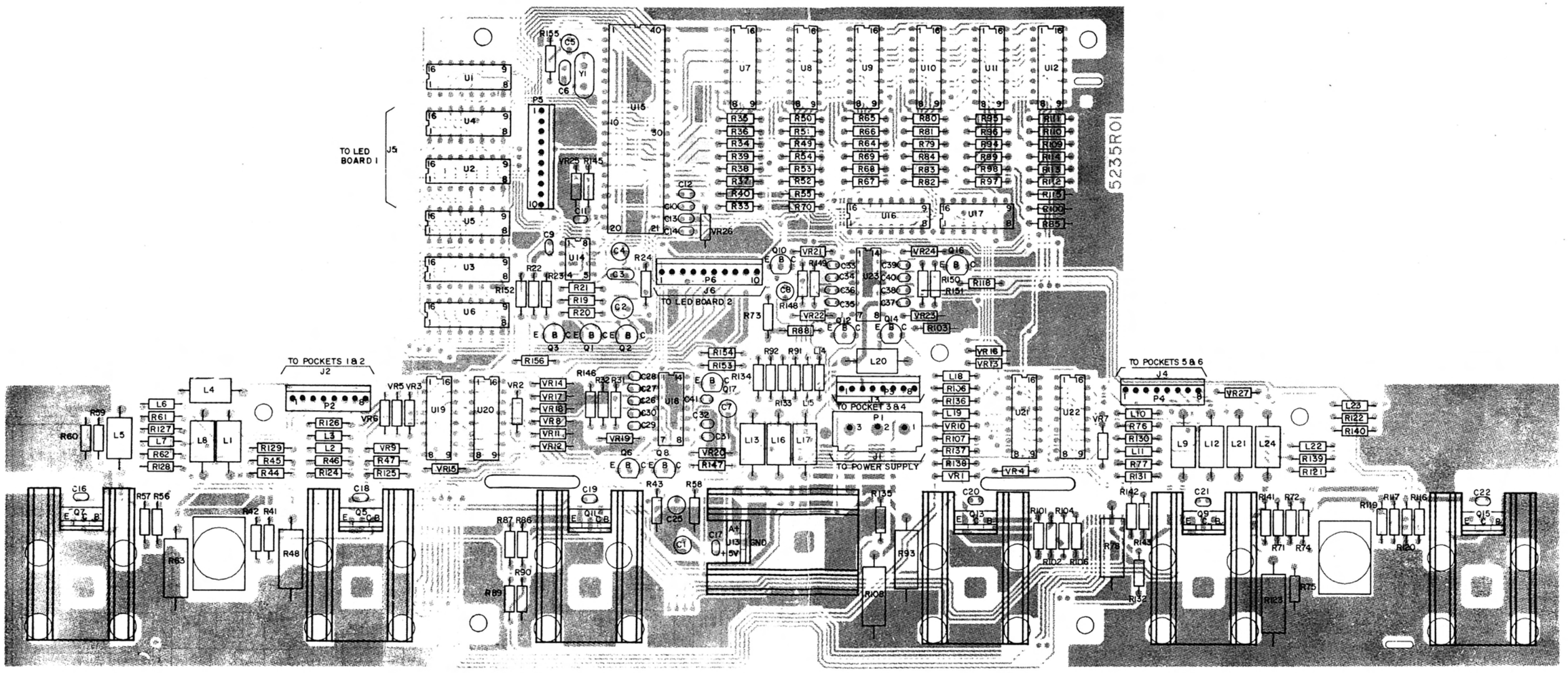
CQP7XXX K8 DISPLAY BOARD
D404.819



CQP7xxx MAIN BOARD
D404.803



MAINBOARD FOR MULTI-UNIT BATTERY CHARGERS
D404.813



COMPONENT LAYOUT
MAINBOARD FOR MULTI-UNIT BATTERY CHARGERS
D404.814

COLOUR CODE/CODE DES COULEURS/FARBKODE

0	BK	BLACK	NOIR	SCHWARZ
1	BN	BROWN	MARRON	BRAUN
2	RD	RED	ROUGE	ROT
3	OR	ORANGE	ORANGE	ORANGE
4	YW	YELLOW	JAUNE	GELB
5	GN	GREEN	VERT	GRÜN
6	BL	BLUE	BLEU	BLAU
7	VT	VIOLET	VIOLET	VIOLET
8	GY	GREY	GRIS	GRAU
9	WH	WHITE	BLANC	WEISS