STORNOPHONE 7000

MAINTENANCE MANUAL

VOLUME I

MARCH 1989

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MODEL NOMENCLATURE

CQP7000

The diagram below is a schematic description of the radionomenclature explaining the meaning of the different numbers and characters contained in the radio specification.

LOCATION	TYPE OF UNIT	TX POWER W	FREQ. MHz	MODEL SERIES	SQUELCH	CHANNEL SPACING kHz	NO.OF CHANNELS	MODEL VAR'N	ISSUE	
MD Basingstoke	H Hand held	3 .1-2.5	3 VHF 136-178	SAN (a) non-subm. No keys 10 freq.	9 *Coded	1 20/25	0 10 or more	9 Wide space RX/TX	- 	N Packaged **Model
		4 1-6	4 UHF 403-512	SAJ (b) 3 keys 70 Freq.		5 12.5				
				SAK (c) 15 keys 100 freq.						
				YBN submersi. no keys 10 freq.						

* Select 5 tone signalling

** Packaged model, includes accessories such as battery, antenna etc.

NOTE:

20 kHz channel spacing is ordered by ordering a 25 kHz radio with the appropriate option.

MODEL CONFIGURATION

CQP7000 - VHF

FACTORY I.D.	POWER LEVEL	FREQUENCY	SUBMERSIBLE	CHANNEL SPACING
MDH33SAN9109AN	0.1W/1W/2.5W	146-178 MHz	No	20/25 kHz
MDH33SAN9509AN	0.1W/1W/2.5W	146-178 MHz	No	12.5 kHz
MDH43SAN9109AN	1W/2.5W/6W	136-150.8 MHz	No	20/25 kHz
MDH43SAN9109AN	1W/2.5W/6W	146-162 MHz	No	20/25 kHz
MDH43SAN9109AN	1W/2.5W/6W	157-174 MHz	No	20/25 kHz
MDH43SAN9509AN	1W/2.5W/6W	146-162 MHz	No	12.5 kHz
MDH43SAN9509AN	1W/2.5W/6W	157-174 MHz	No	12.5 kHz
MDH33YBN9109AN	0.1W/1W/2.5W	146-178 MHz	Yes	20/25 kHz
MDH33YBN9509AN	0.1W/1W/2.5W	146-178 MHz	Yes	12.5 kHz
MDH43YBN9109AN	1W/2.5W/6W	136-150.8 MHz	Yes	20/25 kHz
MDH43YBN9109AN	1W/2.5W/6W	146-162 MHz	Yes	20/25 kHz
MDH43YBN9109AN	1W/2.5W/6W	157-174 MHz	Yes	20/25 kHz
MDH43YBN9509AN	1W/2.5W/6W	146-162 MHz	Yes	12.5 kHz
MDH43YBN9509AN	1W/2.5W/6W	157-174 MHz	Yes	12.5 kHz
MDH33SAJ9109AN	0.1W/1W/2.5W	146-178 MHz	No	20/25 kHz
MDH33SAJ9509AN	0.1W/1W/2.5W	146-178 MHz	No	12.5 kHz
MDH43SAJ9109AN	1W/2.5W/6W	136-150.8 MHz	No	20/25 kHz
MDH43SAJ9109AN	1W/2.5W/6W	146-162 MHz	No	20/25 kHz
MDH43SAJ9109AN	1W/2.5W/6W	157-174 MHz	No	20/25 kHz
MDH43SAJ9509AN	1W/2.5W/6W	146-162 MHz	No	12.5 kHz
MDH43SAJ9509AN	1W/2.5W/6W	157-174 MHz	No	12.5 kHz
MDH33SAK9109AN	0.1W/1W/2.5W	146-178 MHz	No	20/25 kHz
MDH33SAK9509AN	0.1W/1W/2.5W	146-178 MHz	No	12.5 kHz
MDH43SAK9109AN	1W/2.5W/6W	136-150.8 MHz	No	20/25 kHz
MDH43SAK9109AN	1W/2.5W/6W	146-162 MHz	No	20/25 kHz
MDH43SAK9109AN	1W/2.5W/6W	157-174 MHz	No	20/25 kHz
MDH43SAK9509AN	1W/2.5W/6W	146-162 MHz	No	12.5 kHz
MDH43SAK9509AN	1W/2.5W/6W	157-174 MHz	No	12.5 kHz

CHAPTER 1a

MODEL NOMENCLATURE
MODEL CONFIGURATION UHF

MODEL NOMENCLATURE

CQP7000

The diagram below is a schematic description of the radionomenclature explaining the meaning of the different numbers and characters contained in the radio specification.

LOCATION	TYPE OF UNIT	TX POWER W	FREQ. MHz	MODEL SERIES	SQUELCH	CHANNEL SPACING kHz	NO.OF CHANNELS	MODEL VAR'N	ISSUE	
MD Basingstoke	H Hand held	3 .1-2.5	3 VHF 136-178	SAN (a) non-subm. No keys 10 freq.	9 *Coded	1 20/25	0 10 or more	9 Wide space RX/TX	-	N Packaged **Model
		4 1-6	4 UHF 403-512	SAJ (b) 3 keys 70 Freq.		5 12.5				
				SAK (c) 15 keys 100 freq.						
				YBN submersi. no keys 10 freq.						

* Select 5 tone signalling

** Packaged model, includes accessories such as battery, antenna etc.

NOTE:

20 kHz channel spacing is ordered by ordering a 25 kHz radio with the appropriate option.

MODEL CONFIGURATION

CQP7000 - UHF

FACTORY I.D.	POWER LEVEL	FREQUENCY	SUBMERSIBLE	CHANNEL SPACING
MDH34SAN9109AN	0.1W/1W/2W	440-470 MHz	No	20/25 kHz
MDH34SAN9109AN	0.1W/1W/2W	403-433 MHz	No	20/25 kHz
MDH34SAN9509AN	0.1W/1W/2W	440-470 MHz	No	12.5 kHz
MDH34SAN9509AN	0.1W/1W/2W	403-433 MHz	No	12.5 kHz
MDH44SAN9109AN	1W/2W/5W	403-433 MHz	No	20/25 kHz
MDH44SAN9109AN	1W/2W/5W	440-470 MHz	No	20/25 kHz
MDH44SAN9109AN	1W/2W/5W	460-490 MHz	No	20/25 kHz
MDH44SAN9109AN	1W/2W/5W	482-512 MHz	No	20/25 kHz
MDH44SAN9509AN	1W/2W/5W	403-433 MHz	No	12.5 kHz
MDH44SAN9509AN	1W/2W/5W	440-470 MHz	No	12.5 kHz
MDH34YBN9109AN	0.1W/1W/2W	440-470 MHz	Yes	20/25 kHz
MDH34YBN9109AN	0.1W/1W/2W	403-433 MHz	Yes	20/25 kHz
MDH34YBN9509AN	0.1W/1W/2W	440-470 MHz	Yes	12.5 kHz
MDH34YBN9509AN	0.1W/1W/2W	403-433 MHz	Yes	12.5 kHz
MDH44YBN9109AN	1W/2W/5W	403-433 MHz	Yes	20/25 kHz
MDH44YBN9109AN	1W/2W/5W	440-470 MHz	Yes	20/25 kHz
MDH44YBN9109AN	1W/2W/5W	460-490 MHz	Yes	20/25 kHz
MDH44YBN9109AN	1W/2W/5W	482-512 MHz	Yes	20/25 kHz
MDH44YBN9509AN	1W/2W/5W	403-433 MHz	Yes	12.5 kHz
MDH44YBN9509AN	1W/2W/5W	440-470 MHz	Yes	12.5 kHz
MDH34SAJ9109AN	0.1W/1W/2W	440-470 MHz	No	20/25 kHz
MDH34SAJ9109AN	0.1W/1W/2W	403-433 MHz	No	20/25 kHz
MDH34SAJ9509AN	0.1W/1W/2W	440-470 MHz	No	12.5 kHz
MDH34SAJ9509AN	0.1W/1W/2W	403-433 MHz	No	12.5 kHz
MDH44SAJ9109AN	1W/2W/5W	403-433 MHz	No	20/25 kHz
MDH44SAJ9109AN	1W/2W/5W	440-470 MHz	No	20/25 kHz
MDH44SAJ9109AN	1W/2W/5W	460-490 MHz	No	20/25 kHz
MDH44SAJ9109AN	1W/2W/5W	482-512 MHz	No	20/25 kHz
MDH44SAJ9509AN	1W/2W/5W	403-433 MHz	No	12.5 kHz
MDH44SAJ9509AN	1W/2W/5W	440-470 MHz	No	12.5 kHz
MDH34SAK9109AN	0.1W/1W/2W	440-470 MHz	No	20/25 kHz
MDH34SAK9109AN	0.1W/1W/2W	403-433 MHz	No	20/25 kHz
MDH34SAK9509AN	0.1W/1W/2W	440-470 MHz	No	12.5 kHz
MDH34SAK9509AN	0.1W/1W/2W	403-433 MHz	No	12.5 kHz
MDH44SAK9109AN	1W/2W/5W	403-433 MHz	No	20/25 kHz
MDH44SAK9109AN	1W/2W/5W	440-470 MHz	No	20/25 kHz
MDH44SAK9109AN	1W/2W/5W	460-490 MHz	No	20/25 kHz
MDH44SAK9109AN	1W/2W/5W	482-512 MHz	No	20/25 kHz
MDH44SAK9509AN	1W/2W/5W	403-433 MHz	No	12.5 kHz
MDH44SAK9509AN	1W/2W/5W	440-470 MHz	No	12.5 kHz

SPECIFICATIONS

CQP7000 - VHF

GENERAL

FREQUENCY RANGE:
146-174 MHz

BANDSPLITS:
146-162 MHz
157-174 MHz
146-174 (LP Models)

POWER SUPPLY: (RECHARGEABLE)
Nickel-Cadmium Battery or Primary Battery

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

TEMPERATURE RANGE
Operating: -25°C to +55°C
Storage: -40°C to +85°C

DIMENSIONS (H x W x D)

Less Battery:	98.29 x 74.67 x 29.97 mm
With Light-Capacity Battery:	155.70 x 74.67 x 29.97 mm
With Medium-Capacity Battery:	178.05 x 74.67 x 29.97 mm
With Ultra-High-Capacity Battery: (or Primary Battery)	197.35 x 74.67 x 29.97 mm

WEIGHT (NON-KEYPAD)

Less Battery:	310 g
With Light-Capacity Battery:	484 g
With Medium-Capacity Battery:	643 g
With Ultra-High-Capacity Battery:	702 g

WEIGHT (KEYPAD)

Less Battery:	321 g
With Light-Capacity Battery:	495 g
With Medium-Capacity Battery:	654 g
With Ultra-High-Capacity Battery:	713 g

TRANSMITTER

RF POWER OUTPUT
Low-Power Models: 0.1, 1, 2.5 Watts
High-Power Models: 1, 2.5, 6 Watts

FREQUENCY STABILITY (-25°C to +55°C; +25°C REF.):
20/25 kHz: ±.0005% (±.0002% optional)
12.5 kHz: ±.0002%

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

FM HUM AND NOISE:
-40 dB

SPURIOUS EMISSION:
≤1 GHz: 0.25 uV
1 to 4 GHz: 1 uV

AUDIO DISTORSION:
3% Maximum (@ 1 kHz, 60% deviation)

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

CHANNEL SPACING:	DEVIATION:	PL DEVIATION:
25 kHz	±5 kHz	±1.0 kHz
20 kHz	±4 kHz	±0.8 kHz
12.5 kHz	±2.5 kHz	±0.5 kHz

MAXIMUM FREQUENCY SEPARATION: (NO DEGRADATION)
Full Bandsplit

RECEIVER

SENSITIVITY:

	12.5 kHz	20/25 kHz
20 dBS:	0.5 uV	0.45 uV
12 dBS	0.4 uV	0.35 uV

Squelch (Programmable)

USEABLE BANDWIDTH:
±5 kHz Minimum, @ 25 kHz

SELECTIVITY:

Adjacent channel:	20/25 kHz	-70 dB
	12.5 kHz	-60 dB

INTERMODULATION:
-70 dB

FM HUM AND NOISE:
-40 dB

FREQUENCY STABILITY (-25°C TO +55°C; +25°C REF.):
20/25 kHz ±.0005% (±.0002% optional)
12.5 kHz ±.0002%

AUDIO SPL (AT 30 cm WITH RATED AUDIO):
Weighted, 300 - 3000 Hz
90 dB Nominal (Non-Submersible)
89 dB Nominal (-SAJ and -SAK models)
88 dB Nominal (-YBN models)

RATED AUDIO OUTPUT:
500 mW (At less than 5% distorsion, @ 1 kHz into rated load)

CHANNEL SPACING:
25 kHz, 20 kHz, 12.5 kHz

MAXIMUM FREQUENCY SEPARATION (NO DEGRADATION):
Full bandsplit

12.5 kHz specifications reflect CEPT 84 test methods at -10°C to +55°C.

Specifications are subjects to change without notice, and assume CEPT 84 test methods unless otherwise noted.

CURRENT DRAINS (SEE NOTE)

		CQP7000a	CQP7000b AND CQP7000c
STANDBY		80 mA	83 mA
RECEIVE		210 mA	213 mA
MDH43 MODELS:	6-WATT	3100 mA	3100 mA
	2.5-WATT	1900 mA	1900 mA
	1.0-WATT	1600 mA	1600 mA
MDH33 MODELS:	2.5-WATT	1800 mA	1800 mA
	1-WATT	1300 mA	1300 mA
	0.1-WATT	800 mA	800 mA

NOTE:
Drain specifications are in milliamperes at 7.5 Vdc. These current drains apply to test mode, with the radio operating through the external antenna port. Current drains decrease in normal operation due to antenna switch drains and antenna loading.

SPECIFICATIONS

CQP7000 - VHF

GENERAL

FREQUENCY RANGE:
146-174 MHz

BANDSPLITS:
146-162 MHz
157-174 MHz
146-174 (LP Models)

POWER SUPPLY: (RECHARGEABLE)
Nickel-Cadmium Battery or Primary Battery

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

TEMPERATURE RANGE
Operating: -25°C to +55°C
Storage: -40°C to +85°C

DIMENSIONS (H x W x D)

Less Battery:	98.29 x 74.67 x 29.97 mm
With Light-Capacity Battery:	155.70 x 74.67 x 29.97 mm
With Medium-Capacity Battery:	178.05 x 74.67 x 29.97 mm
With Ultra-High-Capacity Battery: (or Primary Battery)	197.35 x 74.67 x 29.97 mm

WEIGHT (NON-KEYPAD)

Less Battery:	310 g
With Light-Capacity Battery:	484 g
With Medium-Capacity Battery:	643 g
With Ultra-High-Capacity Battery:	702 g

WEIGHT (KEYPAD)

Less Battery:	321 g
With Light-Capacity Battery:	495 g
With Medium-Capacity Battery:	654 g
With Ultra-High-Capacity Battery:	713 g

TRANSMITTER

RF POWER OUTPUT
Low-Power Models: 0.1, 1, 2.5 Watts
High-Power Models: 1, 2.5, 6 Watts

FREQUENCY STABILITY (-25°C to +55°C; +25°C REF.):
20/25 kHz: ±.0005% (±.0002% optional)
12.5 kHz: ±.0002%

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

FM HUM AND NOISE:
-40 dB

SPURIOUS EMISSION:
≤1 GHz: 0.25 uV
1 to 4 GHz: 1 uV

AUDIO DISTORSION:
3% Maximum (@ 1 kHz, 60% deviation)

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

CHANNEL SPACING:	DEVIATION:	PL DEVIATION:
25 kHz	±5 kHz	±1.0 kHz
20 kHz	±4 kHz	±0.8 kHz
12.5 kHz	±2.5 kHz	±0.5 kHz

MAXIMUM FREQUENCY SEPARATION: (NO DEGRADATION)
Full Bandsplit

RECEIVER

SENSITIVITY:

	12.5 kHz	20/25 kHz
20 dBS:	0.5 uV	0.45 uV
12 dBS	0.4 uV	0.35 uV

Squelch (Programmable)

USEABLE BANDWIDTH:
±5 kHz Minimum, @ 25 kHz

SELECTIVITY:

Adjacent channel:	20/25 kHz	-70 dB
	12.5 kHz	-60 dB

INTERMODULATION:
-70 dB

FM HUM AND NOISE:
-40 dB

FREQUENCY STABILITY (-25°C TO +55°C; +25°C REF.):
20/25 kHz ±.0005% (±.0002% optional)
12.5 kHz ±.0002%

AUDIO SPL (AT 30 cm WITH RATED AUDIO):
Weighted, 300 - 3000 Hz
90 dB Nominal (Non-Submersible)
89 dB Nominal (-SAJ and -SAK models)
88 dB Nominal (-YBN models)

RATED AUDIO OUTPUT:
500 mW (At less than 5% distorsion, @ 1 kHz into rated load)

CHANNEL SPACING:
25 kHz, 20 kHz, 12.5 kHz

MAXIMUM FREQUENCY SEPARATION (NO DEGRADATION):
Full bandsplit

12.5 kHz specifications reflect CEPT 84 test methods at -10°C to +55°C.

Specifications are subjects to change without notice, and assume CEPT 84 test methods unless otherwise noted.

CURRENT DRAINS (SEE NOTE)

		CQP7000a	CQP7000b AND CQP7000c
STANDBY		80 mA	83 mA
RECEIVE		210 mA	213 mA
MDH43 MODELS:	6-WATT	3100 mA	3100 mA
	2.5-WATT	1900 mA	1900 mA
	1.0-WATT	1600 mA	1600 mA
MDH33 MODELS:	2.5-WATT	1800 mA	1800 mA
	1-WATT	1300 mA	1300 mA
	0.1-WATT	800 mA	800 mA

NOTE:
Drain specifications are in milliamperes at 7.5 Vdc. These current drains apply to test mode, with the radio operating through the external antenna port. Current drains decrease in normal operation due to antenna switch drains and antenna loading.

SPECIFICATIONS

CQP7000 - UHF

GENERAL

FREQUENCY RANGE:
403-470 MHz

BANDSPLITS:
403-433 MHz
440-470 MHz

POWER SUPPLY: (RECHARGEABLE)
Nickel-Cadmium Battery or Primary Battery

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

TEMPERATURE RANGE
Operating: -25°C to +55°C
Storage: -40°C to +85°C

DIMENSIONS (H x W x D)

Less Battery:	98.29 x 74.67 x 29.97 mm
With Light-Capacity Battery:	155.70 x 74.67 x 29.97 mm
With Medium-Capacity Battery:	178.05 x 74.67 x 29.97 mm
With Ultra-High-Capacity Battery: (or Primary Battery)	197.35 x 74.67 x 29.97 mm

WEIGHT (NON-KEYPAD)

Less Battery:	310 g
With Light-Capacity Battery:	484 g
With Medium-Capacity Battery:	643 g
With Ultra-High-Capacity Battery:	702 g

WEIGHT (KEYPAD)

Less Battery:	321 g
With Light-Capacity Battery:	495 g
With Medium-Capacity Battery:	654 g
With Ultra-High-Capacity Battery:	713 g

TRANSMITTER

RF POWER OUTPUT
Low-Power Models: 0.1, 1, 2 Watts
High-Power Models: 1, 2, 5 Watts

FREQUENCY STABILITY (-25°C to +55°C; +25°C REF.):
20/25 kHz: ±.0005% (±.0002% optional)
12.5 kHz: ±.0002%

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

FM HUM AND NOISE:
-40 dB

SPURIOUS EMISSION:
≤1 GHz: 0.25 uV
1 to 4 GHz: 1 uV

AUDIO DISTORSION:
3% Maximum (@ 1 kHz, 60% deviation)

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

CHANNEL SPACING:	DEVIATION:	PL DEVIATION:
25 kHz	±5 kHz	±1.0 kHz
20 kHz	±4 kHz	±0.8 kHz
12.5 kHz	±2.5 kHz	±0.5 kHz

MAXIMUM FREQUENCY SEPARATION: (NO DEGRADATION)
Full Bandsplit

RECEIVER

SENSITIVITY:

	12.5 kHz	20/25 kHz
20 dBS:	0.45 uV	0.4 uV
12 dBS	0.35 uV	0.3 uV

Squelch (Programmable)

USEABLE BANDWIDTH:
±5 kHz Minimum, @ 25 kHz

SELECTIVITY:

Adjacent channel:	20/25 kHz	-70 dB
	12.5 κHz	-60 dB

INTERMODULATION:
-70 dB

FREQUENCY STABILITY (-25°C TO +55°C; +25°C REF.):
20/25 kHz ±.0005% (±.0002% optional)
12.5 kHz ±.0002%

AUDIO SPL (AT 30 cm WITH RATED AUDIO):
Weighted, 300 - 3000 Hz
90 dB Nominal (Non-Submersible)
89 dB Nominal (-SAJ and -SAK models)
88 dB Nominal (-YBN models)

RATED AUDIO OUTPUT:
500 mW (At less than 5% distorsion, @ 1 kHz into rated load)

CHANNEL SPACING:
25 kHz, 20 kHz, 12.5 kHz

MAXIMUM FREQUENCY SEPARATION (NO DEGRADATION):
Full bandsplit

12.5 kHz specifications reflect CEPT 84 test methods at -10°C to +55°C.

Specifications are subjects to change without notice, and assume CEPT 84 test methods unless otherwise noted.

CURRENT DRAINS (SEE NOTE)

		CQP7000a	CQP7000b AND CQP7000c
STANDBY		80 mA	83 mA
RECEIVE		210 mA	213 mA
MDH44 MODELS:	5-WATT	2900 mA	2900 mA
	2-WATT	1700 mA	1700 mA
	1-WATT	1600 mA	1600 mA
MDH34 MODELS:	2-WATT	1400 mA	1400 mA
	1-WATT	1200 mA	1200 mA
	0.1-WATT	1200 mA	1200 mA

NOTE:
Drain specifications are in milliamperes at 7.5 Vdc. These current drains apply to test mode, with the radio operating through the external antenna port. Current drains decrease in normal operation due to antenna switch drains and antenna loading.

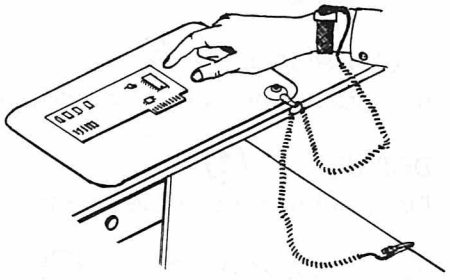
Storno
SERVICE INSTRUMENTS
AND SOFTWARE

**TOOLS
TEST AND
PROGRAMMING
EQUIPMENT**

TOOLS

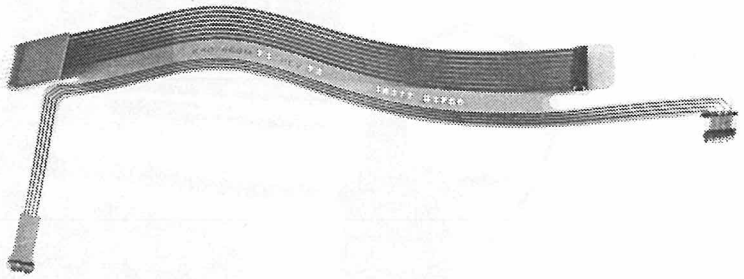
ANTI-STATIC PROTECTION MATERIAL
Used during all radio assembly and disassembly procedures.

95D5042-00	3-layer laminated table mat 0.6 x 1.2 m with grounding wire and connector.
95D5045-00	Wrist strap with coil cord.

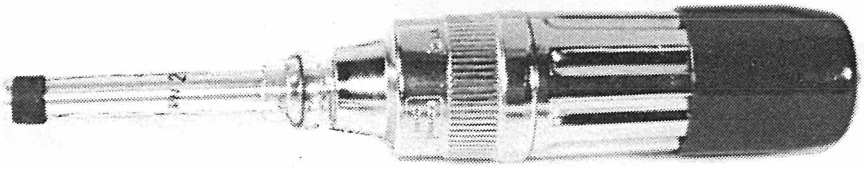


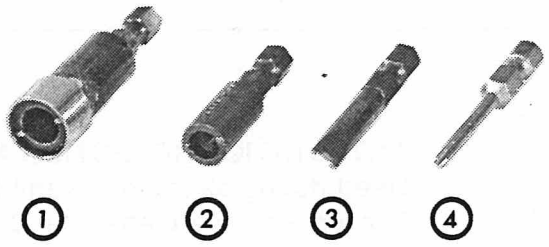
66-80385A11 **MODULE EXTRACTOR**
Allows easy removal of CQP7000 series radio modules.

84-07668M01 **DISPLAY EXTENDER CABLE**
Allows you to extend the display electronics away from the radio's main chassis for display electronics servicing.



RSX-4043A **TORQUE SCREW DRIVER AND BITS**
Handle for bits:





Bits described below:

66-80370B90 **ANTENNA NUT DRIVER** ①
Removes the antenna nut.

66-80370B88 **CONTROL NUT DRIVER** ②
Removes the nuts for the volume control and channel selector switch.

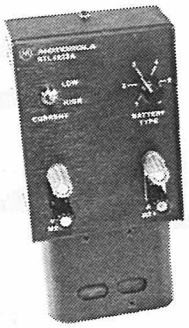
66-80370B89 **SLOTTED DRIVER** ③
Removes the spanner nuts at the bottom of the radio.

66-80321B78 **TORQUE SCREW DRIVER BIT** ④
Removes Phillips head screws in the radio

TEST EQUIPMENT

RTL-4223A **CHARGER TESTER**

Allows you to diagnose and repair all CQP7000 series chargers.

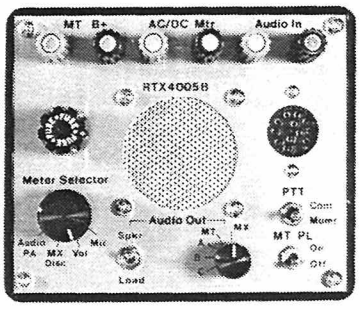


RTL-4224A **BATTERY ELIMINATOR**

Replaces the battery pack during servicing of all CQP7000 Series radio models. The power supply input is over voltage protected to 10 VDC maximum supply voltage. Reverse supply polarity protection and input fuse protection are also provided.

RTX-4005B **PORTABLE PRODUCTS TEST SET**

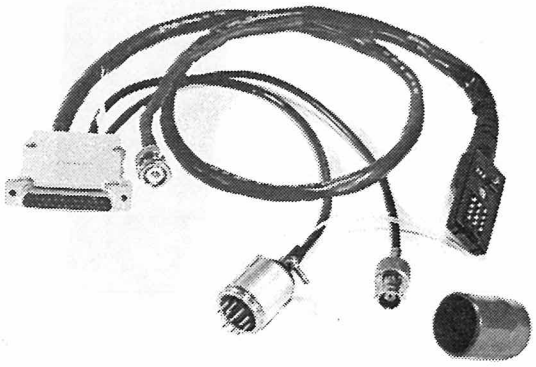
Provides the capability for testing many transmitter and receiver functions. Transmitter Modulation and keying can be simulated and receiver parameters can be tested without opening up the radio. The Test Set is used in conjunction with the RTK-4203A Programme/Test Cable.



RTK-4203A

PROGRAM/TEST CABLE

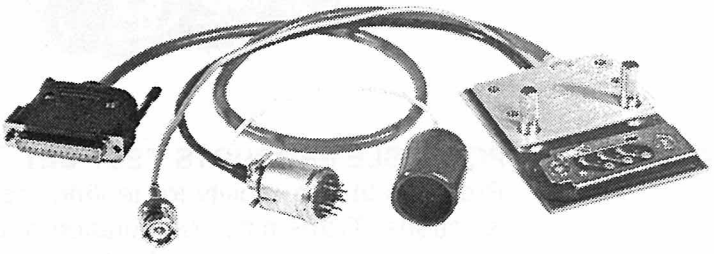
Provides electrical interconnection to RIB computer interface box and to the RTX-4005B for programming and testing of all CQP7000 Series radios.



RTL-4225A

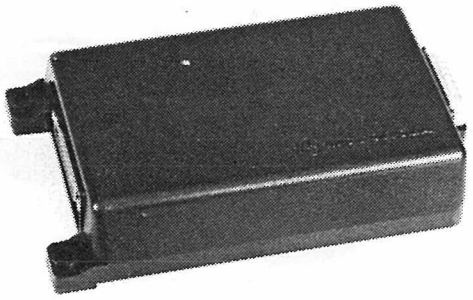
HOUSING ELIMINATOR

Replaces the radio housing during servicing of all CQP7000 Series radio models. The Housing Eliminator is mounted to the base of the radio frame providing an easy slide on mount for a battery or the RTL-4224A Battery Eliminator. With the Housing Eliminator in place, electrical test points located on the back of the CQP7000 series radio RF board are accessible.



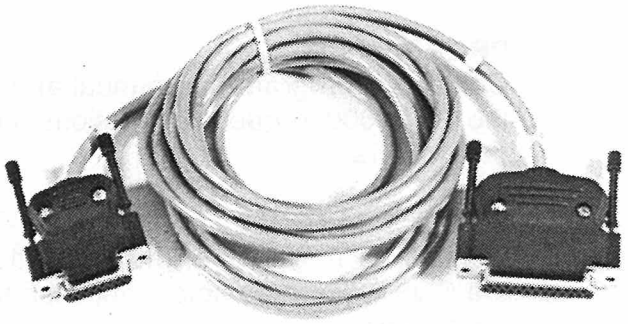
FIELD PROGRAMMING EQUIPMENT

01-80353A74 **RADIO INTERFACE BOX (RIB)**
Voltage level shifter to enable communications between the radio and the computers RS232 Serial Communications Adapter.



30-80369B71 **COMPUTER INTERFACE CABLE (PC-XT)**
Used to connect the computer's asynchronous Serial Communications Adapter to the RIB.

30-80369B72 **COMPUTER INTERFACE CABLE (PC-AT)**
Use B72 for IBM PC AT. All other IBM models use B71.



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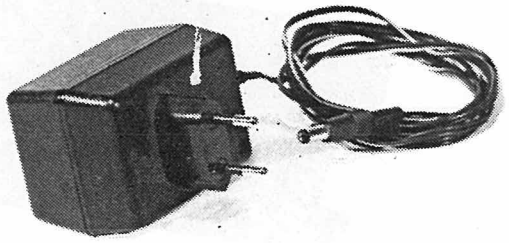
AND SOFTWARE

**TOOLS
TEST AND
PROGRAMMING
EQUIPMENT**

EPN-4040A — **POWER SUPPLY FOR RIB**
240 V U.K. Plug

EPN-4041A — **POWER SUPPLY FOR RIB**
220 V Euro Plug



NLN9839A — **VACUUM PUMP KIT**
The vacuum pump kit includes a vacuum pump and gauge, a vacuum hose, and the NTN4264A adapter with gasket. The adapter connects the vacuum hose to the radio's baseplate. The adapter and gasket are also available separately (NTN4264).

NTN4265A — **PRESSURE PUMP KIT**
The pump kit includes a pressure pump and gauge, a pressure hose, and the NTN4264A adapter with gasket.

EVN-4410A — **PROGRAM KIT**
Containing programmer manual and 5 1/4" program disk. For changing the CQP7000 frequencies, options, and electronically tunable parameters.

EVN-4411A — **PROGRAM KIT**
Containing programmer manual and 3 1/2" program disk. For changing the CQP7000 frequencies, options, and electronically tunable parameters.

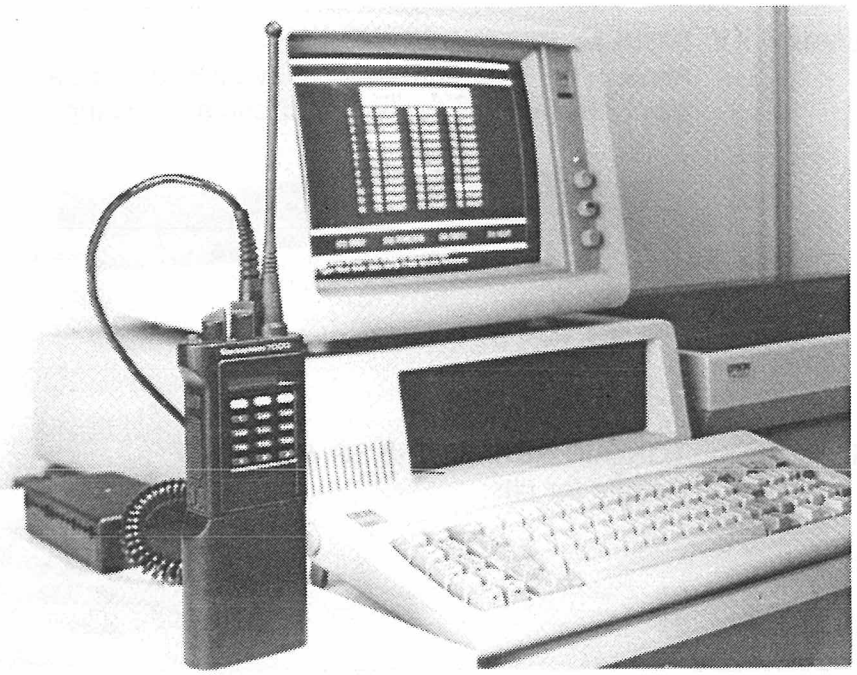
**82-02002F01/
82-02002F02/
82-02002F03** — **5 1/4" PROGRAM DISK**
For changing frequencies, options and electronically tunable parameters (same as contained in program kit EVN-4410A).

**82-02004F01/
82-02004F02** — **3 1/2" PROGRAM DISK**
For changing frequencies, options and electronically tunable parameters (same as contained in program kit EVN-4411A).

8314.7701 — **PROGRAMMER MANUAL**
For use with the two above program disks.

Storno
SERVICE INSTRUMENTS
AND SOFTWARE

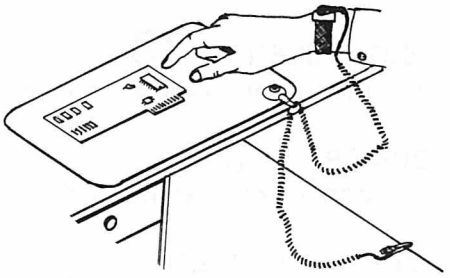
**TOOLS
TEST AND
PROGRAMMING
EQUIPMENT**



TOOLS

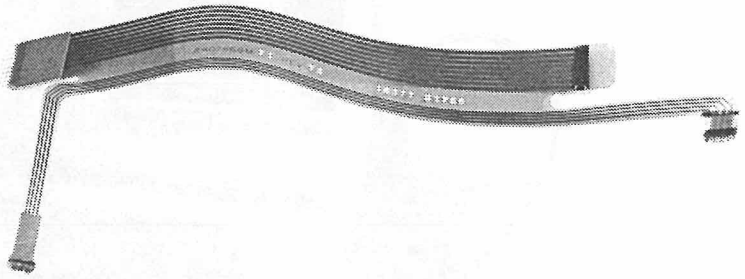
ANTI-STATIC PROTECTION MATERIAL
Used during all radio assembly and disassembly procedures.

95D5042-00	3-layer laminated table mat 0.6 x 1.2 m with grounding wire and connector.
95D5045-00	Wrist strap with coil cord.

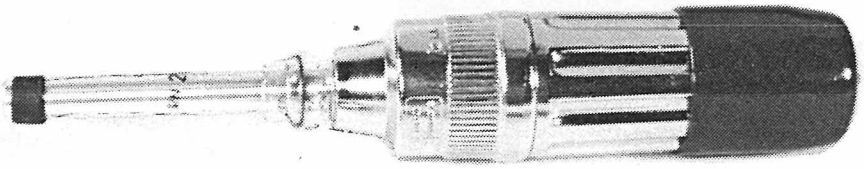


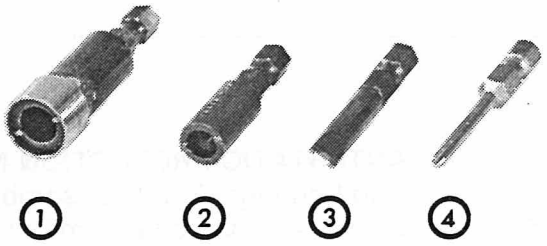
66-80385A11 **MODULE EXTRACTOR**
Allows easy removal of CQP7000 series radio modules.

84-07668M01 **DISPLAY EXTENDER CABLE**
Allows you to extend the display electronics away from the radio's main chassis for display electronics servicing.



RSX-4043A **TORQUE SCREW DRIVER AND BITS**
Handle for bits:





Bits described below:

66-80370B90 **ANTENNA NUT DRIVER** ①
Removes the antenna nut.

66-80370B88 **CONTROL NUT DRIVER** ②
Removes the nuts for the volume control and channel selector switch.

66-80370B89 **SLOTTED DRIVER** ③
Removes the spanner nuts at the bottom of the radio.

66-80321B78 **TORQUE SCREW DRIVER BIT** ④
Removes Phillips head screws in the radio

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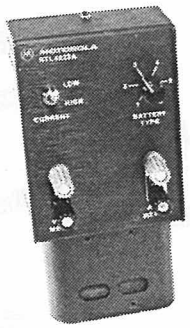
TEST EQUIPMENT

RTL-4223A **CHARGER TESTER**

Allows you to diagnose and repair all CQP7000 series chargers.

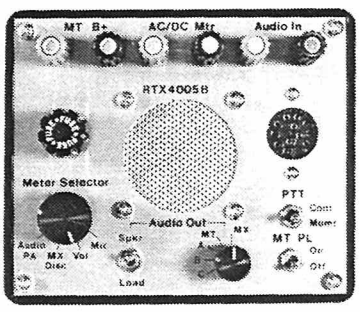


RTL-4224A **BATTERY ELIMINATOR**

Replaces the battery pack during servicing of all CQP7000 Series radio models. The power supply input is over voltage protected to 10 VDC maximum supply voltage. Reverse supply polarity protection and input fuse protection are also provided.

RTX-4005B **PORTABLE PRODUCTS TEST SET**

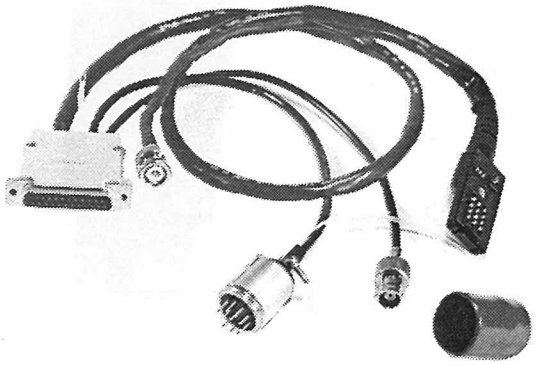
Provides the capability for testing many transmitter and receiver functions. Transmitter Modulation and keying can be simulated and receiver parameters can be tested without opening up the radio. The Test Set is used in conjunction with the RTK-4203A Programme/Test Cable.



RTK-4203A

PROGRAM/TEST CABLE

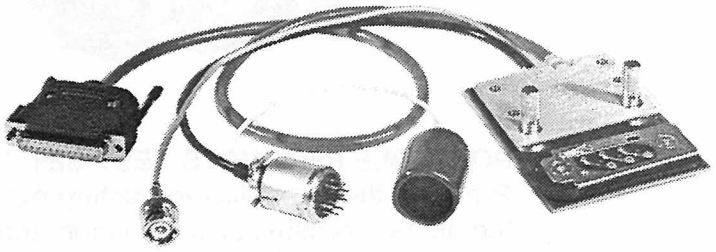
Provides electrical interconnection to RIB computer interface box and to the RTX-4005B for programming and testing of all CQP7000 Series radios.



RTL-4225A

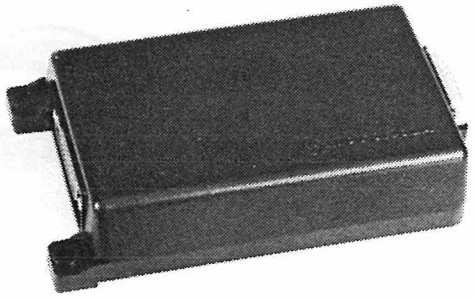
HOUSING ELIMINATOR

Replaces the radio housing during servicing of all CQP7000 Series radio models. The Housing Eliminator is mounted to the base of the radio frame providing an easy slide on mount for a battery or the RTL-4224A Battery Eliminator. With the Housing Eliminator in place, electrical test points located on the back of the CQP7000 series radio RF board are accessible.



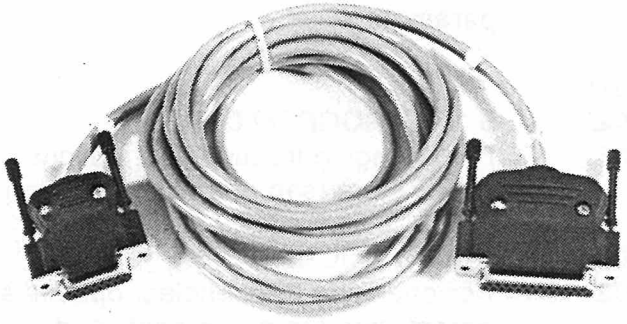
FIELD PROGRAMMING EQUIPMENT

01-80353A74 **RADIO INTERFACE BOX (RIB)**
Voltage level shifter to enable communications between the radio and the computers RS232 Serial Communications Adapter.



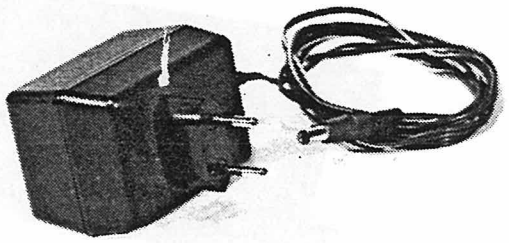
30-80369B71 **COMPUTER INTERFACE CABLE (PC-XT)**
Used to connect the computer's asynchronous Serial Communications Adapter to the RIB.

30-80369B72 **COMPUTER INTERFACE CABLE (PC-AT)**
Use B72 for IBM PC AT. All other IBM models use B71.



EPN-4040A **POWER SUPPLY FOR RIB**
240 V U.K. Plug

EPN-4041A **POWER SUPPLY FOR RIB**
220 V Euro Plug



EVN-4410A **PROGRAM KIT**
Containing programmer manual and 5 1/4" program disk. For changing the CQP7000 frequencies, options, and electronically tunable parameters.

EVN-4411A **PROGRAM KIT**
Containing programmer manual and 3 1/2" program disk. For changing the CQP7000 frequencies, options, and electronically tunable parameters.

82-02002F01/
82-02002F02/
82-02002F03 **5 1/4" PROGRAM DISK**
For changing frequencies, options and electronically tunable parameters (same as contained in program kit EVN-4410A).

82-02004F01/
82-02004F02 **3 1/2" PROGRAM DISK**
Fcr changing frequencies, options and electronically tunable parameters (same as contained in program kit EVN-4411A).

8314.7701 **PROGRAMMER MANUAL**
For use with the two above program disks.

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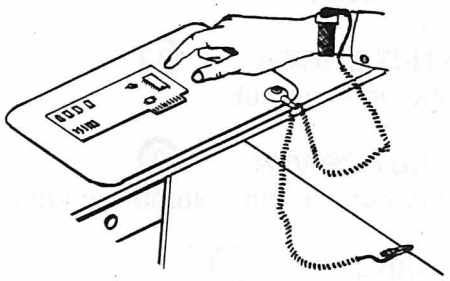
AND SOFTWARE

TOOLS TEST AND PROGRAMMING EQUIPMENT

TOOLS

01-80386A82 **ANTI-STATIC GROUNDING KIT**
Used during all radio assembly and disassembly procedures.



or

95D5042-00 3-layer laminated table mat 0.6 x 1.2 m with grounding wire and connector.

95D5044-00 Wrist strap with coil cord.

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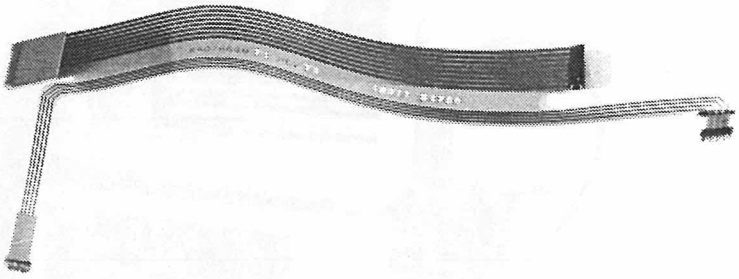
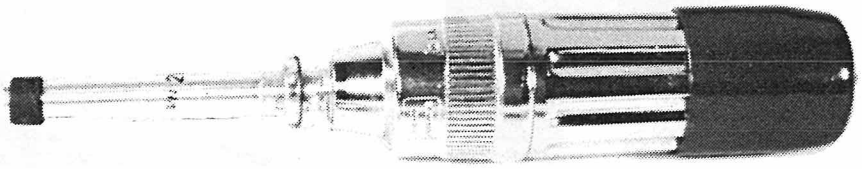
SERVICE INSTRUMENTS
AND SOFTWARE

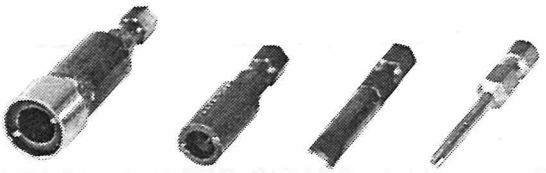
66-80385A11 **MODULE EXTRACTOR**
Allows easy removal of CQP7000 series radio modules.

84-07668M01 **DISPLAY EXTENDER CABLE**
Allows you to extend the display electronics away from the radio's main chassis for display electronics servicing.



RSX-4043A **TORQUE SCREW DRIVER AND BITS**
Handle for bits:





① ② ③ ④

Bits described below:

66-80370B90 **ANTENNA NUT DRIVER** ①
Removes the antenna nut.

66-80370B88 **CONTROL NUT DRIVER** ②
Removes the nuts for the volume control and channel selector switch.

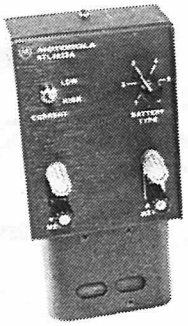
66-80370B89 **SLOTTED DRIVER** ③
Removes the spanner nuts at the bottom of the radio.

66-80321B78 **TORQUE SCREW DRIVER BIT** ④
Removes Phillips head screws in the radio

TEST EQUIPMENT

RTL-4223A **CHARGER TESTER**

Allows you to diagnose and repair all CQP7000 series chargers.

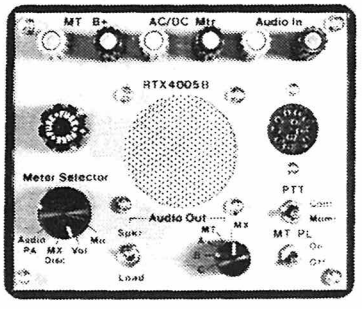


RTL-4224A **BATTERY ELIMINATOR**

Replaces the battery pack during servicing of all CQP7000 Series radio models. The power supply input is over voltage protected to 10 VDC maximum supply voltage. Reverse supply polarity protection and input fuse protection are also provided.

RTX-4005B **PORTABLE PRODUCTS TEST SET**

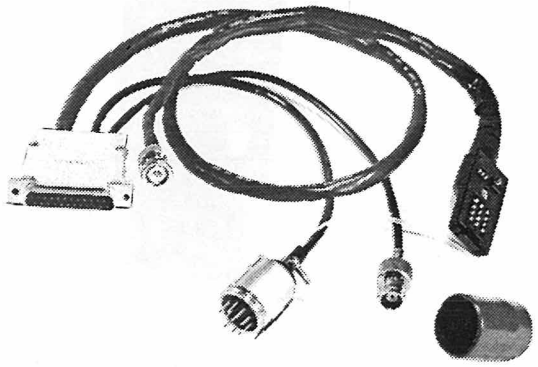
Provides the capability for testing many transmitter and receiver functions. Transmitter Modulation and keying can be simulated and receiver parameters can be tested without opening up the radio. The Test Set is used in conjunction with the RTK-4203A Programme/Test Cable.



RTK-4203A

PROGRAM/TEST CABLE

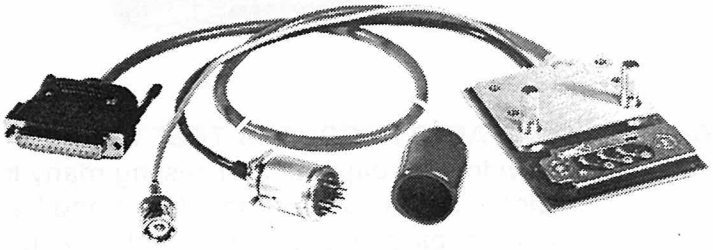
Provides electrical interconnection to RIB computer interface box and to the RTX-4005B for programming and testing of all CQP7000 Series radios.



RTL-4225A

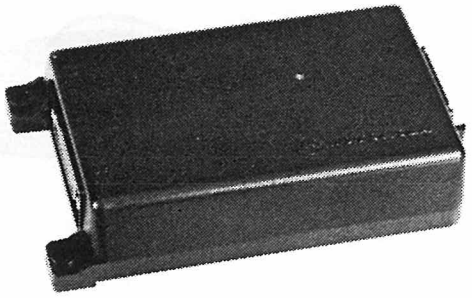
HOUSING ELIMINATOR

Replaces the radio housing during servicing of all CQP7000 Series radio models. The Housing Eliminator is mounted to the base of the radio frame providing an easy slide on mount for a battery or the RTL-4224A Battery Eliminator. With the Housing Eliminator in place, electrical test points located on the back of the CQP7000 series radio RF board are accessible.



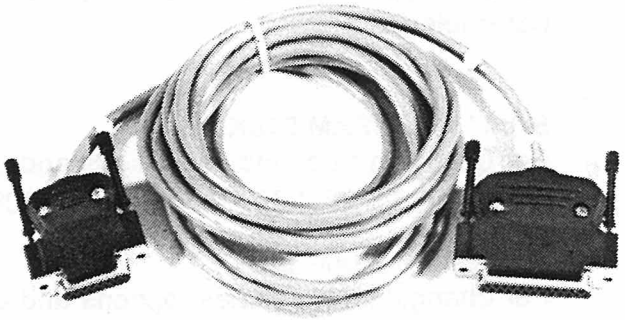
FIELD PROGRAMMING EQUIPMENT

01-80353A74 **RADIO INTERFACE BOX (RIB)**
Voltage level shifter to enable communications between the radio and the computers RS232 Serial Communications Adapter.



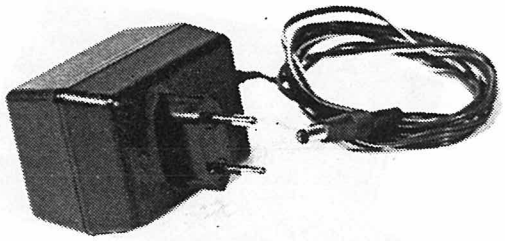
30-80369B71 **COMPUTER INTERFACE CABLE (PC-XT)**
Used to connect the computer's asynchronous Serial Communications Adapter to the RIB.

30-80369B72 **COMPUTER INTERFACE CABLE (PC-AT)**
Use B72 for IBM PC AT. All other IBM models use B71.



EPN-4040A **POWER SUPPLY FOR RIB**
240 V U.K. Plug

EPN-4041A **POWER SUPPLY FOR RIB**
220 V Euro Plug



EVN-4410A **PROGRAM KIT**
Containing programmer manual and 5 1/4" program disk. For changing the CQP7000 frequencies, options, and electronically tunable parameters.

EVN-4411A **PROGRAM KIT**
Containing programmer manual and 3 1/2" program disk. For changing the CQP7000 frequencies, options, and electronically tunable parameters.

82-02002F01/
82-02002F02/
82-02002F03 **5 1/4" PROGRAM DISK**
For changing frequencies, options and electronically tunable parameters (same as contained in program kit EVN-4410A).

82-02004F01/
82-02004F02 **3 1/2" PROGRAM DISK**
For changing frequencies, options and electronically tunable parameters (same as contained in program kit EVN-4411A).

8314.7701 **PROGRAMMER MANUAL**
For use with the two above program disks.

CQP7000

SUBMERSIBLE VERSION

INTRODUCTION

CQP7000 Series submersible radio models maintain watertight integrity when immersed in one metre of water for two hours. Radios shipped from the factory have passed the water immersion test and should not be disassembled. If disassembly is necessary, refer to qualified service personnel and service shops capable of restoring the watertight integrity of the radio.

CAUTION

It is strongly recommended that maintenance of the CQP7000 Submersible Radio be referred to qualified service personnel and service shops. This is of paramount importance as irreparable damage to the radio can result from service by unauthorised persons. If disassembly is necessary, unauthorised attempts to repair the radio may void any existing warranties or extended performance agreements.

Submersible models can be identified by a special label on the back of the radio housing, or by the use of a black escutcheon with white lettering on top of the radio. If the rado is accidentally dropped in water, shake the radio to remove the excess water from the speaker grille area before operating; otherwise, the sound may be distorted until the water has evaporated from this area. Also, remove the battery and dry the battery contacts on the bottom of the radio.

GENERAL INFORMATION

To ensure that the submersible radio is truly a watertight unit, special testing, test procedures, and specialised test equipment are required. The special testing involves a vacuum check of the radio and pressure testing (troubleshooting) for water leaks if the vacuum check fails. The specialised test equipment is needed to perform the vacuum check and pressure testing, if required.

DISASSEMBLY AND REASSEMBLY

DISASSEMBLY

Disassemble the radio according to the "DISASSEMBLY/REASSEMBLY PROCEDURES" section.

REASSEMBLY

DO NOT REASSEMBLE THE RADIO WITHOUT FIRST PERFORMING THE FOLLOWING PRELIMINARY ASSEMBLY PROCEDURE:

1. Remove the main seal o-ring from the control top panel.

2. Inspect the seal area around the control top panel for foreign material that might prevet the main seal o-ring from sealing properly.

3. Lubricate and install a new main seal o-ring; discard the old o-ring.

> **CAUTION**
>
> The main seal o-ring should not be visible when looking at the top side of the radio. If the seal is visible, it is improperly installed.

4. Check to ensure that both frame stod seals are in place and are not damaged in any way.

5. Replace both frame stud seals if any damage or foreign material is visible.

6. Reassemble the radio according to the "DISASSEMBLY/REASSEMBLY PROCEDURES" section. Tighten all hardware which was loosened or removed per the Torque Specifications table.

> **NOTE**
>
> When seating the main seal o-ring in the radio housing, use hand pressure to press the radio into the housing. Make sure that the base plate slotted-spanner nuts are properly aligned before tightening them.

CQP7000

SPECIAL TEST FOR SUBMERSIBLE RADIOS

TEST EQUIPMENT

Vacuum Pump Kit, NLN9839A (See Tools, Test and Programming equipment)
Pressure Pump Kit, NTN4265A (See Tools, Test and Programming equipment)

Micellaneous hardware
Other items needed for testing the submersible radio include:

- Water container, preferably a ten-litre glass fishbowl type.
- Fresh water.
- A supply of replacement seals, o-rings, and gaskets (refer to the exploded view parts lists for part numbers).

VACUUM TEST

GENERAL

The vacuum test uses a vacuum pump and gauge. The pump creates a vacuum condition inside the radio, and the gauge monitors the radio for a stable vacuum reading; that is, checking for a properly sealed, watertight unit. Before starting the vacuum test:

- Remove the battery and check the four battery contact mounting screws for correct torque.
- Check the two baseplate slotted-spanner nuts for correct torque.
- Check the antenna bushing spanner nut for correct torque.
- Remove the universal connector cover to expose the universal connector.

CONDUCTING THE TEST

1. Attach the vacuum hose to the vacuum pump. Check the pump and hose for leaks by blocking off the open end of the hose and operating the pump a few times. The actual reading on the gauge at this point is not important; it is important that the gauge pointer remains steady, indicating no vacuum leaks in the pump.

2. Ensure that a rubber gasket is attached to the hose-to-baseplate adapter. Screw the adapter into the tapped hole in the baseplate.

3. Attach the open end of the hose to the adapter.

4. Operate the pump a few times until the gauge indicates 127 mm Hg.

   Note: do not pull more than 254 mm Hg of vacuum on the radio.

   The gauge should indicate a leaking-down and should stabilise at some lower value. The leak-down is normal and important; it indicates that the pressure is equalizing across the port seal membrane.

NOTE

If this leak-down phenomenon does not occur, the port seal is probably missing, damaged, or wet. Refer to the "Baseplate Elastomer Seal and Vacuum Port Seal" paragraph of the "PRESSURE TEST" section.

Operate the pump again until the gauge indicates 127 mm Hg. Some additional leak-down will occur. After repeating this action two or three more times, the gauge should stabilise at 127 mm Hg.

5. Observe the gauge for approximately two minutes.
   - If the needle holds steady, then the radio has passed the vacuum test and is approved for submersibility. No additional testing will be required.
   - If the needle does not hold steady, then the radio has failed the vacuum test and the radio might leak if submersed. Additional troubleshooting of the radio will be required; complete this procedure, then go to the "PRESSURE TEST" section of this manual.

6. Remove the vacuum hose and adapter from the radio.

PRESSURE TEST

GENERAL

Pressure testing the radio is necessary only if the radio has failed the vacuum test. Do not perform the pressure test until the vacuum test has been completed. Pressure testing involves creating a pressure condition inside the radio, submersing the radio in water, and observing the radio for a stream of bubbles (leak). Since all areas of the radio are being checked, obseve the entire unit carefully for the possibility of multiple leaks before completing this test.

CONDUCTING THE TEST

1. Screw the adapter (with gasket) into the tapped hole in the baseplate.

2. Attach one end of the pressure hose to the adapter and the other end to the pressure pump.

3. Operate the pump until the gauge reads approximately 6,891 Pa. Some leak-down is normal as the pressure equalises across the port seal membrane.

CAUTION

Pressure any greater than 6,891 Pa may push air around the main seal and may damage the grille area.

4. Maintain the pressure at 6,891 Pa and submerse the radio into a water-filled container.

5. Watch for any continuous series of bubbles.

NOTE

Some air entrapment may cause the accumulation of bubbles, especially in the grille area, but the bubbles should not be continuous.

6. Note all of the seal areas that show signs of leakage. Pinpoint the problem(s) to one (or more) of the following areas:
   - Housing
   - Baseplate elastomer seal or vacuum port seal
   - Antenna bushing seal or light pibe seal
   - Frequency switch
   - On/off/volume control
   - RF connector
   - Dual-function switch
   - Frame stud seals
   - Main seal

7. Remove the radio from the water container and dry it thoroughly. Be especially careful to dry the area around the main seal to prevent contamination of the internal electronics while the unit is open. Also, to keep the area around the port seal dry, make sure that there is no water around the basepate vacuum port.

   Remove the adapter and pressure hose added in steps (1) and (2).

TROUBLESHOOTING LEAK AREAS

Before repairing any leak, read all applicable area repair paragraphs. This will help to eliminate unnecessary disassembly and reassembly of a radio with multiple leaks. Troubleshoot only the faulty seal areas listed in the "PRESSURE TEST" section, and, when multiple leaks exist, in the order listed.

> **NOTE**
>
> Before reassembling the radio, always install a new main seal o-ring, and new o-rings in the defective area.

HOUSING

If a leak occurs in any portion of the housing assembly (monitor or push-to-talk switches, speaker grille, or universal connector), replace the housing.

BASEPLATE ELASTOMER SEAL OR VACUUM PORT SEAL

These seals can, and should, be repaired without removing the radio chassis from the housing assembly. Remove the baseplate by loosening the slotted-spanner nuts and removing the center three battery contact screws.

> **NOTE**
>
> Before removing the baseplate, note the location and orientation of the battery latch and battery latch spring.

Inspect the elastomer seal for damage or foreign material; replace or clean as necessary. Remove the old vacuum port seal, and inspect the sealing surfaces of the housing and baseplate for damage; replace any faulty items, and install a new vacuum port seal.

Ensure that the three center o-ring portions of the elastomer seal are fully seated around the threaded bushings in the housing. Reassemble the baseplate with the convex surface of the latch spring toward the baseplate. Tighten the battery contact screws and slotted-spanner nuts to the correct torque.

ANTENNA BUSHING SEAL OR LIGHTPIPE SEAL

Check the antenna bushing spanner nut for correct torque. If the nut is loose, tighten it to the correct value and run the pressure test again. If the nut is not loose, the antenna bushing must be replaced. This will require the removal of the main circuit board from the frame assembly according to the following procedure:

1. Referring to the "DISASSEMBLY" section, disassemble the radio until the speaker bracket assembly is disconnected and removed from the frame assembly.

2. Read the precautions outlined in the "SERVICING MAJOR SUBASSEMBLIES" section before performing steps 3 through 8, below.

3. Disconnect the PTT/controls flexible circuit from the radio circuit board.

4. Remove the backshield.

5. Remove the two bottom connector screws and three power amplifier module (U202) screws (one through the PCB, and two through the frame), securing the main circuit board.

6. Gently remove the earth clip. If the clip is bent during removal, replace it.

7. Remove the power amplifier module (U202).

8. Grasping the main circuit board at the bottom connector end, lift the board and carefully slide it out from under the control top panel.

CAUTTION

When the main circuit board is removed, fragile wireform and earth contact are exposed. Handle gently to avoid damage.

The control top panel must now be removed from the frame assembly. Remove the two screws that hold the panel to the side of the radio frame.

Remove the on/off/volume control and frequency switch knobs by grasping the tip of each knob with pliers and pulling the knob off the shaft of the switch. Then, grasp the insert wth the pliers and pull the insert off the shaft.

Remove the detent washer from around the frequency switch, noting the orientation of the washer, relative to the switch, prior to removal. Then, remove the spanner nut from each switch.

Noting the location of the lightpipe, which will be loose, lift the control top panel off the frame.

Remove the antenna bushing spanner nut and the antenna bushing from the contrc! top panel. Inspect the sealing surfaces on the control top panel and bushing; replace faulty items as required. Remove and discard the old antenna bushing o-ring, and install a new one.

Before reassembling the radio, inspect the o-rings on the lightpipe, on/off/volume control, and frequency switch for damage and foreign material. Also, ensure that the lightpipe and the antenna bushing's hex head are properly seated in the control top panel.

Reassemble the radio in reverse order of disassembly, using new frequency switch and on/off/volume control knobs and inserts.

FREQEUNCY SWITCH AND ON/OFF/VOLUME CONTROL

Remove the suspect knob by grasping it with pliers and pulling it off the shaft of the switch. Then, grasp the insert with the pliers and pull it off the shaft. If you are working on the frequency switch, remove the detent washer from around the switch as well, noting the orientation of the washer, relative to the switch, prior to removal.

Check the switch's spanner nut for correct torque. If the nut is loose, tighten it to the correct value, and rerun the pressure test. If the nut is not loose, detemine if the leak is internal (from within the switch), or external (from around the switch) by pressurising the radio to 6,891 Pa, submersing the unit water, and observing the flow of bubbles.

Following the procedures detailed in "ANTENNA BUSHING SEAL OR LIGHTPIPE SEAL," above, disassemble the radio until the control top panel is removed from the frame assembly.

If the leak is from the internal switch seal, replace the switch; follow the unsoldering and replacement instructions contained in the new switch's instruction sheet. If the leak is from the external switch seal, replace the switch's o-ring.

Before reassembling the radio, inspect the light pipe seal and both switch seals for damage and foreign material. Repair or clean as necessary.

Reassemble the radio in reverse order of disassembly, using new frequency switch and on/off/volume control knobs and inserts.

RF CONNECTOR

To replace the RF connector seal, disassemble the radio until the main circuit board is removed from the frame assembly, following the procedures detailed in "ANTENNA BUSHING SEAL OR LIGHTPIPE SEAL," above.

While applying light pressure on the RF connector, pull and disconnect the RF earth clip. Lift out the RF connector and replace the o-ring. Inspect the RF connector hole in the control top panel for foreign material, and clean as required.

Reassemble the RF connector, snapping the RF earth clip in place while applying pressure to the connector. Ensure that the earth clip is fully seated within the groove in the connector.

Reassemble the radio in reverse order of disassembly.

FRAME STUD SEALS

Remove the seals by pulling them off the frame studs.

Inspect sealing areas on the radio housing for foreign material, scratches, and nicks. Clean off foreign material as required; replace the housing assembly if it is damaged in any way.

Install the new seals, ensuring that they are fully seated against the radio frame before reassembling the radio.

MAIN SEAL

Remove and discard the old main seal o-ring around the control top panel. Inspect the sealing surfaces on the housing and control top panel, replacing faulty items and cleaning off any foreign material.

Inspect the speaker bracket assembly to ensure that the two tabs protruding from the top of the speaker bracket are properly seated between the frame and the control top panel. An improperly located speaker bracket will distort the housing in the seal area, causing leakage.

Remove the antenna before installing a new main seal o-ring. Install the main seal o-ring by first placing it in the groove on the antenna side of the radio, then by slowly stretching the o-ring around and over the frequency switch and on/off/volume control, and finally by dropping into the groove on the push-to-talk switch side of the radio.

Inspect again for proper seating of the main seal all around the control top panel, and foreign material. Observe carefully to ensure that the main seal o-ring is not pinched between the radio housing and the control top panel during insertion of the radio chassis into the housing assembly. Pinched main seal o-rings are one of the most common causes of vacuum test failures.

SAFETY INFORMATION

DO NOT hold the radio with the antenna close to, or touching, exposed parts of the body, especially the face or eyes, while transmitting. The radio will perform best if the microphone is five to eight centimeters away from the lips and the radio is vertical.

DO NOT hold the transmit (PTT) switch on when not actually desiring to transmit.

DO NOT allow children to play with any radio equipment containing a transmitter.

DO NOT operate a transmitter near unshielded electrical blasting caps or in an explosive atmosphere unless it is a type especially qualified for such use.

CMOS PRECAUTIONS

This radio contains static-sensitive devices. Do not open the radio unless properly grounded. Take the following precautions when working on this unit.

The red printed circuit boards indicate static sensitive devices and contained on these boards, and should be handled with the following precautions.

1. Store and transport all CMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS devices into conventional plastic "snow" or plastic trays used for storage and transportation of other semiconductor devices.

2. Ground the working surface of the service bench to protect the CMOS device. We recommend using the P/N 95D5042-00 Static Protection Table Mat (0.6 x 1.2 m) which includes ground cord and connector, plus wrist wrap with coil cord 95D5045-00.
   See also TEST INSTRUMENTS AND SOFTWARE).

3. Do not wear nylon clothing while handling CMOS devices.

4. Neither insert nor remove CMOS devices with power applied. Check all power supplies to be used for testing CMOS devices and be certain there are no voltage transients present.

5. When straightening CMOS pins, provide ground straps for apparatus used.

6. When soldering, use a grounded soldering unit.

7. If at all possible, handle CMOS devices by the package and not by the leads. Prior to touching the unit, touch an electrical ground to remove any static charge that you may have accumulated. The package and substrate may be electrically common. If so, the reaction of a discharge to the case would cause the same damage as touching the leads.

CAUTION

Do not depress the PTT or side switches while inserting the frame into the housing; damage to the switches could occur.
For reassembly, use only the tools that are recommended. Using unauthorised tools, or failing to adhere to torque specifications may cause irreparable damage.
Do not attempt to remove the antenna bushing from the control top; it is ultrasonically welded in place.
Do not desolder or resolder any connections between the volume potentiometer flex and the on/off-volume potentiometer with the switch in the off position. Make sure that the switch is in the on position before applying any heat; otherwise the internal parts of the switch will be damaged.

CLEANING

- Clean all external radio surfaces with a 0.5% solution of a mild dishwashing detergent in water (one teaspoon of detergent per 4 liters of water).
- Stronger cleaning agents may only be used to remove soldering flux from circuit boards after making repairs.
- Clean internal surfaces with water-activated optical wipes.

CAUTION

Never allow any alcohol- or solvent-based product to contact any plastic or rubber radio part.

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DO NOT hold the radio with the antenna close to, or touching, exposed parts of the body, especially the face or eyes, while transmitting. The radio will perform best if the microphone is five to eight centimeters away from the lips and the radio is vertical.

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2. Ground the working surface of the service bench to protect the CMOS device. We recommend using the P/N 0180386A82 Static Protection Kit which includes a wrist strap, 2 ground cords, a table mat, and a floor mat.

3. Wear a conductive wrist strap in series with a 1M resistor to ground. Replacement Wrist Straps that connect to the bench top covering - P/N RSX-4015B.

4. Do not wear nylon clothing while handling CMOS devices.

5. Neither insert nor remove CMOS devices with power applied. Check all power supplies to be used for testing CMOS devices and be certain there are no voltage transients present.

6. When straightening CMOS pins, provide ground straps for apparatus used.

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- Stronger cleaning agents may only be used to remove soldering flux from circuit boards after making repairs.
- Clean internal surfaces with water-activated optical wipes.

CAUTION

Never allow any alcohol- or solvent-based product to contact any plastic or rubber radio part.

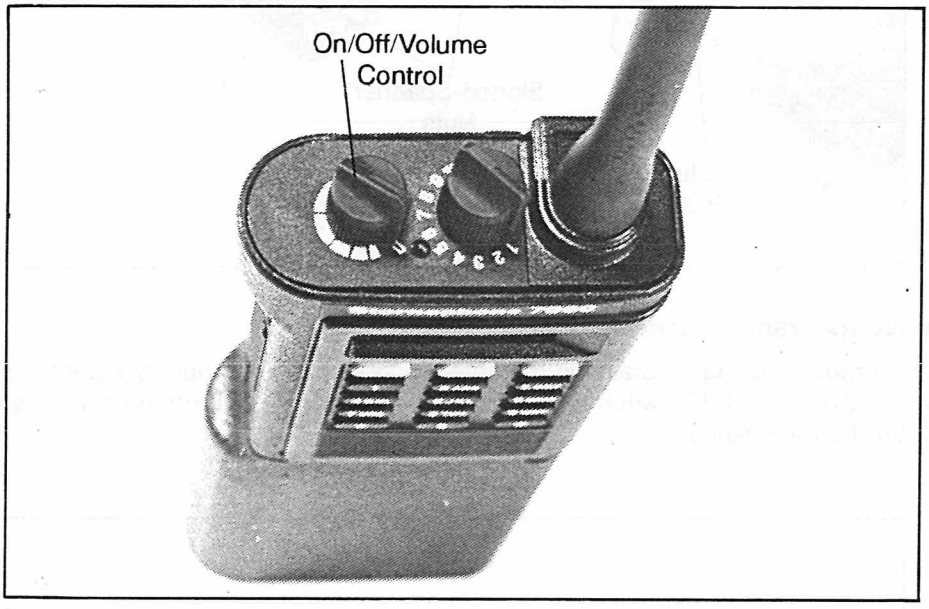
DISASSEMBLY/REASSEMBLY PROCEDURES

CQP7000

1. DISASSEMBLY

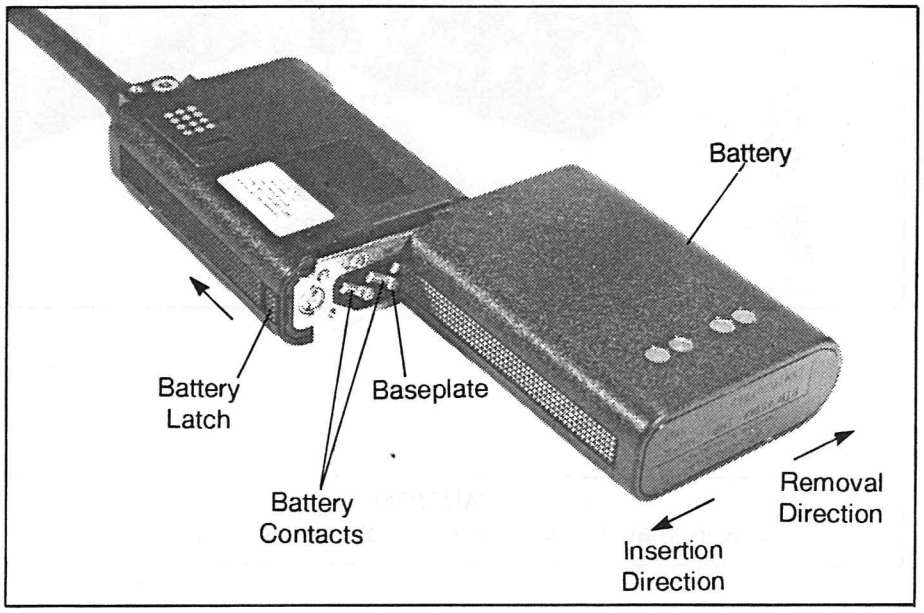
1.1. Turn off the radio -

by rotating the on/off-volume control knob fully counterclockwise until you hear a click. Remove the universal connector cover or any accessory connected to the radio before beginning disassembly.



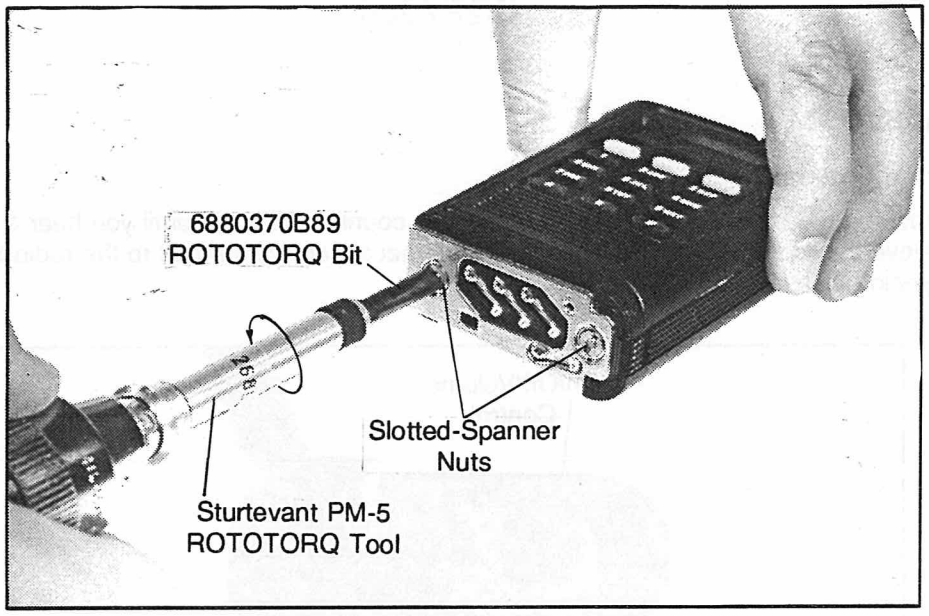
1.2. Remove the battery -

from the baseplate on the bottom of the radio housing by pushing the springloaded battery latch towards the top of the radio, and sliding the battery away from the latch until it clears the baseplate.



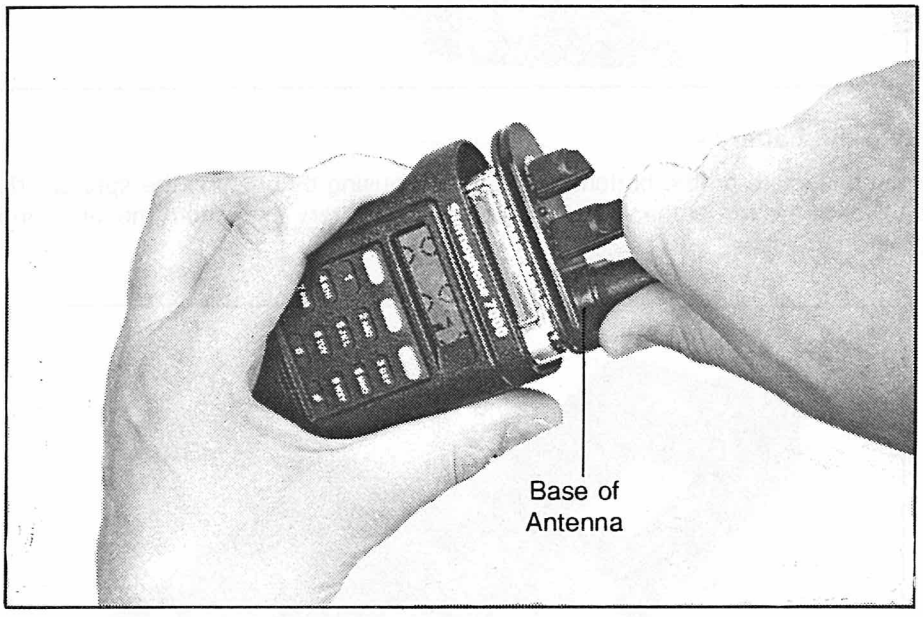
1.3. Loosen the two slotted-spanner nuts -

on the bottom of the radio using Rototorq tool bit No. 6680370B89. When loosened, the slotted-spanner nuts are captive and will spin freely without separating from the baseplate.



1.4. Remove the frame assembly -

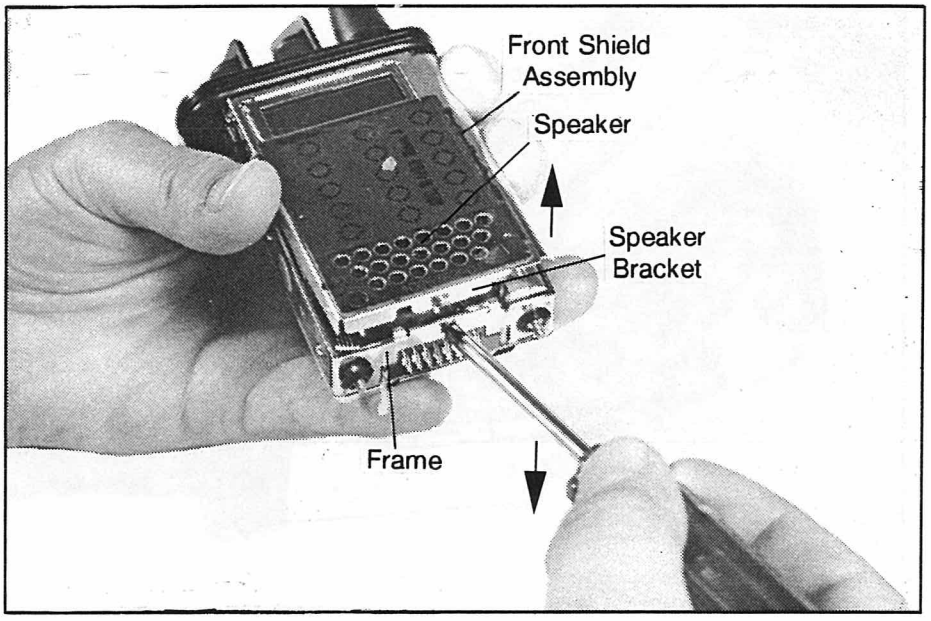
from the radio housing by grasping the antenna at its base and pulling it gently upwards. Do not depress the PTT switch during removal and do not push on the slotted-spanner nuts to lift the frame assembly.



CAUTION
Ensure that all static electricity safeguards are in place.

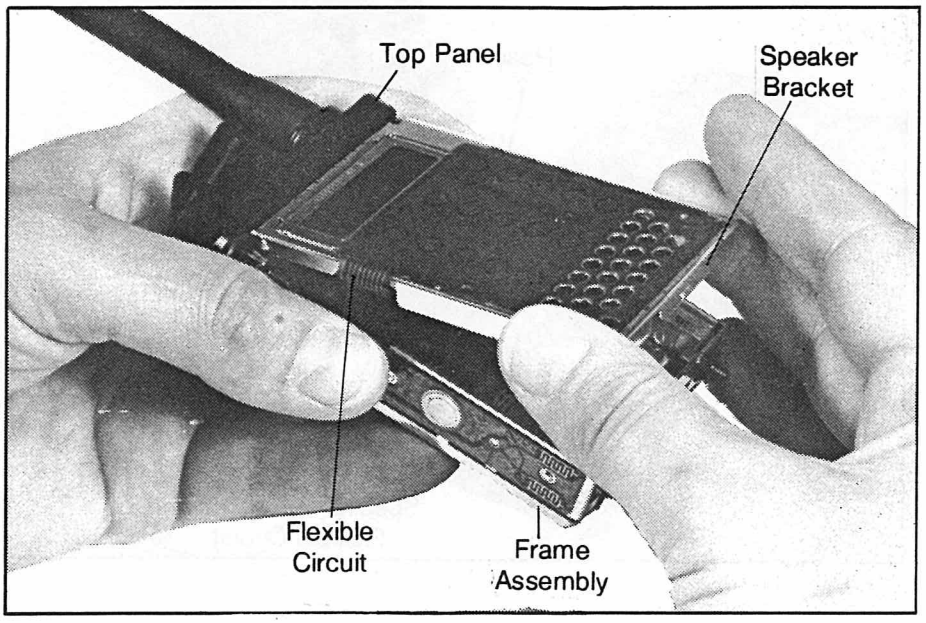
1.5. Remove the speaker bracket assembly -

,the speaker facing upwards, by insèrting 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.



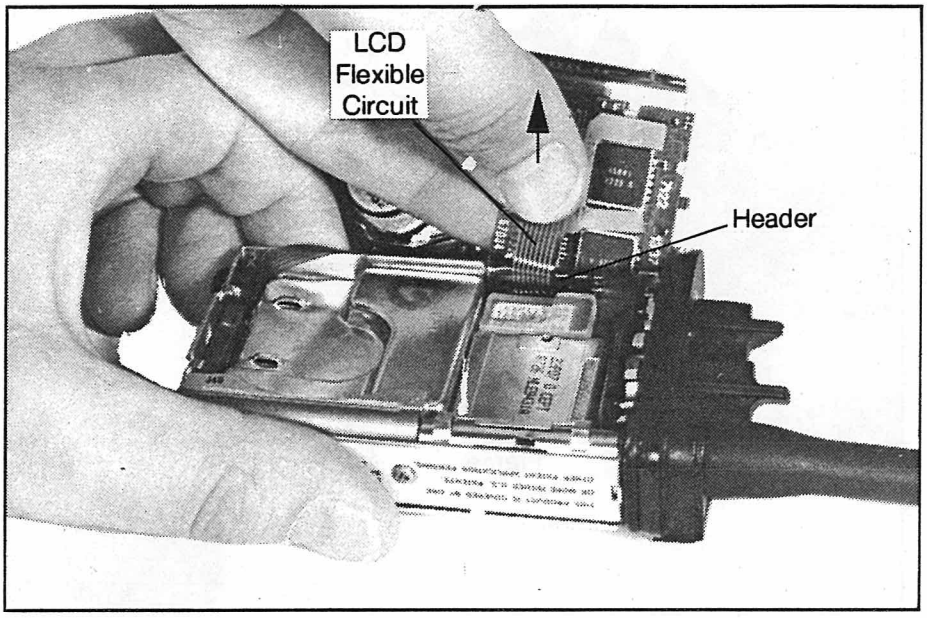
1.6. Lift the speaker bracket assembly -

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.



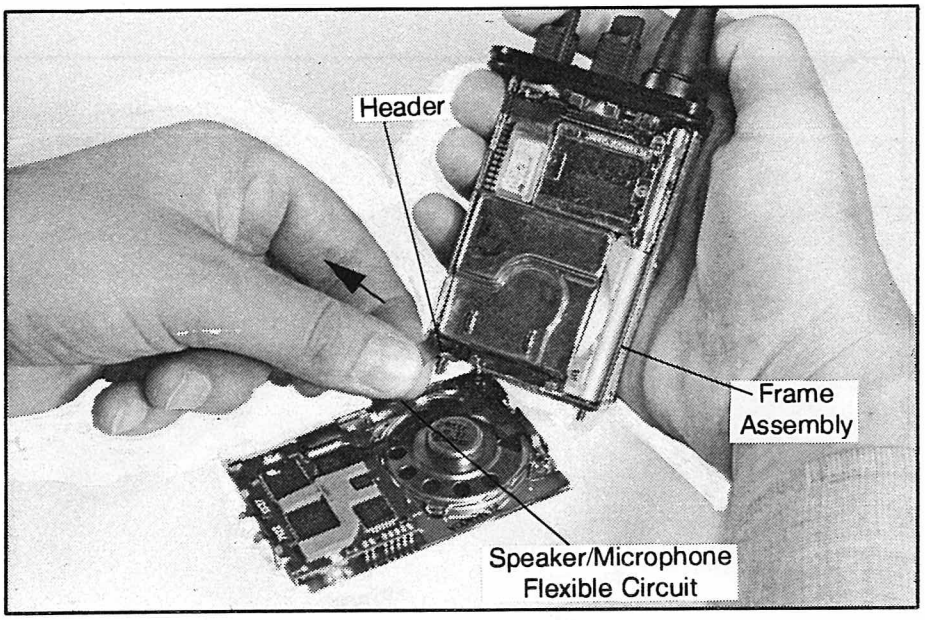
1.7. Disconnect the LCD interconnect flexible circuit -

from the frame assembly by pulling the header straight out and away from the main printed circuit board.
(ON CQP7000 b AND CQP7000 c RADIOS ONLY)



1.8. Disconnect the speaker/microphone flexible circuit -

from the frame assembly by pulling the connector straight out and away from the main printed circuit board.



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.

2. SERVICING MAJOR SUBASSEMBLIES

2.1. 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).

2.2. 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.

2.3. 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 the torque tool; 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 10-position frequency switch would have the top tab aligned with the "7" on the escutcheon. A new frequency knob and insert must be used each time this change is made.

> **NOTE**
>
> There are different detent washers for even or odd numbers of switch positions; see the appropriate exploded view parts lists.

2.4. LCD/SPEAKER ASSEMBLY

The LSD assembly can be replaced on CQP7000 b and CQP7000 c radio PC board assemblies, 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.

2.5. BACKSHIELD ASSEMBLY

Before removing the backshield, ensure that all static electricity 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.

2.6. 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 module 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 electrically testing and/or probing the main circuit board with the back shield removed, always use the three finger screws on the CQP7000 Series housing eliminator service aid to provide grounding to the VCO synthesizer module U300 (two places), and the RF ground clip (one place).

When removing the main circuit board from the frame assembly, do the following:

- Remove the back shield assembly.
- Unplug the PTT/controls flexible circuit.
- Remove power amplifier module U202.
- Remove the two main compression connector screws.
- 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.

2.7. 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 the PTT/controls flex circuit must be lifted or removed for any reason, it must not be readhered to the frame; the flex must be replaced.

2.8. DUAL-FUNCTION SWITCH (S801) AND ACTUATOR ASSEMBLY

Before removing the switch, remove the knob by gently separating the two arms of the switch bracket (located between the switch and the main O-ring seal) and pulling upward on the knob.

Before reinserting the knob, ensure that the slot in the switch is properly aligned with the blade on the knob's shaft.

When the knob is properly inserted, the arms of the switch bracket will snap into position (approximately 5 mm apart), the knob will not be loose in the switch bracket, and the bracket will hold the switch firmly against the inside of the top control panel. If this is not the case, replace the switch bracket.

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 CQP7000 b and CQP7000 c 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 recommended torque driver (RSX4043 Rototorq Tool or equivalent).

- that there is no foreign material on the main O-ring or stud seals.

CAUTION

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

- 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	6680371B34
Back Shield to Frame Screws	2.5	0.28	6680321B79
Bottom Connector to Frame Screws	2.5	0.28	6680321B79
Frequency Switch Spanner Nut	8	0.91	6680370B88
All Module Screws	2.5	0.28	6680321B79
Power Contact Screws	2.5	0.28	6680321B79
Slotted-Spanner Nut (Baseplate)	4	0.45	6680370B89
Top Panel to Frame Screws	2	0.23	6680321B79
Volume Pot Spanner Nut	8	0.91	6680370B88

CHAPTER 7

RADIO FUNCTIONAL TESTS

a) Performance Test

b) Test & Programming Set-up

RADIO FUNCTIONAL TESTS (@ 7.5 Vdc)

CQP7000

TRANSMITTER PERFORMANCE

TEST	SERVICE MONITOR	RADIO	TEST BOX	COMMENTS
REFERENCE FREQUENCY	Set to POWER MONITOR, FREQ.ERROR; frequency to radio transmit frequency; input to RF IN/OUT	Set to channel corresponding to frequency of test	PTT Continuous (during performance check)	Frequency error= ≤450 Hz (vhf) ≤750 Hz (uhf)
RF POWER OUT	Same as above, except set monitor to measure POWER	Set to channel corresponding to frequency and power level under test.	PTT Continuous (during performance check)	RF power output ≥ published specs for channel under test.*
VOICE MODULATION	Same as above, except set monitor to measure DEVIATION	Set to channel corresponding to frequency and power level under test.		Press radio's PTT switch and say "four" loudly into mic. Deviation should be 25kHz: ≥4.0, ≤5.0 kHz 20kHz: ≥3.0, ≤4.0 kHz 12.5kHz: ≥2.0, ≤2.5 kHz

RECEIVER PERFORMANCE

TEST	SERVICE MONITOR	RADIO	TEST BOX	COMMENTS
RATED AUDIO	Set to GENERATOR; frequency to radio receive frequency; 1 mV RF output; 1 kHz modulation; 3 kHz deviation	Set to open squelch	Speaker selector on position "A"; switch to load.	Verify that audio is present; adjust radio volume control to read 3.7 to 3.9 Vac on DVM.
12 dB SINAD	Same as above, except set monitor to measure SINAD	Set to open squelch	Set to speaker load	Reduce RF level to achieve 12 dB SINAD; RF level ≤published specs.

Note: Tests should be performed with Test Box RTX-4005 and associated Test Cable RTK4203.

* RF power levels can be different for each individual channel.

CHAPTER 7a

PERFORMANCE TEST

PERFORMANCE TEST

CQP7000

SPECIAL PRECAUTIONS/INSTRUCTIONS

All parameters are specified at a temperature of 25 ±3°C.
Radio power supply must be set to nominal voltage unless otherwise noted.
Set frequency switch to F1, enable the remote antenna port, and turn the radio volume control switch to "ON" position for all tune and test procedures unless otherwise noted.

TUNING PROCEDURE

All tuning of the CQP7000 series radio is accomplished using an IBM computer and test equipment as defined below. The radio parameters can be monitored via the external connector while tuning the oscillator, RF power deviation, and squelch setting. No manual tuning adjustments are required.

RECOMMENDED TEST EQUIPMENT

Radio Interface Box (RIB)	0180353A74
RIB power supply	EPN4040 (240 V)/ EPN4O41 (220 V)
Programming cable	RTK4203
Digital Voltmeter	General Purpose
Power Supply 15 V 3 A	95D5003-00 or equivalent
Speaker Load Resistor	26 ohm, 1 W
Radio communication Test Set	R2002D

RECEIVER TEST PROCEDURE

NOTES

All generator levels are in dB (closed circuit volts). Perform all tests with a DC supply voltage of 7.5 V ±0.1 V.

Channel spacing (kHz)	Full System deviation (FSD)	60% of FSD
25	±5.0 kHz	±3.0 kHz
20	±4.0 kHz	±2.4 kHz
12.5	±2.5 kHz	±1.5 kHz

20 dB SINAD SENSITIVITY TEST

Apply an on-channel RF signal at a level of 1 mV.
Modulate with a 1 kHz tone at 60% of FSD.
Adjust the volume control for 2.69 RMS across the 26 ohm load.
Set the distortion analyzer for flat response, and establish a zero dB reference on the psophometer.
Switch on the distortion analyzer's 1 kHz band reject filter and adjust for null.
Reduce the generator RF output level until 20 dB SINAD is obtained.
Note the generator RF output level uV, limit: 4.0 uV maximum (any channel).

12 dB SINAD SENSITIVITY TEST

Apply an on-channel RF signal at a level of 1 mV.
Modulate with a 1 kHz tone at 60% FSD.
Adjust the volume control for 3.81 RMS across the 26 ohm load.
Using the distortion analyzer only (no psophometric weighting is used for this test). Reduce the generator RF output until 12 dB SINAD is obtained.
Note the generator RF output level uV PD, limit: 0.3 uV maximum (any channel).

AUDIO POWER OUTPUT AND DISTORTION TEST

Apply an on-channel RF signal at a level of 1 mV.
Modulate with a 1 kHz tone at 60% FSD.
Adjust the volume control for 3.81 RMS across the 26 ohm load.
Measure the audio distortion, limit: 5% maximum (any channel).

RECEIVER HUM AND NOISE TEST

Apply a 1 mV on-channel RF signal.
Modulate with a 1 kHz tone at 60% FSD.
Adjust the volume control for 2.69 RMS across the 26 ohm load.
Set the zero dB reference on the psophometer.
Remove modulation and note the hum and noise level (measured on any chanel) in dB on the psophometer.
Limit: 4.0 uV minimum, 12.5/20/25 kHz CS.

RECEIVER AUDIO RESPONSE TEST

Apply an on-channel 1 mV RF signal.
Modulate with a 1 kHz tone at 20% FDS. See table below.

Channel spacing (kHz)	Full System deviation (FSD)	20% of FSD
25	±5.0 kHz	±1.0 kHz
20	±4.0 kHz	±0.8 kHz
12.5	±2.5 kHz	±0.5 kHz

Use the distortion analyzer (no psophometric weighting is used for this test) to establish a zero dB reference.
Change the modulating frequency to 300 Hz, then to 2550 Hz (12.5 kHz CS) or 2700 Hz (20 and 25 kHz CS), then to 6000 Hz.
Verify that the audio response (relative to the zero dB reference) is within the following limits.

Limits for 12.5 kHz Models:

Frequency	Minimum	Maximum
300 Hz	+7.45 dB	+11.45 dB
2550 Hz	-11.13 dB	-7.13 dB
6000 Hz	N/A	-20.00 dB

Limits for 20/25 kHz Models:

Frequency	Minimum	Maximum
300 Hz	+7.45 dB	+11.45 dB
3000 Hz	-10.12 dB	-7.60 dB
6000 Hz	N/A	-20.00 dB

Limits for 12.5 kHz Models with flat audio option:

Frequency	Minimum	Maximum
300 Hz	-3.0 dB	+1.0 dB
2550 Hz	-3.0 dB	+1.0 dB

Limits for 20/25 kHz Models with flat audio option:

Frequency	Minimum	Maximum
300 Hz	-3.0 dB	+1.0 dB
3000 Hz	-1.5 dB	+1.0 dB

SQUELCH OPENING SENSITIVITY TEST

Use the side control switch to defeat the carrier squelch circuit.
With no RF input signal, adjust the volume control for 1 V RMS of noise on the distortion analyzer.
Set a zero dB reference.
Turn the carrier squelch on and make sure that the noise is muted (typically 50 dB attenuation).
Apply an on-channel unmodulated RF signal and slowly increase the RF level from zero until the radio just unsquelches.
Monitor the amount of noise quieting.
UHF/VHF 9 - 11 dB SINAD; 7 - 9 dBQ

RECEIVER FULL AUDIO CURRENT DRAIN TEST

Apply an on-channel RF signal at a level of 1 mV.
Modulate with 1 kHz at 60% FSD.
Adjust the volume control for 3.81 V RMS across the 26 load.
Measure the current drain from the 7.5 VDC supply with a true RMS AC-plus-DC ammeter.
Limit: 200 mA at any channel.

RECEIVER STANDBY CURRENT DRAIN TEST

With no RF input and the radio muted (carrier squelch on), measure the current drain on any channel with a DC ammeter. Limit: 78 mA.

TRANSMITTER TEST PROCEDURE

NOTE

Perform all tests with a DC supply voltage of 7.5 V ±0.1 V unless otherwise specified.

RF POWER OUTPUT TEST

Measure the RF power output on all channels at supply voltages of 6 VDC, 7.5 VDC, and 9 VDC: Verify that the RF power output is within the following limits:

At a DC supply voltage of 7.5 V:

Rating	Minimum
1.0 W	1.0 W
2.0 W	2.0 W
2.5 W	2.5 W
5.0 W	5.0 W
6.0 W	6.0 W

At a DC supply voltage of 6 and 9 V:

Rating	Minimum	Maximum
2.0 W	1.8 W	4.0 W
2.5 W	2.2 W	4.4 W
6 W/5 W	3.5 W	6.0 W

CURRENT DRAIN TEST

Check the current drain while the transmitter is keyed, using a calibrated ammeter.
Make sure that the current drain on any channel is within the following limits (any channel):

UHF RADIOS:

Rating	Current Drain
2.0 W	1.67 A
5.0 W	2.9 A

VHF RADIOS:

Rating	Current Drain
2.5 W	1.9 A
6.0 W	3.1 A

DEVIATION LIMITING TEST

Apply a 1 kHz tone from an audio oscillator to the microphone audio input, as above, and adjust the oscillator output level to 15 mV RMS.
Switch through all channels and note the deviation of each channel. If postive and negative deviatons are not equal, use the higher rating.
Limit: Between 70% and 100% of FSD on all channels.

DISTORTION TEST

Apply a 1 kHz tone from an audio oscillator to the microphone audio input.
Key the transmitter and adjust the oscillator output level to obtain 60% of FSD on the modulation analyzer. Use the 50 Hz and 15 kHz filters for this test.
Using predisplay 750 microsecond de-emphasis and average detector, measure the distortion with a distortion analyzer connected to the modulation output of the modulation analyzer.
Limit: 10% maximum.

HUM AND NOISE TEST

Apply a 1 kHz audio signal to the microphone audio input.
Key the transmitter and adjust the oscillator output level to obtain 60% FSD.
Using the 300 Hz and 3 kHz filters, and the pre-display 750 microsecond de-emphasis and average detector, set the reference to zero dB.
Remove the oscillator signal in a manner that maintains the 600 ohm source impedance, and read the hum and noise ratio in dB.
Limits: 40 dB minimum for 12.5 kHz, 40 dB minimum for 20 kHz and 25 kHz CS.

AUDIO FREQUENCY RESPONSE TEST

Apply a 1 kHz audio signal to the microphone audio input.
Key the transmitter and adjust the oscillator output level to set the proper deviation.
Using the 15 kHz filter, flat response, and average detector; set the reference to zero dB.
Vary the oscillator frequency to 300 Hz, then 2550 Hz (12.5 kHz CS) or 2700 Hz (20 & 25 kHz CS), then 6000 Hz, and verify that the audio response is within the limits in the following table.

NOTE

If the radio has the flat audio response option, refer to the following table.

Limits for 12.5 kHz Models with flat audio option:

Frequency	Minimum	Maximum
300 Hz	-3.0 dB	+1.0 dB
2550 Hz	-3.0 dB	+1.0 dB
6000 Hz	N/A	-20.00 dB

Limits for 20/25 kHz Models with flat audio option:

Frequency	Minimum	Maximum
300 Hz	-3.0 dB	+1.0 dB
3000 Hz	-3.0 dB	+1.0 dB
5000 Hz	N/A	-20.00 dB

Limits for 12.5 kHz standard models:

Frequency	Minimum	Maximum
300 Hz	-13.45 dB	-9.45 dB
2500 Hz	+5.13 dB	+9.13 dB
6000 Hz	N/A	-20.00 dB

Limits for 20/25 kHz standard models:

Frequency	Minimum	Maximum
300 Hz	-13.45 dB	-9.45 dB
3000 Hz	+7.12 dB	+9.62 dB
6000 Hz	N/A	-20.00 dB

FREQUENCY TEST

Connect a calibrated frequency counter or modulation analyzer to the transmitter RF output via a suitable attentuator.
Make sure that all channels are programmed to the correct frequency.

Verify that the exact frequency (on any channel) is within the following limits for supply voltages:

Band	Tune-Up Error	Total Error at 25°C ±5°C
UHF	750 Hz	.0005%
VHF	750 Hz	.0005%

ENVIRONMENTAL TESTS AND ALLOWABLE DEGRADATION

RECEIVER SPECIFICATIONS

- Over extreme conditions, 20 dB SINAD sensitivity may degrade to 0.5 uV maximum.
- Over extreme conditions, 0.5 W of audio power should be obtained at less than 10% distortion.
- Over extreme conditions (including high humidity), receiver hum and noise may degrade to 35 dB for 12.5 kHz channel spacing models or 40 dB for 20 and 25 kHz channel spacing models.
- Over extreme conditions (including high humidity), the radio should not unsquelch with no RF input signal when the front panel carrier squelch switch is on.

TRANSMITTER SPECIFICATIONS

- Over extreme conditions, the transmitter output power must be within +0.8, -4 dB of rated value.
- Over extreme conditions, deviation limiting should not exceed full system deviation.
- Over extreme conditions, transmitter frequency stability must not exceed the maximum ppm error specified for the reference oscillator used (5 ppm).

NOTE

The expression "extreme conditions" relates to the voltage variations between 6 VDC and 9 VDC and a temperature range of -30°C to +60°C occurring simultaneously.

ALIGNMENT PROCEDURE

CQP7000

SPECIAL PRECAUTIONS/INSTRUCTIONS

All parameters are specified at a temperature of 25 ±3°C.
Radio power supply must be set to nominal voltage unless otherwise noted.
Set frequency switch to F1, enable the remote antenna port, and turn the radio volume control switch to "ON" position for all tune and test procedures unless otherwise noted.

TUNING PROCEDURE

All tuning of the CQP7000 series radio is accomplished using an IBM computer and test equipment as defined below. The radio parameters can be monitored via the external connector while tuning the oscillator, RF power deviation, and squelch setting. No manual tuning adjustments are required.

RECOMMENDED TEST EQUIPMENT

Radio Interface Box (RIB)	0180353A74
RIB power supply	EPN4040 (240 V)/ EPN4O41 (220 V)
Programming cable	RTK4203
Digital Voltmeter	General Purpose
Power Supply 15 V 3 A	95D5003-00 or equivalent
Speaker Load Resistor	26 ohm, 1 W
Radio communication Test Set	R2002D

RECEIVER TEST PROCEDURE

NOTES

All generator levels are in dB (closed circuit volts). Perform all tests with a DC supply voltage of 7.5 V ±0.1 V.

Channel spacing (kHz)	Full System deviation (FSD)	60% of FSD
25	±5.0 kHz	±3.0 kHz
20	±4.0 kHz	±2.4 kHz
12.5	±2.5 kHz	±1.5 kHz

20 dB SINAD SENSITIVITY TEST

Apply an on-channel RF signal at a level of 1 mV.
Modulate with a 1 kHz tone at 60% of FSD.
Adjust the volume control for 2.69 RMS across the 26 ohm load.
Set the distortion analyzer for flat response, and establish a zero dB reference on the psophometer.
Switch on the distortion analyzer's 1 kHz band reject filter and adjust for null.
Reduce the generator RF output level until 20 dB SINAD is obtained.
Note the generator RF output level uV, limit: 4.0 uV maximum (any channel).

12 dB SINAD SENSITIVITY TEST

Apply an on-channel RF signal at a level of 1 mV.
Modulate with a 1 kHz tone at 60% FSD.
Adjust the volume control for 3.81 RMS across the 26 ohm load.
Using the distortion analyzer only (no psophometric weighting is used for this test). Reduce the generator RF output until 12 dB SINAD is obtained.
Note the generator RF output level uV PD, limit: 0.3 uV maximum (any channel).

AUDIO POWER OUTPUT AND DISTORTION TEST

Apply an on-channel RF signal at a level of 1 mV.
Modulate with a 1 kHz tone at 60% FSD.
Adjust the volume control for 3.81 RMS across the 26 ohm load.
Measure the audio distortion, limit: 5% maximum (any channel).

RECEIVER HUM AND NOISE TEST

Apply a 1 mV on-channel RF signal.
Modulate with a 1 kHz tone at 60% FSD.
Adjust the volume control for 2.69 RMS across the 26 ohm load.
Set the zero dB reference on the psophometer.
Remove modulation and note the hum and noise level (measured on any chanel) in dB on the psophometer.
Limit: 4.0 uV minimum, 12.5/20/25 kHz CS.

RECEIVER AUDIO RESPONSE TEST

Apply an on-channel 1 mV RF signal.
Modulate with a 1 kHz tone at 20% FDS. See table below.

Channel spacing (kHz)	Full System deviation (FSD)	20% of FSD
25	±5.0 kHz	±1.0 kHz
20	±4.0 kHz	±0.8 kHz
12.5	±2.5 kHz	±0.5 kHz

Use the distortion analyzer (no psophometric weighting is used for this test) to establish a zero dB reference.
Change the modulating frequency to 300 Hz, then to 2550 Hz (12.5 kHz CS) or 2700 Hz (20 and 25 kHz CS), then to 6000 Hz.
Verify that the audio response (relative to the zero dB reference) is within the following limits.

Limits for 12.5 kHz Models:

Frequency	Minimum	Maximum
300 Hz	+7.45 dB	+11.45 dB
2550 Hz	-11.13 dB	-7.13 dB
6000 Hz	N/A	-20.00 dB

Limits for 20/25 kHz Models:

Frequency	Minimum	Maximum
300 Hz	+7.45 dB	+11.45 dB
3000 Hz	-10.12 dB	-7.60 dB
6000 Hz	N/A	-20.00 dB

Limits for 12.5 kHz Models with flat audio option:

Frequency	Minimum	Maximum
300 Hz	-3.0 dB	+1.0 dB
2550 Hz	-3.0 dB	+1.0 dB

Limits for 20/25 kHz Models with flat audio option:

Frequency	Minimum	Maximum
300 Hz	-3.0 dB	+1.0 dB
3000 Hz	-1.5 dB	+1.0 dB

SQUELCH OPENING SENSITIVITY TEST

Use the side control switch to defeat the carrier squelch circuit.
With no RF input signal, adjust the volume control for 1 V RMS of noise on the distortion analyzer.
Set a zero dB reference.
Turn the carrier squelch on and make sure that the noise is muted (typically 50 dB attenuation).
Apply an on-channel unmodulated RF signal and slowly increase the RF level from zero until the radio just unsquelches.
Monitor the amount of noise quieting.
UHF 9 - 11 dB SINAD; 7 - 9 dBQ

RECEIVER FULL AUDIO CURRENT DRAIN TEST

Apply an on-channel RF signal at a level of 1 mV.
Modulate with 1 kHz at 60% FSD.
Adjust the volume control for 3.81 V RMS across the 26 load.
Measure the current drain from the 7.5 VDC supply with a true RMS AC-plus-DC ammeter.
Limit: 200 mA at any channel.

RECEIVER STANDBY CURRENT DRAIN TEST

With no RF input and the radio muted (carrier squelch on), measure the current drain on any channel with a DC ammeter. Limit: UHF 78.

TRANSMITTER TEST PROCEDURE

NOTE

Perform all tests with a DC supply voltage of 7.5 V ±0.1 V unless otherwise specified.

RF POWER OUTPUT TEST

Measure the RF power output on all channels at supply voltages of 6 VDC, 7.5 VDC, and 9 VDC: Verify that the RF power output is within the following limits:

At a DC supply voltage of 7.5 V:

Rating	Minimum
1.0 W 2.0 W 5.0 W	1.0 W 2.0 W 5.0 W

At a DC supply voltage of 6 and 9 V:

Rating	Minimum	Maximum
2.0 W 6 W/5 W	1.8 W 3.5 W	4.0 W 6.0 W

CURRENT DRAIN TEST

Check the current drain while the transmitter is keyed, using a calibrated ammeter.
Make sure that the current drain on any channel is within the following limits (any channel):

Rating	Current Drain
2.0 W	1.67 A
5.0 W	2.9 A

DEVIATION LIMITING TEST

Apply a 1 kHz tone from an audio oscillator to the microphone audio input, as above, and adjust the oscillator output level to 15 mV RMS.
Switch through all channels and note the deviation of each channel. If postive and negative deviatons are not equal, use the higher rating.
Limit: Between 70% and 100% of FSD on all channels.

DISTORTION TEST

Apply a 1 kHz tone from an audio oscillator to the microphone audio input.
Key the transmitter and adjust the oscillator output level to obtain 60% of FSD on the modulation analyzer. Use the 50 Hz and 15 kHz filters for this test.
Using predisplay 750 microsecond de-emphasis and average detector, measure the distortion with a distortion analyzer connected to the modulation output of the modulation analyzer.
Limit: 10% maximum.

HUM AND NOISE TEST

Apply a 1 kHz audio signal to the microphone audio input.
Key the transmitter and adjust the oscillator output level to obtain 60% FSD.
Using the 300 Hz and 3 kHz filters, and the pre-display 750 microsecond de-emphasis and average detector, set the reference to zero dB.
Remove the oscillator signal in a manner that maintains the 600 ohm source impedance, and read the hum and noise ratio in dB.
Limits for UHF: 40 dB minimum for 12.5 kHz, 40 dB minimum for 20 kHz and 25 kHz CS.

AUDIO FREQUENCY RESPONSE TEST

Apply a 1 kHz audio signal to the microphone audio input.
Key the transmitter and adjust the oscillator output level to set the proper deviation.
Using the 15 kHz filter, flat response, and average detector; set the reference to zero dB.
Vary the oscillator frequency to 300 Hz, then 2550 Hz (12.5 kHz CS) or 2700 Hz (20 & 25 kHz CS), then 6000 Hz, and verify that the audio response is within the limits in the following table.

NOTE

If the radio has the flat audio response option, refer to the following table.

Limits for 12.5 kHz Models with flat audio option:

Frequency	Minimum	Maximum
300 Hz	-3.0 dB	+1.0 dB
2550 Hz	-3.0 dB	+1.0 dB
6000 Hz	N/A	-20.00 dB

Limits for 20/25 kHz Models with flat audio option:

Frequency	Minimum	Maximum
300 Hz	-3.0 dB	+1.0 dB
3000 Hz	-3.0 dB	+1.0 dB
6000 Hz	N/A	-20.00 dB

Limits for 12.5 kHz standard models:

Frequency	Minimum	Maximum
300 Hz	-13.45 dB	-9.45 dB
2500 Hz	+5.13 dB	+9.13 dB
6000 Hz	N/A	-20.00 dB

Limits for 20/25 kHz standard models:

Frequency	Minimum	Maximum
300 Hz	-13.45 dB	-9.45 dB
3000 Hz	+7.12 dB	+9.62 dB
6000 Hz	N/A	-20.00 dB

FREQUENCY TEST

Connect a calibrated frequency counter or modulation analyzer to the transmitter RF output via a suitable attentuator.
Make sure that all channels are programmed to the correct frequency.

Verify that the exact frequency (on any channel) is within the following limits for supply voltages:

Band	Tune-Up Error	Total Error at 25°C ±5°C
UHF	750 Hz	.0005%

ENVIRONMENTAL TESTS AND ALLOWABLE DEGRADATION

RECEIVER SPECIFICATIONS

- Over extreme conditions, 20 dB SINAD sensitivity may degrade to 0.5 uV maximum.
- Over extreme conditions, 0.5 W of audio power should be obtained at less than 10% distortion.
- Over extreme conditions (including high humidity), receiver hum and noise may degrade to 35 dB for 12.5 kHz channel spacing models or 40 dB for 20 and 25 kHz channel spacing models.
- Over extreme conditions (including high humidity), the radio should not unsquelch with no RF input signal when the front panel carrier squelch switch is on.

TRANSMITTER SPECIFICATIONS

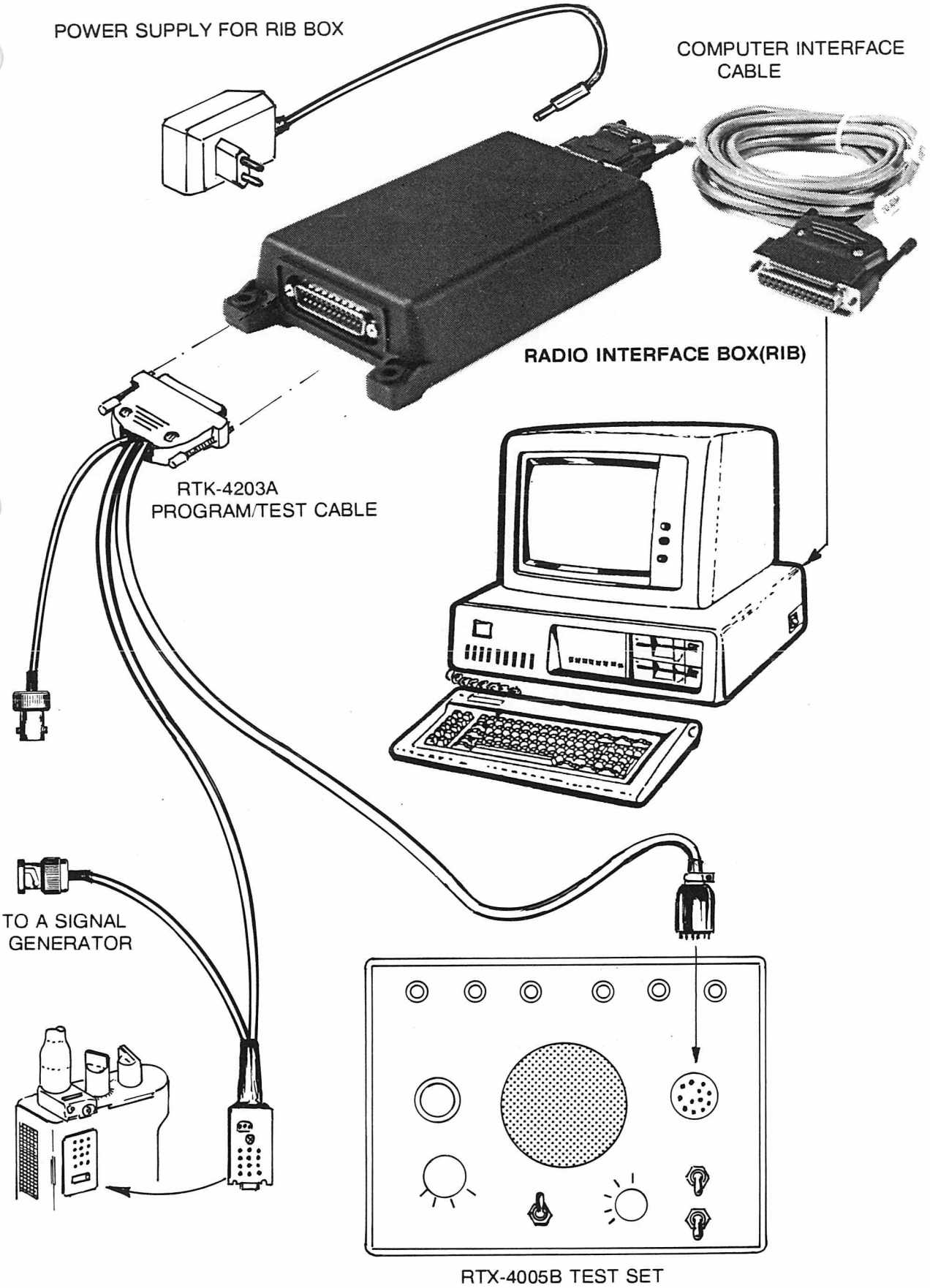
- Over extreme conditions, the transmitter output power must be within +0.8, -4 dB of rated value.
- Over extreme conditions, deviation limiting should not exceed full system deviation.
- Over extreme conditions, transmitter frequency stability must not exceed the maximum ppm error specified for the reference oscillator used (5 ppm).

NOTE

The expression "extreme conditions" relates to the voltage variations between 6 VDC and 9 VDC and a temperature range of -30°C to +60°C occurring simultaneously.

CHAPTER 7b

TEST & PROGRAMMING SET-UP



TEST AND PROGRAMMING SET-UP

M405.546

CIRCUIT DESCRIPTION

CQP7000

RECEIVER

The input signal enters the filter/detector/switch (FDS) module (U203) via either the standard antenna port or the remote antenna port. The FDS module uses pin diodes for switching and has a 0.5 dB insertion loss on receiver ports. In the receive mode, the signal is then passed on to the receiver front end module.

FRONT END

The receiver front end module (U2) consists of a three-pole stripline filter, an RF amplifier, a four-pole stripline filter, a passive, double-balanced mixer, an IF amplifier, and a four-pole crystal filter. The IF frequency is: UHF 73.35, VHF 53.35 MHz. The signal first enters the three-pole stripline filter, which has an insertion loss of 1 dB and a bandwidth of 30 MHz. After the three-pole filter, the signal enters the RF amplifier, supplying a gain of 10 dB, and having less than a 2 dB noise figure. The signal then goes through the four-pole stripline filter, which has an insertion loss of 3.5 dB and a bandwidth of 30 MHz. The first injection signal, using low-side injection, enters the mixer at a level of +5 dBm. The mixer is a passive Schottky ring diode, followed by a duplexer; This gives a constant 50 ohm termination for the mixer. The IF (UHF 73.35, VHF 53.35 MHz) signal goes into IF amplifier with a gain of 10 dB and a noise figure of less than 2 dB. After the amplifier, the signal is fed to the crystal filter, which has an insertion loss of 4 dB and a bandwidth of 15 kHz.

IF (INTERMEDIATE FREQUENCY) IC (U100)

The output of the crystal filter is matched to the input of the IF pre-amp in the IF IC (U100). The output of the pre-amp goes through a matching circuit to the second mixer input. The second injection signal is sent from synthesizer, (U300) pin 32, into pin 11 of the IF IC. This signal has an amplitude of approximately 250 mV rms. The synthesizer has the ability to supply a signal at 450 kHz of the IF frequency. The second mixer output exits the module and passes through FL3, a 15 kHz wide, 450 kHz ceramic filter. The filter output re-enters the module and goes through the IF amplifier. It then back out of the IC to pass through a 450 kHz ceramic filter with a 20 kHz bandwith (15 kHz for 12.5 kHz). The ceramic filter is FL4 for UHF radios and FL2 for VHF radios. The output of the filter goes into the IC and on to the limiter.

The signal out of the limiter goes into the PLL discriminator. The VCO frequency of this demodulation is set by resistor R3 on pin 29 of the IC. The audio output signal goes through an audio amplifier and then into the audio filter IC (U101).

SQUELCH CIRCUIT

The audio signal is fed through an internal resistor out of the IF IC and into the filter network consisting of resistors R4 and R5, and capacitors C12 and C13. The output signal goes into a noise amplifier in the IF IC. The signal is then fed into a four-bit attenuator in the CMOS audio filter by the IC (U101). The attenuator is set by the microprocessor (U400) to correspond to a preset SINAD level for squelch opening. The attenuated limited noise goes into the IF IC and through a squelch rectifier into a hysteresis comparator and a squelch tail circuit. The noise also feeds a speed-up and channel comparator circuit. The output of this circuit of the IF IC supplies the fast squelch signal for the microprocessor. The microprocessor supplies an adapt pulse to the IF IC to make a quicker decision on signal strength.

AUDIO FILTER IC (U101)

The recovered audio signal comes from the IF IC to the CMOS audio filter IC, which uses switched capacitor filters for audio shaping. This method ensures that accurate audio shaping is maintained regardless of piece part tolerances. The voice audio signal first encounters an anti-aliasing low-pass filter with a corner frequency of 3.5 kHz. The signal then goes through a 300 Hz high-pass filter to reject PL tones. The next filter has a dual input, one for the processed audio, and one for the internal alert tone generator. This filter is the de-emphasis filter with a corner at 212 Hz. The output signal then goes into a low-pass filter with a corner frequency of 10 kHz. The output of this filter goes both to a buffer amplifier and to an 8-bit volume attenuator. The output of the attenuator is then buffered. The processed audio signal goes through an RC filter to reduce noise input to the audio power amplifier IC.

AUDIO POWER AMPLIFIER IC (U102)

The signal from the audio filter IC (U101) feeds three parallel amplifiers. One amplifier is always on. This output feeds one common terminal of the internal speaker and, pin 1 of the universal connector, which is one terminal of the external speaker. The other two amplifiers are turned on or off depending on whether the internal or external speaker is enabled.

TRANSMITTER

The exciter for the transmitter is the synthesizer (U300). A ±5 ppm reference frequency signal (±2 ppm optional) is supplied by the reference oscillator. The absolute frequency of the reference oscillator is set via the digital/analog converter (D/A) IC (U200), which provides adjustment by converting the digital word from the microprocessor to a proportional dc tuning voltage. The IF IC (U100), which includes regulator #1, supplies the reference 5 V for the D/A IC and the reference oscillator. The synthesizer has its own internal regulators, and only obtains switched B + from the radio board. The synthesizer supplies a signal of approximately +5 dBm to the input of U202, the RF power amplifier. Raw B + is supplied directly from the battery terminals to the power amplifier. Switched B + is also supplied to the power amplifier by transistor Q204, which is switched from the ALC IC (U201). The RF power output level from the RF power amplifier is set by the control loop inside the ALC IC (U201). After a successful programming cycle, the D/A IC will set a reference voltage on the ALC IC (U201). This feeds the positive side of the loop comparator. The negative side is fed from the RF detector in the FDS module (U203).

DETECTOR

The reference voltage for the detector is set by the TX 5 V from U201 being switched through the multiplexer in the D/A IC into the FDS (U203). This allows the system to rebias the RF detector from the normal higher power level to a selected level. The detector voltage goes into the negative comparator input of the ALC IC (U201).

PROTECTION CIRCUITS

There are several protection circuits in the ALC IC (U201). The temperature sense will reduce the RF output to below a level which would sustain a 120°C temperature. The TX 5 V (from U201) is fed through a resistor, then into a thermistor to ground in the RF power amplifier. The voltage of this divider is monitored by the ALC IC (U201). Once this voltage falls below a set voltage, the power amplifier temperature is at or above 120°C, and the IC will increase the internal reference voltage in order to reduce the output RF level significantly.

Once this happens, the hysteresis in the comparator forces the power amplifier temperature to fall well below the trip point before normal operation is resumed. Another feature of the ALC IC is a red RF-detect LED. If the RF detector voltage is above the trip point, the ALC IC (U201) tells the microprocessor (U400) to turn on the red LED.

FDS (U203)

The RF power from the power amplifier goes into the FDS module (U203) and passes through a coupler, a low-pass filter, and then into a four-port RF PIN diode switch in the FDS module (U203). The coupler feeds a signal to the RF detector diodes proportional to the forward RF power. The RF forward power is converted into a dc signal which is supplied to the ALC IC (U201). Transistors are used to switch supply current to select the standard or the remote antenna port. In the transmit mode, the pin diode current is set by the current sink at pin 26 of the ALC IC (U201). In the receive mode, the current is set by the receiver front end. After the detector circuit is a low-pass, 7-pole elliptical filter providing a minimum of -45 dB attenuation to transmitter harmonics.

MODULATION

The modulation path is through either the internal or the external microphone. The signal passes through a pre-amp in the audio power amplifier (U102) and into the audio filter IC (U101), where it continues through a pre-emphasis/limiter circuit. From the limiter output, the signal goes through a splatter filter to a summer. This sums the MIC inputs with the AUX TX input and the PL/5-tone encode signal. The summer output goes through a buffer into two attenuaters. A five-bit attenuator adjusts the VCO modulation level, and a four-bit attenuator adjusts the reference modulation for the 2-port modulation system.

POWER AMPLIFIER (U202)

The power amplifier (U202) will provide 38 dB of gain for a 6.8 Watt power output (5 Watt radio) with approximately 8 dB of dynamic gain adjustment, in order to provide for a 1 or 2 Watt radio. A low-power amplifier which will provide 100 mW, 1 W, or 2 W of output power is also available. The input stage is a resistive-matched Class A buffer, which is supplied by a regulated voltage from the TX ALC IC (U201). The driver is a Class B stage using an RF bypassed emitter resistor. The collector of the driver is driven by the ALC loop. The remaining two stages are typical Class C stages, connected directly to the battery to minimize voltage drops due to high current requirements.

SIGNALLING FUNCTIONS

In the receive mode, the recovered audio from the IF IC (U100) is coupled to the signalling IC (U700) through pin 31. The signal is applied to the decode filter, which consists of a 4-pole low-pass filter, a 4-pole high-pass filter, and a programmable hysteresis limiter. The filter extracts the signalling tones above 800 Hz and below 3 kHz, and the limiter squares the waveforms to supply the signal to the microprocessor (U400) at pin 43.

The decoder software collects the data coming in and statistically compares it with the data programmed in the code plug, using the Dolikian algorithm. On determining the presence of a valid tone and sequence, the microprocessor broadcasts a serial bus message and takes the appropriate action (unmute, call alert, etc.).

In the transmit mode, the software generates a clock signal which is a function of the frequency of the tone to be generated. This clock signal is supplied at pin 35 of U400, and coupled to pin 9 of the signalling IC (U700). The clock signal drives a system of flip flops that are programmed to one of several possible configurations, depending on the frequency to be generated. The output of the flip flops has multistates, and its magnitude is programmable.

This output is directed two directions. One goes to the AUX RX input of audio IC (U101), if the side tones are enabled, and the other goes to the AUX TX input of U101.

The multistate output from the flips flops is rich in harmonics, and is therefore fed through the splatter filter in the audio IC (U101). This filters all harmonics above 3 kHz. The filtered tone is summed up with the PL in the summer, and the buffered output is applied to the two attenuaters that form the two-port modulation system.

DISPLAY BOARD (FOR CQP7000b AND CQP7000c)

U502 is the COPE HC11 single chip microcomputer. COPE is an acronym for Control Of Peripheral Electronics. Its functions include: reading the 3x5 keypad, sending information to be displayed to the LCD driver IC (U504), communicating with the CORE (an acronym for Control Of Radio Electronics) microcomputer (U400) and other computers on the serial bus, accessing information (read/write) in the external EEPROM device (U501), controlling the DTMF tone generator (U505), and controlling the LCD backlight. Crystal Y502, with adjacent components, controls the HC11's clock oscillator.

U501 is the external EEPROM (8k) device. It stores radio specific information such as channel data used to program the radio's main board IC's. U501 also contains instructions written in a customized menu language for display/keypad menu operation, and display vernacular such as alphanumeric channel names to be displayed. A CMOS serial shift register (U503) with parallel outputs supplies the upper eight-bits of address to U501.

The DTMF tone generator (U505) is controlled via U502. Crystal Y501 is a crystal which controls the DTMF tone frequencies. The DTMF oscillator is turned on only when tone sequences are being generated.

The LCD driver IC (U504) is also controlled from the COPE U502 HC11. Resistors R507 and R511 form a voltage divider used to set the drive level to the LCD.

CIRCUIT DESCRIPTION

CQP7000

RECEIVER

The input signal enters the filter/detector/switch (FDS) module (U203) via either the standard antenna port or the remote antenna port. The FDS module uses pin diodes for switching and has a 0.5 dB insertion loss on receiver ports. In the receive mode, the signal is then passed on to the receiver front end module.

FRONT END

The receiver front end module (U2) consists of a three-pole stripline filter, an RF amplifier, a four-pole stripline filter, a passive, double-balanced mixer, an IF amplifier, and a four-pole crystal filter. The IF frequency is 73.35 MHz. The signal first enters the three-pole stripline filter, which has an insertion loss of 1 dB and a bandwidth of 30 MHz. After the three-pole filter, the signal enters the RF amplifier, supplying a gain of 10 dB, and having less than a 2 dB noise figure. The signal then goes through the four-pole stripline filter, which has an insertion loss of 3.5 dB and a bandwidth of 30 MHz. The first injection signal, using low-side injection, enters the mixer at a level of +5 dBm. The mixer is a passive Schottky ring diode, followed by a duplexer; This gives a constant 50 ohm termination for the mixer. The IF (73.35 MHz) signal goes into IF amplifier with a gain of 10 dB and a noise figure of less than 2 dB. After the amplifier, the signal is fed to the crystal filter, which has an insertion loss of 4 dB and a bandwidth of 15 kHz.

IF (INTERMEDIATE FREQUENCY) IC (U100)

The output of the crystal filter is matched to the input of the IF pre-amp in the IF IC (U100). The output of the pre-amp goes through a matching circuit to the second mixer input. The second injection signal is sent from synthesizer, (U300) pin 32, into pin 11 of the IF IC. This signal has an amplitude of approximately 250 mV rms. The synthesizer has the ability to supply a signal at 450 kHz of the IF frequency. The second mixer output exists the module and passes through FL3, a 15 kHz wide, 450 kHz ceramic filter. The filter output re-enters the module and goes through the IF amplifier and then back put of the IC to pass through FL4, a 20 kHz wide, 450 kHz ceramic filter. The output of the filter goes into the IC and on to the limiter.

The signal out of the limiter goes into the PLL discriminator. The VCO frequency of this demodulation is set by resistor R3 on pin 29 of the IC. The audio output signal goes through an audio amplifier and then into the audio filter IC (U101).

SQUELCH CIRCUIT

The audio signal is fed through an internal resistor out of the IF IC and into the filter network consisting of resistors R4 and R5, and capacitors C12 and C13. The output signal goes into a noise amplifier in the IF IC. The signal is then fed into a four-bit attenuator in the CMOS audio filter by the IC (U101). The attenuator is set by the microprocessor (U400) to correspond to a preset SINAD level for squelch opening. The attenuated limited noise goes into the IF IC and through a squelch rectifier into a hysteresis comparator and a squelch tail circuit. The noise also feeds a speed-up and channel comparator circuit. The output of this circuit of the IF IC supplies the fast squelch signal for the microprocessor. The microprocessor supplies an adapt pulse to the IF IC to make a quicker decision on signal strength.

AUDIO FILTER IC (U101)

The recovered audio signal comes from the IF IC to the CMOS audio filter IC, which uses switched capacitor filters for audio shaping. This method ensures that accurate audio shaping is maintained regardless of piece part tolerances. The voice audio signal first encounters an anti-aliasing low-pass filter with a corner frequency of 3.5 kHz. The signal then goes through a 300 Hz high-pass filter to reject PL tones. The next filter has a dual input, one for the processed audio, and one for the internal alert tone generator. This filter is the de-emphasis filter with a corner at 212 Hz. The output signal then goes into a low-pass filter with a corner frequency of 10 kHz. The output of this filter goes both to a buffer amplifier and to an 8-bit volume attenuator. The output of the attenuator is then buffered. The processed audio signal goes through an RC filter to reduce noise input to the audio power amplifier IC.

AUDIO POWER AMPLIFIER IC (U102)

The signal from the audio filter IC (U101) feeds three parallel amplifiers. One amplifier is always on. This output feeds one common terminal of the internal speaker and, pin 1 of the universal connector, which is one terminal of the external speaker. The other two amplifiers are turned on or off depending on whether the internal or external speaker is enabled.

TRANSMITTER

The exciter for the transmitter is the synthesizer (U300). A ±5 ppm reference frequency signal (±2 ppm optional) is supplied by the reference oscillator. The absolute frequency of the reference oscillator is set via the digital/analog converter (D/A) IC (U200), which provides adjustment by converting the digital word from the microprocessor to a proportional dc tuning voltage. The IF IC (U100), which includes regulator #1, supplies the reference 5 V for the D/A IC and the reference oscillator. The synthesizer has its own internal regulators, and only obtains switched B+ from the radio board. The synthesizer supplies a signal of approximately +5 dBm to the input of U202, the RF power amplifier. Raw B+ is supplied directly from the battery terminals to the power amplifier. Switched B+ is also supplied to the power amplifier by transistor Q204, which is switched from the ALC IC (U201). The RF power output level from the RF power amplifier is set by the control loop inside the ALC IC (U201). After a successful programming cycle, the D/A IC will set a reference voltage on the ALC IC (U201). This feeds the positive side of the loop comparator. The negative side is fed from the RF detector in the FDS module (U203).

DETECTOR

The reference voltage for the detector is set by the TX 5 V from U201 being switched through the multiplexer in the D/A IC into the FDS (U203). This allows the system to rebias the RF detector from the normal higher power level to a selected level. The detector voltage goes into the negative comparator input of the ALC IC (U201).

PROTECTION CIRCUITS

There are several protection circuits in the ALC IC (U201). The temperature sense will reduce the RF output to below a level which would sustain a 120°C temperature. The TX 5 V (from U201) is fed through a resistor, then into a thermistor to ground in the RF power amplifier. The voltage of this divider is monitored by the ALC IC (U201). Once this voltage falls below a set voltage, the power amplifier temperature is at or above 120°C, and the IC will increase the internal reference voltage in order to reduce the output RF level significantly.

Once this happens, the hysteresis in the comparator forces the power amplifier temperature to fall well below the trip point before normal operation is resumed. Another feature of the ALC IC is a red RF-detect LED. If the RF detector voltage is above the trip point, the ALC IC (U201) tells the microprocessor (U400) to turn on the red LED.

FDS (U203)

The RF power from the power amplifier goes into the FDS module (U203) and passes through a coupler, a low-pass filter, and then into a four-port RF PIN diode switch in the FDS module (U203). The coupler feeds a signal to the RF detector diodes proportional to the forward RF power. The RF forward power is converted into a dc signal which is supplied to the ALC IC (U201). Transistors are used to switch supply current to select the standard or the remote antenna port. In the transmit mode, the pin diode current is set by the current sink at pin 26 of the ALC IC (U201). In the receive mode, the current is set by the receiver front end. After the detector circuit is a low-pass, 7-pole elliptical filter providing a minimum of -45 dB attenuation to transmitter harmonics.

MODULATION

The modulation path is through either the internal or the external microphone. The signal passes through a pre-amp in the audio power amplifier (U102) and into the audio filter IC (U101), where it continues through a pre-emphasis/limiter circuit. From the limiter output, the signal goes through a splatter filter to a summer. This sums the MIC inputs with the AUX TX input and the PL/5-tone encode signal. The summer output goes through a buffer into two attenuaters. A five-bit attenuator adjusts the VCO modulation level, and a four-bit attenuator adjusts the reference modulation for the 2-port modulation system.

POWER AMPLIFIER (U202)

The power amplifier (U202) will provide 38 dB of gain for a 6.8 Watt power output (5 Watt radio) with approximately 8 dB of dynamic gain adjustment, in order to provide for a 1 or 2 Watt radio. A low-power amplifier which will provide 100 mW, 1 W, or 2 W of output power is also available. The input stage is a resistive-matched Class A buffer, which is supplied by a regulated voltage from the TX ALC IC (U201). The dirver is a Class B stage using an RF bypassed emitter resistor. The collector of the driver is driven by the ALC loop. The remaining two stages are typical Class C stages, connected directly to the battery to minimize voltage drops due to high current requirements.

SIGNALLING FUNCTIONS

In the receive mode, the recovered audio from the IF IC (U100) is coupled to the signalling IC (U700) through pin 31. The signal is applied to the decode filter, which consists of a 4-pole low-pass filter, a 4-pole high-pass filter, and a programmable hysteresis limiter. The filter extracts the signalling tones above 800 Hz and below 3 kHz, and the limiter squares the waveforms to supply the signal to the microprocessor (U400) at pin 43.

The decoder software collects the data coming in and statistically compares it with the data programmed in the code plug, using the Dolikian algorithm. On determining the presence of a valid tone and sequence, the microprocessor broadcasts a serial bus message and takes the appropriate action (unmute, call alert, etc.).

In the transmit mode, the software generates a clock signal which is a function of the frequency of the tone to be generated. This clock signal is supplied at pin 35 of U400, and coupled to pin 9 of the signalling IC (U700). The clock signal drives a system of flip flops that are programmed to one of several possible configurations, depending on the frequency to be generated. The output of the flip flops has multistates, and its magnitude is programmable.

This output is directed two directions. One goes to the AUX RX input of audio IC (U101), if the side tones are enabled, and the other goes to the AUX TX input of U101.

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DISPLAY BOARD (FOR CQP7000b AND CQP7000c)

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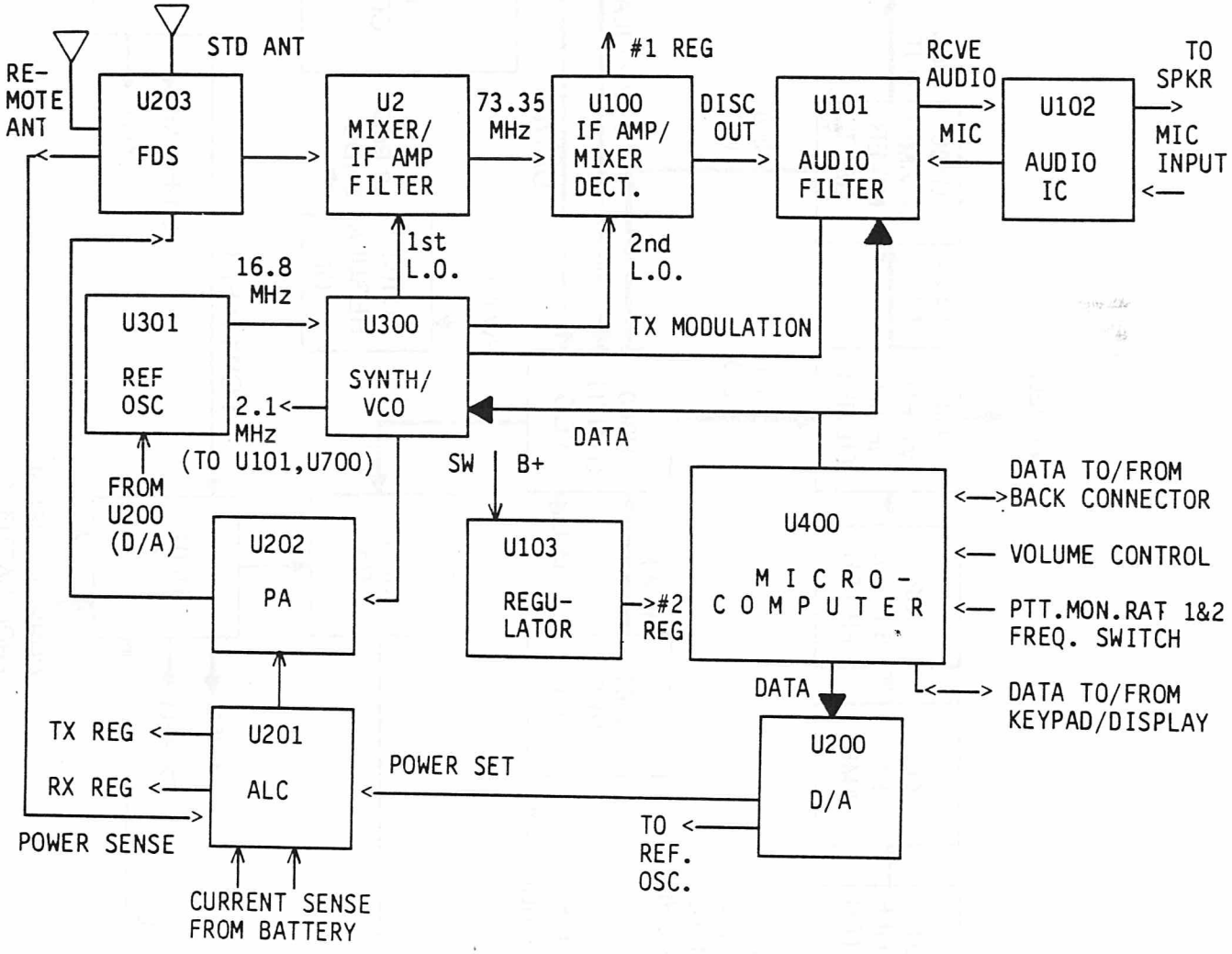

CQP7000 UHF BLOCKDIAGRAM

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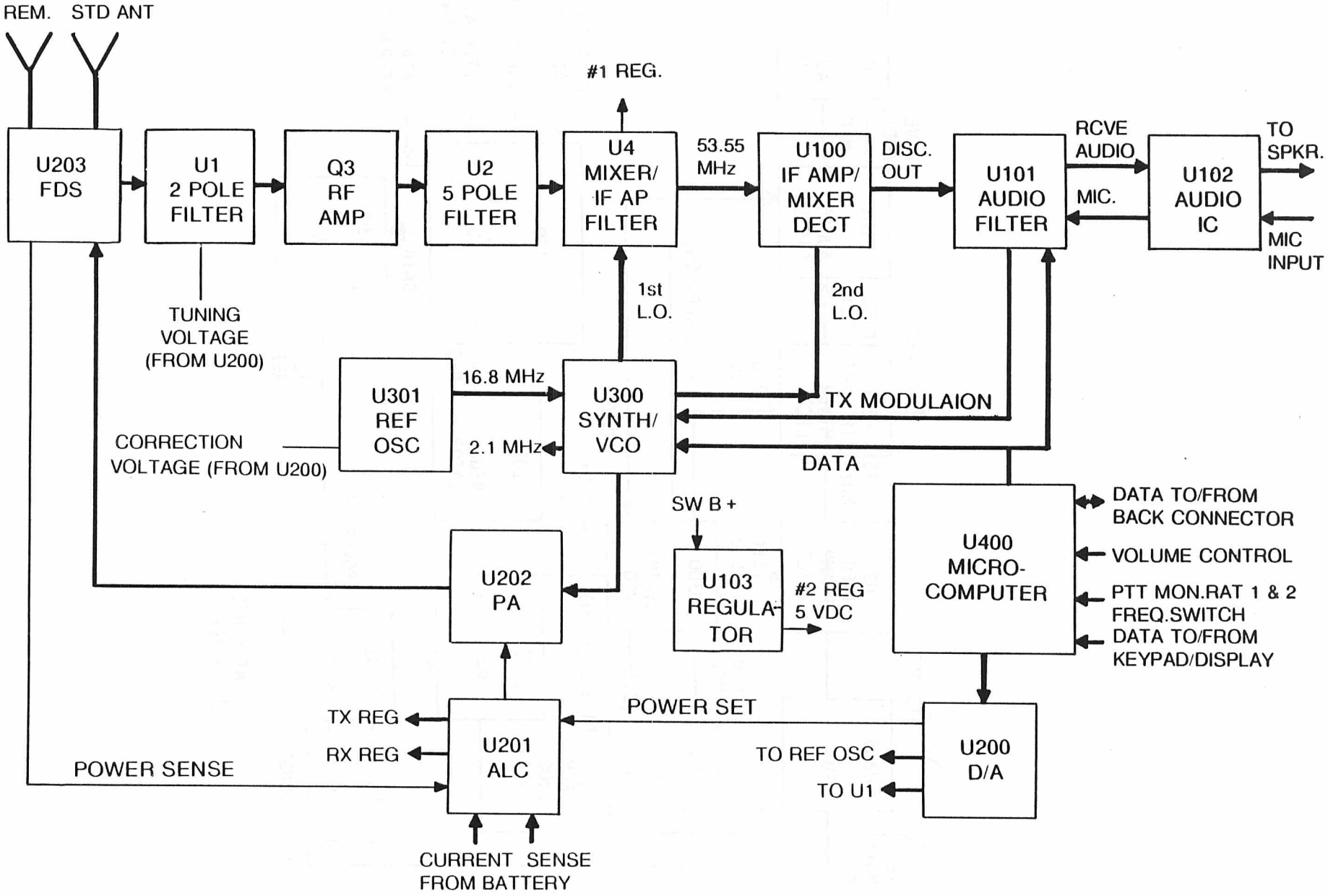


CQP7000 VHF BLOCKDIAGRAM

D405.307

INDEX II

CQP7000

MAINTENANCE MANUAL

VOLUME I

DIAGRAMS AND PART LISTS OVERVIEW

CQP7000 - VHF

CHAPTER 1a

CQP7000 VHF

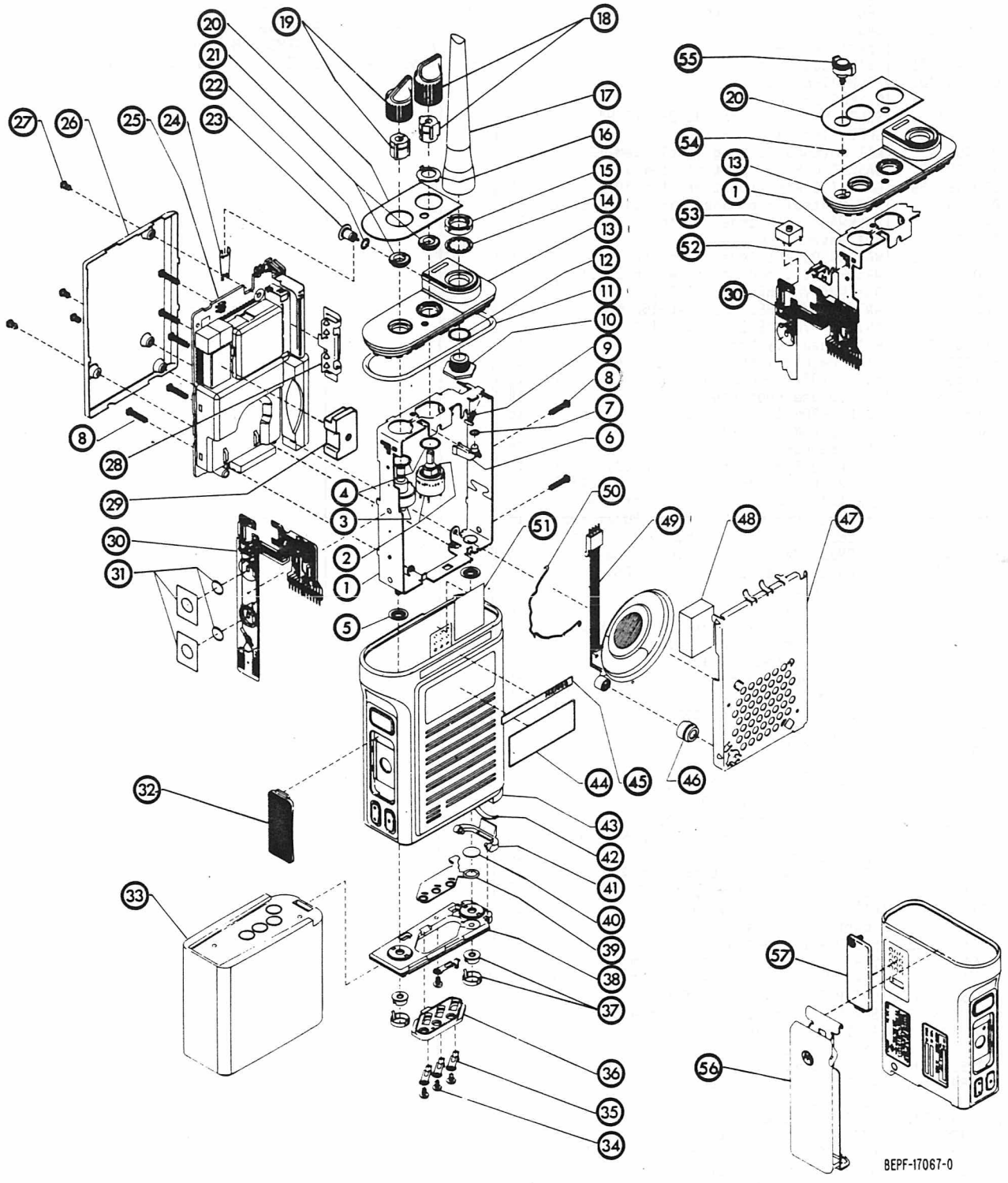
Mechanical Parts List

Exploded View

DATE: 9/26/1988

Pos	Code No	Description	Qt
1	RPX4695A	ASMBL. Frame Stud (incl. item 5)	1
2	RPX4689A	KIT Freq. Sw. (S823) (incl. item 4)	1
3	RPX4690A	KIT On/Off Switch (S800)/Vol. Contr.	1
		(R800) (includes item 4)	1
4	3205082E62	GASKET O-Ring	2
		(part of items 2 and 3)	2
5	3205422Q01	SEAL Stud (part of item 1)	2
6	6105436Q01	LIGHTPIPE LED	1
7	3205082E59	GASKET O-Ring	1
8	0305714J09	SCREW Module Ph Pan Hd 2-56x3/8"	7
9	0305381L02	SCREW Top Panel; 2-32	2
10	RPX4693A	KIT Anten. Bushing (incl. item 12)	1
11	3205082E71	GASKET O-Ring (part of item 13)	1
12	3205082E58	GASKET O-Ring (part of item 10)	1
13	RPX4692A	KIT Control Top Panel (incl item 11)	1
14	0400139731	LOCKWASHER Internal Tooth	1
15	0205591R01	NUT Antenna Bushing	1
16	0405781Q01	WASHER Detent (even no. of sw. pos.)	1
16	0405781Q03	WASHER Det. (odd no. of switch pos)	1
17	EAD6471	ANTENNA VHF HELICAL (136-150.8 MHz)	1
17	EAD6472	ANTENNA VHF Helical (146-162 MHz)	1
17	EAD6473	ANTENNA VHF Helical (152-174 MHz)	1
18	RPX4699A	KIT Frequency Knob	1
19	RPX4698A	KIT On/Off/Volume Knob	1
20	1305622Q02	ESCUTCHEON 10-Frequency	1
20	1305622Q12	ESCUTCHEON 10-Frequency Emergency	1
20	1305622Q05	ESCUTCHEON 10-Frequency Submersible	1
20	1305622Q14	ESCUTCHEON 10-Freq Emerg Submersible	1
21	0205916P01	NUT Spanner	2
22	3205082E61	GASKET O-Ring (part of item 23)	1
23	RPX4691A	KIT RF Connect. (incl. items 22 24)	1
24	4205852N01	CONTACT Ground RF (part of item 23)	1
25	NLD8230A	ASSEMBLY VHF Main PC Board 20/25kHz	1
25	NLD8250A	ASSEMBLY VHF Main PC Board 12.5kHz	1
26	NTN4647A	ASSEMBLY Back Shield (incl item 27)	1
27	0305706Q01	SCREW Captive	4
		(part of item 26)	1
28	4205577Q01	CLIP Ground	1
29	1405343S01	BOOT Oscillator	1
30	RPX4700A	KIT PTT/Controls Flex (incl item 31)	1
30	RPX4701A	KIT PTT/Controls Flex Assembly	1
		(includes items 2 3 31)	2
31	RPX4694A	KIT Contact Snapdome (S803 , 805)	2
		(part of item 30)	1
32	4505022P02	LEVER PTT	1
33	NTN4537A	BATTERY 500 mAh 220 V AC	1
33	NTN4538A	BATTERY 900 mAh 220 V AC	1
33	NTN4592A	BATTERY 500 mAh 220 V AC	1
33	NTN4593A	BATTERY 900 mAh 220 V AC	1
33	NTN4595A	BATTERY 1500 mAh 220 V AC	1
33	NTN4596A	BATTERY 1500 mAh 220 V AC	1
34	0305706Q02	SCREW Baseplate Ph Pan Hd 2-56x3/32"	4
		(part of item 43)	4
35	3905453Q01	CONTACT Power	4
		(part of item 43)	2
36	4205437Q01	RETAINER Baseplate (part of item 43)	1
37	RPX4696A	KIT Slotted Spanner Nut	2
		(part of item 43)	1
38	6405847N03	BASEPLATE (part of item 43)	1
39	3205701Q01	SEAL Elastomer (part of item 43)	1
40	3205472M01	SEAL Vacuum Port (part of item 43)	1
41	5505333Q01	LATCH Battery (part of item 43)	1
42	4105775Q01	SPRING Latch (part of ite	1
43	NHN6395A	ASSEMBLY Housing	1
		(incl. items 34 thru 42)	1
43	NHN6393A	ASSEMBLY Housing Submersible	1
		(incl. items 34 thru 42)	1
44	3305183R01	LABEL Bottom Nameplate	1
45	3305183R04	LABEL Top Nameplate	1
46	1405490Q01	BOOT Microphone	1
47	RPX4697A	KIT LS Brack. (incl. item 48)	1
48	7505641N03	PAD LS Bracket (part of item 47)	1
49	0105958M34	ASSEMBLY LS/ Mic. Flex	1
50	4205604Q01	RETAINER LS	1
51	1405182M03	INSULATOR Universal Connector	1
52	0705319R02	BRACKET Switch (optional)	1
53	4005221R02	SWITCH Dual-Func.(S801)(optional)	1
54	3205082E68	GASKET O-Ring (optional)	1
54	3205082E68	GASKET O-Ring (optional)	1
56	4305607S01	PLUG Seal	1

Pos	Code No	Description	Qt
55	NTN5076A	KIT Push-Only Knob (incl. item 54)	
55	NTN5068A	KIT Push-and-Rotate Knob	
		(incl. item 54)	1
55	NTN5069A	KIT Rotate-Only Knob (incl.item 54)	1
55	4305607S01	PLUG Seal	1
56	NTN4741A	ASSEMBLY Belt Clip	1
57	NTN5025A	COVER Universal Connector	1



CQP7000a, VHF (WITHOUT BUTTONS)
EXPLODED VIEW & MECHANICAL PART NUMBERS

M405.547

DATE: 9/26/1988

Pos	Code No	Description	Qt
1	RPX4695A	ASSEMBLY Frame Stud (incl. item 5)	1
2	RPX4689A	KIT Freq. Sw. (S823) (incl.item 4)	1
3	RPX4690A	KIT On/Off Switch (S800)/Vol.Contr.	1
		(R800) (includes item 4)	1
4	3205082E62	GASKET O-Ring	2
		(part of items 2 and 3)	2
5	3205422Q01	SEAL Stud (part of item 1)	2
6	6105436Q01	LIGHTPIPE LED	1
7	3205082E59	GASKET O-Ring	1
8	0305714J09	SCREW Module Ph Pan Hd 2-56x3/8"	7
9	0305381L02	SCREW Top Panel 2-32	2
10	RPX4693A	KIT Antenna Bushing (incl.item 12)	1
11	3205082E71	GASKET O-Ring (part of item 13)	1
12	3205082E58	GASKET O-Ring (part of item 10)	1
13	RPX4692A	KIT Control Top Panel (incl.item 11)	1
14	0400139731	LOCKWASHER Internal Tooth	1
15	0205591R01	NUT Antenna Bushing	1
16	0405781Q01	WASHER Detent (even no of sw. pos.)	1
16	0405781Q03	WASHER Det.(odd no of switch pos.)	1
17	EAD6471	ANTENNA VHF HELICAL (136-150.8 MHz)	1
17	EAD6472	ANTENNA VHF HELICAL (146-162 MHz)	1
17	EAD6473	ANTENNA VHF HELICAL (152-174 MHz)	1
18	RPX4699A	KIT Frequency Knob	1
18	RPX4017A	KIT Frequency Knob Low Profile	1
19	RPX4698A	KIT On/Off/Volume Knob	1
19	REX4016A	KIT Volume Knob Low Profile	1
20	1305622Q02	ESCUTCHEON 10-Frequency	1
20	1305622Q12	ESCUTCHEON 10-Frequency Emergency	1
21	0205916P01	NUT Spanner	2
22	3205082E61	GASKET O-Ring (part of item 23)	1
23	RPX4691A	KIT RF Connector (incl.items 22 24)	1
24	4205852N01	CONTACT Ground RF (part of item 23)	1
25	NLD8230A	ASSEMBLY VHF MAIN PC BOARD 20/25 kHz	1
25	NLD8250A	ASSEMBLY VHF MAIN PC BOARD 12.5 kHz	1
26	NTN4647A	ASSEMBLY Back Shield (incl.item 27)	1
27	0305706Q01	SCREW Captive (part of item 26)	4
28	4205577Q01	CLIP Ground	1
29	1405387R01	BOOT Oscillator	1
30	RPX4700A	KIT PTT/Controls Flex (incl.item 31)	1
30	RPX4701A	KIT PTT/Controls Flex Assembly	1
		(includes item 2 3 31)	1
31	RPX4694A	KIT Contact Snapdome	2
		(part of item 30)	
32	4505022P02	LEVER PTT (part of item 43)	1
33	NTN4537A	BATTERY 500 mAh 220 V AC	1
33	NTN4538A	BATTERY 900 mAh 220 V AC	1
33	NTN4592A	BATTERY 500 mAh 220 V AC	1
33	NTN4593A	BATTERY 900 mAh 220 V AC	1
33	NTN4595A	BATTERY 1500 mAh 220 V AC	1
33	NTN4596A	BATTERY 1500 mAh 220 V AC	1
34	0305706Q02	SCREW Baseplate Ph Pan Hd 2-56x3/32"	4
		(part of item 43)	1
35	3905453Q01	CONTACT Power (part of item 43)	4
36	4205437Q01	RETAINER Baseplate (part of item 43)	1
37	RPX4696A	KIT Slotted Spanner Nut	2
		(part of item 43)	1
38	6405847N03	BASEPLATE (part of item 43)	1
39	3205701Q01	SEAL Elastomer (part of item 43)	1
40	3205472M01	SEAL Vacuum Port (part of item 43)	1
41	5505333Q01	LATCH Battery (part of item 43)	1
42	4105775Q01	SPRING Latch (part of item 43)	1
43	NHN6422A	ASSEMBLY Housing	1
		(incl. 34 thru 42)	1
44	3305183R05	LABEL Nameplate	1
45	0105958M24	ASSEMBLY LS/Mic.Flex	1
		(8K Display)	1
46	1405490Q01	BOOT Microphone	1
47	RPX4702A	ASSEMBLY LCD/Speaker Bracket	1
48	RPX4703A	KIT LCD Assembly (part of item 49)	1
49	8460999A34	ASSEMBLY 8k Display PC Board	1
		(incl. item 48)	1
50	8405532Q01	FLEX CIRCUIT LCD Interconnect	1
51	4205604Q01	RETAINER Speaker	1
52	1405182M03	INSULATOR Universal Connector	1
53	0705319R02	BRACKET Switch (optional)	1
54	4005221R02	SWITCH Dual-Funct. (S801)(optional)	1
55	3205082E68	GASKET O-Ring (optional)	1
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56	4305607S01	PLUG Seal	1

Pos	Code No	Description	Qt
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56	NTN5068A	KIT Push-and -Rotate Knob	
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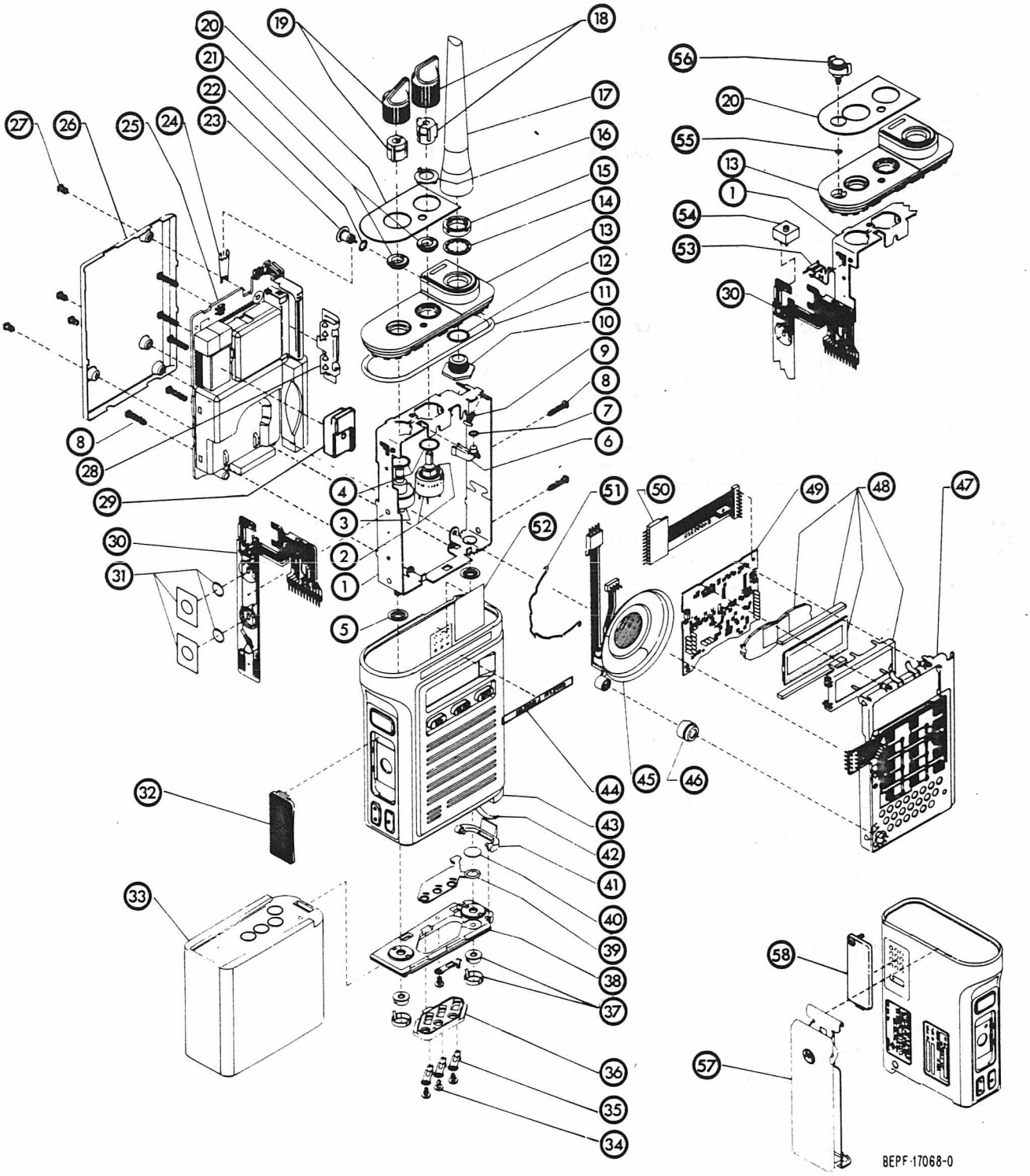
56	4305607S01	PLUG Seal	1
57	NTN4741A	ASSEMBLY Belt Clip	1
58	NTN5025A	COVER Universal Connector	1



CQP7000b, VHF (WITH 3 BUTTONS)
EXPLODED VIEW & MECHANICAL PART NUMBERS

M405.548

DATE: 9/26/1988

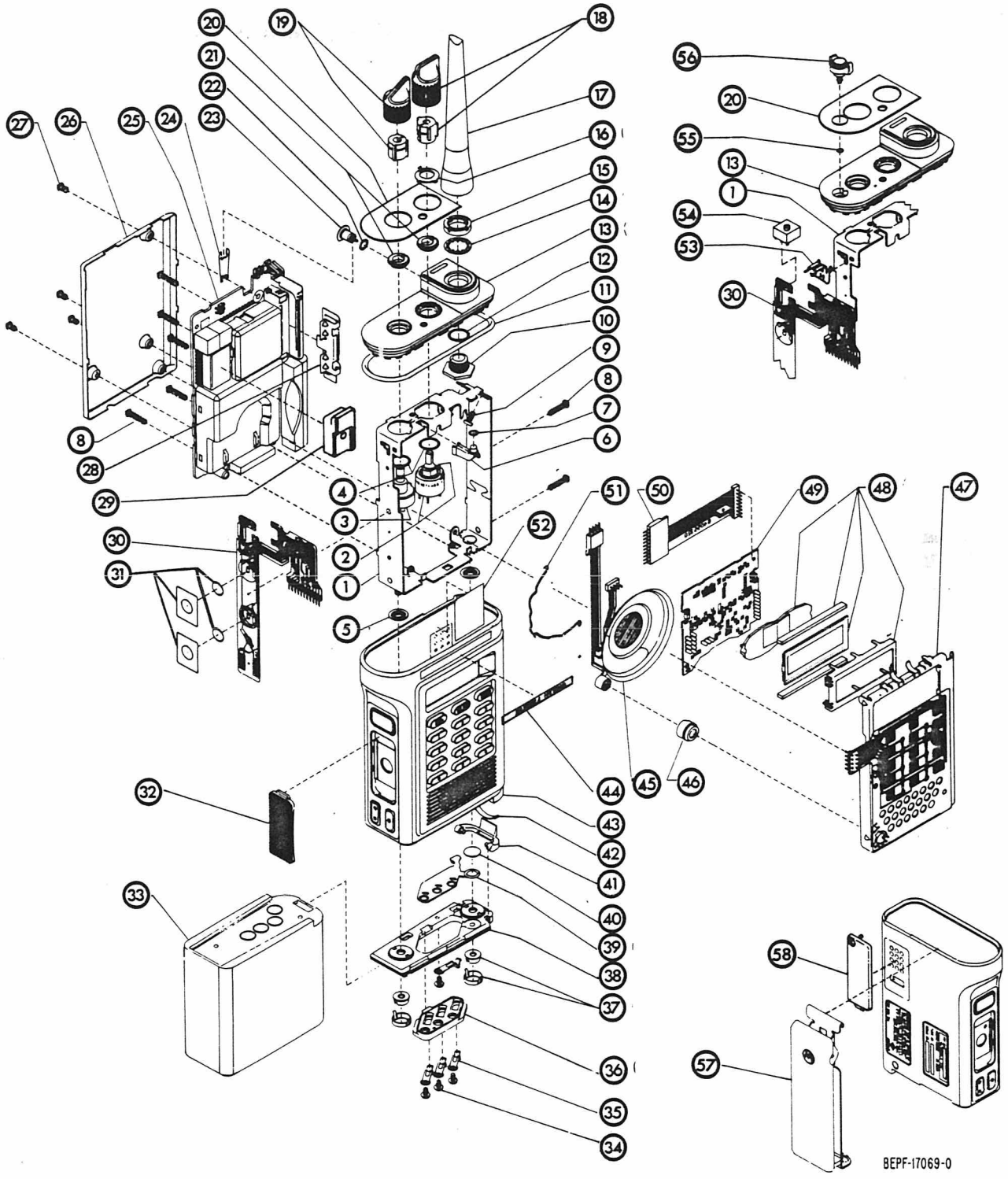
Pos	Code No	Description	Qt
1	RPX4695A	ASSEMBLY Frame Stud (incl. item 5)	1
2	RPX4689A	KIT Freq. Sw. (S823) (incl.item 4)	1
3	RPX4690A	KIT On/Off Switch (S800)/Vol.Contr.	1
		(R800) (incl. item 4)	1
4	3205082E62	GASK. O-Ring (part of items 2 and 3)	2
5	3205422Q01	SEAL Stud (part of item 1)	2
6	6105436Q01	LIGHTPIPE LED	1
7	3205082E59	GASKET O-Ring	1
8	0305714J09	SCREW Module Ph Pan Hd 2-56x3/8"	7
9	0305381L02	SCREW Top Panel 2-32	2
10	RPX4693A	KIT Antenna Bushing (incl.item 12)	1
11	3205082E71	GASKET O-Ring (part of item 13)	1
12	3205082E58	GASKET O-Ring (part of item 10)	1
13	RPX4692A	KIT Control Top Panel (incl.item 11)	1
14	0400139731	LOCKWASHER Internal Tooth	1
15	0205591R01	NUT Antenna Bushing	1
16	0405781Q01	WASHER Detent (even no of sw. pos.)	1
16	0405781Q03	WASHER Detent (odd no of switch pos)	1
17	EAD6471	ANTENNA VHF HELICAL (136-150.8 MHz)	1
17	EAD6472	ANTENNA VHF HELICAL (146-162 MHz)	1
17	EAD6473	ANTENNA VHF Helical (152-174 MHz)	1
17	EAD6440A	ANTENNA VHF Whip (403-520 MHz)	1
18	RPX4699A	KIT Frequency Knob	1
18	REX4017A	KIT Frequency Knob Low Profile	1
19	RPX4698A	KIT On/Off/Volume Knob	1
19	REX4016A	KIT On/Off/Volume Knob Low Profile	1
20	1305622Q02	ESCUTCHEON 10-Frequency	1
20	1305622Q12	ESCUTCHEON 10-Frequency Emergency	1
21	0205916P01	NUT Spanner	2
22	3205082E61	GASKET O-Ring (part of item 23)	1
23	RPX4691A	KIT RF Connector (incl. items 22 24)	1
24	4205852N01	CONTACT Ground RF (part of item 23)	1
25	NLD8230A	ASSEMBLY VHF MAIN PC BOARD 20/25 kHz	1
25	NLD8250A	ASSEMBLY VHF MAIN PC BOARD 12.5 kHz	1
26	NTN4647A	ASSEMBLY Back Shield	1
27	0305706Q01	SCREW Captive (part of item 26)	4
28	4205577Q01	CLIP Ground	1
29	1405387R01	BOOT Oscillator	1
30	RPX4700A	KIT PTT/Controls Flex (incl.item 31)	1
30	RPX4701A	KIT PTT/Controls Flex Assembly	1
		(incl. items 2 3 31)	1
31	RPX4694A	KIT Contact Snapdome	2
		(part of item 30)	
32	4505022P02	LEVER PTT	1
33	NTN4537A	BATTERY 500 mAh 220 V AC	1
33	NTN4538A	BATTERY 900 mAh 220 V AC	1
33	NTN4592A	BATTERY 500 mAh 220 V AC	1
33	NTN4593A	BATTERY 900 mAh 220 V AC	1
33	NTN4595A	BATTERY 1500 mAh 220 V AC	1
33	NTN4596A	BATTERY 1500 mAh 220 V AC	1
34	0305706Q02	SCREW Baseplate Ph Pan Hd 2-56x3/32"	4
		(part of item 43)	1
35	3905453Q01	CONTACT Power (part of item 43)	4
36	4205437Q01	RETAINER Baseplate (part of item 43)	1
37	RPX4696A	KIT Slot. Span. Nut(part of item 43)	2
38	6405847N03	BASEPLATE (part of item 43)	1
39	3205701Q01	SEAL Elastomer (part of item 43)	1
40	3205472M01	SEAL Vacuum Port (part of item 43)	1
41	5505333Q01	LATCH Battery (part of item 43)	1
42	4105775Q01	SPRING Latch (part of item 43)	1
43	NHN6397A	ASSEMBLY Housing	1
		(incl. items 34 thru 42)	1
44		LABEL Nameplate	1
45	0105958M24	ASSEMBLY LS/Mic. Flex	1
46	1405490Q01	BOOT Microphone	1
47	RPX4702A	ASSEMBLY LCD/Speaker Bracket	1
48	RPX4703A	KIT LCD Assembly (part of item 49)	1
49	8460999A34	ASSEMBLY Display PC Board	1
		(incl. item 48)	1
50	8405532Q01	FLEX CIRCUIT LCD Interconnect	1
51	4205604Q01	RETAINER Speaker	1
52	1405182M03	INSULATOR Universal Connector	1
53	0705319R02	BRACKET Switch (optional)	1
54	4005221R02	SWITCH Dual Funct. (S801)(optional)	1
55	3205082E68	GASKET O-Ring (optional)	1
56	NTN5076A	KIT Push-Only Knob (incl.item 54)	1
56	NTN5068A	KIT Push-and-Rotate Knob	1
		(incl. item 54)	1
56	NTN5069A	KIT Rotate-Only Knob (incl.item 54)	1
56	4305607S01	PLUG Seal	1

Pos	Code No	Description	Qt
57	NTN4741A	ASSEMBLY Belt Clip	
58	NTN5025A	COVER Universal Connector	
		(incl.item 54)	1
56	NTN5069A	KIT Rotate-Only Knob (incl.item 54)	1
56	4305607S01	PLUG Seal	1
57	NTN4741A	ASSEMBLY Belt Clip	1
58	NTN5025A	COVER Universal Connector	1

MECHANICAL PARTS LIST FOR CQP7000c, VHF (WITH 15 BUTTONS)

Pos	Code No.	Description	Qt
1	RPX4695A	ASS. Frame Stud(incl.item 5)	1
2	RPX4689A	KIT Freq.Sw.(S823)(incl.item 4)	1
3	RPX4690A	KIT On/Off Switch (S800)/Vol.	1
		Control (R800) (incl. item 4)	1
4	3205082E62	GASK.O-Ring(part of items 2&3)	2
5	3205422Q01	SEAL Stud (part of item 1)	2
6	6105436Q01	LIGHTPIPE LED	1
7	3205082E59	GASKET O-Ring	1
8	0305714J09	SCREW Mod. Ph Pan Hd 2-56x3/8"	7
9	0305381L02	SCREW Top Panel 2-32	2
10	RPX4693A	KIT Ant. Bushing (incl.item 12)	1
11	3205082E71	GASKET O-Ring (part of item 13)	1
12	3205082E58	GASKET O-Ring (part of item 10)	1
13	RPX4692A	KIT Ctrl.Top Panel(incl.item11)	1
14	0400139731	LOCKWASHER Internal Tooth	1
15	0205591R01	NUT Antenna Bushing	1
16	0405781Q01	WASH.Detent(even no of sw. pos)	1
16	0405781Q03	WASH.Detent (odd no of sw. pos)	1
17	EAD6471	ANT. VHF HELICAL(136-150.8 MHz)	1
17	EAD6472	ANT. VHF HELICAL(146-162 MHz)	1
17	EAD6473	ANT. VHF Helical(152-174 MHz)	1
17	EAD6440A	ANTENNA VHF Whip (403-520 MHz)	1
18	RPX4699A	KIT Frequency Knob	1
18	REX4017A	KIT Frequency Knob Low Profile	1
19	RPX4698A	KIT On/Off/Volume Knob	1
19	REX4016A	KIT On/Off/Vol.Knob Low Profile	1
20	1305622Q02	ESCUTCHEON 10-Frequency	1
20	1305622Q12	ESCUTCHEON 10-Freq. Emergency	1
21	0205916P01	NUT Spanner	2
22	3205082E61	GASKET O-Ring (part of item 23)	1
23	RPX4691A	KIT RF Conn. (incl.items 22 24)	1
24	4205852N01	CONTACT Ground RF	1
		(part of item 23)	
25	NLD8230A	ASS.VHF MAIN PC BOARD 20/25 kHz	1
25	NLD8250A	ASS.VHF MAIN PC BOARD 12.5 kHz	1
26	NTN4647A	ASS. Back Shield	1
27	0305706Q01	SCREW Captive (part of item 26)	4
28	4205577Q01	CLIP Ground	1
29	1405387R01	BOOT Oscillator	1
30	RPX4700A	KIT PTT/CTRL.Flex(incl.item 31)	1
30	RPX4701A	KIT PTT/Controls Flex Assembly	1
		(incl. items 2 3 31)	1
31	RPX4694A	KIT Contact Snapdome	2
		(part of item 30)	
32	4505022P02	LEVER PTT	1
33	NTN4537A	BATTERY 500 mAh 220 V AC	1
33	NTN4538A	BATTERY 900 mAh 220 V AC	1
33	NTN4592A	BATTERY 500 mAh 220 V AC	1
33	NTN4593A	BATTERY 900 mAh 220 V AC	1
33	NTN4595A	BATTERY 1500 mAh 220 V AC	1
33	NTN4596A	BATTERY 1500 mAh 220 V AC	1
34	0305706Q02	SCREW Baseplate Ph Pan	4
		Hd. 2-56x3/32"(part of item 43)	1
35	3905453Q01	CONTACT Power (part of item 43)	4
36	4205437Q01	RETAINER Baseplate	1
		(part of item 43)	
37	RPX4696A	KIT Slot. Span. Nut	2
		(part of item 43)	
38	6405847N03	BASEPLATE (part of item 43)	1

Pos	Code No.	Description	Qt
39	3205701Q01	SEAL Elastom.(part of item 43)	1
40	3205472M01	SEAL Vac.Port(part of item 43)	1
41	5505333Q01	LATCH Battery(part of item 43)	1
42	4105775Q01	SPRING Latch (part of item 43)	1
43	NHN6397A	ASSEMBLY Housing	1
		(incl. items 34 thru 42)	1
44		LABEL Nameplate	1
45	0105958M24	ASSEMBLY LS/Mic. Flex	1
46	1405490Q01	BOOT Microphone	1
47	RPX4702A	ASSEMBLY LCD/Speaker Bracket	1
48	RPX4703A	KIT LCD Ass. (part of item 49)	1
49	8460999A34	ASSEMBLY Display PC Board	1
		(incl. item 48)	1
47			
48	ZL6400A	FRONT SHIELD	1
49		for 2200 version	
50	8405532Q01	FLEX CIRCUIT LCD Interconnect	1
51	4205604Q01	RETAINER Speaker	1
52	1405182M03	INSULATOR Universal Connector	1
53	0705319R02	BRACKET Switch (optional)	1
54	4005221R02	SWITCH Dual Funct.(S801)(opt.)	1
55	3205082E68	GASKET O-Ring (optional)	1
56	NTN5076A	KIT Push-Only Knob	1
		(incl. item 54)	
56	NTN5068A	KIT Push-and-Rotate Knob	1
		(incl. item 54)	1
56	NTN5069A	KIT Rotate-Only Knob	1
		(incl. item 54)	
56	4305607S01	PLUG Seal	1
57	NTN4741A	ASSEMBLY Belt Clip	1
58	NTN5025A	COVER Universal Connector	1
		(incl.item 54)	1
56	NTN5069A	KIT Rotate-Only Knob	1
		(incl. item 54)	
56	4305607S01	PLUG Seal	1
57	NTN4741A	ASSEMBLY Belt Clip	1
58	NTN5025A	COVER Universal Connector	1



CQP7000c, VHF (WITH 15 BUTTONS)
EXPLODED VIEW & MECHANICAL PART NUMBERS

M405.549

CHAPTER 1b

MAIN BOARD VHF

Component Layout

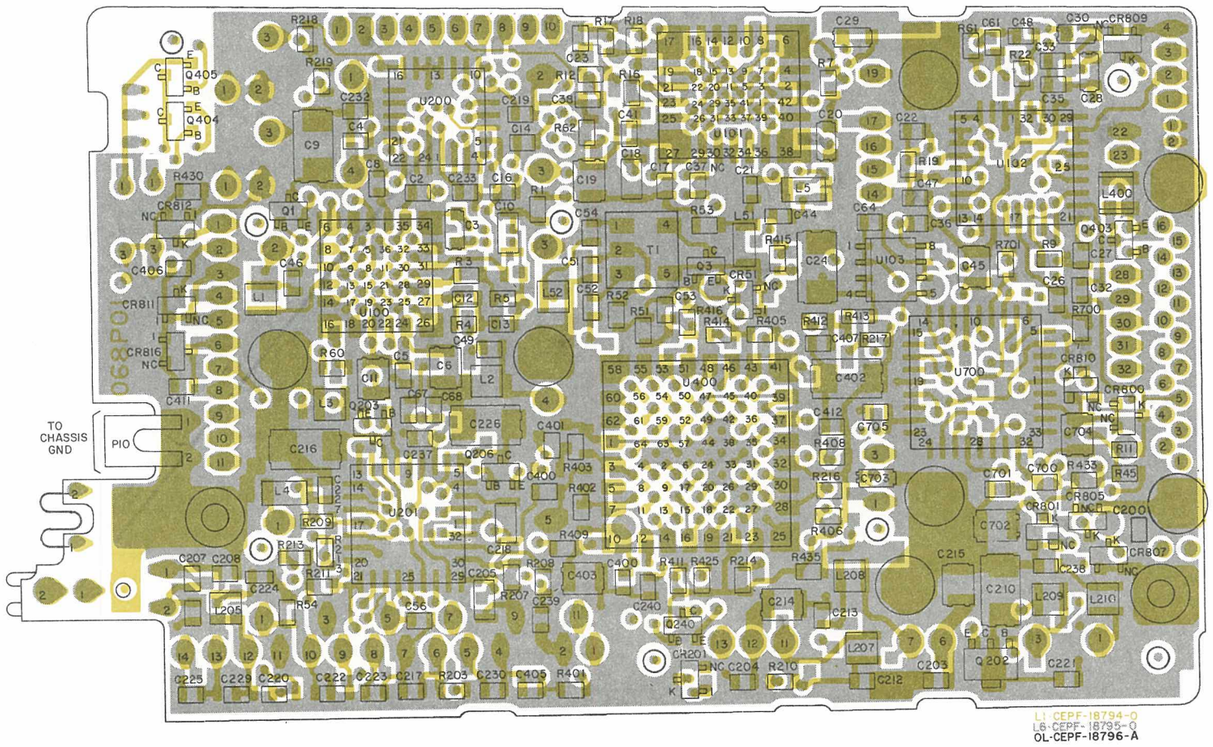
Electrical Diagram

Parts List

CQP7000 VHF MAIN BOARD
COMPONENT LAYOUT

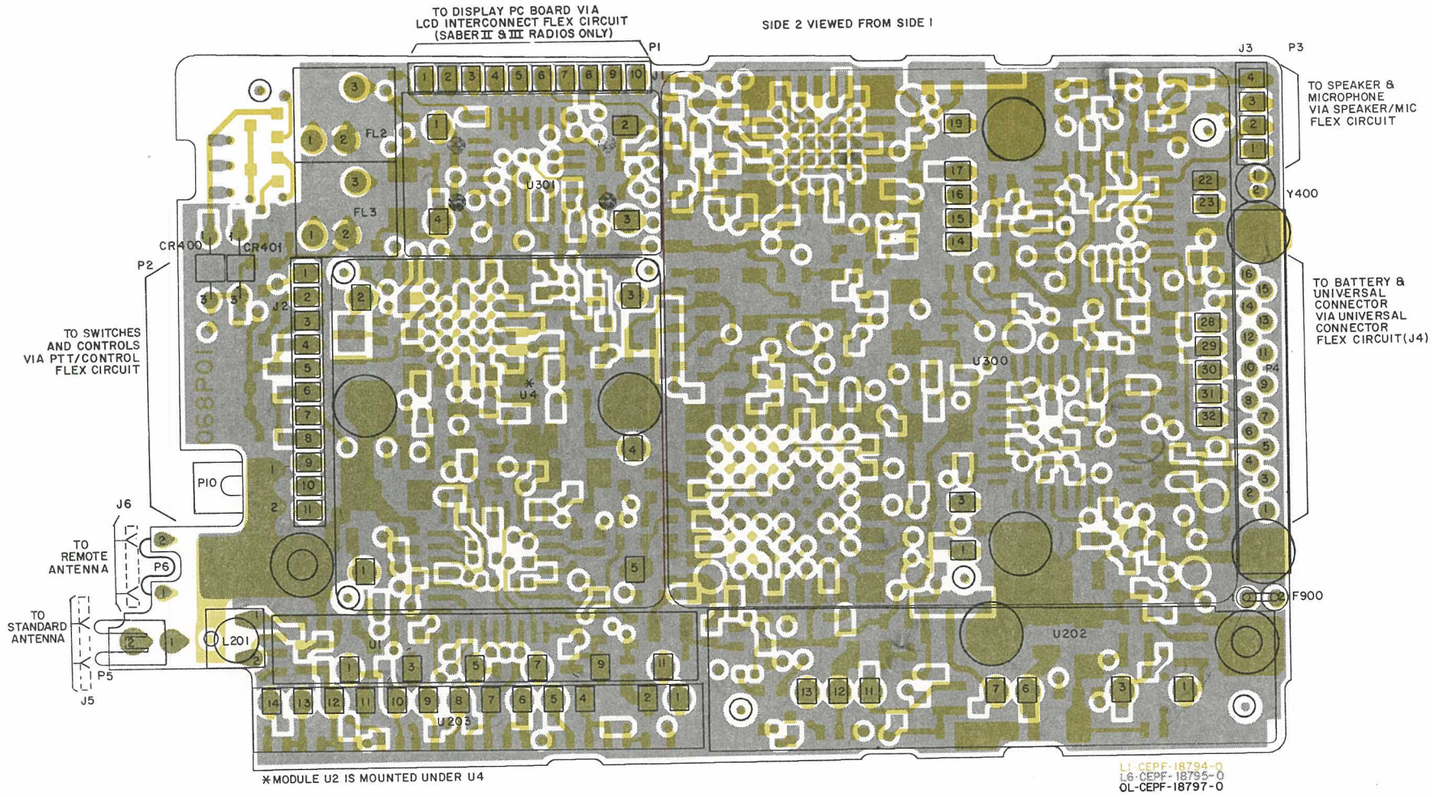
D405.228

SIDE 1 -VIEWED FROM SIDE 1

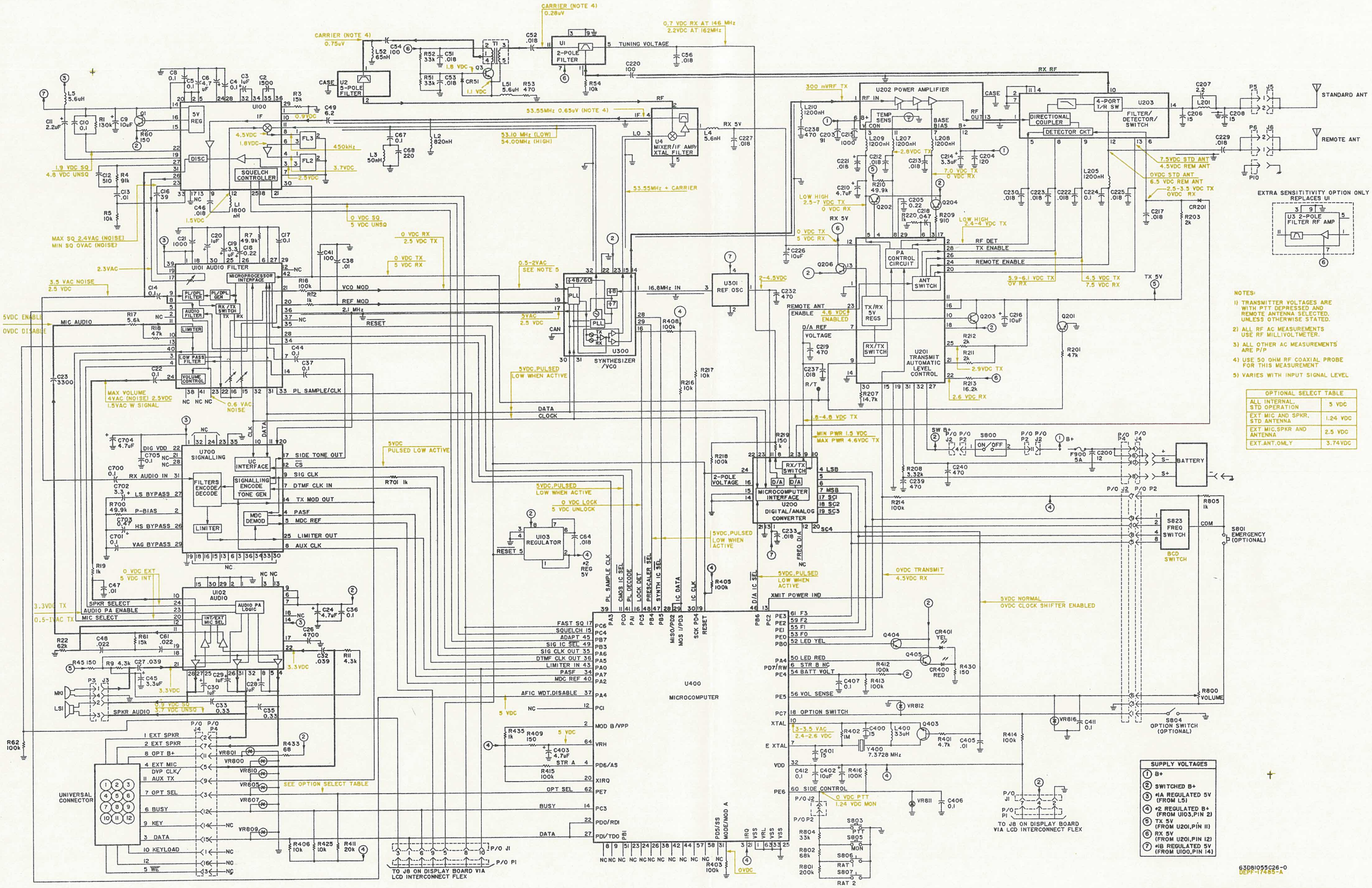


TO DISPLAY PC BOARD VIA LCD INTERCONNECT FLEX CIRCUIT (SABER II & III RADIOS ONLY)

SIDE 2 VIEWED FROM SIDE 1



*MODULE U2 IS MOUNTED UNDER U4


CARRIER (NOTE 4) 0.28uV
CARRIER (NOTE 4) 0.75uV
0.7 VDC RX AT 146 MHz 2.2VDC AT 162MHz
2-POLE FILTER
TUNING VOLTAGE
5-POLE FILTER
1.8 VDC
1.1 VDC
53.55MHz 0.65uV (NOTE 4)
53.10 MHz (LOW) 54.00MHz (HIGH)
53.55MHz + CARRIER
U4 MIXER/IF AMP/ XTAL FILTER
U202 POWER AMPLIFIER
300 mVRF TX
RF IN
RF OUT
TEMP SENS
BASE BIAS
DIRECTIONAL COUPLER
DETECTOR CKT
4-PORT T/R SW
FILTER/ DETECTOR/ SWITCH
STANDARD ANT
REMOTE ANT
EXTRA SENSITITIVITY OPTION ONLY REPLACES U1
U3 2-POLE FILTER RF AMP
5V REG
DISC
SQUELCH CONTROLLER
4.5VDC
1.8VDC
3.7VDC
2.5VDC
450kHz
1.9 VDC SQ 4.8 VDC UNSQ
MAX SQ 2.4VAC (NOISE) MIN SQ OVAC (NOISE)
0 VDC SQ 5 VDC UNSQ
0 VDC RX 2.5 VDC TX
0 VDC TX 5 VDC RX
U101 AUDIO FILTER
MICROPROCESSOR INTERFACE
2.3VAC
3.5 VAC NOISE 2.5 VDC
5VDC ENABLE
OVDC DISABLE
MIC AUDIO
PL/DPL FILTER
PL/DPL GEN
AUDIO FILTER
RX/TX SWITCH
LIMITER
LOW PASS FILTER
VOLUME CONTROL
MAX VOLUME 4VAC (NOISE) 2.3VDC 1.5VAC W SIGNAL
0.6 VAC NOISE
PL SAMPLE/CLK
VCO MOD
REF MOD
2.1 MHz
RESET
0.5-2VAC SEE NOTE 5
5VAC 2.5 VDC
CAN
U301 REF OSC
16.8MHz IN
SYNTHESIZER /VCO
5VDC,PULSED LOW WHEN ACTIVE
DATA
CLOCK
5VDC PULSED LOW ACTIVE
U700 SIGNALLING
UC INTERFACE
FILTERS ENCODE/ DECODE
SIGNALLING ENCODE TONE GEN
MDC DEMOD
LIMITER
SIDE TONE OUT
CS
SIG CLK
DTMF CLK IN
TX MOD OUT
PASF
MDC REF
LIMITER OUT
AUX CLK
RX AUDIO IN
LS BYPASS
P-BIAS
HS BYPASS
VAG BYPASS
U102 AUDIO
AUDIO PA LOGIC
INT/EXT MIC SEL
SPKR SELECT
AUDIO PA ENABLE
MIC SELECT
SPKR AUDIO
3.3VDC TX
0.5-1VAC TX
0 VDC EXT 5 VDC INT
5.9 VDC SQ 3.7 VDC UNSQ
U103 REGULATOR
#2 REG 5V
U400 MICROCOMPUTER
FAST SQ
SQUELCH
ADAPT
SIG IC SEL
SIG CLK OUT
DTMF CLK OUT
LIMITER IN
PASF
MDC REF
AFIC WDT.DISABLE
MOD B/VPP
VRH
STR A
OPT SEL
BUSY
PDO/RDI
PDI/TDO
PL SAMPLE CLK
CMOS IC SEL
PL DECODE
LOCK DET
PRESCALER SEL
SYNTH IC SEL
IC DATA
IC CLK
D/A IC SEL
SCK PD4
RESET
MISO/PD2
MOS I/PD3
MODE/MOD A
PD5/SS
IRQ
VSS
VRL
VSS
VSS
U200 DIGITAL/ANALOG CONVERTER
MICROCOMPUTER INTERFACE
2-POLE VOLTAGE
RX/TX SWITCH
FREQ D/A
XMIT POWER IND
0VDC TRANSMIT 4.5VDC RX
5VDC NORMAL 0VDC CLOCK SHIFTER ENABLED
PA CONTROL CIRCUIT
ANT SWITCH
TX/RX 5V REGS
RX/TX SWITCH
U201 TRANSMIT AUTOMATIC LEVEL CONTROL
RF DET
TX ENABLE
REMOTE ENABLE
D/A REF VOLTAGE
REMOTE ANT ENABLE
4.6 VDC ENABLED
LOW HIGH 2.5-7 VDC TX 0 VDC RX
LOW HIGH 2.4-4 VDC TX
5.9-6.1 VDC TX 0V RX
4.5 VDC TX 7.5 VDC RX
7.5VDC STD ANT 4.5VDC REM ANT
OVDC STD ANT 6.5 VDC REM ANT
2.5-3.5 VDC TX OVDC RX
2.6VDC TX
7.0 VDC TX 0 VDC RX
2.9VDC TX
2.6 VDC RX
.8-4.6 VDC TX
MIN PWR 1.5 VDC MAX PWR 4.6VDC TX
RX 5V
TX 5V
SW B+
S800 ON/OFF
F900 5A
BATTERY
S823 FREQ SWITCH
BCD SWITCH
S801 EMERGENCY (OPTIONAL)
S804 OPTION SWITCH (OPTIONAL)
R805 1k COM
R800 VOLUME
UNIVERSAL CONNECTOR
1 EXT SPKR
2 EXT SPKR
8 OPT B+
4 EXT MIC
DVP CLK/
11 AUX TX
7 OPT SEL
6 BUSY
9 KEY
3 DATA
10 KEYLOAD
12
5 WE
SEE OPTION SELECT TABLE
TO J8 ON DISPLAY BOARD VIA LCD INTERCONNECT FLEX
P/O J1
P/O P1
0 VDC PTT 1.24 VDC MON
S803 PTT
S805 MON
S806 RAT 1
S807 RAT 2
Y400 7.3728 MHz
3-3.5 VAC 2.4-2.6 VDC
OVDC
VR812
VR816
VR811
Q403
Q404
Q405
CR401 YEL
CR400 RED
Q206
Q202
Q204
Q203
Q201
CR201
R430 150
R414 100k
R405 100k
R403 100k
R407 100k
R408 100k
R409 150
R433 68
R435 1k
R441 100k
R442 100k
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R718 100k
R719 100k
R720 100k
R721 100k

DATE: 9/26/1988

Pos	Code No	Description	Qt
C2	2160521A15	CAP 1500pF ±5%	1
C3	2362998B09	CAP 1µF ±10% 16V	1
C4	2160521G37	CAP 0.1µF +80-20%	1
C5	2160521G37	CAP 0.1µF +80-20%	1
C6	2362998B68	CAP 4.7µF 10V	1
C8	2160521G37	CAP 0.1µF +80-20%	1
C9	2362998B73	CAP 10µF 16V	1
C10	2160521D37	CAP 0.1µF ±10%	1
C11	2362998B64	CAP 2.2µF 20V	1
C12	2160520C18	CAP 510pF ±5% 50V	1
C13	2160521E25	CAP FIXED CHIP .01µF ±20% 25V	1
C14	2160521G37	CAP 0.1µF +80-20%	1
C16	2160520F15	CAP 39pF ±5%	1
C17	2160521G37	CAP 0.1µF +80-20%	1
C18	2160521H41	CAP .22µF +80-20%	1
C19	2362998B16	CAP 3.3µF ±10% 16V	1
C20	2362998B59	CAP 1µF 16V	1
C21	2160521A13	CAP 1000pF ±5%	1
C22	2160521G37	CAP 0.1µF +80-20%	1
C23	2160521A19	CAP 3300pF ±5%	1
C24	2362998B69	CAP 4.7µF 20V	1
C26	2160521A21	CAP 4700pF ±5%	1
C27	2160521A32	CAP .039µF ±5%	1
C28	2362998B59	CAP 1µF 16V	1
C29	2362998B59	CAP 1µF 16V	1
C30	2362998B59	CAP 1µF 16V	1
C32	2160521A32	CAP .039µF ±5%	1
C33	2160521H43	CAP .33µF +80 -20%	1
C35	2160521H43	CAP .33µF +80 -20%	1
C36	2160521G37	CAP 0.1µF +80-20%	1
C37	2160521G37	CAP 0.1µF +80-20%	1
C38	2160521E25	CAP FIXED 0.01µF ±20% 25V	1
C41	2160520C01	CAP 100pF ±5% 50V	1
C44	2160521G37	CAP 0.1µF +80-20%	1
C45	2362998B16	CAP 3.3µF ±10% 16V	1
C46	2160521E28	CAP 0.018µF ±20% 25V	1
C47	2160521E25	CAP FIXED .01µF 20% 25V	1
C48	2160521A29	CAP .022µF ±5%	1
C49	2160520A20	CAP 6.2pF ±0.25pF	1
C51	2160521E28	CAP FIXED 0.018µF ±20% 25V	1
C52	2160521E28	CAP FIXED 0.018µF ±20% 25V	1
C53	2160521E28	CAP FIXED 0.018µF ±20% 25V	1
C54	2160520C01	CAP 100pF ±5% 50V N150	1
C56	2160521E28	CAP FIXED 0.018µF ±20% 25V	1
C61	2160521A29	CAP .022µF ±5%	1
C64	2160521E28	CAP FIXED .018µF ±20% 25V	1
C67	2160521G37	CAP .1µF +80 -20%	1
C68	2160520C09	CAP 220pF	1
C200	2105454G34	CAP 12pF	1
C203	2160520B24	CAP 91pF	1
C204	2160520C03	CAP 120pF	1
C205	2160521H41	CAP .22µF +80-20%	1
C206	2160520B05	CAP 15pF ±5% 50V NPO	1
C207	2160520A09	CAP 2.2pF ±0.25pF NPO	1
C208	2160520B05	CAP 15pF ±5% 50V NPO	1
C210	2362998B69	CAP 4.7µF 20V	1
C212	2160521E28	CAP FIXED 0.018µF ±20% 25V	1
C213	2160521E28	CAP FIXED 0.018µF ±20% 25V	1
C214	2362998B16	CAP 3.3µF ±10%	1
C215	2362998B16	CAP 3.3µF ±10% 16V	1
C216	2362998B73	CAP 10µF 16V	1
C217	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C218	2160521F33	CAP FIXED CHIP .047µF ±20% 25V	1
C219	2160521C09	CAP 470pF ±10%	1
C220	2160520C01	CAP 100pF ±5% 50V	1
C221	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C222	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C223	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C224	2160521G37	CAP 0.1µF +80-20%	1
C225	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C226	2362998B73	CAP 10µF 16V	1
C227	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C229	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C230	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C232	2160521C09	CAP 470pF ±10%	1
C233	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C237	2160521E28	CAP FIXED CHIP .018µF ±20% 25V	1
C238	2160521C09	CAP 470pF ±10%	1
C239	2160521C09	CAP 470pF ±10%	1
C240	2160521C09	CAP 470pF ±10%	1
C400	2160520B05	CAP 15pF ±5% 50V NPO	1
C401	2160520B05	CAP 15pF ±5% 50V NPO	1
C402	2362998B73	CAP 10µF 16V	1

Pos	Code No	Description	Qt
C403	2362998B68	CAP 4.7µF 10V	1
C405	2160521A25	CAP .01µF ±5%	1
C406	2160521G37	CAP 0.1µF +80-20%	1
C407	2160521G37	CAP 0.1µF +80-20%	1
C411	2160521G37	CAP 0.1µF +80-20%	1
C412	2160521G37	CAP 0.1µF +80-20%	1
C700	2160521G37	CAP 0.1µF +80-20%	1
C701	2160521G37	CAP 0.1µF +80-20%	1
C702	2362998B16	CAP 3.3µF ±10% 16V	1
C703	2362998B05	CAP .47µF ±10%	1
C704	2362998B68	CAP 4.7µF 10V	1
C705	2160521G37	CAP 0.1µF +80-20%	1
CR51	4805129M64	DIO SOT-23	1
CR201	4805129M05	DIO SOT-23	1
CR400	4805729G22	DIO LED Red	1
CR401	4805729G23	DIO LED YELLOW	1
F900	0105955P27	FUSE Assembly 5 Amp	1
FL2	9105685Q02	FILTER Ceramic 450kHz 20kHz BW (20/25kHz CHANNEL SPACING ONLY)	1
FL2	9105685Q03	FILTER Ceramic 450kHz 15kHz BW (12.5kHz CHANNEL SPACING ONLY)	1
FL3	9105685Q03	FILTER Ceramic 450kHz 15kHz BW	1
J1	0905287C07	JACK Sock. Printed Circuit (LCD interconnect) (10 req'd)	1
J2	0905287C07	JACK Sock. Printed Circuit (PTT/Controls Flex) (11 req'd)	1
J3	0905287C07	JACK Sock. Printed Circuit (Speaker/Mic Connector) (4 req'd)	1
L1	2405452C66	COIL RF 1800nH ±5%	1
L2	2462575A03	COIL RF 820nH ±10%	1
L3	2405452C09	COIL RF 50nH ±5%	1
L4	2462575A08	COIL RF 5.6µH ±6%	1
L5	2462575A08	COIL RF 5.6µH ±6%	1
L51	2462575A08	COIL RF 5.6µH ±6%	1
L52	2405452C38	COIL RF 65nH ±5%	1
L201	2405855Q01	Air Wound, Leaded; 6T; 0.086ID	1
L205	2405452C62	COIL RF 1200nH ±5%	1
L207	2405452C62	COIL RF 1200nH ±5%	1
L208	2405452C62	COIL RF 1200nH ±5%	1
L209	2405452C62	COIL RF 1200nH ±5%	1
L210	2405452C62	COIL RF 1200nH ±5%	1
L400	2462585A40	COIL RF 33uH	1
LS1		SPEAKER 28Ω ±10% (See Mech. PL)	1
MK1		MIC. (See Mech. Parts list)	1
P4	2805520Q01	PLUG Connector Bottom	1
P5	3905446Q03	PLUG Contact Antenna	1
P6	3905445Q03	PLUG Contact RF Wireform	1
P10	3905889R01	Contact, PCB Earth	1
Q1	4805128M16	TSTR PNP SOT-23 MMBT3906	1
Q3	4805128N03	Bipolar; SOT-23; MMBR901	1
Q201	4805128M23	TSTR NPN SOT-23	1
Q202	4805128M27	TSTR PNP SOT-89	1
Q203	4805128M16	TSTR PNP SOT-23 MMBT3906	1
Q204	4805128M16	TSTR PNP SOT-23 MMBT3906	1
Q206	4805128M16	TSTR PNP SOT-23 MMBT3906	1
Q403	4805128M44	TSTR NPN SOT-23	1
Q404	4805128M44	TSTR NPN SOT-23	1
Q405	4805128M44	TSTR NPN SOT-23	1
R1	0660079V28	RES 130k	1
R3	0660076E77	RES 15k ±1%	1
R4	0660078T24	RES 91k	1
R5	0660078T01	RES 10k	1
R7	0660078J80	RES 49.9k 1%	1
R9	0660076A64	RES FIXED 4300 ±5% 1/8W	1
R11	0660076A64	RES FIXED 4300 ±5% 1/8W	1
R12	0660076A49	RES 1k	1
R16	0660078L01	RES 100k ±1%	1
R17	0660076A67	RES FIXED 5600 ±5% 1/8W	1
R18	0660076E89	RES 47k ±1%	1
R19	0660076A49	RES 1k	1
R22	0660076A92	RES 62k ±1%	1
R45	0660076A29	RES FIXED CHIP 150 ±5% 1/8W	1
R51	0660076A85	RES 33k	1
R52	0660076A85	RES 33k	1
R53	0660076A41	RES 470 ±5% 1/8W	1
R54	0660076A73	RES 10k	1
R60	0660076A29	RES FIXED CHIP 150 ±5% 1/8W	1
R61	0660076A77	RES 15k	1
R62	0660076B01	RES 100k	1
R201	0660076A89	RES 47k	1
R203	0660078G33	RES 2k ±1%	1
R207	0660078J18	RES 14.7k ±1%	1
R209	0660076A48	RES FIXED CHIP 910 ±5% 1/8W	1

DATE: 9/26/1988

Pos	Code No	Description	Qt
R210	0660078J80	RES 49.9k ±1%	1
R211	0660078G33	RES 2K ±1%	1
R212	0660078G33	RES 2K ±1%	1
R213	0660078J23	RES 16.2k ±1%	1
R214	0660076B01	RES 100k	1
R216	0660076A73	RES 10k	1
R217	0660076A73	RES 10k	1
R218	0660076B01	RES 100k	1
R219	0660076B05	RES 150k	1
R220	0660076A49	RES 1k	1
R401	0660076A65	RES 4.7k	1
R402	0660076B25	RES 1M	1
R403	0660076B01	RES 100k	1
R405	0660076B01	RES 100k	1
R406	0660076A73	RES 10k	1
R408	0660076B01	RES 100k	1
R409	0660076A29	RES FIXED CHIP 150 ±5% 1/8W	1
R411	0660076A80	RES 20k	1
R412	0660078L01	RES 100k ±1%	1
R413	0660078L01	RES 100k ±1%	1
R414	0660076B01	RES 100k	1
R415	0660076B01	RES 100k	1
R416	0660076B01	RES 100k	1
R425	0660076A73	RES 10k	1
R430	0660076A29	RES FIXED CHIP 150 ±5% 1/8W	1
R433	0660076A21	RES FIXED CHIP 68 ±5% 1/8W	1
R435	0660076A49	RES 1k	1
R700	0660078J80	RES 49.9k ±1%	1
R701	0660076A49	RES 1k	1
R800	RPX4690A	Pot. Kit On/Off/Vol. (INCLUDES S800	1
R801		RES 200k (PART OF PTT/CONTROLS FLEX RPX4700A OR RPX4701A)	1
R802		RES 68k (PART OF PTT/CONTROLS FLEX RPX4700A OR RPX4701A)	1
R804		RES 33k (PART OF PTT/CONTROLS FLEX RPX4700A OR RPX4701A)	1
R805		RES 1k (PART OF PTT/CONTROLS FLEX RPX4700A OR RPX4701A)	1
S800	RPX4690A	SWITCH Kit On/Off/Vol. (INCL. R800)	1
S801	4005221R01	SWITCH Dual Func. Emerg. (opto.)	1
S803	RPX4694A	SWITCH Kit Contact Snapdome PTT	1
S804	RPX4694A	SWITCH Kit Contact Snapdome Option	1
S805	RPX4694A	SWITCH Kit Contact Snapdome Monitor	1
S823	RPX4689A	SWITCH Kit Frequency	1
T1	2405548Q03	Transformer Ferrite	1
U1	NFD6112A	Filter, 2-Pole (146-174MHz)	1
U2	NFD6092A	Filter, 5-Pole (146-174MHz)	1
U4	NLD8180A	Receiver Front End (146-174MHz 20-25kHz Channel Spacing)	1
U4	NLD8220A	Receiver Front End (146-174MHz 12.5kHz Channel Spacing)	1
U100	0105953N02	IC I-F	1
U101	0105952N99	IC Audio Filter CMOS	1
U102	0105958P74	IC Audio Bipolar	1
U103	5105469E65	IC Regulator	1
U200	0105953N05	IC Digital/Analog Converter CMOS	1
U201	0105959P66	IC Transmit Automatic Level Control	1
U202	NLD8122A	HIGH Power Amplifier (146-162 MHz)	1
U202	NLD8123A	HIGH Power Amplifier (157-174 MHz)	1
U203	NFD6132A	Filter/Detector/Switch (146-174 MHz	1
U205	NLD8133A	LOW Power Amplifier (146-174 MHz)	1
U300	NLD8210A	VCO/Synthesizer (146-174 MHz)	1
U301	NXN6268A	Oscillator Reference 16.8MHz 5 PPM	1
U301	NXN6269A	Oscillator Reference 16.8MHz 2PPM	1
U400	0105953N08	Microcomputer MC68HC11 Tone	1
U700	0105953N11	Signal Filter CMOS	1
VR800	4805129M35	DIO Zener 5.6V	1
VR801	4805129M49	DIO Zener 16V	1
VR805	4805129M35	DIO Zener 5.6V	1
VR807	4805129M35	DIO Zener 5.6V	1
VR809	4805129M35	DIO Zener 5.6V	1
VR810	4805129M35	DIO Zener 5.6V	1
VR811	4805129M35	DIO Zener 5.6V	1
VR812	4805129M35	DIO Zener 5.6V	1
VR816	4805129M35	DIO Zener 5.6V	1
Y400	4805664G32	Crystal 7.3728MHz	1
		NONREFERENCED ITEMS	
	0905287C05	SOCKET Printed Circuit (for all modules)(49 req'd)	
	1405881R01	BOOT Crystal (for Y400)	
	7505934Q01	PAD Oscillator (for U301)	

Pos	Code No	Description	Qt

DIAGRAMS AND PART LISTS OVERVIEW

CQP7000 - UHF

DESCRIPTION	NO.
CQP7000 UHF WITHOUT KEYS PART LIST	MPL405.474
CQP7000 UHF WITHOUT KEYS EXPLODED VIEW	M405.474
CQP7000 UHF WITH 3 KEYS PART LIST	MPL405.475
CQP7000 UHF WITH 3 KEYS EXPLODED VIEW	M405.475
CQP7000 UHF WITH 15 KEYS PART LIST	MPL405.394
CQP7000 UHF WITH 15 KEYS EXPLODED VIEW	M405.394
CQP7000 UHF MAIN BOARD COMPONENT LAYOUT	D404.804
CQP7000 UHF MAIN BOARD	D404.803
CQP7000 UHF MAIN BOARD PART LIST	X404.806
CQP7000 8 K DISPLAY BOARD COMPONENT LAYOUT	D404.820
CQP7000 8 K DISPLAY BOARD	D404.819
CQP7000 8 K DISPLAY BOARD PART LIST	X404.821

CHAPTER 2a

CQP7000 UHF

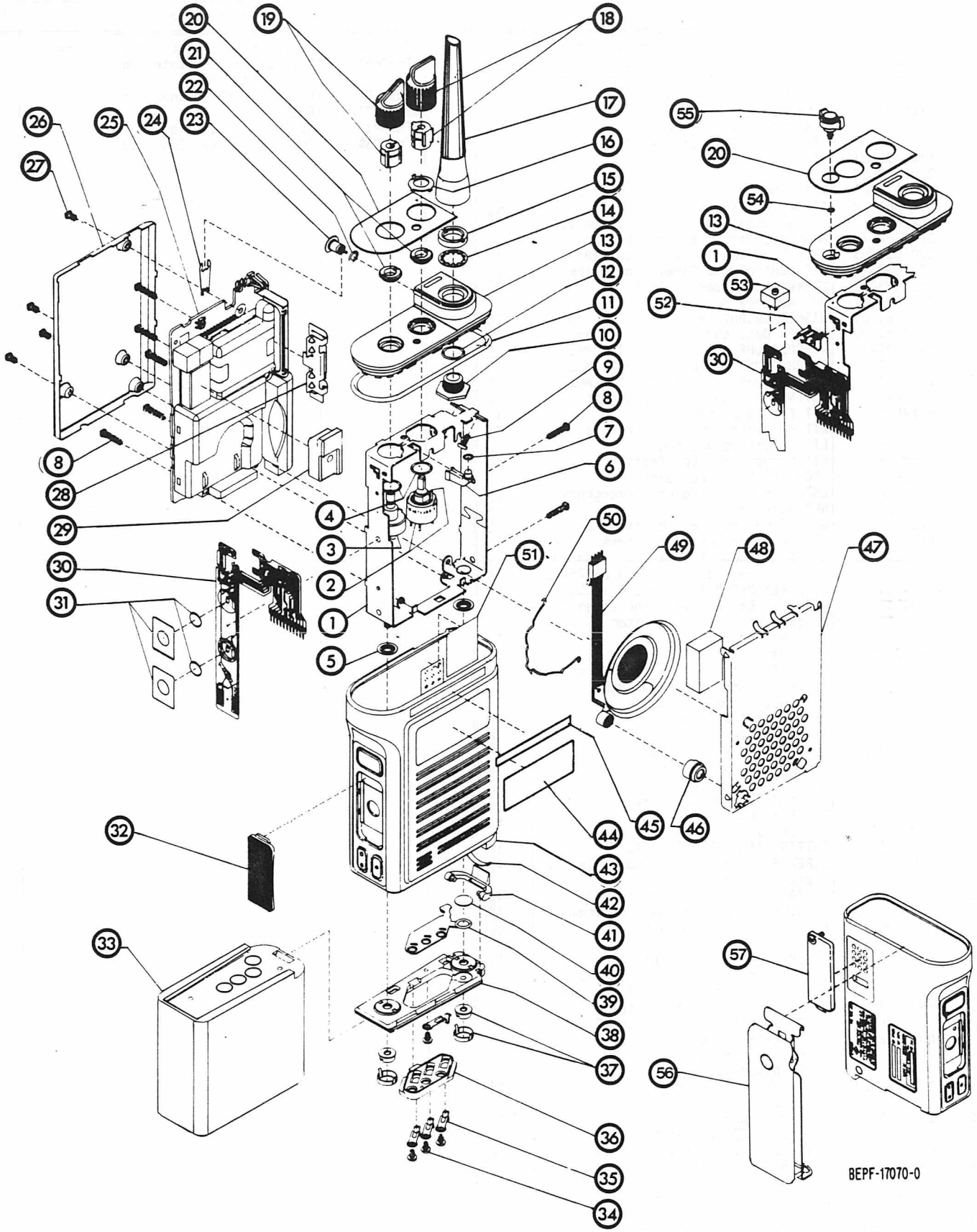
Mechanical Parts List

Exploded View

DATE: 9/20/1988

Pos	Code No	Description	Qt
1	RPX4695A	ASMBL. Frame Stud (incl. item 5)	1
2	RPX4689A	KIT Freq. Sw. (S823) (incl. item 4)	1
3	RPX4690A	KIT On/Off Switch (S800)/Vol. Contr. (R800) (includes item 4)	1
4	3205082E62	GASKET O-Ring (part of items 2 and 3)	2
5	3205422Q01	SEAL Stud (part of item 1)	2
6	6105436Q01	LIGHTPIPE LED	1
7	3205082E59	GASKET O-Ring	1
8	0305714J09	SCREW Module Ph Pan Hd 2-56x3/8"	7
9	0305381L02	SCREW Top Panel; 2-32	2
10	RPX4693A	KIT Anten. Bushing (incl. item 12)	1
11	3205082E71	GASKET O-Ring (part of item 13)	1
12	3205082E58	GASKET O-Ring (part of item 10)	1
13	RPX4692A	KIT Control Top Panel (incl item 11)	1
14	0400139731	LOCKWASHER Internal Tooth	1
15	0205591R01	NUT Antenna Bushing	1
16	0405781Q01	WASHER Detent (even no. of sw. pos.)	1
16	0405781Q03	WASHER Det. (odd no. of switch pos)	1
17	EAE6431A	ANTENNA UHF Helical (400-440 MHz)	1
17	EAE6432A	ANTENNA UHF Helical (438-470 MHz)	1
17	EAD6440	WHIP ANTENNA (403-520 MHz)	1
18	RPX4699A	KIT Frequency Knob	1
19	RPX4698A	KIT On/Off/Volume Knob	1
20	1305622Q02	ESCUTCHEON 10-Frequency	1
20	1305622Q12	ESCUTCHEON 10-Frequency Emergency	1
20	1305622Q02	ESCUTCHEON 10-Frequency Submersible	1
20	1305622Q12	ESCUTCHEON 10-Freq Emerg Submersible	1
21	0205916P01	NUT Spanner	2
22	3205082E61	GASKET O-Ring (part of item 23)	1
23	RPX4691A	KIT RF Connect. (incl. items 22 24)	1
24	4205852N01	CONTACT Ground RF (part of item 23)	1
25	NLE9530A	ASSEMBLY UHF Main PC Board 20/25kHz	1
25	NLE9550A	ASSEMBLY UHF Main PC Board 12.5kHz	1
26	NTN4647A	ASSEMBLY Back Shield (incl item 27)	1
27	0305706Q01	SCREW Captive (part of item 26)	4
28	4205577Q01	CLIP Ground	1
29	1405343S01	BOOT Oscillator	1
30	RPX4700A	KIT PTT/Controls Flex (incl item 31)	1
30	RPX4701A	KIT PTT/Controls Flex Assembly (includes items 2 3 31)	1
31	RPX4694A	KIT Contact Snapdome (S803 , 805) (part of item 30)	2
32	4505022P02	LEVER PTT	1
33	NTN4537A	BATTERY 500 mAh 220 V AC	1
33	NTN4538A	BATTERY 900 mAh 220 V AC	1
33	NTN4592A	BATTERY 500 mAh 220 V AC	1
33	NTN4593A	BATTERY 900 mAh 220 V AC	1
33	NTN4595A	BATTERY 1500 mAh 220 V AC	1
33	NTN4596A	BATTERY 1500 mAh 220 V AC	1
34	0305706Q02	SCREW Baseplate Ph Pan Hd 2-56x3/32" (part of item 43)	4
35	3905453Q01	CONTACT Power (part of item 43)	4
36	4205437Q01	RETAINER Baseplate (part of item 43)	1
37	RPX4696A	KIT Slotted Spanner Nut (part of item 43)	2
38	6405847N03	BASEPLATE (part of item 43)	1
39	3205701Q01	SEAL Elastomer (part of item 43)	1
40	3205472M01	SEAL Vacuum Port (part of item 43)	1
41	5505333Q01	LATCH Battery (part of item 43)	1
42	4105775Q01	SPRING Latch (part of item 43)	1
43	NHN6395A	ASSEMBLY Housing (incl. items 34 thru 42)	1
43	NHN6393A	ASSEMBLY Housing Submersible (incl. items 34 thru 42)	1
44		LABEL Bottom Nameplate	1
45		LABEL Top Nameplate	1
46	1405490Q01	BOOT Microphone	1
47	RPX4697A	KIT LS Brack. (incl. item 48)	1
48	7505641N03	PAD LS Bracket (part of item 47)	1
49	0105958M34	ASSEMBLY LS/ Mic. Flex	1
50	4205604Q01	RETAINER LS	1
51	1405182M03	INSULATOR Universal Connector	1
52	0705319R02	BRACKET Switch (optional)	1
53	4005221R02	SWITCH Dual-Func.(S801)(optional)	1
54	3205082E68	GASKET O-Ring (optional)	1

Pos	Code No	Description	Qt
55	NTN5076A	KIT Push-Only Knob (incl. item 54)	1
55	NTN5068A	KIT Push-and-Rotate Knob (incl. item 54)	1
55	NTN5069A	KIT Rotate-Only Knob (incl.item 54)	1
55	4305607S01	PLUG Seal	1
56	NTN4741A	ASSEMBLY Belt Clip	1
57	NTN5025A	COVER Universal Connector	1



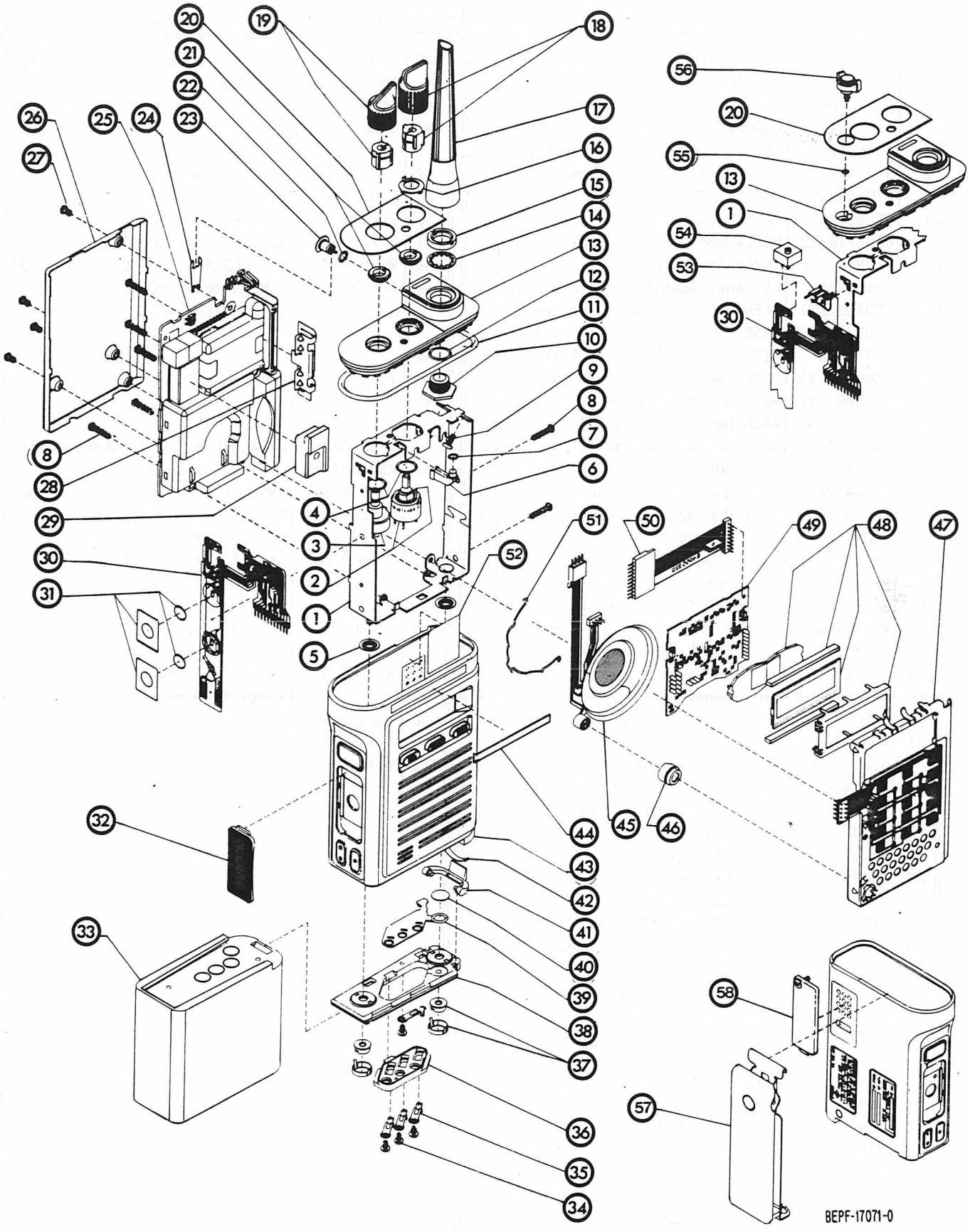
CQP7000a UHF WITHOUT KEYS
EXPLODED VIEW

M405.474

DATE: 9/20/1988

Pos	Code No	Description	Qt
1	RPX4695A	ASSEMBLY Frame Stud (incl. item 5)	1
2	RPX4689A	KIT Freq. Sw. (S823) (incl.item 4)	1
3	RPX4690A	KIT On/Off Switch (S800)/Vol.Contr. (R800) (includes item 4)	1
4	3205082E62	GASKET O-Ring (part of items 2 and 3)	2
5	3205422Q[illegible]	SEAL Stud (part of item 1)	2
6	6105436Q01	LIGHTPIPE LED	1
7	3205082E59	GASKET O-Ring	1
8	0305714J09	SCREW Module Ph Pan Hd 2-56x3/8"	7
9	0305381L02	SCREW Top Panel 2-32	2
10	RPX4693A	KIT Antenna Bushing (incl.item 12)	1
11	3205082E71	GASKET O-Ring (part of item 13)	1
12	3205082E58	GASKET O-Ring (part of item 10)	1
13	RPX4692A	KIT Control Top Panel (incl.item 11)	1
14	0400139731	LOCKWASHER Internal Tooth	1
15	0205591R01	NUT Antenna Bushing	1
16	0405781Q01	WASHER Detent (even no of sw. pos.)	1
16	0405781Q03	WASHER Det.(odd no of switch pos.)	1
17	EAE6431A	ANTENNA UHF Helical (400-440 MHz)	1
17	EAE6432A	ANTENNA UHF Helical (438-470 MHz)	1
17	EAE6434A	ANTENNA UHF Helical (470-520 MHz)	1
17	EAD6440A	ANTENNA UHF Whip (403-520 MHz)	1
18	RPX4699A	KIT Frequency Knob	1
18	RPX4017A	KIT Frequency Knob Low Profile	1
19	RPX4698A	KIT On/Off/Volume Knob	1
19	RPX4018A	KIT Volume Knob Low Profile	1
20	1305622Q02	ESCUTCHEON 10-Frequency	1
20	1305622Q12	ESCUTCHEON 10-Frequency Emergency	1
21	0205916P01	NUT Spanner	2
22	3205082E61	GASKET O-Ring (part of item 23)	1
23	RPX4691A	KIT RF Connector (incl.items 22 24)	1
24	4205852N01	CONTACT Ground RF (part of item 23)	1
25	NLE9530A	ASSEMBLY UHF Main PC Board 20/25kHz	1
25	NLE9550A	ASSEMBLY UHF Main PC Board 12.5kHz	1
26	NTN4647A	ASSEMBLY Back Shield (incl.item 27)	1
27	0305706Q01	SCREW Captive (part of item 26)	4
28	4205577Q01	CLIP Ground	1
29	1405387R01	BOOT Oscillator	1
30	RPX4700A	KIT PTT/Controls Flex (incl.item 31)	1
30	RPX4701A	KIT PTT/Controls Flex Assembly (includes item 2 3 31)	1
31	RPX4694A	KIT Contact Snapdome (part of item 30)	2
32	4505022P02	LEVER PTT (part of item 43)	1
33	NTN4537A	BATTERY 500 mAh 220 V AC	1
33	NTN4538A	BATTERY 900 mAh 220 V AC	1
33	NTN4592A	BATTERY 500 mAh 220 V AC	1
33	NTN4593A	BATTERY 900 mAh 220 V AC	1
33	NTN4595A	BATTERY 1500 mAh 220 V AC	1
33	NTN4596A	BATTERY 1500 mAh 220 V AC	1
34	0305706Q02	SCREW Baseplate Ph Pan Hd 2-56x3/32" (part of item 43)	4
35	3905453Q01	CONTACT Power (part of item 43)	4
36	4205437Q01	RETAINER Baseplate (part of item 43)	1
37	RPX4696A	KIT Slotted Spanner Nut (part of item 43)	2
38	6405847N03	BASEPLATE (part of item 43)	1
39	3205701Q01	SEAL Elastomer (part of item 43)	1
40	3205472M01	SEAL Vacuum Port (part of item 43)	1
41	5505333Q01	LATCH Battery (part of item 43)	1
42	4105775Q01	SPRING Latch (part of item 43)	1
43	NHN6422A	ASSEMBLY Housing (incl. 34 thru 42)	1
44		LABEL Nameplate	1
45	0105958M24	ASSEMBLY LS/Mic.Flex (8K Display)	1
46	1405490Q01	BOOT Microphone	1
47	RPX4702A	ASSEMBLY LCD/Speaker Bracket	1
48	RPX4703A	KIT LCD Assembly (part of item 49)	1
49	8460999A34	ASSEMBLY 8k Display PC Board (incl. item 48)	1
50	8405532Q01	FLEX CIRCUIT LCD Interconnect	1
51	4205604Q01	RETAINER Speaker	1
52	1405182M03	INSULATOR Universal Connector	1
53	0705319R02	BRACKET Switch (optional)	1
54	4005221R02	SWITCH Dual-Funct. (S801)(optional)	1
55	3205082E68	GASKET O-Ring (optional)	1

Pos	Code No	Description	Qt
56	NTN5076A	KIT Push-Only Knob (incl.item 54)	
56	NTN5068A	KIT Push-and -Rotate Knob (incl.item 54)	
56	NTN5069A	KIT Rotate-Only Knob (incl.item 54)	1
56	4305607S01	PLUG Seal	1
57	NTN4741A	ASSEMBLY Belt Clip	1
58	NTN5025A	COVER Universal Connector	1



CQP7000b UHF WITH 3 KEYS
EXPLODED VIEW

M405.475

MECHANICAL PARTS LIST FOR CQP7000c, UHF (WITH 15 BUTTONS)

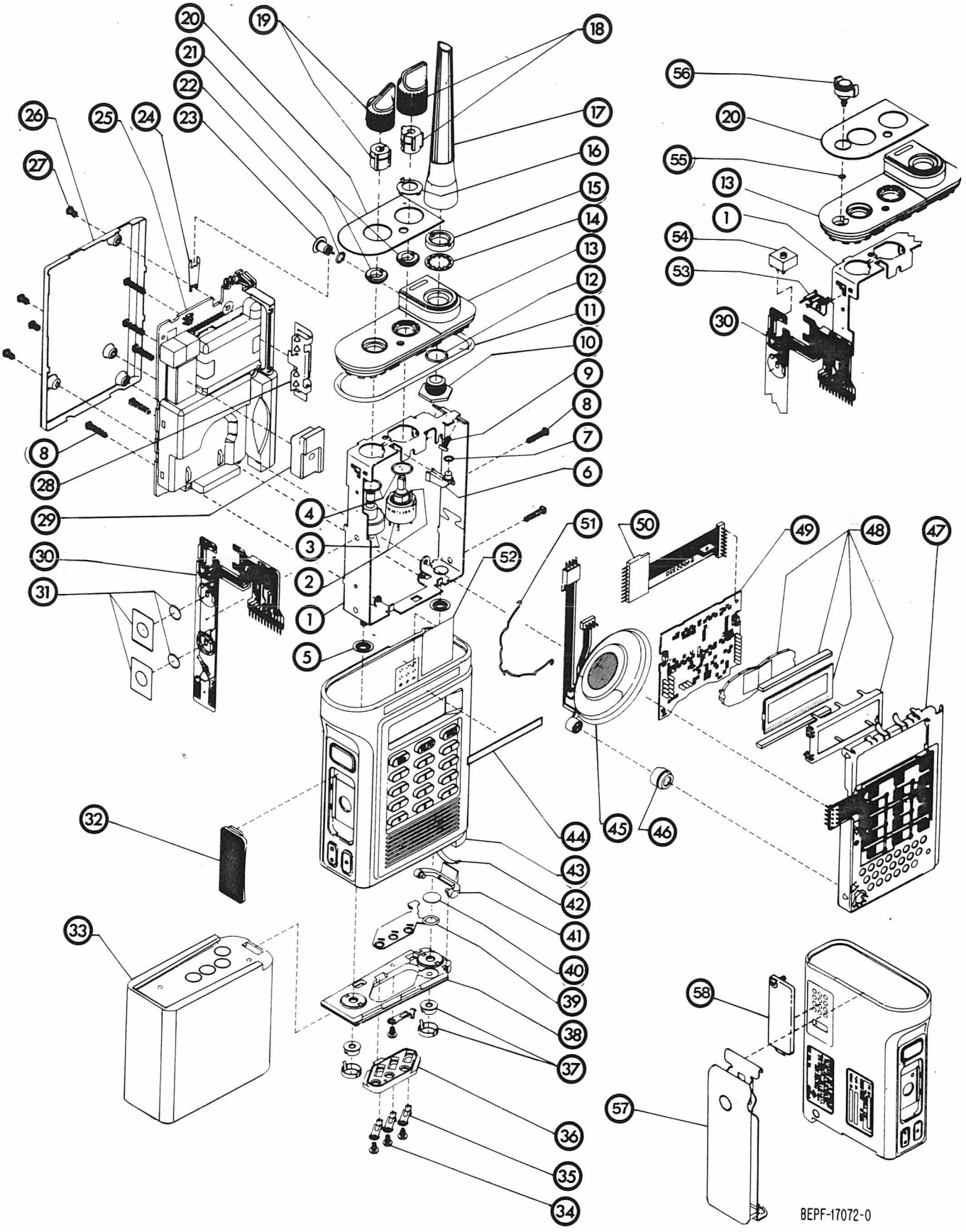
Pos	Code No.	Description	Qt
1	RPX4695A	ASM. Frame Stud (incl. item 5)	1
2	RPX4689A	KIT Freq.Sw.(S823)(incl.item 4)	1
3	RPX4690A	KIT On/Off Sw.(S800)/Vol.Contr.	1
		(R800) (incl. item 4)	1
4	3205082E62	GASK.O-Ring (part of items 2&3)	2
5	3205422Q01	SEAL Stud (part of item 1)	2
6	6105436Q01	LIGHTPIPE LED	1
7	3205082E59	GASKET O-Ring	1
8	0305714J09	SCREW Mod. Ph Pan Hd 2-56x3/8"	7
9	0305381L02	SCREW Top Panel 2-32	2
10	RPX4693A	KIT Ant. Bushing (incl.item 12)	1
11	3205082E71	GASKET O-Ring (part of item 13)	1
12	3205082E58	GASKET O-Ring (part of item 10)	1
13	RPX4692A	KIT Ctrl.Top Panel(incl.item11)	1
14	0400139731	LOCKWASHER Internal Tooth	1
15	0205591R01	NUT Antenna Bushing	1
16	0405781Q01	WASH.Detent(even no of sw.pos.)	1
16	0405781Q03	WASH.Detent (odd no of sw.pos)	1
17	EAE6431A	ANT. UHF Helical (400-440 MHz)	1
17	EAE6432A	ANT. UHF Helical (438-470 MHz)	1
17	EAE6434A	ANT. UHF Helical (470-520 MHz)	1
17	EAD6440A	ANT. UHF Whip (403-520 MHz)	1
18	RPX4699A	KIT Frequency Knob	1
18	REX4017A	KIT Frequency Knob Low Profile	1
19	RPX4698A	KIT On/Off/Volume Knob	1
19	REX4016A	KIT On/Off/Vol.Knob Low Profile	1
20	1305622Q02	ESCUTCHEON 10-Frequency	1
20	1305622Q12	ESCUTCHEON 10-Frequency Emerg.	1
21	0205916P01	NUT Spanner	2
22	3205082E61	GASKET O-Ring (part of item 23)	1
23	RPX4691A	KIT RF Conn.(incl. items 22 24)	1
24	4205852N01	CONT.Ground RF(part of item 23)	1
25	NLE9450A	ASM. UHF Main PC Board 20/25kHz	1
25	NLE9530A	ASM. UHF Main PC Board 12.5kHz	1
26	NTN4647A	ASM. Back Shield	
27	0305706Q01	SCREW Captive (part of item 26)	4
28	4205577Q01	CLIP Ground	1
29	1405387R01	BOOT Oscillator	1
30	RPX4700A	KIT PTT/Ctrl.Flex(incl.item 31)	1
30	RPX4701A	KIT PTT/Controls Flex ASM.	1
		(incl. items 2 3 31)	
31	RPX4694A	KIT Contact Snapdome	2
		(part of item 30)	
32	4505022P02	LEVER PTT	1
33	NTN4537A	BATTERY 500 mAh 220 V AC	1
33	NTN4538A	BATTERY 900 mAh 220 V AC	1
33	NTN4592A	BATTERY 500 mAh 220 V AC	1
33	NTN4593A	BATTERY 900 mAh 220 V AC	1
33	NTN4595A	BATTERY 1500 mAh 220 V AC	1
33	NTN4596A	BATTERY 1500 mAh 220 V AC	1
34	0305706Q02	SCREW Base pl.Pan Hd 2-56x3/32"	4
		(part of item 43)	
35	3905453Q01	CONTACT Power (part of item 43)	4
36	4205437Q01	RETAINER Base pl.	1
		(part of item 43)	
37	RPX4696A	KIT Slot. Span. Nut	2
		(part of item 43)	
38	6405847N03	Base pl. (part of item 43)	1
39	3205701Q01	SEAL Elastomer(part of item 43)	1

Pos	Code No.	Description	Qt
40	3205472M01	SEAL Vac.Port(part of item 43)	1
41	5505333Q01	LATCH Battery(part of item 43)	1
42	4105775Q01	SPRING Latch (part of item 43)	1
43	NHN6397A	ASM. Housing	1
		(incl. items 34 thru 42)	
44	----------	LABEL Nameplate	1
45	0105958M24	ASM. LS/Mic. Flex	1
46	1405490Q01	BOOT Microphone	1
47	RPX4702A	ASM. LCD/Speaker Bracket	1
48	RPX4703A	KIT LCD ASM. (part of item 49)	1
49	8460999A34	ASM. Display PC Board	1
		(incl. item 48)	
47			
48	ZLN6400A	Front shield	1
49		for 2200 version	
50	8405532Q01	FLEX CIRCUIT LCD Interconnect	1
51	4205604Q01	RETAINER Speaker	1
52	1405182M03	INSULATOR Universal Connector	1
53	0705319R02	BRACKET Switch (optional)	1
54	4005221R02	SWITCH Dual Funct.(S801)(opt.)	1
55	3205082E68	GASKET O-Ring (optional)	1
56	NTN5076A	KIT Push-Only Knob	1
		(incl.item 54)	
56	NTN5068A	KIT Push-and-Rotate Knob	1
		(incl. item 54)	
56	NTN5069A	KIT Rotate-Only Knob	1
		(incl.item 54)	
56	4305607S01	PLUG Seal	1
57	NTN4741A	ASM. Belt clip	1
58	NTN5025A	COVER Universal Connector	1

MECHANICAL PARTS LIST FOR CQP7000c, UHF (WITH 15 BUTTONS)

Pos	Code No.	Description	Qt
1	RPX4695A	ASM. Frame Stud (incl. item 5)	1
2	RPX4689A	KIT Freq.Sw.(S823)(incl.item 4)	1
3	RPX4690A	KIT On/Off Sw.(S800)/Vol.Contr.	1
		(R800) (incl. item 4)	1
4	3205082E62	GASK.O-Ring (part of items 2&3)	2
5	3205422Q01	SEAL Stud (part of item 1)	2
6	6105436Q01	LIGHTPIPE LED	1
7	3205082E59	GASKET O-Ring	1
8	0305714J09	SCREW Mod. Ph Pan Hd 2-56x3/8"	7
9	0305381L02	SCREW Top Panel 2-32	2
10	RPX4693A	KIT Ant. Bushing (incl.item 12)	1
11	3205082E71	GASKET O-Ring (part of item 13)	1
12	3205082E58	GASKET O-Ring (part of item 10)	1
13	RPX4692A	KIT Ctrl.Top Panel(incl.item11)	1
14	0400139731	LOCKWASHER Internal Tooth	1
15	0205591R01	NUT Antenna Bushing	1
16	0405781Q01	WASH.Detent(even no of sw.pos.)	1
16	0405781Q03	WASH.Detent (odd no of sw.pos)	1
17	EAE6431A	ANT. UHF Helical (400-440 MHz)	1
17	EAE6432A	ANT. UHF Helical (438-470 MHz)	1
17	EAE6434A	ANT. UHF Helical (470-520 MHz)	1
17	EAD6440A	ANT. UHF Whip (403-520 MHz)	1
18	RPX4699A	KIT Frequency Knob	1
18	REX4017A	KIT Frequency Knob Low Profile	1
19	RPX4698A	KIT On/Off/Volume Knob	1
19	REX4016A	KIT On/Off/Vol.Knob Low Profile	1
20	1305622Q02	ESCUTCHEON 10-Frequency	1
20	1305622Q12	ESCUTCHEON 10-Frequency Emerg.	1
21	0205916P01	NUT Spanner	2
22	3205082E61	GASKET O-Ring (part of item 23)	1
23	RPX4691A	KIT RF Conn.(incl. items 22 24)	1
24	4205852N01	CONT.Ground RF(part of item 23)	1
25	NLE9450A	ASM. UHF Main PC Board 20/25kHz	1
25	NLE9530A	ASM. UHF Main PC Board 12.5kHz	1
26	NTN4647A	ASM. Back Shield	
27	0305706Q01	SCREW Captive (part of item 26)	4
28	4205577Q01	CLIP Ground	1
29	1405387R01	BOOT Oscillator	1
30	RPX4700A	KIT PTT/Ctrl.Flex(incl.item 31)	1
30	RPX4701A	KIT PTT/Controls Flex ASM.	1
		(incl. items 2 3 31)	
31	RPX4694A	KIT Contact Snapdome	2
		(part of item 30)	
32	4505022P02	LEVER PTT	1
33	NTN4537A	BATTERY 500 mAh 220 V AC	1
33	NTN4538A	BATTERY 900 mAh 220 V AC	1
33	NTN4592A	BATTERY 500 mAh 220 V AC	1
33	NTN4593A	BATTERY 900 mAh 220 V AC	1
33	NTN4595A	BATTERY 1500 mAh 220 V AC	1
33	NTN4596A	BATTERY 1500 mAh 220 V AC	1
34	0305706Q02	SCREW Base pl.Pan Hd 2-56x3/32"	4
		(part of item 43)	
35	3905453Q01	CONTACT Power (part of item 43)	4
36	4205437Q01	RETAINER Base pl.	1
		(part of item 43)	
37	RPX4696A	KIT Slot. Span. Nut	2
		(part of item 43)	
38	6405847N03	Base pl. (part of item 43)	1
39	3205701Q01	SEAL Elastomer(part of item 43)	1

Pos	Code No.	Description	Qt
40	3205472M01	SEAL Vac.Port(part of item 43)	1
41	5505333Q01	LATCH Battery(part of item 43)	1
42	4105775Q01	SPRING Latch (part of item 43)	1
43	NHN6397A	ASM. Housing	1
		(incl. items 34 thru 42)	
44	----------	LABEL Nameplate	1
45	0105958M24	ASM. LS/Mic. Flex	1
46	1405490Q01	BOOT Microphone	1
47	RPX4702A	ASM. LCD/Speaker Bracket	1
48	RPX4703A	KIT LCD ASM. (part of item 49)	1
49	8460999A34	ASM. Display PC Board	1
		(incl. item 48)	
47			
48	ZLN6400A	Front shield	1
49		for 2200 version	
50	8405532Q01	FLEX CIRCUIT LCD Interconnect	1
51	4205604Q01	RETAINER Speaker	1
52	1405182M03	INSULATOR Universal Connector	1
53	0705319R02	BRACKET Switch (optional)	1
54	4005221R02	SWITCH Dual Funct.(S801)(opt.)	1
55	3205082E68	GASKET O-Ring (optional)	1
56	NTN5076A	KIT Push-Only Knob	1
		(incl.item 54)	
56	NTN5068A	KIT Push-and-Rotate Knob	1
		(incl. item 54)	
56	NTN5069A	KIT Rotate-Only Knob	1
		(incl.item 54)	
56	4305607S01	PLUG Seal	1
57	NTN4741A	ASM. Belt clip	1
58	NTN5025A	COVER Universal Connector	1



CQP7000c UHF WITH 15 KEYS
EXPLODED VIEW

M405.394/2

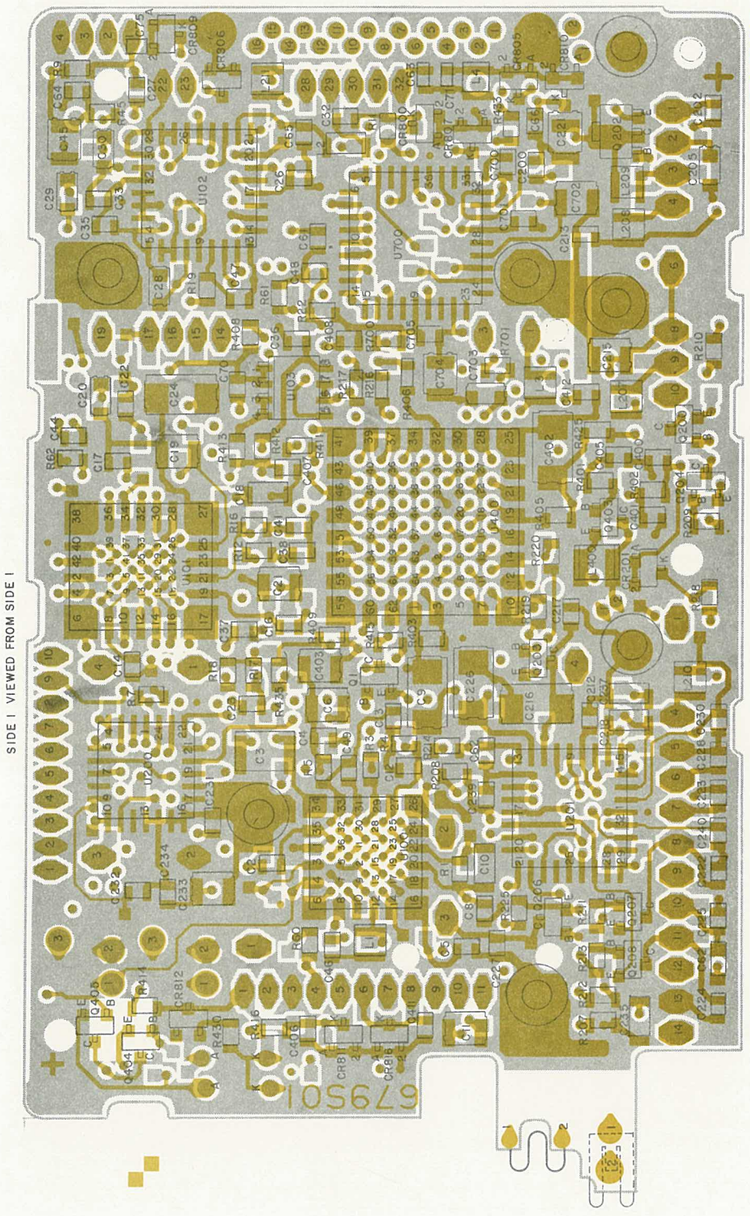
CHAPTER 2b

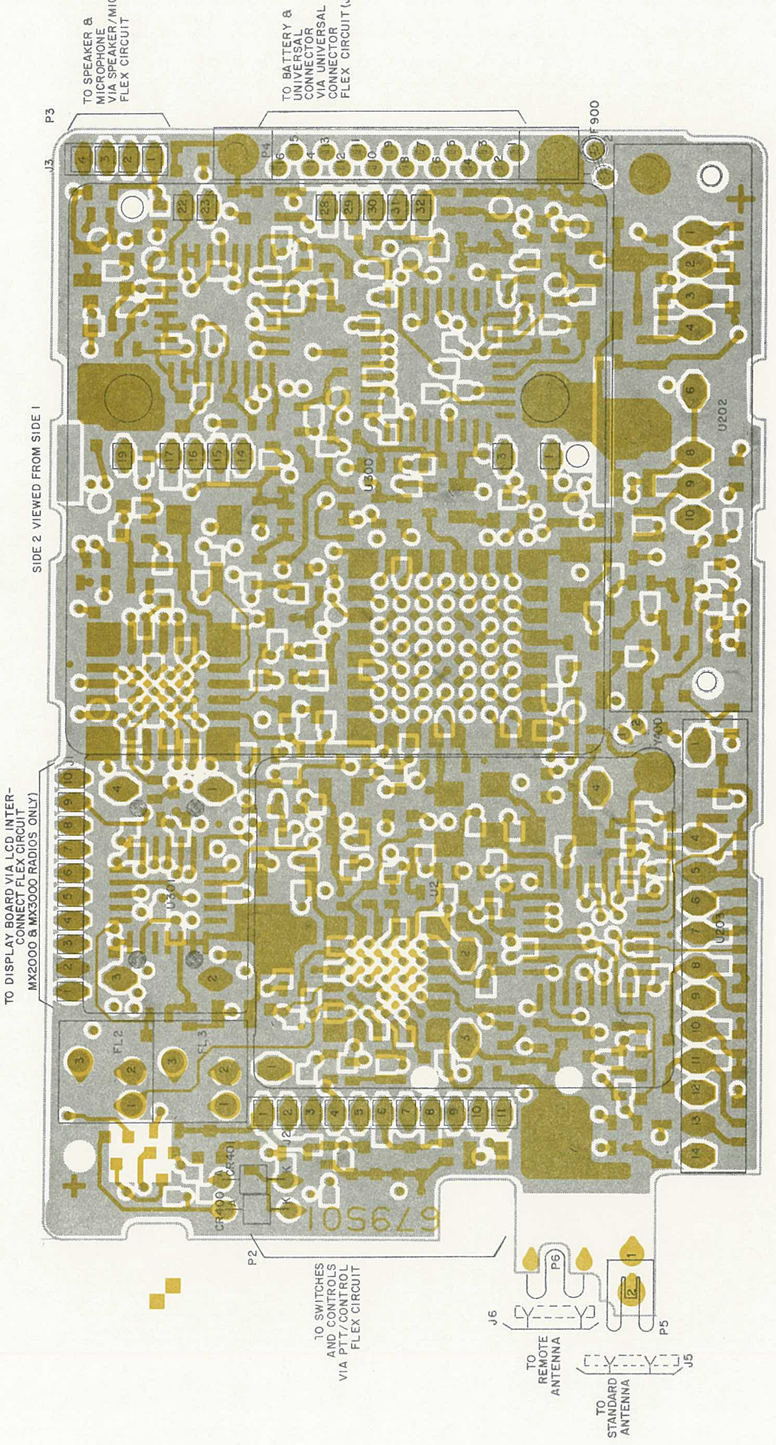
MAIN BOARD UHF

Component Layouts

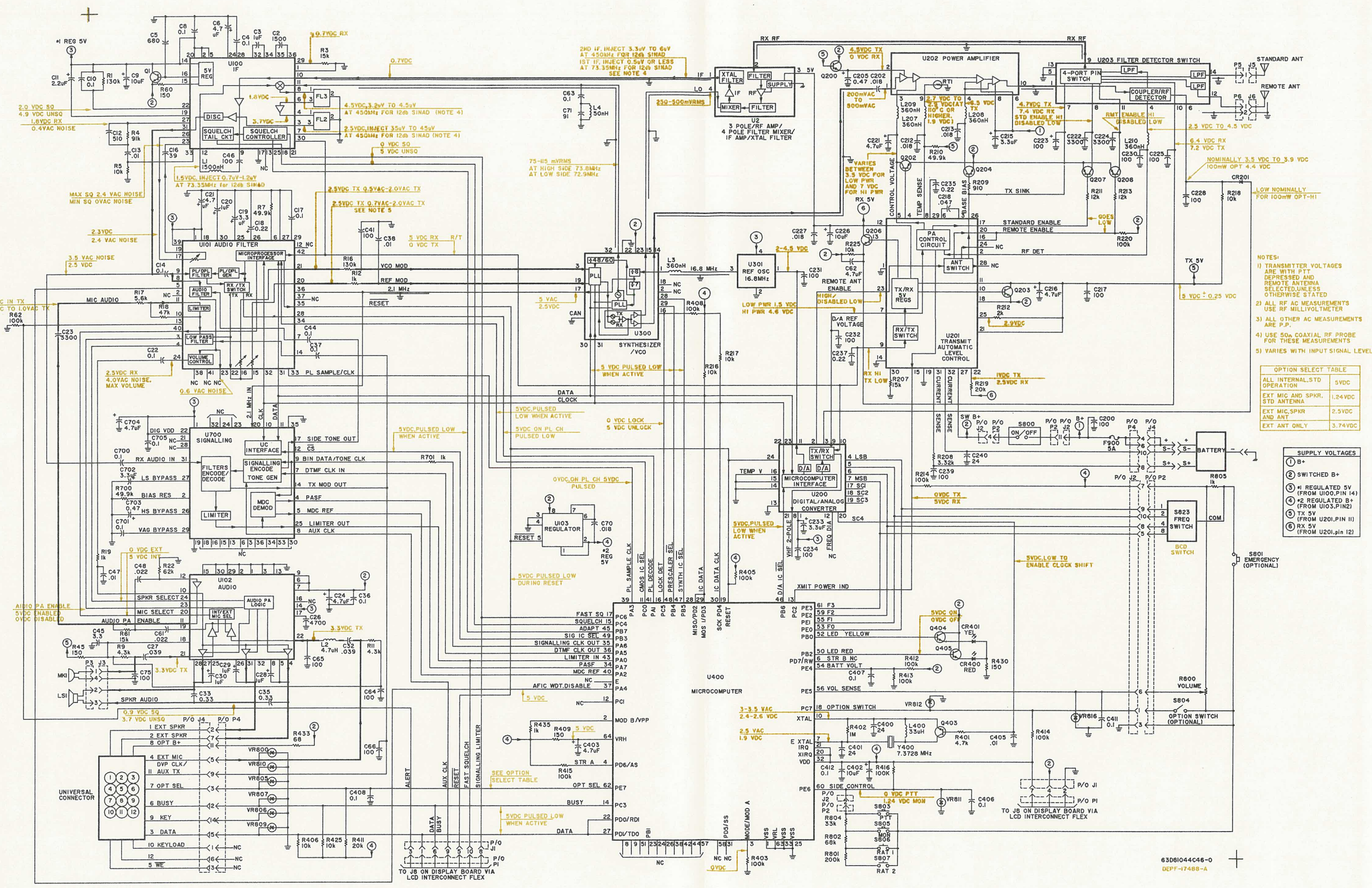
Electrical Diagrams

Parts List





CQP7000 UHF MAIN BOARD
COMPONENT LAYOUT
D404.804/3


U100 IF
U101 AUDIO FILTER
U102 AUDIO
U700 SIGNALLING
U200 DIGITAL/ANALOG CONVERTER
U201 TRANSMIT AUTOMATIC LEVEL CONTROL
U202 POWER AMPLIFIER
U203 FILTER DETECTOR SWITCH
U2 3 POLE/RF AMP/ 4 POLE FILTER MIXER/ IF AMP/XTAL FILTER
U300 SYNTHESIZER /VCO
U301 REF OSC 16.8MHz
U400 MICROCOMPUTER
U103 REGULATOR
MICROPROCESSOR INTERFACE
PL/DPL FILTER
PL/DPL GEN
AUDIO FILTER
LIMITER
LOW PASS FILTER
VOLUME CONTROL
UC INTERFACE
SIGNALLING ENCODE TONE GEN
FILTERS ENCODE/ DECODE
MDC DEMOD
SQUELCH TAIL CKT
SQUELCH CONTROLLER
AUDIO PA LOGIC
INT/EXT MIC SEL
MICROCOMPUTER INTERFACE
TX/RX SWITCH
PA CONTROL CIRCUIT
ANT SWITCH
TX/RX 5V REGS
RX/TX SWITCH
4-PORT PIN SWITCH
COUPLER/RF DETECTOR
ON/OFF
BCD SWITCH
UNIVERSAL CONNECTOR
TO J8 ON DISPLAY BOARD VIA LCD INTERCONNECT FLEX
TO J8 ON DISPLAY BOARD VIA LCD INTERCONNECT FLEX
STANDARD ANT
REMOTE ANT
BATTERY
#1 REG 5V
0.7VDC RX
0.7VDC
1.8VDC
3.7VDC
2.0 VDC SQ
4.9 VDC UNSQ
1.8VDC RX
0.4VAC NOISE
MAX SQ 2.4 VAC NOISE
MIN SQ 0VAC NOISE
2.3VDC
2.4 VAC NOISE
3.5 VAC NOISE
2.5 VDC
3.3VDC IN TX
0.5VAC TO 1.0VAC TX
MIC AUDIO
2.5VDC RX
4.0VAC NOISE, MAX VOLUME
0.6 VAC NOISE
0 VDC EXT
5 VDC INT
AUDIO PA ENABLE
5VDC ENABLED
0VDC DISABLED
SPKR AUDIO
0.9 VDC SQ
3.7 VDC UNSQ
MK1
LS1
P/O J4
P/O P4
1 EXT SPKR
2 EXT SPKR
8 OPT B+
4 EXT MIC
DVP CLK/
11 AUX TX
7 OPT SEL
6 BUSY
9 KEY
3 DATA
10 KEYLOAD
12
5 WE
UNIVERSAL CONNECTOR
4.5VDC,3.2uV TO 4.5uV AT 450MHz FOR 12db SINAD (NOTE 4)
2.5VDC,INJECT 35uV TO 45uV AT 450MHz FOR 12db SINAD (NOTE 4)
0 VDC SQ
5 VDC UNSQ
1.5VDC, INJECT 0.7uV-1.2uV AT 73.35MHz for 12db SINAD
2.5VDC TX 0.5VAC-2.0VAC TX
2.5VDC TX 0.7VAC-2.0VAC TX SEE NOTE 5
5 VDC RX R/T
0 VDC TX
VCO MOD
REF MOD
2.1 MHz
RESET
2.1 MHz IN
CLK
DATA
PL SAMPLE/CLK
2ND IF, INJECT 3.3uV TO 6uV AT 450MHz FOR 12db SINAD
1ST IF, INJECT 0.5uV OR LESS AT 73.35MHz FOR 12db SINAD SEE NOTE 4
250-500mVRMS
75-115 mVRMS AT HIGH SIDE 73.8MHz AT LOW SIDE 72.9MHz
5 VAC 2.5VDC
CAN
5 VDC PULSED LOW WHEN ACTIVE
0 VDC LOCK 5 VDC UNLOCK
5VDC,PULSED LOW WHEN ACTIVE
5VDC ON PL CH PULSED LOW
0VDC,ON PL CH 5VDC PULSED
5VDC PULSED LOW DURING RESET
5VDC PULSED LOW WHEN ACTIVE
SEE OPTION SELECT TABLE
ALERT
AUX CLK
RESET
FAST SQUELCH
SIGNALLING LIMITER
DATA
BUSY
4.5VDC TX 0 VDC RX
200mVAC TO 500mVAC
2.7 VDC TO 4.5 VDC(AT 60°C OR HIGHER, 1.9 VDC)
6.5 VDC TX
4.7VDC TX 7.4 VDC RX STD ENABLE HI DISABLED LOW
RMT ENABLE HI DISABLED LOW
2.5 VDC TO 4.5 VDC
6.4 VDC RX 7.2 VDC TX
NOMINALLY 3.5 VDC TO 3.9 VDC 100mW OPT 4.4 VDC
LOW NOMINALLY FOR 100mW OPT-HI
VARIES BETWEEN 3.3 VDC FOR LOW PWR AND 7 VDC FOR HI PWR
CONTROL VOLTAGE
TEMP SENSE
BASE BIAS
TX SINK
STANDARD ENABLE
REMOTE ENABLE
RF DET
GOES LOW
2-4.5 VDC
REMOTE ANT ENABLE
HIGH/ DISABLED LOW
LOW PWR 1.5 VDC HI PWR 4.6 VDC
D/A REF VOLTAGE
RX HI TX LOW
2.9VDC
1VDC TX 2.5VDC RX
CURRENT SENSE
TX 5V
5 VDC ± 0.25 VDC
SW B+
5VDC TX 5VDC RX
5VDC,LOW TO ENABLE CLOCK SHIFT
XMIT POWER IND
5VDC ON 0VDC OFF
0 VDC PTT
1.24 VDC MON
PTT
MON
RAT 1
RAT 2
S801 EMERGENCY (OPTIONAL)
S804 OPTION SWITCH (OPTIONAL)
R800 VOLUME
S823 FREQ SWITCH
F900 5A
S800 ON/OFF
R805 1k
R801 200k
R802 68k
R804 33k
R806 100k
R807 100k
R808 100k
R809 100k
R810 100k
R811 100k
R812 100k
R813 100k
R814 100k
R815 100k
R816 100k
R817 100k
R818 100k
R819 100k
R820 100k
R821 100k
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R825 100k
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R827 100k
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R831 100k
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R833 68
R834 68
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Pos	Code No	Description	Qt
C2	2160521A15	CAP 1500pF 5%	1
C3	2305265B14	CAP FIXED CHIP 1µF ±20% 25V	1
C4	2160521G37	CAP 0.1µF +80-20%	1
C5	2160521A11	CAP 680pF	1
C6	2362998B68	CAP 4.7 10V	1
C8	2160521G37	CAP 0.1µF +80-20%	1
C9	2362998B73	CAP 10µF 16V	1
C10	2160521D37	CAP 0.1µF 10%	1
C11	2362998B64	CAP 2.2µF 20V	1
C12	2160520C18	CAP 510pF 5% 50V	1
C13	2160521E25	CAP FIXED CHIP .01µF 20% 25V	1
C14	2160521G37	CAP 0.1µF +80-20%	1
C16	2160520F15	CAP 39pF 5%	1
C17	2160521G37	CAP 0.1µF +80-20%	1
C18	2160521H41	CAP .22µF +80-20%	1
C19	2362998B16	CAP 3.3µF 10% 16V	1
C20	2362998B59	CAP 1µF 16V	1
C21	2362998B68	CAP 4.7µF 10V	1
C22	2160521G37	CAP 0.1µF +80-20%	1
C23	2160521A19	CAP 3300pF 5%	1
C24	2362998B69	CAP 4.7µF 20V	1
C26	2160521A21	CAP 4700pF 5%	1
C27	2160521A32	CAP .039µF 5%	1
C28	2362998B59	CAP 1µF 16V	1
C29	2362998B59	CAP 1µF 16V	1
C30	2362998B59	CAP 1µF 16V	1
C32	2160521A32	CAP .039µF 5%	1
C33	2160521H43	CAP FIXED CHIP .33µF 20% 25V	1
C35	2160521H43	CAP FIXED CHIP .33µF 20% 25V	1
C36	2160521G37	CAP 0.1µF +80-20%	1
C37	2160521G37	CAP 0.1µF +80-20%	1
C38	2160521E31	CAP FIXED CHIP .01µF 20% 25V	1
C41	2160520C01	CAP 100pF 5% 50V	1
C44	2160521G37	CAP 0.1µF +80-20%	1
C45	2362998B16	CAP 3.3µF 10% 16V	1
C46	2160520C01	CAP 100pF 5% 50V	1
C47	2160521E31	CAP FIXED CHIP .01µF 20% 25V	1
C48	2160521A29	CAP .022µF ±5%	1
C61	2160521A29	CAP .022µF ±5%	1
C62	2362998D76	CAP 4.7µF 4V	1
C63	2160521G37	CAP 0.1µF +80-20%	1
C64	2160520G01	CAP 100pF 5%	1
C65	2160520G01	CAP 100pF 5%	1
C66	2160520G01	CAP 100pF 5%	1
C70	2160521E28	CAP FIXED CHIP .018µF 20% 25V	1
C71	2160520B24	CAP 91pF	1
C75	2160520G01	CAP 100pF 5%	1
C200	2160520G01	CAP 100pF 5%	1
C202	2160521E28	CAP FIXED CHIP .018µF 20% 25V	1
C205	2362998B05	CAP .47µF 10%	1
C212	2160521E28	CAP FIXED CHIP .018µF 20% 25V	1
C213	2160521E28	CAP FIXED CHIP .018µF 20% 25V	1
C215	2362998B16	CAP 3.3µF 10% 16V	1
C216	2362998B69	CAP 4.7µF 20V	1
C217	2160520G01	CAP 100pF 5%	1
C218	2160521F33	CAP FIXED CHIP .047µF 20% 25V	1
C221	2362998B68	CAP 4.7µF 10V	1
C222	2160521A19	CAP 3300pF 5%	1
C223	2160520G01	CAP 100pF 5%	1
C224	2160521A19	CAP 3300pF 5%	1
C225	2160520G01	CAP 100pF 5%	1
C226	2362998B73	CAP 10µF 16V	1
C227	2160521E28	CAP FIXED CHIP .018µF 20% 25V	1
C228	2160520G01	CAP 100pF 5%	1
C230	2160520G01	CAP 100pF 5%	1
C231	2160520G01	CAP 100pF 5%	1
C232	2160520G01	CAP 100pF 5%	1
C233	2362998B16	CAP 3.3µF 10% 16V	1
C234	2160520G01	CAP 100pF 5%	1
C235	2160521H41	CAP 0.22µF +80-20%	1
C237	2160521H41	CAP 0.22µF +80-20%	1
C239	2160520G01	CAP 100pF 5%	1
C240	2160520B10	CAP 24pF ±5% 50V NPO	1
C400	2160520B10	CAP 24pF 5% 50V NPO	1
C401	2160520B10	CAP 24pF 5% 50V NPO	1
C402	2362998B73	CAP 10µF 16V	1
C403	2362998B68	CAP 4.7µF 10V	1
C405	2160521E25	CAP FIXED CHIP .01µF 20% 25V	1
C406	2160521G37	CAP 0.1µF +80-20%	1
C407	2160521G37	CAP 0.1µF +80-20%	1
C408	2160521G37	CAP 0.1µF +80-20%	1
C412	2160521G37	CAP 0.1µF +80-20%	1
C412	2160521G37	CAP 0.1µF +80-20%	1

Pos	Code No	Description	Qt
C700	2160521G37	CAP 0.1µF +80-20%	1
C701	2160521G37	CAP 0.1µF +80-20%	1
C702	2362998B16	CAP 3.3µF 10% 16V	1
C703	2362998B05	CAP .47µF 10%	1
C704	2362998B68	CAP 4.7µF 10V	1
C705	2160521G37	CAP 0.1µF +80-20%	1
CR201	4805129M05	DIO SOT	1
CR400	4805729G22	DIO LED Red	1
CR401	4805729G23	DIO LED YELLOW	1
F900	0105955P27	FUSE Assembly 5 Amp	1
FL2	9105685Q02	FILTER Ceramic 450kHz 20kHz BW	1
OR		(20/25kHz CHANNEL SPACING ONLY)	
FL2	9105685Q03	FILTER Ceramic 450kHz 15kHz BW	1
		(12.5kHz CHANNEL SPACING ONLY)	
FL3	9105685Q03	FILTER Ceramic 450kHz 15kHz BW	1
J1	0905287C05	JACK Sock. 10 Pins	1
J2	0905287C05	JACK Sock. 11 Pins	1
J3	0905287C05	JACK Sock. 4 Pins	1
L1	2405452C64	COIL RF 1500nH ±5%	1
L2	2462575A05	COIL RF Choke 4.7uH	1
L3	2405452C49	COIL RF 360nH 5%	1
L4	2405452C09	COIL RF 50nH 5%	1
L207	2405452C49	COIL RF 360nH 5%	1
L208	2405452C49	COIL RF 360nH 5%	1
L209	2405452C49	COIL RF 360nH 5%	1
L210	2405452C49	COIL RF 360nH 5%	1
L400	2462585A40	COIL RF 33uH	1
LS1		SPEAKER 28ΩF ±1% (See Mech. PL)	1
MK1		MIC. (See Mech. Parts list)	1
P4	2805520Q01	PLUG Connector Bottom	1
P5	3905446Q03	PLUG Contact Antenna	1
P6	3905445Q03	PLUG Contact RF Wireform	1
Q1	4805128M16	TSTR PNP SOT-23 MMBT3906	1
Q200	4805128M44	TSTR NPN SOT-23	1
Q202	4805128M27	TSTR PNP SOT-89	1
Q203	4805128M16	TSTR PNP SOT-23 MMBT3906	1
Q204	4805218N13	TSTR PNP SOT MMBTA63	1
Q206	4805128M16	TSTR PNP SOT-23 MMBT3906	1
Q207	4805128M29	TSTR PNP SOT-23	1
Q208	4805128M29	TSTR PNP SOT-23	1
Q403	4805218N03	TSTR NPN SOT-23 MMBR901	1
Q405	4805128M44	TSTR NPN SOT-23	1
R1	0660079V28	RES 130k	1
R3	0660076A77	RES 15k	1
R4	0660078T24	RES 91k	1
R5	0660078T01	RES 10k	1
R7	0660078J80	RES 49.9k 1%	1
R9	0660076A64	RES FIXED 4300 ±5% 1/8W	1
R11	0660076A64	RES FIXED 4300 ±5% 1/8W	1
R12	0660076A49	RES 1k	1
R16	0660079V28	RES 130k	1
R17	0660076E73	RES 10k 1%	1
R18	0660076E89	RES 47k 1%	1
R19	0660076A49	RES 1k	1
R22	0660076A92	RES 33k ±1%	1
R45	0660076A29	RES FIXED CHIP 150 5% 1/8W	1
R60	0660076A29	RES FIXED CHIP 150 5% 1/8W	1
R61	0660076A77	RES 15k	1
R62	0660076B01	RES 100k	1
R207	0660076E77	RES 15k ±1%	1
R208	0660078G58	RES 3.32k ±1%	1
R209	0660076A48	RES FIXED CHIP 910 5% 1/8W	1
R210	0660078J80	RES 49.9k 1%	1
R211	0660076A75	RES 12k	1
R212	0660078G33	RES 2K ±1%	1
R213	0660076A75	RES 12k	1
R214	0660076B01	RES 100k	1
R216	0660076A73	RES 10k	1
R217	0660076A73	RES 10k	1
R218	0660076E73	RES 10k ±1%	1
R219	0660076A80	RES 20k	1
R220	0660076B01	RES 100k	1
R225	0660076A73	RES 10k	1
R401	0660076A65	RES 4.7k 1%	1
R402	0660076B25	RES 1M	1
R403	0660076B01	RES 100k	1
R405	0660076B01	RES 100k	1
R406	0660076A73	RES 10k	1
R408	0660076B01	RES 100k	1
R409	0660076A29	RES FIXED CHIP 150 5% 1/8W	1
R411	0660076A80	RES 20k	1
R412	0660078L01	RES 100k ±1%	1

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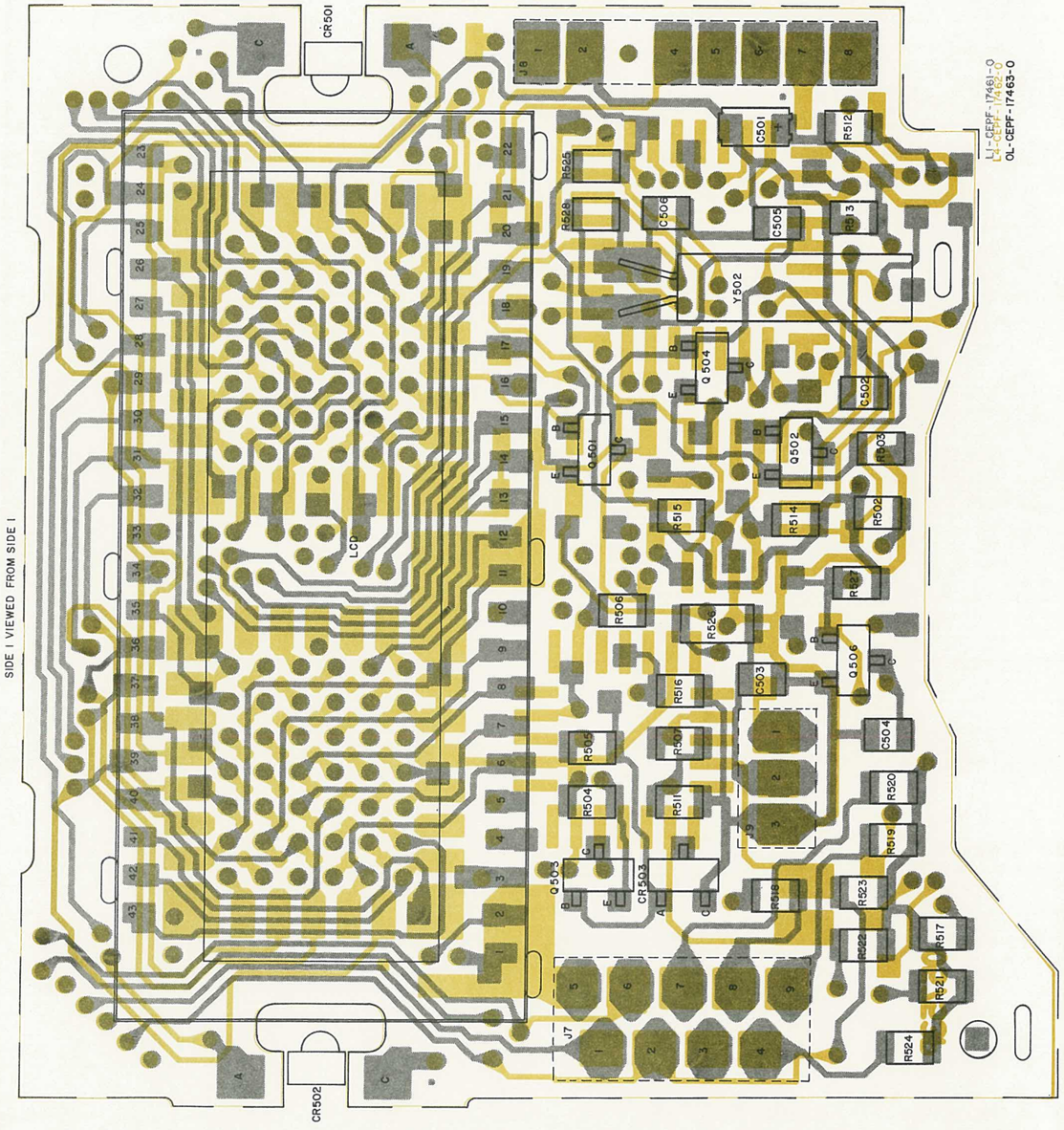
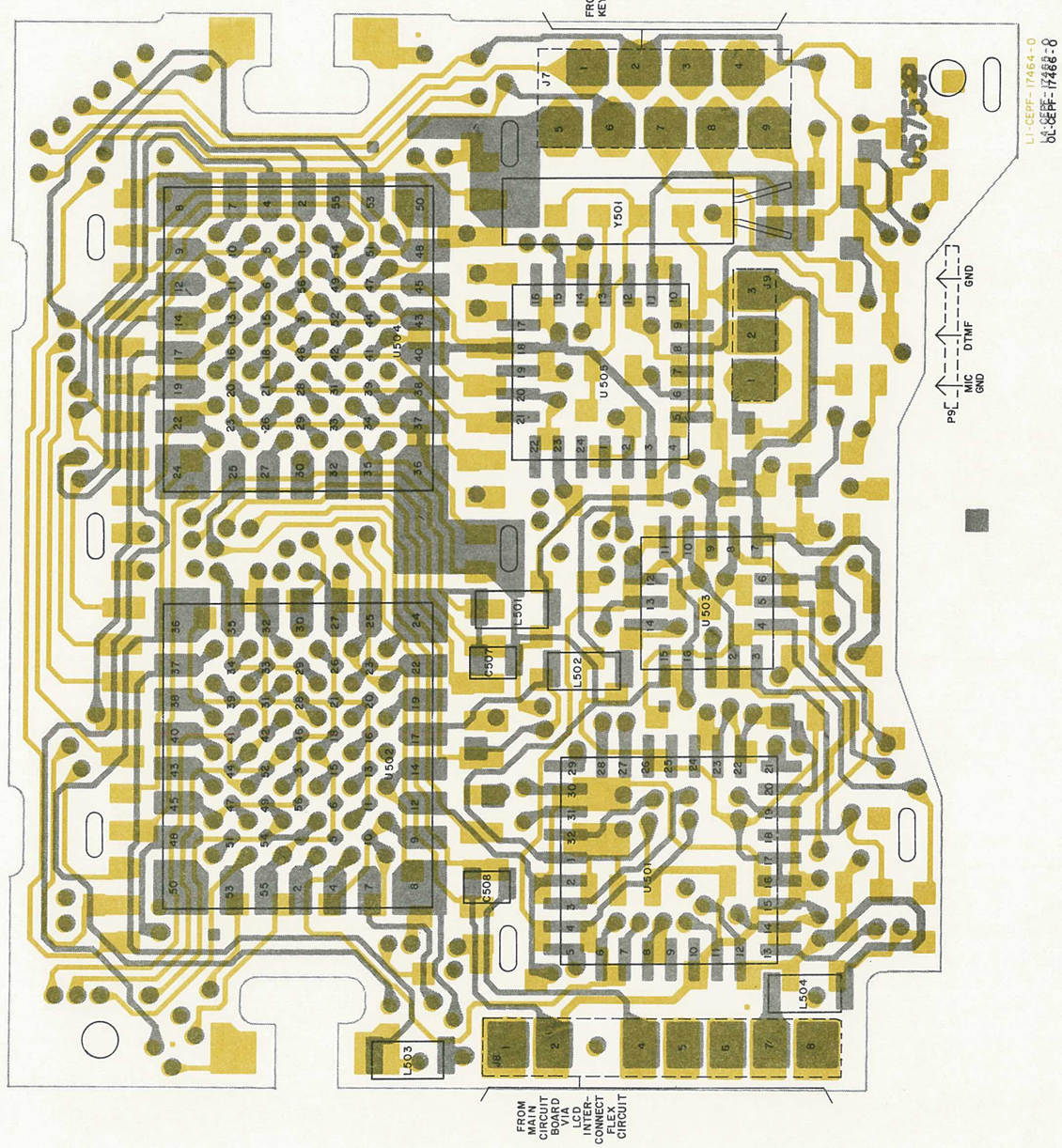
Pos	Code No	Description	Qt
R413	0660078L01	RES 100k ±1%	1
R414	0660076B01	RES 100k	1
R415	0660076B01	RES 100k	1
R416	0660076B01	RES 100k	1
R425	0660076A73	RES 10k	1
R430	0660076A29	RES FIXED CHIP 150 5% 1/8W	1
R433	0660076A21	RES FIXED CHIP 68 5% 1/8W	1
R435	0660076A49	RES 1k	1
R700	0660078J80	RES 49.9k 1%	1
R701	0660076A49	RES 1k	1
R800	RPX4690A	Pot. Kit On/Off/Vol. (INCLUDES S800)	1
R801		RES 200k (PART OF PTT/CONTROLS FLEX RPX4700A OR RPX4701A)	1
R802		RES 68k (PART OF PTT/CONTROLS FLEX RPX4700A OR RPX4701A)	1
R804		RES 33k (PART OF PTT/CONTROLS FLEX RPX4700A OR RPX4701A)	1
R805		RES 1k (PART OF PTT/CONTROLS FLEX RPX4700A OR RPX4701A)	1
S800	RPX4690A	SWITCH Kit On/Off/Vol. (INCLUDES R80	1
S801	4005221R01	SWITCH Dual Func. Emerg. (opto.)	1
S803	RPX4694A	SWITCH Kit Contact Snapdome PTT	1
S804	RPX4694A	SWITCH Kit Contact Snapdome Option	1
S805	RPX4694A	SWITCH Kit Contact Snapdome Monitor	1
S823	RPX4689A	SWITCH Kit Frequency	1
U2	NLE9431A	Filt/Amp/Mixer (403-433MHz) 20/25kHz	1
U2	NLE9501A	Filt/Amp/Mixer (403-433MHz) 12.5kHz	1
U2	NLE9432A	Filt/Amp/Mixer (440-470MHz) 20/25kHz	1
U2	NLE9502A	Filt/Amp/Mixer (440-470MHz) 12.5kHz	1
U100	0105953N02	IC I-F	1
U101	0105952N99	IC Audio Filter CMOS	1
U102	0105958P74	IC Audio Bipolar	1
U103	5160870A16	IC Regulator	1
U200	0105953N05	IC Digital/Analog Converter CMOS	1
U201	0105959P66	IC Transmit Automatic Level	1
U202	NLE9471A	HIGH Power Amplifier (403-433 MHz)	1
U202	NLE9472A	HIGH Power Amplifier (440-470 MHz)	1
U202	NLE9851A	LOW Power Amplifier (403-433 MHz)	1
U202	NLE9852A	LOW Power Amplifier (440-470 MHz)	1
U203	NFE6061A	Filter/Detector/Switch (403-470 MHz)	1
U300	NLE9461A	Filter VCO/Synthesizer (403-433 MHz)	1
U300	NLE9462A	VCO/Synthesizer (440-470 MHz)	1
U300	NLE9463A	VCO/Synthesizer (470-500 MHz)	1
U301	NXN6268A	Oscillator Reference 16.8MHz 5 PPM	1
U301	NXN6269A	Oscillator Reference 16.8MHz 2PPM	1
U400	0105953N08	Microcomputer MC68HC11 Tone	1
U700	0105953N11	Signal Filter CMOS	1
VR800	4805129M35	DIO Zener 5.6V	1
VR805	4805129M35	DIO Zener 5.6V	1
VR806	4805129M35	DIO Zener 5.6V	1
VR807	4805129M35	DIO Zener 5.6V	1
VR805	4805129M35	DIO Zener 5.6V	1
VR805	4805129M35	DIO Zener 5.6V	1
VR805	4805129M35	DIO Zener 5.6V	1
VR805	4805129M35	DIO Zener 5.6V	1
VR805	4805129M35	DIO Zener 5.6V	1
VR816	4805129M35	DIO Zener 5.6V	1
Y400	4805664G32	7.3728MHz	1
		NONREFERENCED ITEMS	
	0905287C05	SOCKET Printed Circuit (for all modules)(51 req'd)	
	1405881R01	BOOT Crystal (for Y400)	
	7505934Q01	PAD Oscillator (for U301)	

Pos	Code No	Description	Qt

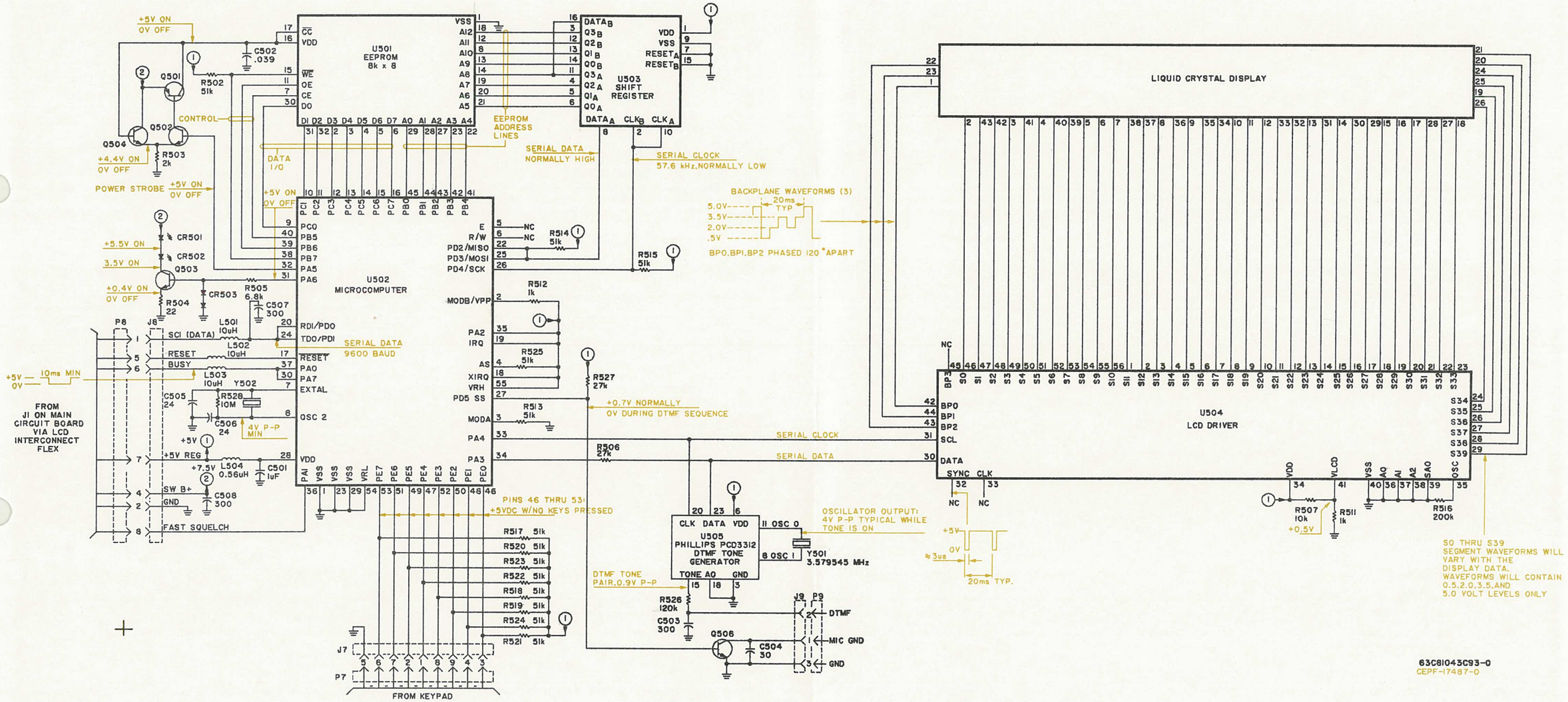
SIDE 1 VIEWED FROM SIDE 1



SIDE 2 VIEWED FROM SIDE 2



CQP7000 8K DISPLAY BOARD
COMPONENT LAYOUT
D404.820/3



CQP7000 8K DISPLAY BOARD

D404.819/3

DATE: 9/20/1988

Pos	Code No	Description	Qt
C501	2362998B59	CAP 1µF ±10% 20V	1
C502	2160521C32	CAP .039µF ±10% 25V	1
C503	2160520C12	CAP FIXED CHIP 300pF ±5% 50V	1
C504	2160520B12	CAP FIXED CHIP 30pF ±5% 50V	1
C505	2160520B10	CAP FIXED CHIP 24pF ±5% 50V	1
C506	2160520B10	CAP FIXED CHIP 24pF ±5% 50V	1
C507	2160520C12	CAP FIXED CHIP 300pF ±5% 50V	1
C508	2160520C12	CAP FIXED CHIP 300pF ±5% 50V	1
CR501	4805729G27	DIO LED YELLOW	1
CR502	4805729G27	DIO LED YELLOW	1
CR503	4805129M06	DIO Dual SOT-23	1
J7	0905287C05	JACK Socket 9 pins	1
J8	0905287C05	JACK Socket 8 pins	1
J9	0905287C05	JACK Socket 3 pins	1
L501	2462575A07	COIL RF Choke 10µH	1
L502	2462575A07	COIL RF Choke 10µH	1
L503	2462575A07	COIL RF Choke 10µH	1
L504	2462575A09	COIL RF Choke 0.56µH	1
Q501	4805128M29	TSTR PNP BCX18 (LH)	1
Q502	4805128M12	TSTR NPN BCW60B (RH)	1
Q503	4805128M12	TSTR NPN BCW60B (RH)	1
Q504	4805128M12	TSTR NPN BCW60B (RH)	1
Q506	4805128M12	TSTR NPN BCW60B (RH)	1
R502	0660076A90	RES 51k	1
R503	0660076A56	RES 2k	1
R504	0660076A09	RES FIXED CHIP 22 ±5% 1/8W	1
R505	0660076A69	RES 6.8k	1
R506	0660076A83	RES 27k	1
R507	0660076A73	RES 10k	1
R511	0660076A49	RES 1k	1
R512	0660076A49	RES 1k	1
R513	0660076A90	RES 51k	1
R514	0660076A90	RES 51k	1
R515	0660076A90	RES 51k	1
R516	0660076F08	RES 200k ±1%	1
R517	0660076A90	RES 51k	1
R518	0660076A90	RES 51k	1
R519	0660076A90	RES 51k	1
R520	0660076A90	RES 51k	1
R521	0660076A90	RES 51k	1
R522	0660076A90	RES 51k	1
R523	0660076A90	RES 51k	1
R524	0660076A90	RES 51k	1
R525	0660076A90	RES 51k	1
R526	0611024B02	RES 150k	1
R527	0660076A83	RES 27k	1
R528	0660076H49	RES 10M ±10%	1
U501	0105953N12	IC EEPROM 8k x 8	1
U502	0105954P48	IC Microcomputer HCMOS	1
U503	0105953N09	IC Shift Register CMOS	1
U504	0105953N10	IC LCD Driver	1
U505	0105953N18	IC Tone Encoder	1
Y501	4805664G40	CRYSTAL 3.579545MHz	1
Y502	4805664G39	CRYSTAL 3.6864MHz	1
		NONREFERENCED ITEMS	
	7505440S01	PAD Display Board	1

Pos	Code No	Description	Qt

CQP7000

ACCESSORIES INDEX BY CODE

CODE	DESCRIPTION		CHAPT. 1 PAGE	DETAILED CHAPT.
EAD6431	Helical antenna (UHF)	400 - 440 MHz	1	
EAD6432	Helical antenna (UHF)	440 - 470 MHz	1	
EAD6434	Helical antenna (UHF)	470 - 520 MHz	1	
EAD6440	Whip antenna	403 - 520 MHz	1	
EAD6471	Helical antenna (VHF)	136 - 150.8 MHz	1	
EAD6472	Helical antenna (VHF)	146 - 162 MHz	1	
EAD6473	Helical antenna (VHF)	152 - 174 MHz	1	
EAE6131	Helical Antenna for ETN6001	403 - 433 MHz.	1	
EAE6132	Helical Antenna for ETN6001	433 - 470 MHz.	1	
EAE6133	Helical Antenna for ETN6001	470 - 512 MHz.	1	
ELN1022	Mains operated automatic single unit charger from a 220 V AC power source.		3	2
ELN1023	Mains operated automatic single unit charger from a 240 V AC power source - with U.K. plug.		3	2
ELN1070	Mains operated automatic multi unit charger from a 220 V AC power source.		3	3
ELN1071	Mains operated automatic multi unit charger - with U.K. plug from a 240 V AC power source.		3	3
ELN4240	Count station Kit single unitcharger.		3	
EMN6001	Remote speaker microphone with clip and ear jack.		4	4
ETN4770	Small leather belt loop carrying case with nylon hold down strap for use with light capacity battery (500 mAh).		5	
ETN4771	Medium leather belt loop carrying case with nylon hold down strap for use with medium capacity battery (900 mAh).		5	
ETN4772	Large leather belt loop carrying case with nylon hold down strap for use with ultra high capacity battery (1500 mAh).		5	
ETN6001	Public safety microphone for UHF radios only. (with Velcro back and ear jack).		4	5

CODE	DESCRIPTION	CHAPT. 1 PAGE	DETAILED CHAPT.
GLN6591	Shoulder strap in nylon attaching to the leather carrying case.	5	
NLN4741	3" belt clip for attaching the radio to the belt.	5	
NLN5424	2" belt clip for attaching the radio to the belt.	5	
NLN7967	Wall mounting kit for multi-unit chargers ELN1070 and ELN1071.	3	
NLN7968	Rack mounting kit for multi-unit chargers ELN1070 and ELN1071.	3	
NTN4537	Intrinsically safe rechargeable nickel-cadmium battery 220 V AC. Light capacity: 500 mAh.	2	
NTN4538	Intrinsically safe rechargeable nickel-cadmium battery 220 V AC. Medium capacity: 900 mAh.	2	
NTN4592	Rechargeable nickel-cadmium battery 220 V AC. Light capacity: 500 mAh.	2	
NTN4593	Rechargeable nickel-cadmium battery 220 V AC. Medium capacity: 900 mAh.	2	
NTN4595	Rechargeable nickel-cadmium battery 220 V AC. Ultra high capacity: 1500 mAh.	2	
NTN4596	Intrinsically safe rechargeable nickel-cadmium battery 220 V AC. Ultra high capacity: 1500 mAh.	2	
NTN4799	Green card single unit charger rapid 220 V Europlug.	3	
ZMN6035	Remote speaker microphone (less belt clip)	4	
ZMN6036	Public safety microphone for UHF radios only (less Velcro back).	4	

CQP7000

ACCESSORIES INDEX BY CODE

CODE	DESCRIPTION		CHAPT. 1 PAGE	DETAILED CHAPT.
EAD6440	Whip antenna	403 - 520 MHz	1	
EAD6471	Helical antenna (VHF)	136 - 150.8 MHz	1	
EAD6472	Helical antenna (VHF)	146 - 162 MHz	1	
EAD6473	Helical antenna (VHF)	152 - 174 MHz	1	
EAE6131	Helical Antenna for ETN6001	403 - 433 MHz.	1	
EAE6132	Helical Antenna for ETN6001	438 - 470 MHz.	1	
EAE6133	Helical Antenna for ETN6001	470 - 512 MHz.	1	
EAE6431	Helical antenna (UHF)	400 - 440 MHz	1	
EAE6432	Helical antenna (UHF)	438 - 470 MHz	1	
EAE6434	Helical antenna (UHF)	470 - 520 MHz	1	
ELN1022	Mains operated automatic single unit charger from a 220 V AC power source.		3	2
ELN1023	Mains operated automatic single unit charger from a 240 V AC power source - with U.K. plug.		3	2
ELN1070	Mains operated automatic multi unit charger from a 220 V AC power source.		3	3
ELN1071	Mains operated automatic multi unit charger - with U.K. plug from a 240 V AC power source.		3	3
ELN4240	Count station Kit single unitcharger.		3	
EMN6001	Remote speaker microphone with clip and ear jack.		4	4
ETN4770	Small leather belt loop carrying case with nylon hold down strap for use with light capacity battery (500 mAh).		5	
ETN4771	Medium leather belt loop carrying case with nylon hold down strap for use with medium capacity battery (900 mAh).		5	
ETN4772	Large leather belt loop carrying case with nylon hold down strap for use with ultra high capacity battery (1500 mAh).		5	
ETN6001	Public safety microphone for UHF radios only. (with Velcro back and ear jack).		4	5

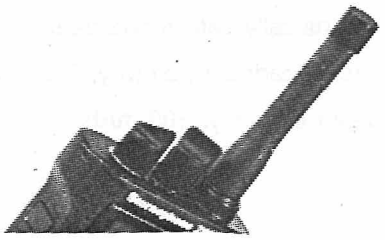
CODE	DESCRIPTION	CHAPT. 1 PAGE	DETAILED CHAPT.
GLN6591	Shoulder strap in nylon attaching to the leather carrying case.	5	
NLN7967	Wall mounting kit for multi-unit chargers ELN1070 and ELN1071.	3	
NLN7968	Rack mounting kit for multi-unit chargers ELN1070 and ELN1071.	3	
NTN4537	Intrinsically safe rechargeable nickel-cadmium battery 220 V AC. Light capacity: 500 mAh.	2	
NTN4538	Intrinsically safe rechargeable nickel-cadmium battery 220 V AC. Medium capacity: 900 mAh.	2	
NTN4592	Rechargeable nickel-cadmium battery 220 V AC. Light capacity: 500 mAh.	2	
NTN4593	Rechargeable nickel-cadmium battery 220 V AC. Medium capacity: 900 mAh.	2	
NTN4595	Rechargeable nickel-cadmium battery 220 V AC. Ultra high capacity: 1500 mAh.	2	
NTN4596	Intrinsically safe rechargeable nickel-cadmium battery 220 V AC. Ultra high capacity: 1500 mAh.	2	
NTN4741	3" belt clip for attaching the radio to the belt.	5	
NTN4799	Green card single unit charger rapid 220 V Europlug.	3	
NTN5424	2" belt clip for attaching the radio to the belt.	5	
ZMN6035	Remote speaker microphone (less belt clip)	4	
ZMN6036	Public safety microphone for UHF radios only (less Velcro back).	4	

CQP7000

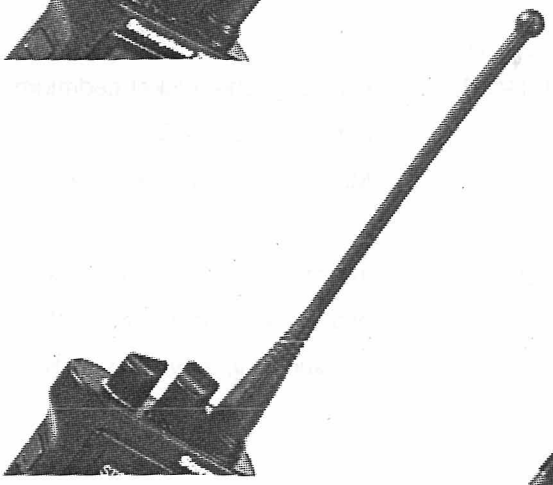
ACCESSORIES OVERVIEW

ANTENNAS

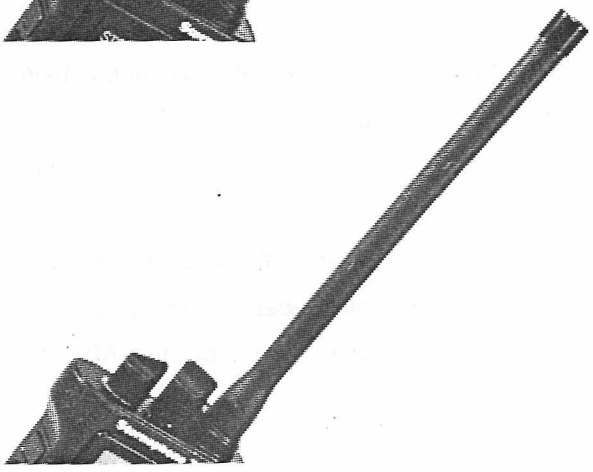
EAD6431	Helical antenna (UHF) 400 - 440 MHz
EAD6432	Helical antenna (UHF) 440 - 470 MHz
EAD6434	Helical antenna (UHF) 470 - 520 MHz



EAD6440	Whip antenna, 403 - 520 MHz



EAD6471	Helical antenna (VHF) 136 - 150.8 MHz
EAD6472	Helical antenna (VHF) 146 - 162 MHz
EAD6473	Helical antenna (VHF) 152 - 174 MHz



EAE6131	Helical Antenna, 403 - 433 MHz. Used with Public Safety speaker microphone (ETN6001)
EAE6132	Helical Antenna, 433 - 470 MHz. Used with Public Safety speaker microphone (ETN6001)
EAE6133	Helical Antenna, 470 - 512 MHz. Used with Public Safety speaker microphone (ETN6001)

see Public Safety Microphone

BATTERIES

NTN4592 Rechargeable nickel-cadmium battery, 220 V AC.
Light capacity: 500 mAh.

NTN4537 Intrinsically safe rechargeable nickel-cadmium battery, 220 V AC.
Light capacity: 500 mAh.

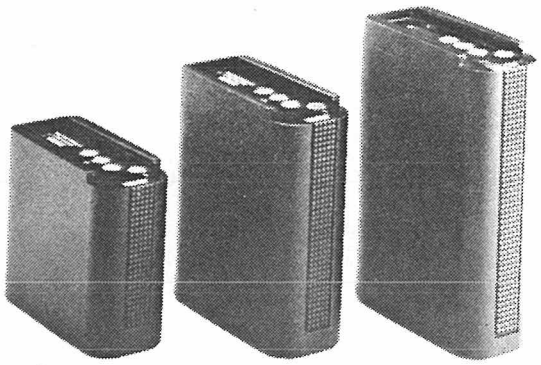
NTN4593 Rechargeable nickel-cadmium battery, 220 V AC.
Medium capacity: 900 mAh.

NTN4538 Intrinsically safe rechargeable nickel-cadmium battery, 220 V AC.
Medium capacity: 900 mAh.

NTN4595 Rechargeable nickel-cadmium battery, 220 V AC.
Ultra high capacity: 1500 mAh.

NTN4596 Intrinsically safe rechargeable nickel-cadmium battery, 220 V AC.
Ultra high capacity: 1500 mAh.

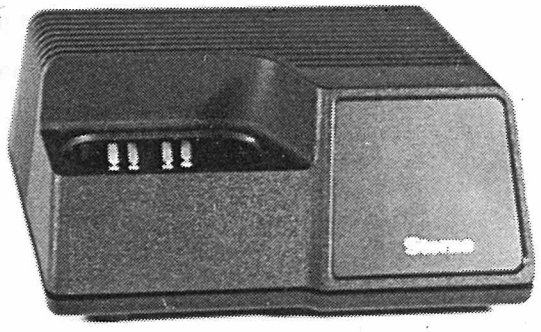
Nickel Cadmium batteries



Light Capacity | Medium Capacity | Ultra high Capacity

CHARGERS

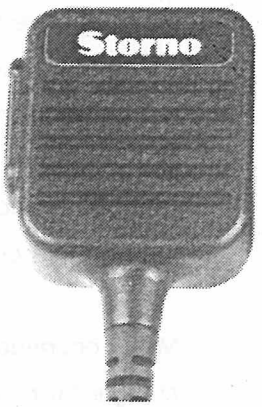
ELN1022	Mains operated automatic single unit charger for rechargeable nickel-cadmium batteries. Operates from a 220 V AC power source. Charge one loose battery as well as a battery fitted on the radio.
ELN1023	Mains operated automatic single unit charger for rechargeable nickel-cadmium batteries. Operates from a 240 V AC power source. Equipped with U.K. plug. Charge one loose battery as well as a battery fitted on the radio.
ELN1070	Mains operated automatic multi unit charger for rechargeable nickel-cadmium batteries. Operates from a 220 V AC power source.
ELN1071	Mains operated automatic multi unit charger for rechargeable nickel-cadmium batteries. Equipped with U.K. plug. Operates from a 240 V AC power source.
ELN4240	Count station Kit single unit charger.
NLN7967	Wall Mounting Kit for multi-unit chargers.
NLN7968	Rack Mounting Kit for multi-unit chargers.
NTN4799	Green card signle unit charger rapid 220 V Europlug.



AUDIO ACCESSORIES

EMN6001/
ZMN6035

Remote speaker microphone, including a speaker, a microphone and a push-to-talk switch (PTT). A coil cord with special plug provides the connection to the universal connector of the radio. EMN6001 includes a belt clip. ZMN6035 is without belt clip.



ETN6001/
ZMN6036

Public Safety microphone for UHF radios only. Includes a speaker, a microphone, a push to talk-switch and a high/low volume switch. A coil cord with special plug provides the connection to the universal connector of the radio. Note: The removable antenna EAE6131/EAE6132/EAE6133 must be ordered separately (see antennas). ETN6001 includes a Velcro Back. ZMN6036 is without Velcro Back. A separate Velcro patch pin attachment, NLN8410 can be ordered for ZMN6036.

CARRYING ACCESSORIES

ETN4770 Small leather belt loop carrying case with nylon hold down strap for use with light capacity battery (500 mAh).

ETN4771 Medium leather belt loop carrying case with nylon hold down strap for use with medium capacity battery (900 mAh).

ETN4772 Large leather belt loop carrying case with nylon hold down strap for use with ultra high capacity battery (1500 mAh).

NLN4741 3" belt clip for attaching the radio to the belt.

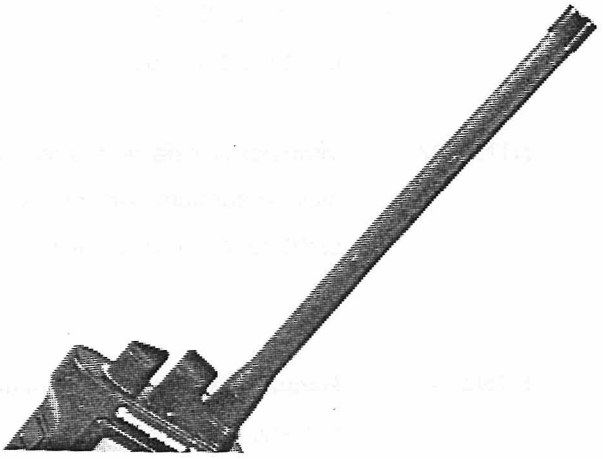
NLN5424 2" belt clip for attaching the radio to the belt.

GLN6591 Shoulder strap in nylon attaching to the leather carrying case.

CQP7000

ACCESSORIES OVERVIEW

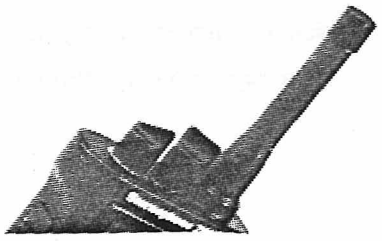
ANTENNAS



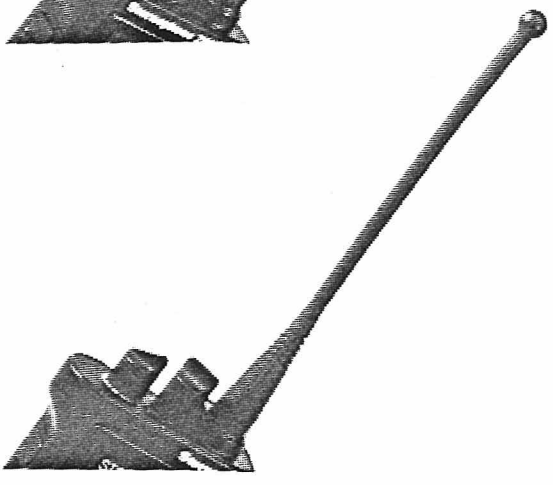
EAD6471	Helical antenna (VHF) 136 - 150.8 MHz
EAD6472	Helical antenna (VHF) 146 - 162 MHz
EAD6473	Helical antenna (VHF) 152 - 174 MHz

EAE6131	Helical Antenna, 403 - 433 MHz. Used with Public Safety speaker microphone (ETN6001)
EAE6132	Helical Antenna, 438 - 470 MHz. Used with Public Safety speaker microphone (ETN6001)
EAE6133	Helical Antenna, 470 - 512 MHz. Used with Public Safety speaker microphone (ETN6001)

see Public Safety Microphone



EAE6431	Helical antenna (UHF) 400 - 440 MHz
EAE6432	Helical antenna (UHF) 438 - 470 MHz
EAE6434	Helical antenna (UHF) 470 - 520 MHz



EAE6440	Whip antenna, 403 - 520 MHz

BATTERIES

NTN4592 Rechargeable nickel-cadmium battery, 220 V AC.
Light capacity: 500 mAh.

NTN4537 Intrinsically safe rechargeable nickel-cadmium battery, 220 V AC.
Light capacity: 500 mAh.

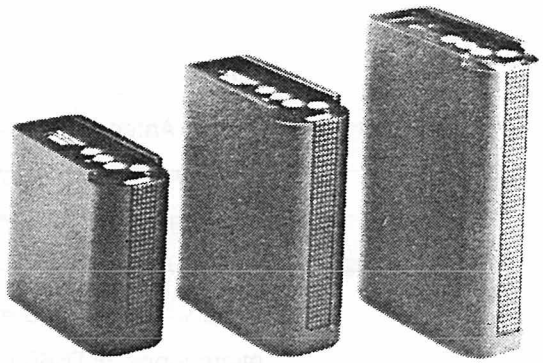
NTN4593 Rechargeable nickel-cadmium battery, 220 V AC.
Medium capacity: 900 mAh.

NTN4538 Intrinsically safe rechargeable nickel-cadmium battery, 220 V AC.
Medium capacity: 900 mAh.

NTN4595 Rechargeable nickel-cadmium battery, 220 V AC.
Ultra high capacity: 1500 mAh.

NTN4596 Intrinsically safe rechargeable nickel-cadmium battery, 220 V AC.
Ultra high capacity: 1500 mAh.

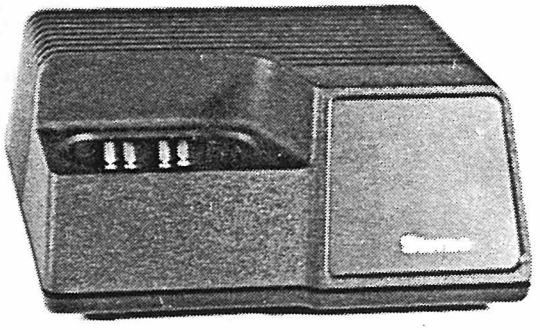
Nickel Cadmium batteries



Light Capacity | Medium Capacity | Ultra high Capacity

CHARGERS

ELN1022 Mains operated automatic single unit charger for rechargeable nickel-cadmium batteries. Operates from a 220 V AC power source. Charge one loose battery as well as a battery fitted on the radio.



ELN1023 Mains operated automatic single unit charger for rechargeable nickel-cadmium batteries. Operates from a 240 V AC power source. Equipped with U.K. plug. Charge one loose battery as well as a battery fitted on the radio.

ELN1070 Mains operated automatic multi unit charger for rechargeable nickel-cadmium batteries. Operates from a 220 V AC power source.

ELN1071 Mains operated automatic multi unit charger for rechargeable nickel-cadmium batteries. Equipped with U.K. plug. Operates from a 240 V AC power source.

ELN4240 Count station Kit single unit charger.

NLN7967 Wall Mounting Kit for multi-unit chargers.

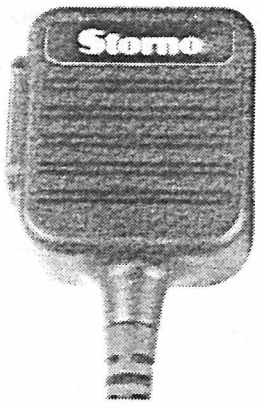
NLN7968 Rack Mounting Kit for multi-unit chargers.

NTN4799 Green card signle unit charger rapid 220 V Europlug.

AUDIO ACCESSORIES

EMN6001/
ZMN6035

Remote speaker microphone, including a speaker, a microphone and a push-to-talk switch (PTT). A coil cord with special plug provides the connection to the universal connector of the radio. EMN6001 includes a belt clip. ZMN6035 is without belt clip.



ETN6001/
ZMN6036

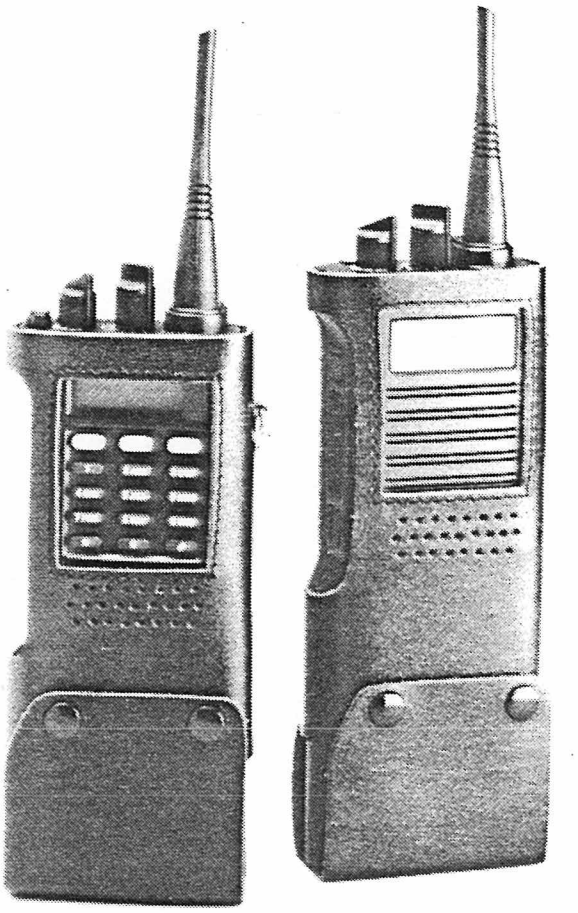
Public Safety microphone for UHF radios only. Includes a speaker, a microphone, a push to talk-switch and a high/low volume switch. A coil cord with special plug provides the connection to the universal connector of the radio. Note: The removable antenna EAE6131/EAE6132/EAE6133 must be ordered separately (see antennas). ETN6001 includes a Velcro Back. ZMN6036 is without Velcro Back. A separate Velcro patch pin attachment, NLN8410 can be ordered for ZMN6036.

CARRYING ACCESSORIES

ETN4770 Small leather belt loop carrying case with nylon hold down strap for use with light capacity battery (500 mAh).

ETN4771 Medium leather belt loop carrying case with nylon hold down strap for use with medium capacity battery (900 mAh).

ETN4772 Large leather belt loop carrying case with nylon hold down strap for use with ultra high capacity battery (1500 mAh).



NTN4741 3" belt clip for attaching the radio to the belt.

NTN5424 2" belt clip for attaching the radio to the belt.

GLN6591 Shoulder strap in nylon attaching to the leather carrying case.

ELN1022/ELN1023

SINGLE-UNIT RAPID-CHARGE BATTERY CHARGERS

IMPORTANT
SAFETY INTRUCTIONS

- 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 the nickel-cadmium type rechargeable batteries listed. Other types of batteries may furst, causing personal injury and damage.
- Do not expose charger to rain or snow.
- Use of an attachment not recommended or sold by Storno 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:
    - That pins on plug of extension cord are same number; size, and shape as those on plug on charger;
    - That extension cord is properly wired and in good electrical conditions;
    - The cord size is 18AWG for lengths up to 100 ft., 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.

INTRODUCTION

The Single-Unit Rapid-Charge Battery Chargers are accessory items using rechargeable nickel-cadmium batteries with the following capacities:

- Light-Capacity
- Medium-Capacity
- High-Capacity
- Ultra-High-Capacity

WARNING

Do not discard batteries in fire; they may explode

SPECIFICATIONS

INPUT POWER	220 VAC, 240 VAC; 50 Hz
SIZE	5.5" x 7.75" x 3.5"
WEIGHT	4 lbs
RAPID CHARGE TIME	Approximately 1 hour
OPERATING TEMPERATURE RANGE	0°C to 50°C
RAPID-CHARGE TEMPERATURE WINDOW	10°C to -41°C

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 a one-hour charge rate, after which the charging rate is automatically reduced to the 16-hour rate. The battery may be left in the battery charger indefinitely without any resultant harm.

A line voltage selector (placement of AC fuse F1 and receptacle) at the bottom of the unit permits either charger to operate from a 220 VAC, or 240 VAC power source.

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:

1. Make sure that the line voltage selector (fuse F1 and receptacle) is placed in the proper position to accept 220 VAC, or 240 VAC 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:

   - Remove the fuse drawer (item 22) from the AC connector (item 2).
   - Remove the voltage selector (item 21) from the fuse drawer.
   - Replace the voltage selector insert in the fuse drawer with the desired VAC showing through the fuse drawer's slotted window.
   - Replace the fuse drawer in the AC connector.

2. Connect the AC cord (jack J1 end) to the battery charger.

3. 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.

4. 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**
>
> 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.
> If the orange LED flashes, a problem exists with the battery.
> **TRY RESEATING THE BATTERY.** Refer to "Circuit Description" for details.

5. 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.

IN CASE OF TROUBLE

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

NOTE
Use only STORNO 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 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.

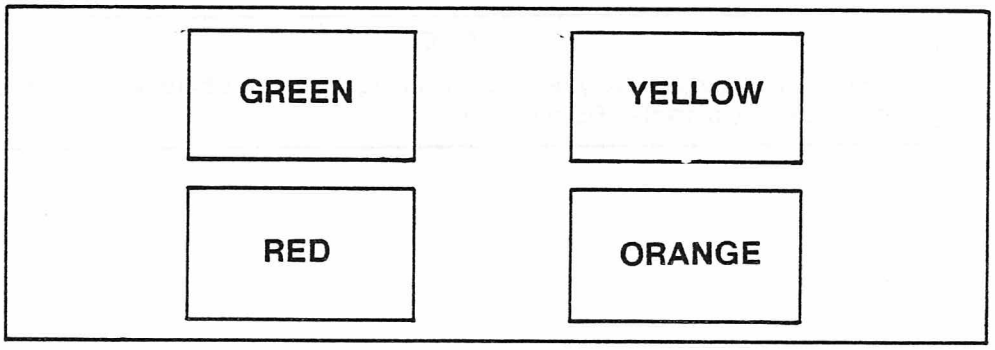


Figure 1. Front Panel LED locations

CIRCUIT DESCTIPTION

GENERAL

The mechanical placement of fuse F1 and its receptacle select the primary windings of transformer T1 for the 220 VAC, or 240 VAC 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 circuit 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.

RC VALUE	BATTERY TYPE
2.4 K ohm	LIGHT CAPACITY
5.1 K ohm	MEDIUM CAPACITY
18.0 K ohm	ULTRA-HIGH CAPACITY

Table 1. Normal RC Values

If the battery temperature is outside the temperature window below 10°C (3.33 VDC on the RT contact) or above 40°C (1.87 VDC 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 600 mA 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 7 VDC and 11 VDC. 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).

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).

BATTERY TYPE	CHARGE RATE (mA)	
	RAPID	TRICKLE
LIGHT CAPACITY	600	50
MEDIUM CAPACITY	1080	90
ULTRA-HIGH CAPACITY	1500	150

Table 2. Charge Rates

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 11 VDC, 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 (80 mV), 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.

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 fuction 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.

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.

MAINTENANCE

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.

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:

VOLTAGE MEASUREMENTS

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

BATTERY TYPE	BATTERY CONDITIONS	PIN	B+	Q1 B	Q1 C*	Q7 B	Q7 E	Q15 E	Q15 B	U2 5	U2 6	U2 7
NO BATTERY			17.0	17.0	8.1	0.2	0	17.0	17.0	0	0	0
NTN4537 NTN4592	RAPID CHARGE		15.5	14.8	10.2	0.7	0.1	15.5	15.5	.32	.32	1.9
NTN4537 NTN4592	CHARGE COMPLETE		16.7	16.2	9.1	1.0	0.4	16.7	16.7	.03	.03	0.1
NTN4538 NTN4593	RAPID CHARGE		14.7	14.0	10.7	0.8	0.2	14.7	14.7	.64	.64	3.5
NTN4538 NTN4593	CHARGE COMPLETE		16.7	16.1	8.7	1.0	0.4	16.7	16.7	.05	.05	0.3

BATTERY TYPE	BATTERY CONDITIONS	PIN	U3 2	U3 21	U3 22*	U3 23	U3 24**	U3 29	U3 40	CHARGING CURRENT (mA)
NO BATTERY			4.8	0	2.8	4.9	4.9	0	4.9	0
NTN4537 NTN4592	RAPID CHARGE		4.8	1.94	3.5	0.5	2.7	3.4	4.9	600
NTN4537 NTN4592	CHARGE COMPLETE		4.8	0.14	3.1	0.2	2.5	0	4.9	50
NTN4538 NTN4593	RAPID CHARGE		4.8	3.55	3.7	1.0	2.8	3.4	4.9	1080
NTN4538 NTN4593	CHARGE COMPLETE		4.8	0.29	3.0	2.8	2.6	0	4.9	90

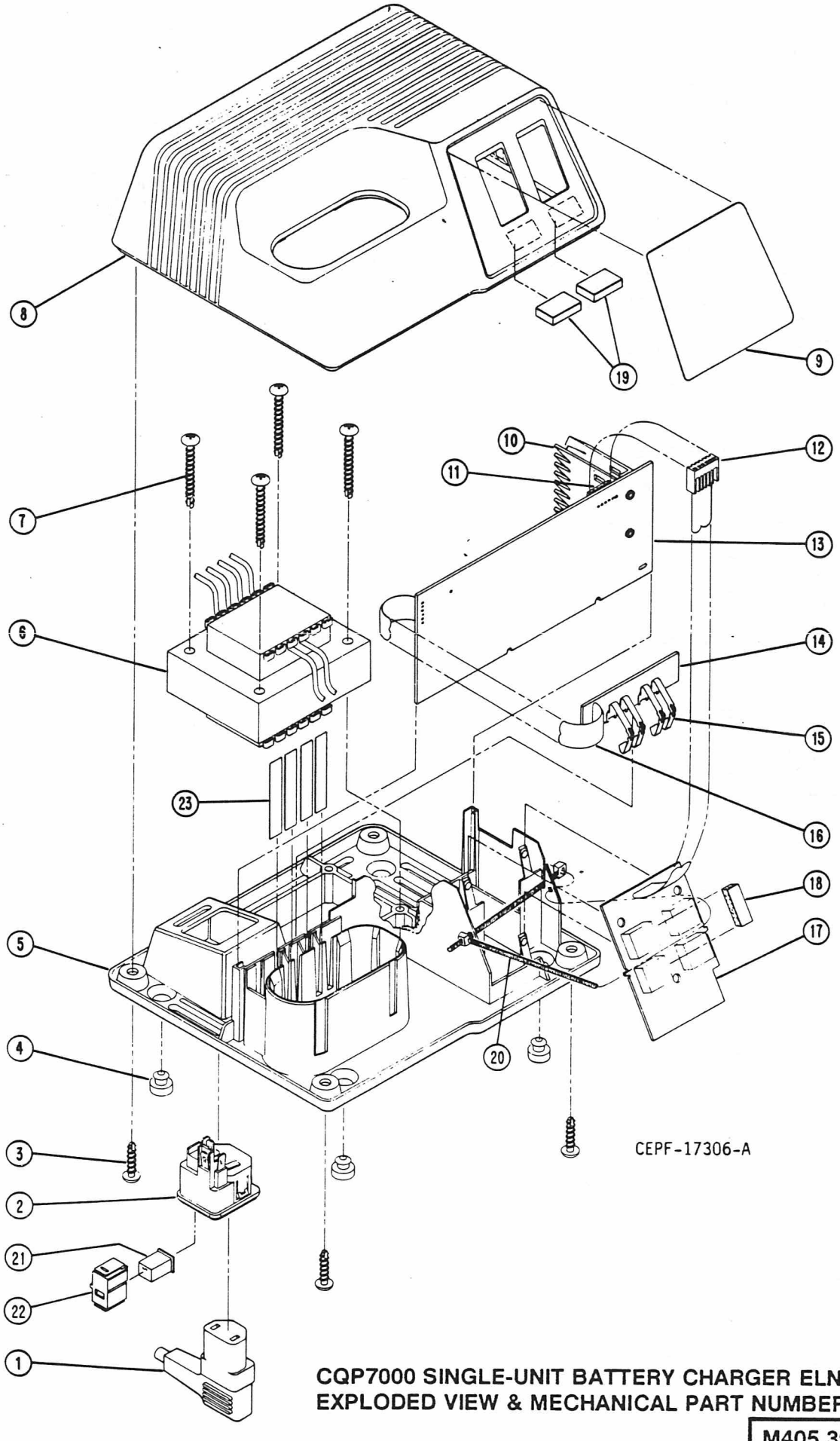
NOTES:

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.

DATE: 9/15/1988

Pos	Code No	Description	Qt
1	SEE NOTE	CORD, LINE	1
2	SEE NOTE	CONNECTOR , AC	1
3	0305199R02	SCREW, CUTTING, PHIL PAN HEAD; #10-16x0.625"	4
4	7505870R01	FOOT	4
5	1505556Q01	BASE	1
6	SEE NOTE	TRANSFORMER (T1)	1
7	0305199R01	SCREW, CUTTING, PHIL PAN HEAD; #10-16x1.625"	4
8	1505557Q01	HOUSING	1
9	1305679Q01	ESCUTCHEON	1
10		HEAT SINK (PART OF ITEM 13)	1
11		CONNECTOR, HEADER,6-POS (PART OF 13)	1
12		CONNECTOR, 6-POS (PART OF ITEM 17)	1
13	SEE NOTE	ASSEMBLY, LOGIC BOARD (INCLUDING ITEMS 10,11,14,15 AND 16)	1
14		PRINTED CIRCUIT BOARD, CONTACT (PART OF 13)	1
15		CONTACT (PART OF 13)	4
16		CABLE, FLEXIBLE (PART OF 13)	1
17	SEE NOTE	ASSM. DISP.BOARD (INCLUDES ITEM 12)	
18	7505083E08	PAD	1
19	7505641N03	PAD	2
20	4210217A26	TIE WRAP	2
21		INSERT, VOLTAGE (PART OF ITEM 22)	1
22	2805245S01	DRAWER, FUSE (INCLUDES ITEM 21)	1
23	1405209L09	INSULATOR	4
		NOTE: REFER TO ELECTRICAL PARTS LIST FOR PART NUMBER AND DESCRIPTION	

Pos	Code No	Description	Qt

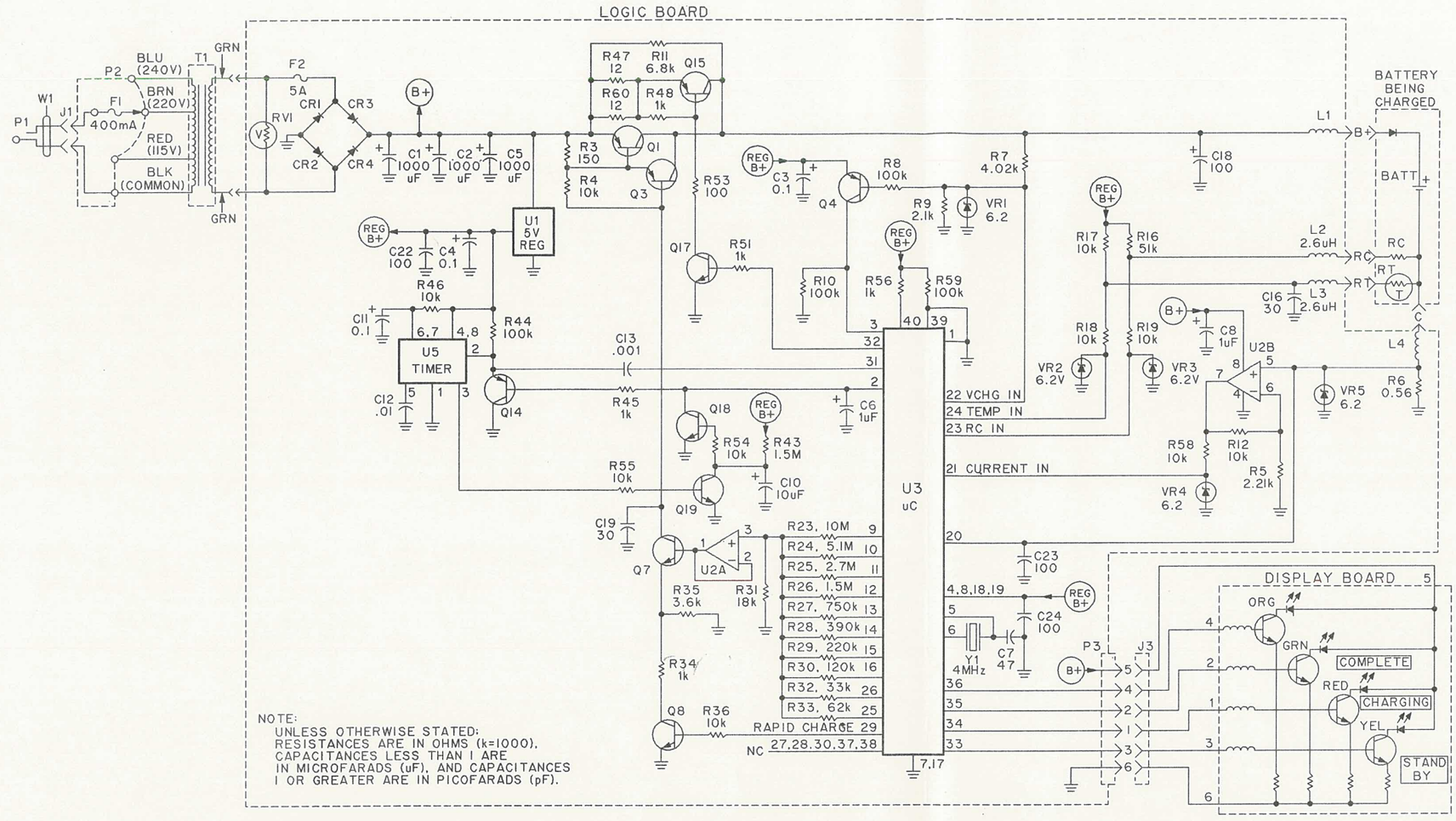


CQP7000 SINGLE-UNIT BATTERY CHARGER ELN1022
EXPLODED VIEW & MECHANICAL PART NUMBERS

M405.399/3

DATE: 9/15/1988

Pos	Code No	Description	Qt
C1	2360561H19	CAP 1000µF ±20% 35V	1
C2	2360561H19	CAP 1000µF ±20% 35V	1
C3	2383441B20	CAP 0.1µF ±20% 35V	1
C4	2383441B20	CAP 0.1µF ±20% 35V	1
C5	2360561H19	CAP 1000µF ±20% 35V	1
C6	2383441B15	CAP 1µF ±20% 35V	1
C7	2105529B11	CAP 47pF 5% N150	1
C8	2383441B15	CAP 1µF ±20% 35V	1
C10	2305499G16	CAP 10µF ±10% 16V	1
C11	2383441B20	CAP 0.1µF ±20% 35V	1
C12	2105457G14	CAP .01 +30-80% 63V	1
C13	2105457G09	CAP 1000pF 63V	1
C16	2105454G47	CAP 30pF ±5% 63V N150	1
C18	2105455G12	CAP 100pF ±10% 63V N750	1
C19	2105454G47	CAP 30pF ±5% 63V N150	1
C22	2105455G12	CAP 100pF ±10% 63V N750	1
C23	2105455G12	CAP 100pF ±10% 63V N750	1
C24	2105455G12	CAP 100pF ±10% 63V N750	1
CR1	4882525G19	DIO SILICON 3A 50PIV	1
CR2	4882525G19	DIO SILICON 3A 50PIV	1
CR3	4882525G19	DIO SILICON 3A 50PIV	1
CR4	4882525G19	DIO SILICON 3A 50PIV	1
F1	6505700Q04	FUSE 400mA	1
F2	6505214E02	FUSE 5 Amp	1
L1	2483977B02	COIL RF CHOKE	1
L2	2482723H19	COIL RF 2.6uH	1
L3	2482723H19	COIL RF 2.6uH	1
L4	2483977B02	COIL RF CHOKE	1
Q1	4800869807	TSTR PNP TYPE M9807	1
Q3	4800869643	TSTR PNP TYPE M9643	1
Q4	4800869643	TSTR PNP TYPE M9643	1
Q7	4800869642	TSTR NPN TYPE M9642	1
Q8	4800869642	TSTR NPN TYPE M9642	1
Q14	4800869643	TSTR PNP TYPE M9643	1
Q15	4800869807	TSTR PNP TYPE M9807	1
Q17	4800869706	TSTR NPN TYPE M9706	1
Q18	480086942	TSTR NPN TYPE M9642	1
Q19	480086942	TSTR NPN TYPE M9642	1
R3	0611009C29	RES 150 ±5% 1/4W	1
R4	0611009C73	RES 10k	1
R5	0610621C28	RES 2.21k ±1%	1
R6	1782036G18	RES .56 ±5% 2W	1
R7	0610621C53	RES 4.02k ±1%	1
R8	0611009C97	RES 100k	1
R9	0610621C26	RES 2.1k ±1%	1
R10	0611009C97	RES 100k	1
R11	0611009C69	RES 6.8k	1
R12	0610621C91	RES 10k ±1%	1
R16	0611009C90	RES 51k	1
R17	0610621C91	RES 10k ±1%	1
R18	0611009C73	RES 10k	1
R19	0611009C73	RES 10k	1
R23	0610164K58	RES 10M	1
R24	0610164K51	RES 5.1M	1
R25	0610164K44	RES 2.M	1
R26	0610164K38	RES 1.5M	1
R27	0611009B19	RES 750k	1
R28	0611009D12	RES 390k	1
R29	0611009D06	RES 220k	1
R30	0611009C99	RES 120k	1
R31	0611009C79	RES 18k	1
R32	0611009C85	RES 33k	1
R33	0611009C92	RES 62k	1
R34	0611009C49	RES 1k	1
R35	0611009C62	RES 3.6k	1
R36	0611009C73	RES 10k	1
R43	0610164K38	RES 1.5M	1
R44	0611009C97	RES 100k	1
R45	0611009C49	RES 1k	1
R46	0611009C73	RES 10k	1
R47	1705261K15	RES 12 ±10% 5W	1
R48	0611009C49	RES 1k	1
R51	0611009C49	RES 1k	1
R53	1705530L07	RES 100 ±10% 2W	1
R54	061109C73	RES 10k	1
R55	0611009C73	RES 10k	1
R56	0611009C49	RES 1k	1
R58	0611009C73	RES 10k	1
R59	0611009C97	RES 100k	1
R60	1705261K15	RES 12 ±10% 5W	1
RV1	0605220M01	VARISTOR 35V	1
T1	2505578Q01	TRANSFORMER	1
U1	5184320A47	IC 5V REGULATOR	1
U2	5105469E40	IC DUAL OP Amp	1
U3	5105849Q01	IC MICROCOMPUTER	1
U5	5184320A35	IC 555 TIMER	1
VR1	4811034G13	DIO ZENER 6.2V	1
VR2	4811034G13	DIO ZENER 6.2V	1
VR3	4811034G13	DIO ZENER 6.2V	1
VR4	4811034G13	DIO ZENER 6.2V	1
VR5	4811034G13	DIO ZENER 6.2V	1
Y1	4805664G25	CRYSTAL 4MHz	1
		NONREFERENCED ITEMS	1
	2805546Q02	CONNECTOR AC	1
	3005204R01	CORD LINE (115VAC 50/60Hz)	1
	3005204R03	CORD LINE (220/240VAC 50/60Hz)	1
	0105959M91	ASSEMBLY LOGIC BOARD	1
	8460999A40	ASSEMBLY DISPLAY BOARD	1



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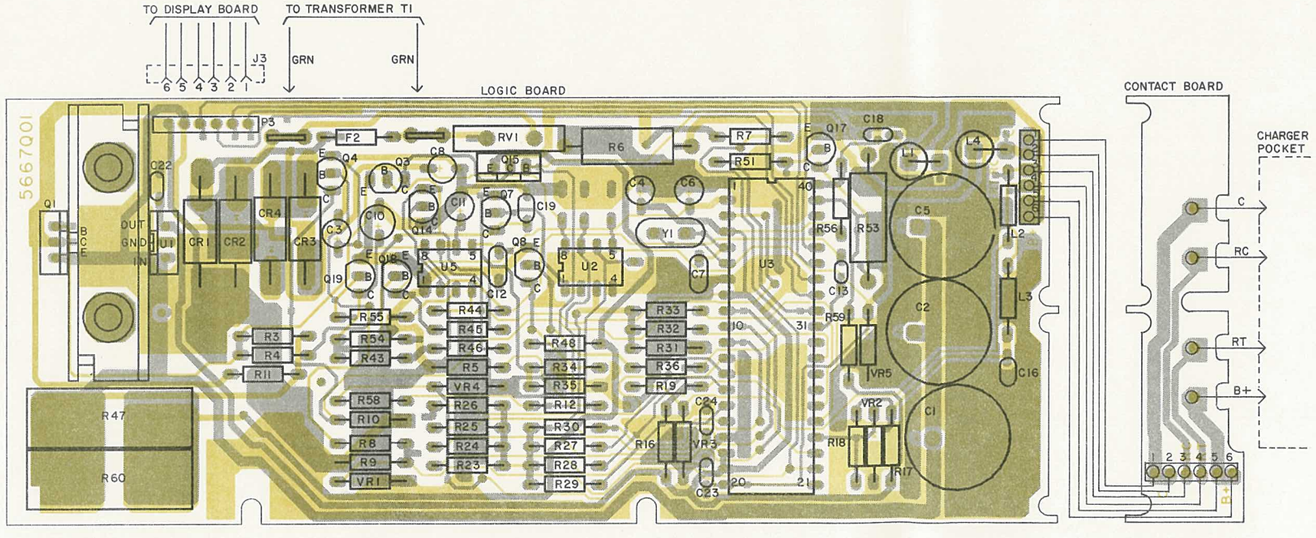

SS-CEPF-17309-0
CS-CEPF-17310-0
OL-CEPF-17311-0

CQP7000
SINGLE-UNIT BATTERY CHARGER ELN1022
D404.816/3

ELN1070/ELN1071

MULTI-UNIT RAPID-CHARGE BATTERY CHARGERS

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- To reduce risk of electric shock, unplug charger from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.

INTRODUCTION

WARNING

Do not discard batteries in fire; they may explode

The Multi-Unit Rapid-Charge Battery Chargers are accessory items for "Handie-Talkie" Portable Radios using rechargeable nickel-cadmium batteries with the following capacities:

SPECIFICATIONS

INPUT POWER	220 VAC, 240 VAC; 50 Hz
SIZE	450 x 310 x 140 mm
WEIGHT	4 kg
RAPID CHARGE TIME	Approximately 1 hour
OPERATING TEMPERATURE RANGE	0°C to 50°C
RAPID-CHARGE TEMPERATURE WINDOW	10°C to -40°C

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 a one-hour charge 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.

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.

OPERATION

After a period of use, a battery normally requires approximately one hour of rapid charging. The radio may be left on while attached to a battery being recharged; however, charging time will be increased. Place the charger in operation as follows:

1. Connect the AC cord to the battery charger.

2. 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.

> **IMPORTANT NOTE**
>
> DO NOT press the PTT switch on the radio while the radio is in a charger pocket.

3. 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**
>
> 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.
> 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.

4. 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.

IN CASE OF TROUBLE

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

NOTE
Use only STORNO nickel-cadmium (NI-CD) batteries with this charger.

CONDITION	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.
Red **Charging** LED flashes	• Try reseating battery. • Check battery contacts for dirt, grease, or foreign material. Wipe with 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.

CIRCUIT DESCTIPTION

POWER SUPPLY

The position os the line voltage selector switch on the bottom of the power supply determines the input source voltage.

Operating B + 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 postion 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 +5 VDC to the microcomputer (U15) and all other ICs.

MICROCOMPUTER AND DISPLAY CIRCUITS

All of the timing, monitoring, and sensing of the circuit 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 seding 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.

MONITORING AND SENSING CIRCUITS

Before any batteries can be charged, the microcomputer (U15) must first determine the charger type 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 PB0 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 seaches 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°C (3.33 VDC on the RT contact) and 40°C (1.87 VDC on the RT contact) is detected, the pocket's charge cycle will begin.

RC VALUE	BATTERY TYPE
2.4 K ohm	LIGHT CAPACITY
5.1 K ohm	MEDIUM CAPACITY
18.0 K ohm	ULTRA-HIGH CAPACITY

Table 1. Normal RC Values

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.

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).

BATTERY TYPE	CHARGE RATE (mA)	
	RAPID	TRICKLE
LIGHT CAPACITY	600	50
MEDIUM CAPACITY	1080	90
ULTRA-HIGH CAPACITY	1500	150

Table 2. Charge Rates

The microcomputer first precharges the battery at 600 mA 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 7 VDC and 11 VDC 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 (80 mV), the charger switches to the trickle-charge mode, turning off the red **Charging** LED, and turning on the green **Complete** LED.

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 ceasing to fuction 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.

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.

MAINTENANCE

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.

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:

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.

BATTERY AND CONDITIONS / PIN	B+	U22	Q7		Q8		U8						U18		
		4	B	C*	B	E	2	5	7	10	12	15	1	3	9
NO BATTERY	12.7	3.7	12.7	8.8	0	0	0	0	0	0	0	0	0	0	0
NTN4537/4592 RAPID CHARGE	12.7	3.7	12.0	9.6	2.2	1.5	5.0	0	0	5.0	5.0	0	1.70	.36	.36
NTN4537/9592 COMPLETE	12.7	3.7	12.0	9.0	0.9	0.2	5.0	5.0	0	0	0	0	0.16	.04	.04
NTN4538/4593 RAPID CHARGE	12.7	3.7	12.0	10.0	4.0	3.3	5.0	0	0	5.0	0	5.0	3.00	.64	.64
NTN4538/4593 COMPLETE	12.7	3.7	12.0	9.2	1.0	0.3	5.0	0	5.0	0	0	0	0.27	.06	.06
NTN4595/4596 RAPID CHARGE	12.7	3.7	12.0	10.4	6.2	5.4	0	0	5.0	5.0	5.0	5.0	4.20	.90	.90
NTN4595/4596 COMPLETE	12.7	3.7	12.0	9.0	1.0	0.3	5.0	5.0	5.0	0	0	0	0.37	.08	.08

BATTERY AND CONDITIONS / PIN	U15						P1	U1			CHARGING CURRENT (mA)
	2	21	22*	23	24**	29	1	16	15	14	
NO BATTERY	5.0	0	2.5	4.9	4.0	4.8	0	11.2	11.2	11.2	0
NTN4537/4592 RAPID CHARGE	5.0	1.70	2.8	0.60	2.7	4.8	0	11.2	0.7	11.2	600
NTN4537/4592 COMPLETE	5.0	0.16	2.6	0.28	0.5	4.8	0	11.2	11.2	0.7	50
NTN4538/4593 RAPID CHARGE	5.0	3.0	2.9	1.10	2.8	4.8	0	11.2	0.7	11.2	1080
NTN4538/4593 COMPLETE	5.0	0.27	2.6	0.45	0.5	4.8	0	11.2	11.2	0.7	90
NTN4595/4596 RAPID CHARGE	5.0	4.20	3.0	2.00	2.9	4.8	0	11.2	0.7	11.2	1500
NTN4595/4596 COMPLETE	5.0	0.37	2.6	1.36	0.6	4.8	0	11.2	11.2	0.7	150

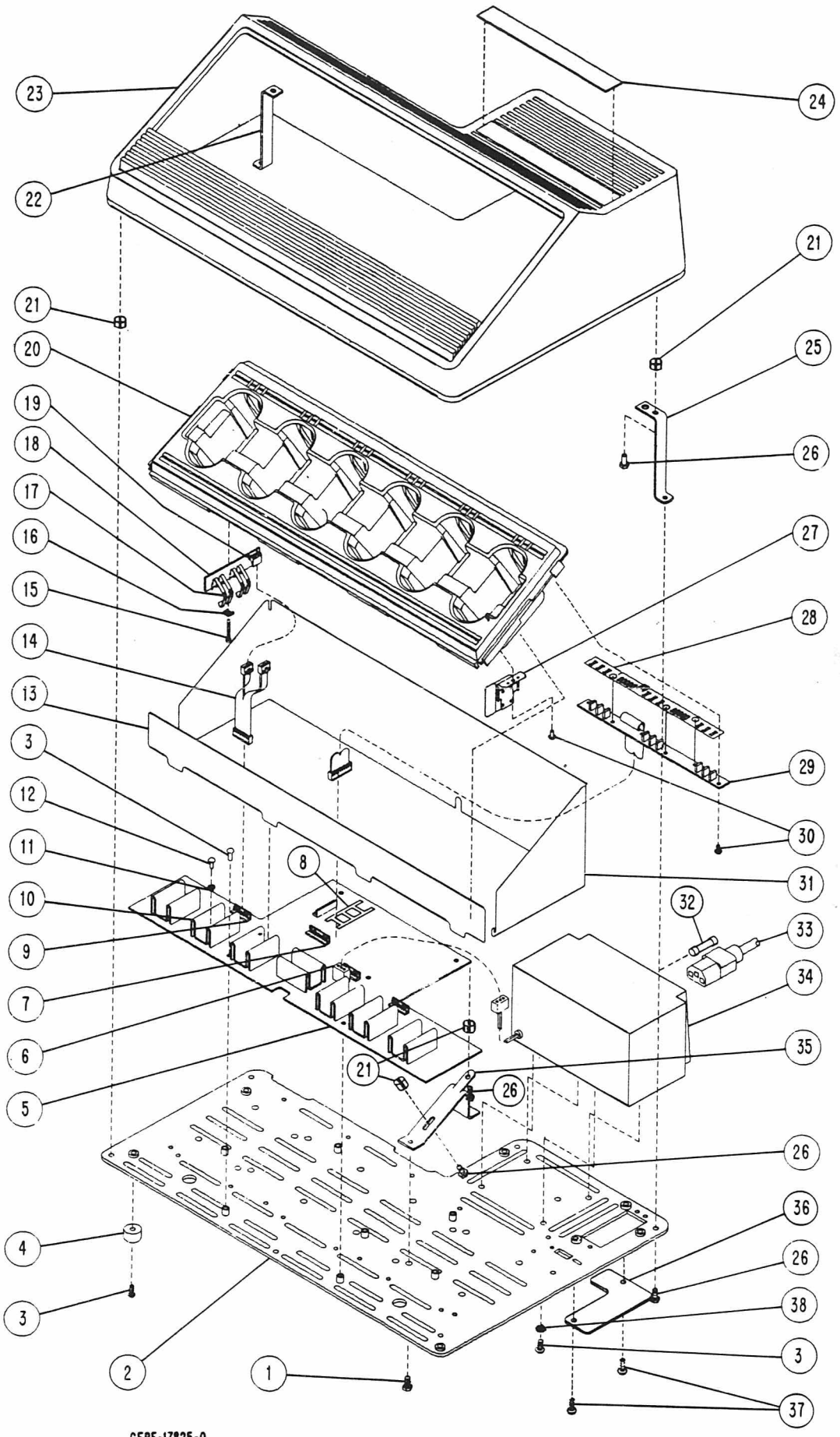
NOTES:

1. All voltages referenced to charger ground.
2. Voltages designated * will vary with the voltage of the battery, battery voltage for this tagle is 9 VDC.
3. Voltages designated ** will vary with the temperature of the battery, for this table, rapid-charge RT = 10 K ohm and charge complete RT = 1 K ohm.

DATE: 9/15/1988

Pos	Code No	Description	Qt
1	0300129890	SCREW MACHINE 10-32x.375"	4
2	0105952P82	ASSEMBLY BASE PLATE	1
3	0300121057	SCREW MASHINE 6-32x.375"	16
4	7505413D01	BUMPER RUBBER	5
5	SEE NOTE	ASSEMBLY MAIN PBC (INCLUDES ITEMS 6,7,8,9,10,11 & 12)	1
6	SEE NOTE	CONNECTOR 3-POSITION (P1) (PART OF ITEM 5)	1
7	SEE NOTE	CONNECTOR 10-POSITION (P5,P6) (PART OF ITEM 5)	2
8	SEE NOTE	SOCKET IC (PART OF ITEM 5)	1
9	SEE NOTE	CONNECTOR 8-POSITION (P2,P3 AND P4) (PART OF ITEM 5)	3
10	2605239R01	HEAT SINK 5-WATT (PART OF ITEM 5)	7
11	0410057A13	WASHER SHOULDER PLASTIC (PART OF ITEM 5)	7
12	0300002951	SCREW MASHINE 4-40x.250" (PART OF ITEM 5)	7
13	2605541L02	SHIELD THERMAL	1
14	SEE NOTE	ASSEMBLY CABLE (INCLUDES J2,J3,J4,J7,J8,J9,J10,J11)	3
15	0300140396	SCREW TAPPING 4-24x.875"	6
16	4205378S01	BRACKET CONTACT	6
17	SEE NOTE	CONTACT	24
18	SEE NOTE	PRINTED CIRCUIT BOARD CONTACT	6
19	SEE NOTE	CONNECTOR HEADER RIGHT-ANGLE 4-POSITION (P7,P8,P9,P10 AND P11)	6
20	1505196R01	HOUSING POCKET	1
	NTN4796	CHARGER POCKET (PART OF ITEM 20)	
	NTN4797	CHARGER POCKET (PART OF ITEM 20)	
21	4205722C02	CLIP FASTENER	10
22	0705466Q01	BRACKET CHARGER HOUSING	1
23	1505277L02	HOUSING MULIT-UNIT CHARGER	1
24	3305543L06	NAMEPLATE CHARGER	1
25	0705193L01	BRACKET COVER TIN-PLATED	2
26	0300131632	SCREW TAPPING 8-32x.375"	13
27	0105955H89	ASSEMBLY KICKER	6
28	2605407S01	SHIELD STATIC	2
29	SEE NOTE	PRINTED CIRCUIT BOARD LED	2
30	0300135922	SCREW TAPPING 4-24x.25"	12
31	2605238R01	SHIELD THERMAL	1
32	SEE NOTE	FUSE POWER SUPPLY	1
33	SEE NOTE	CORD AC POWER (110VAC OR 220VAC)	1
34	SEE NOTE	POWER SUPPLY SWITCH MODE 120-WATT	1
35	0705169L01	BRACKET POCKET	2
36	6405636L03	COVER SWITCH	1
37	0300002941	SCREW MACHINE 6-32x.25"	2
38	0400007666	WASHER EXTERNAL TOOTH #6	4
		NOTE: REFER TO ELECTRICAL PARTS LIST FOR PART NUMBER AND DISCRIPTION	

Pos	Code No	Description	Qt

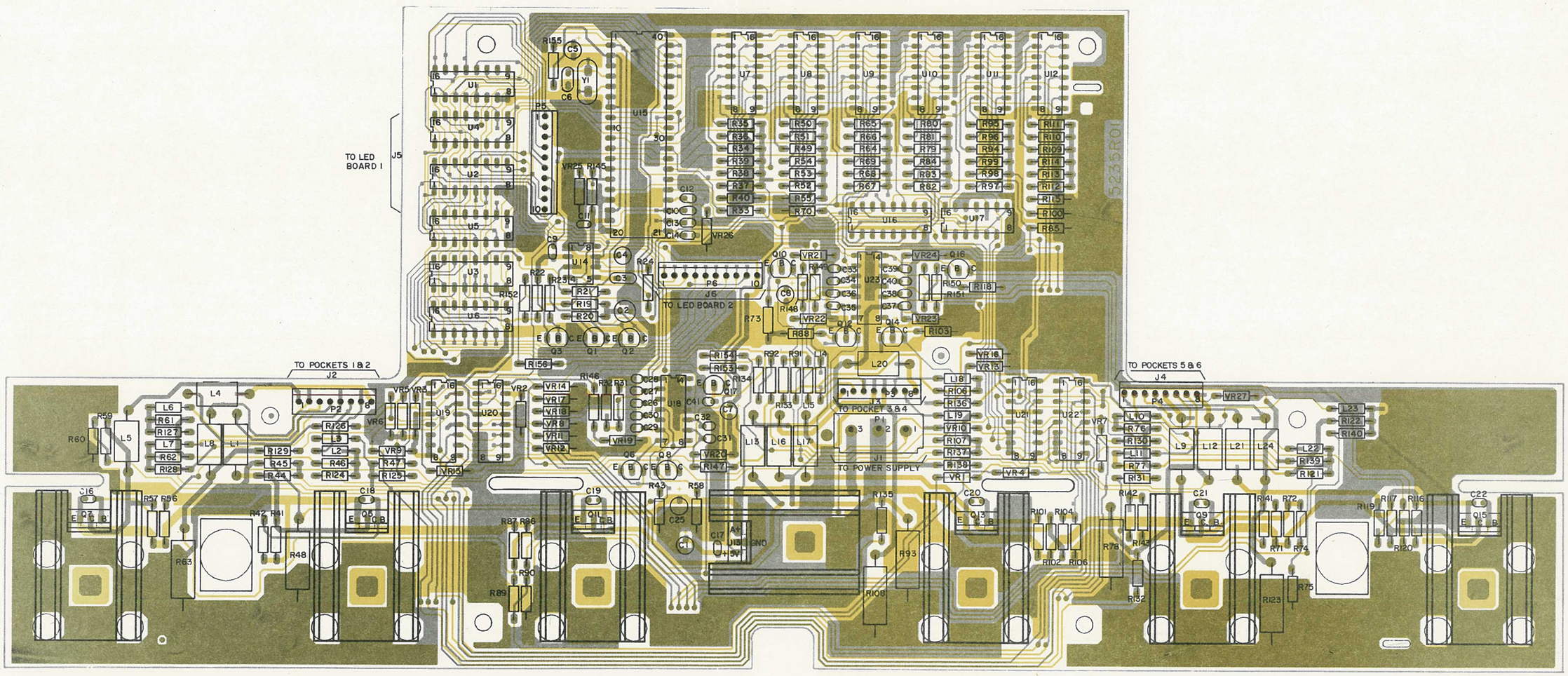


CEPF-17825-0

MULTI-UNIT BATTERY CHARGERS ELN1070/ELN1071
EXPLODED VIEW & MECHANICAL PART NUMBERS

M405.398/3

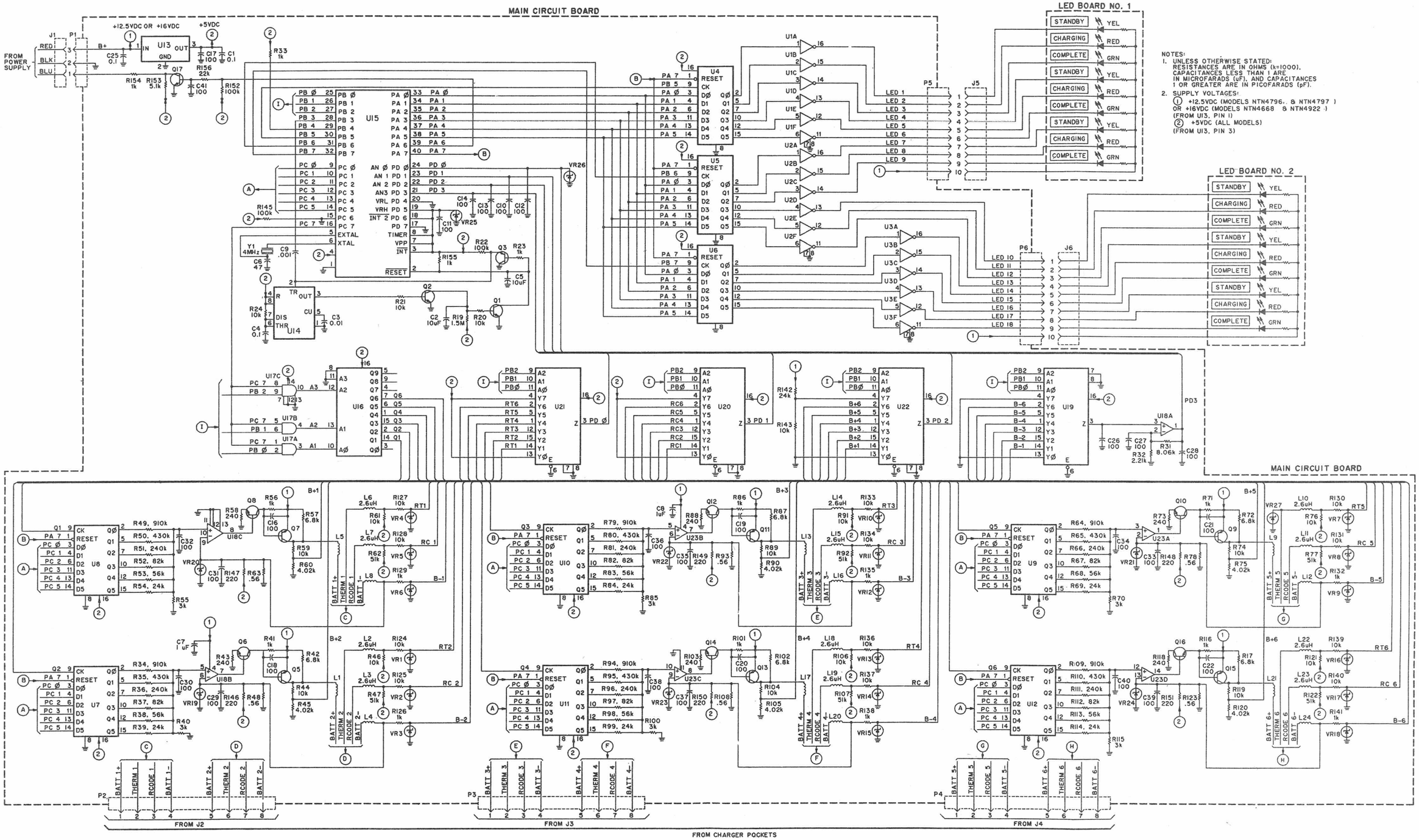
VIEWED FROM COMPONENT SIDE



SS-DEPF-17826-O
CS-DEPF-17827-O
OL-DEPF-17828-O

MAINBOARD FOR MULTI-UNIT BATTERY CHARGERS
COMPONENT LAYOUT

D404.814/3



MAINBOARD FOR MULTI-UNIT BATTERY CHARGERS

63D81107C89-0

D404.813/3

DATE: 9/ 9/1988

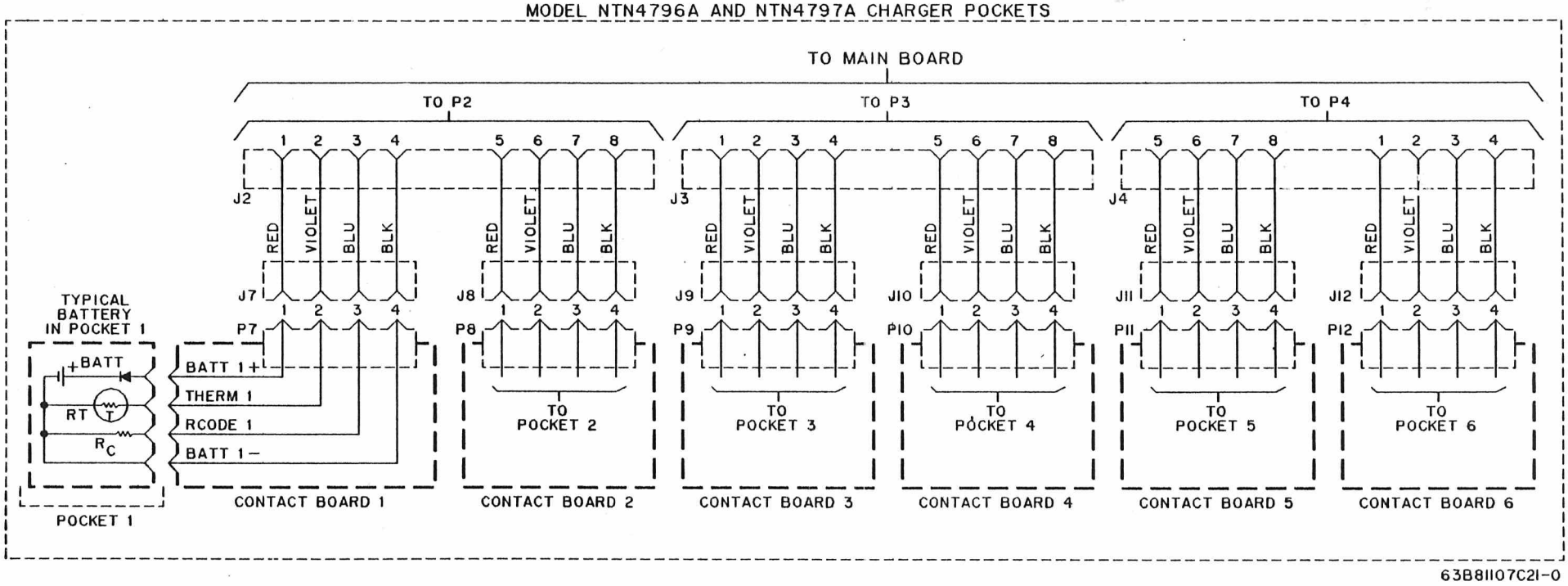
Pos	Code No	Description	Qt
C1	2383441B20	CAP 0.1µF ±20% 35V	1
C2	2305499G16	CAP 10µF 16V	1
C3	2105457G14	CAP .01+30-80%	1
C4	2383441B20	CAP 0.1 ±20% 35V	1
C5	2305499G16	CAP 10µF 16V	1
C6	2105529B11	CAP 47pF ±5% N150	1
C7	2383441B15	CAP 1µF ±20% 35V	1
C8	2383441B15	CAP 1µF ±20% 35V	1
C9	2105457G09	CAP 1000pF	1
C10	2105455G12	CAP 100pF N750	1
C11	2105455G12	CAP 100pF N750	1
C12	2105455G12	CAP 100pF N750	1
C13	2105455G12	CAP 100pF N750	1
C14	2105455G12	CAP 100pF N750	1
C16	2105455G12	CAP 100pF N750	1
C17	2105455G12	CAP 100pF N750	1
C18	2105455G12	CAP 100pF N750	1
C19	2105455G12	CAP 100pF N750	1
C20	2105455G12	CAP 100pF N750	1
C21	2105455G12	CAP 100pF N750	1
C22	2105455G12	CAP 100pF N750	1
C25	2383441B20	CAP 0.1µF ±20% 35V	1
C26	2105455G12	CAP 100pF N750	1
C27	2105455G12	CAP 100pF N750	1
C28	2105455G12	CAP 100pF N750	1
C29	2105455G12	CAP 100pF N750	1
C30	2105455G12	CAP 100pF N750	1
C31	2105455G12	CAP 100pF N750	1
C32	2105455G12	CAP 100pF N750	1
C33	2105455G12	CAP 100pF N750	1
C34	2105455G12	CAP 100pF N750	1
C35	2105455G12	CAP 100pF N750	1
C36	2105455G12	CAP 100pF N750	1
C37	2105455G12	CAP 100pF N750	1
C38	2105455G12	CAP 100pF N750	1
C39	2105455G12	CAP 100pF N750	1
C40	2105455G12	CAP 100pF N750	1
C41	2105455G12	CAP 100pF N750	1
L1	2483977B02	COIL RF CHOKE	1
L2	2482723H39	COIL 2.6uH	1
L3	2482723H39	COIL 2.6uH	1
L4	2483977B02	COIL CHOKE	1
L5	2483977B02	COIL CHOKE	1
L6	2482723H39	COIL 2.6uH	1
L7	2482723H39	COIL 2.6uH	1
L8	2483977B02	COIL CHOKE	1
L9	2483977B02	COIL CHOKE	1
L10	2482723H39	COIL 2.6uH	1
L11	2482723H39	COIL 2.6uH	1
L12	2483977B02	COIL CHOKE	1
L13	2483977B02	COIL CHOKE	1
L14	2482723H39	COIL 2.6uH	1
L15	2482723H39	COIL 2.6uH	1
L16	2483977B02	COIL CHOKE	1
L17	2483977B02	COIL CHOKE	1
L18	2482723H39	COIL 2.6uH	1
L19	2482723H39	COIL 2.6uH	1
L20	2483977B02	COIL CHOKE	1
L21	2483977B02	COIL CHOKE	1
L22	2482723H39	COIL 2.6uH	1
L23	2482723H39	COIL 2.6uH	1
L24	2483977B02	COIL CHOKE	1
P1	0905367R01	PLUG CONNECTOR 3-POSITION	1
P2	2805350R03	PLUG CONNECTOR 8-POSITION	1
P3	2805350R03	PLUG CONNECTOR 8-POSITION	1
P4	2805350R03	PLUG CONNECTOR 8-POSITION	1
P5	2805350R04	PLUG CONNECTOR 10-POSITION	1
P6	2805350R04	PLUG CONNECTOR 10-POSITION	1
P7	2805350R01	PLUG CONNECTOR HEADER RIGHT-ANGLE 4-POSTION	1
P8	2805350R01	PLUG CONNECTOR HEADER RIGHT-ANGLE 4-POSTION	1
P9	2805350R01	PLUG CONNECTOR HEADER RIGHT-ANGLE 4-POSTION	1
P10	2805350R01	PLUG CONNECTOR HEADER RIGHT-ANGLE 4-POSTION	1
P11	2805350R01	PLUG CONNECTOR HEADER RIGHT-ANGLE 4-POSTION	1
Q1	4800869642	TSTR NPN TYPE M9642	1
Q2	4800869642	TSTR NPN TYPE M9642	1
Q3	4800869643	TSTR PNP TYPE M9643	1
Q5	4800869807	TSTR PNP TYPE M9807	1
Q6	4800869642	TSTR NPN TYPE M9642	1
Q7	4800869807	TSTR PNP TYPE M9807	1

Pos	Code No	Description	Qt
Q8	4800869642	TSTR NPN TYPE M9642	1
Q9	4800869807	TSTR PNP TYPE M9807	1
Q10	4800869642	TSTR NPN TYPE M9642	1
Q11	4800869807	TSTR PNP TYPE M9807	1
Q12	4800869642	TSTR NPN TYPE M9642	1
Q13	4800869807	TSTR PNP TYPE M9807	1
Q14	4800869642	TSTR NPN TYPE M9642	1
Q15	4800869807	TSTR PNP TYPE M9807	1
Q16	4800869642	TSTR NPN TYPE M9642	1
Q17	4800869642	TSTR NPN TYPE M9642	1
R19	0610164K38	RES 1.5M	1
R20	0611009C73	RES 10k	1
R21	0611009C73	RES 10k	1
R22	0611009C97	RES 100k	1
R23	0611009C49	RES 1k	1
R24	0611009C73	RES 10k	1
R31	0610621C82	RES 8.06k ±1%	1
R32	0610621C28	RES 2.21k ±1%	1
R33	0611009C49	RES 1k	1
R34	0611009D21	RES 910k	1
R35	0611009D13	RES 430k	1
R36	0611009D07	RES 240k	1
R37	0611009C95	RES 82k	1
R38	0611009C91	RES 56k	1
R39	0611009C82	RES 24k	1
R40	0611009C60	RES 3k	1
R41	0611009C69	RES 6.8k	1
R42	0611009C49	RES 1k	1
R43	0611009C34	RES 240 ±5% 1/4W	1
R44	0610621C91	RES 10k ±1%	1
R45	0610621C53	RES 4.02k ±1%	1
R46	0610621C91	RES 10k ±1%	1
R47	0611009C90	RES 51k	1
R48	1782036G18	RES .56 2W	1
R49	0611009D21	RES 910k	1
R50	0611009D13	RES 430k	1
R51	0611009D07	RES 240k	1
R52	0611009C95	RES 82k	1
R53	0611009C91	RES 56k	1
R54	0611009C82	RES 24k	1
R55	0611009C60	RES 3k	1
R56	0611009C49	RES 1k	1
R57	0611009C69	RES 6.8k	1
R58	0611009C34	RES 240 ±5% 1/4W	1
R59	0610621C91	RES 10k ±1%	1
R60	0610621C53	RES 4.02k ±1%	1
R61	0610621C91	RES 10k ±1%	1
R62	0611009C90	RES 51k	1
R63	1782036G18	RES .56 2W	1
R64	0611009D21	RES 910k	1
R65	0611009D13	RES 430k	1
R66	0611009D07	RES 240k	1
R67	0611009C95	RES 82k	1
R68	0611009C91	RES 56k	1
R69	0611009C82	RES 24k	1
R70	0611009C60	RES 3k	1
R71	0611009C49	RES 1k	1
R72	0611009C69	RES 6.8k	1
R73	0611009C34	RES 240 ±5% 1/4W	1
R74	0610621C91	RES 10k ±1%	1
R75	0610621C53	RES 4.02k ±1%	1
R76	0610621C91	RES 10k ±1%	1
R77	0611009C90	RES 51k	1
R78	1782036G18	RES .56 2W	1
R79	0611009D21	RES 910k	1
R80	0611009D13	RES 430k	1
R81	0611009D07	RES 240k	1
R82	0611009C95	RES 82k	1
R83	0611009C91	RES 56k	1
R84	0611009C82	RES 24k	1
R85	0611009C60	RES 3k	1
R86	0611009C49	RES 1k	1
R87	0611009C69	RES 6.8k	1
R88	0611009C34	RES 240 ±5% 1/4W	1
R89	0610621C91	RES 10k ±1%	1
R90	0610621C53	RES 4.02k ±1%	1
R91	0610621C91	RES 10k ±1%	1
R92	0611009C90	RES 51k	1
R93	1782036G18	RES .56 2W	1
R94	0611009D21	RES 910k	1
R95	0611009D13	RES 430k	1
R96	0611009D07	RES 240k	1
R97	0611009C95	RES 82k	1
R98	0611009C91	RES 56k	1

DATE: 9/ 9/1988

Pos	Code No	Description	Qt
R99	0611009C82	RES 24k	1
R100	0611009C60	RES 3k	1
R101	0611009C49	RES 1k	1
R102	0611009C69	RES 6.8k	1
R103	0611009C34	RES 240 ±5% 1/4W	1
R104	0610621C91	RES 10k ±1%	1
R105	0610621C53	RES 4.02k ±1%	1
R106	0610621C91	RES 10k ±1%	1
R107	0611009C90	RES 51k	1
R108	1782036G18	RES .56 2W	1
R109	0611009D21	RES 910k	1
R110	0611009D13	RES 430k	1
R111	0611009D07	RES 240k	1
R112	0611009C95	RES 82k	1
R113	0611009C91	RES 56k	1
R114	0611009C82	RES 24k	1
R115	0611009C60	RES 3k	1
R116	0611009C49	RES 1k	1
R117	0611009C69	RES 6.8k	1
R118	0611009C34	RES 240 ±5% 1/4W	1
R119	0610621C91	RES 10k ±1%	1
R120	0610621C53	RES 4.02k ±1%	1
R121	0610621C91	RES 10k ±1%	1
R122	0611009C90	RES 51k	1
R123	1782036G18	RES .56 2W	1
R124	0611009C73	RES 10k	1
R125	0611009C73	RES 10k	1
R126	0611009C49	RES 1k	1
R127	0611009C73	RES 10k	1
R128	0611009C73	RES 10k	1
R129	0611009C49	RES 1k	1
R130	0611009C73	RES 10k	1
R131	0611009C73	RES 10k	1
R132	0611009C49	RES 1k	1
R133	0611009C73	RES 10k	1
R134	0611009C73	RES 10k	1
R135	0611009C49	RES 1k	1
R136	0611009C73	RES 10k	1
R137	0611009C73	RES 10k	1
R138	0611009C49	RES 1k	1
R139	0611009C73	RES 10k	1
R140	0611009C73	RES 10k	1
R141	0611009C49	RES 1k	1
R142	0611009C82	RES 24k	1
R143	0611009C73	RES 10k	1
R145	0611009C97	RES 100k	1
R146	0611009C33	RES 220 ±5% 1/4W	1
R147	0611009C33	RES 220 ±5% 1/4W	1
R148	0611009C33	RES 220 ±5% 1/4W	1
R149	0611009C33	RES 220 ±5% 1/4W	1
R150	0611009C33	RES 220 ±5% 1/4W	1
R151	0611009C33	RES 220 ±5% 1/4W	1
R152	0611009C97	RES 100k	1
R153	0611009C66	RES N5.1k	1
R154	0611009C49	RES 1k	1
R155	0611009C73	RES 10k	1
R156	0611009C81	RES 22k	1
U1	5183629M93	IC PERIPHERAL DRIVER ARRAY MC1413	1
U2	5183629M93	IC PERIPHERAL DRIVER ARRAY MC1413	1
U3	5183629M93	IC PERIPHERAL DRIVER ARRAY MC1413	1
U4	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U5	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U6	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U7	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U8	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U9	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U10	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U11	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U12	5184887K70	IC HEX D FLIP-FLOP MC14174	1
U13	5184320A47	IC 5V REGULATOR MC7805	1
U14	5184320A35	IC TIMING NE555	1
U15	0105956P09	IC MICROCOMPUTER MC68705R3	1
U16	5105461G32	IC BINARY-TO-OCTAL DECODER MC14028	1
U17	5184887K75	IC QUAD 2-INPUT AND GATE MC14081	1
U18	5184561L75	IC QUAD LOW-POWER OP Amp MC34074	1
U19	5105461G33	IC 8-CHANN. ANALOG MUX/DEMUX MC14051	1
U20	5105461G33	IC 8-CHANN. ANALOG MUX/DEMUX MC14051	1
U21	5105461G33	IC 8-CHANN. ANALOG MUX/DEMUX MC14051	1
U22	5105461G33	IC 8-CHANN. ANALOG MUX/DEMUX MC14051	1
U23	5184561L75	IC QUAD LOW-POWER OP Amp MC34074	1
VR1	4811034G13	DIO ZENER 6.2V	1
VR2	4811034G13	DIO ZENER 6.2V	1
VR3	4811034G13	DIO ZENER 6.2V	1
VR4	4811034G13	DIO ZENER 6.2V	1

Pos	Code No	Description	Qt
VR5	4811034G13	DIO ZENER 6.2V	
VR6	4811034G13	DIO ZENER 6.2V	
VR7	4811034G13	DIO ZENER 6.2V	1
VR8	4811034G13	DIO ZENER 6.2V	1
VR9	4811034G13	DIO ZENER 6.2V	1
VR10	4811034G13	DIO ZENER 6.2V	1
VR11	4811034G13	DIO ZENER 6.2V	1
VR12	4811034G13	DIO ZENER 6.2V	1
VR13	4811034G13	DIO ZENER 6.2V	1
VR14	4811034G13	DIO ZENER 6.2V	1
VR15	4811034G13	DIO ZENER 6.2V	1
VR16	4811034G13	DIO ZENER 6.2V	1
VR17	4811034G13	DIO ZENER 6.2V	1
VR18	4811034G13	DIO ZENER 6.2V	1
VR19	4811034G13	DIO ZENER 6.2V	1
VR20	4811034G13	DIO ZENER 6.2V	1
VR21	4811034G13	DIO ZENER 6.2V	1
VR22	4811034G13	DIO ZENER 6.2V	1
VR23	4811034G13	DIO ZENER 6.2V	1
VR24	4811034G13	DIO ZENER 6.2V	1
VR25	4811034G13	DIO ZENER 6.2V	1
VR26	4811034G13	DIO ZENER 6.2V	1
VR27	4811034G13	DIO ZENER 6.2V	1
Y1	4805664G25	CRYSTAL 4MHz	1
		NON REFERENCED ITEMS	
	0905035J12	SOCKET IC	
	2505237R01	POWER SUPPLY SWITCH MODE 120 WATT (ICCLUDES J1)	
	3005351R01	ASSEMBLY CABLE (INCLUDES J2,J3,J4,J7,J8,J9,J10,J11) (FOR NTN4796 AND NTN4797 CHARGERS)	
	3060665A04	CORD POWER 110VAC (FOR NTN4796 AND NTN4668 CHARGERS)	
	3060665A05	CORD POWER 220VAC (FOR NTN4797 AND NTN4922 CHARGERS)	
	3905560Q05	CONTACT (FOR NTN4796 AND NTN4797) CHARGERS)	
	6505700Q07	FUSE SLO-BLO 3 Amp 250V	
	0105952P81	ASSEMBLY MAIN PCB	
	8405236R01	PRINTED CIRCUIT BOARD CONTACT(FOR NTN4796 AND NTN47979 CHARGERS)	
	8405366R01	PRINTED CIRCUIT BOARD, LED (INCLUDES J5,J6)	
	0105955N09	ASSEMBLY CONTACT (INCLUDES J2,J3,J4) (FOR NTN4668 AND NTN4922 CHARGERS)	



CHARGER POCKET FOR ELN1070/71

D404.812/3

EMN6001

REMOTE SPEAKER MICROPHONE

DESCRIPTION

The Model EMN6001 Remote Speaker Microphone includes a speaker, a microphone, a push-to-talk (PTT) switch and associated circuitry. A cable, terminated with a special accessory connector, connects the Speaker microphone 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.

INSTALLING THE MICROPHONE

1. Remove the antenna from the radio; unscrew the antenna in the counterclockwise direction.
2. Insert the tab on the microphone's accessory connector (part of item 1) into the slot in the radio's universal connector.
3. 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, insert the mounting screw in the hole.
4. Slide the accessory bracket (part of item 1) down over the radio's antenna bushing nut.

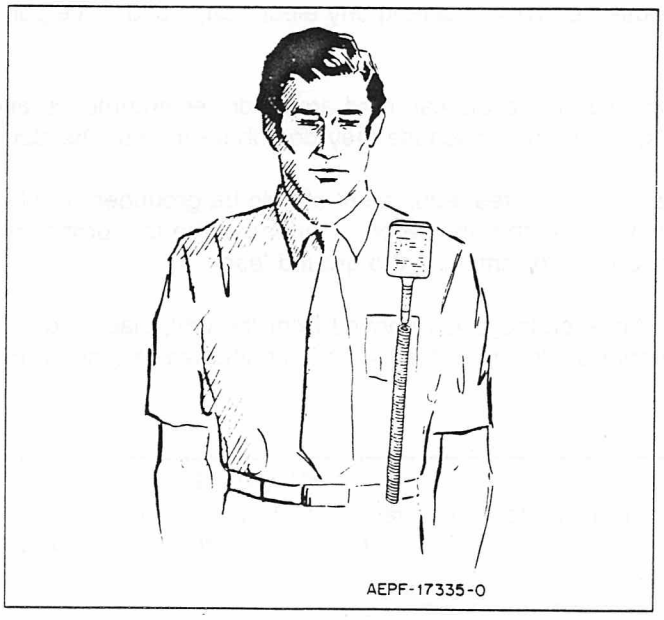


Figure 1

5. 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.).

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

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

OPERATION

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

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

HANDLING PRECAUTIONS

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

1. Prior to and while servicing a remote speaker microphone, particularly after moving within the service area, momentarily place both hands on a bare metal, earthgrounded 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

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.

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

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

4. 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.

5. 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 100 Kohm 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.

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

7. 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.

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

MAINTENANCE

Refer to the schematic diagram, the exploded view, and the part 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 paratheses 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. Use the recommended torque driver (Sturtevant PM-5 Rototorq Tool or equivalent).

TORQUE SPECIFICATIONS

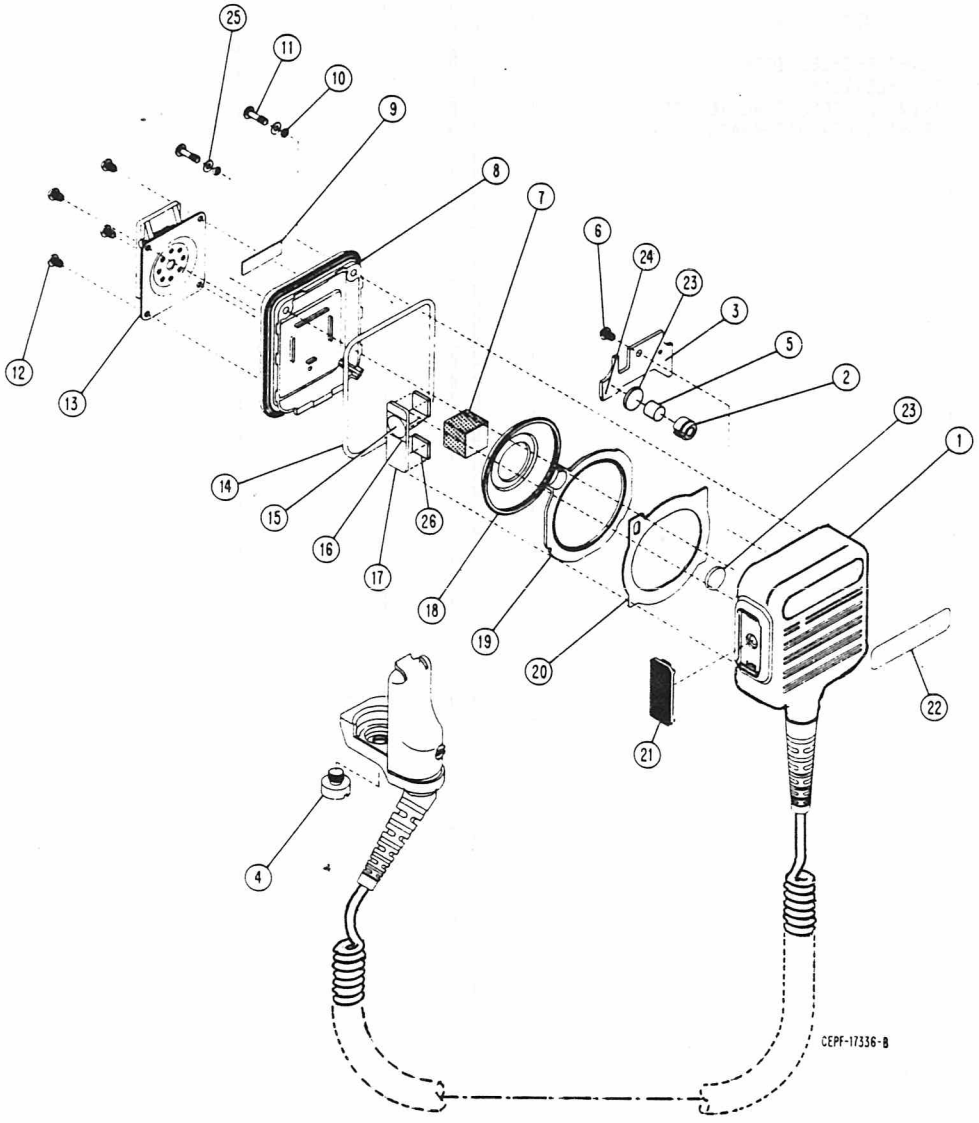
APPLICATION	TORQUE (IN LBS.)	TORQUE (N-m)	TORQUE BIT NO.
Back cover Screws	6	.68	6680321B78
PC Board Screws	4	.45	6680321B78
Pocket Clip Screw	4	.45	6680321B78
Antenna Adapter	10	1.13	6680371B02
Accessory Conn. Mount. Screw	4	.45	6680321B78

If necessary, the external surfaces of the speaker microphone may be cleaned with a 0.5% solution of mild dishwashing detergent in water (one half-teaspone of detergent in five litres of water).

DATE: 9/15/1988

Pos	Code No	Description	Qt
1	0105954P77	ASSEMBLY, HOUSIING/CORD (NOT FIELD REPAIRABLE)	1
2	1405490Q01	BOOT, MIICROPHONE	1
3	SEE NOTE	PRINTED CIRCIUT BOARD, MAIN	1
4	4305270S01	ADAPTER, ANTENNA	1
5	5005227J02	MICROPHONE (MK1)	1
6	0300139047	SCREW, CUTTING	1
7	7582154D33	PAD, SPEAKER	1
8	-----	ASSEMBLY,COVER(NOT FIELD REPAIRABLE)	1
9	3305216K22	LABEL, KIT NUMBER	1
10	3205082E03	GASKET, O-RING	2
11	0382210E19	SCREW, COVER-CAPTIVE;#4-40	2
12	0300139982	SCREW, MACHINE, PHIL BIN; #2-56x.188	4
13	0105959N54	ASSEMBLY, BELT CLIP	1
14	3205082E63	GASKET, O-RING	1
15	3905834K05	DOME, PTT (S1)	1
16	3205264L06	SEAL, PTT	1
17	SEE NOTE	PRINTED CIRCUIT BOARD, PTT	1
18	5005910P03	SPEAKER (LS1)	1
19	4305407R01	SPACER, SPEAKER	1
20	3205190R01	PAD, SEAL	1
21	4505211R01	LEVER, PTT	1
22	3305269R01	LABEL, NAMEPLATE	1
23	7505136L03	PAD, LATCH	2
24	SEE NOTE	PRINTED CIRCUIT BOARD, FLEXIBLE	1
25	0405465C01	WASHER, PLASTIC	2
26	1405424D04	INSULATOR	
		NOTE: REFER TO ELECTRICAL PARTS LIST FOR PART NUMBER AND DISCRIPTION	

Pos	Code No	Description	Qt



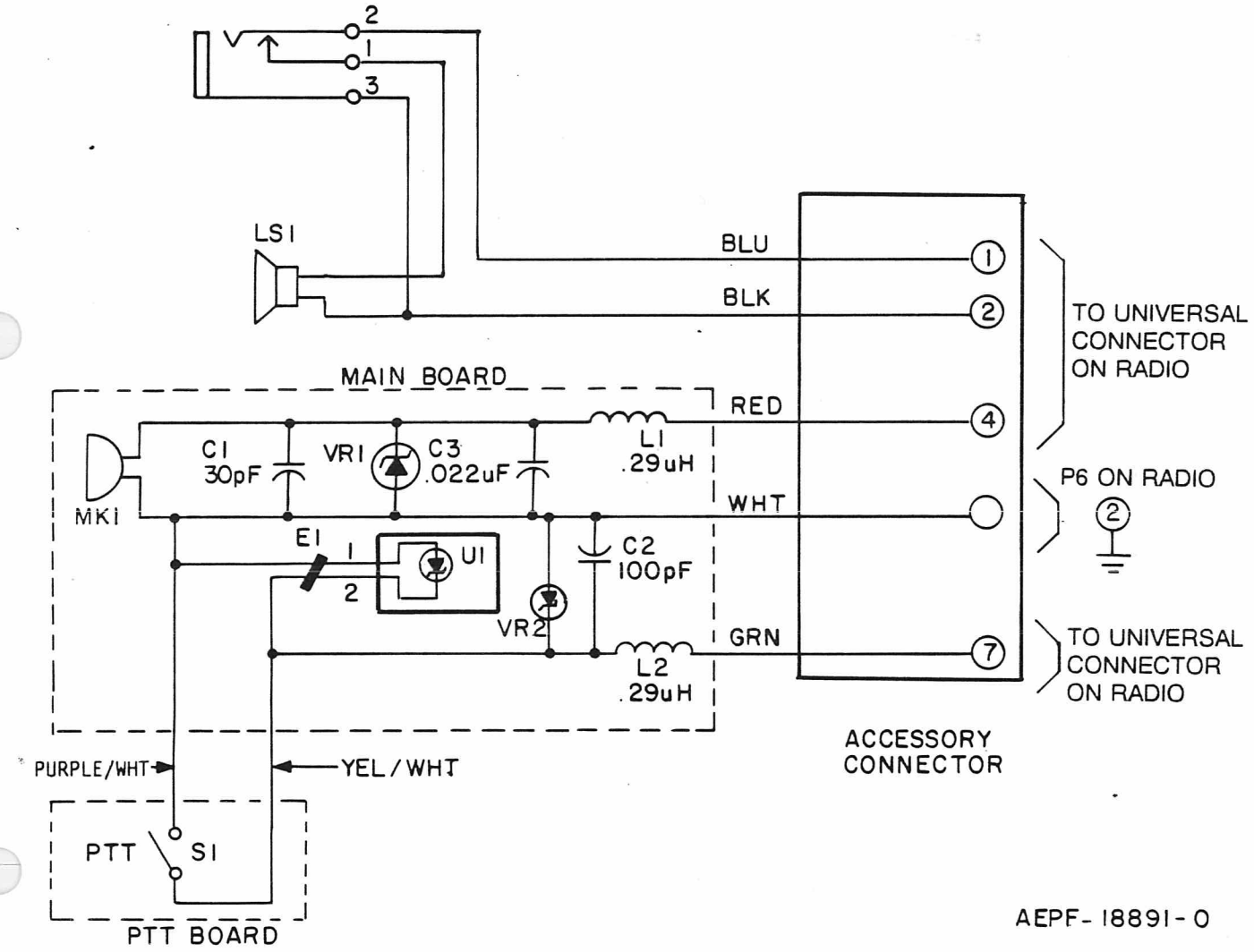
CQP7000 REMOTE SPEAKER MICROPHONE EMN6001
EXPLODED VIEW & MECHANICAL PART NUMBERS

M405.395/3

DATE: 9/15/1988

Pos	Code No	Description	Qt
C1	2105454G47	CAP 30pF N150	1
C2	2182877B55	CAP 100pF ±5% 63V	1
C3	2184008H19	CAP .022uF	1
E1	7605530M01	CORE FERRITE BEAD	1
L1	2482723H28	COIL RF CHOKE .29uH	1
L2	2482723H28	COIL RF CHOKE .29uH	1
LS1	5005910P03	SPEAKER 1 3/4"	1
MK1	5005227J02	MICROPHONE	1
S1	3905834K05	SWITCH DOME PTT	1
U1	5105469E47	IC VOLTAGE REFERENCE DIODE 1.235V TYPE LM285-Z1.2	1
VR1	4883461E26	DIO ZENER 23.8V	1
VR2	4883461E26	DIO ZENER 23.8V	1
		NONREFERENCED ITEMS	
	8405213S01	PBC FLEXIBLE	
	8405296R01	PRINTED CIRCUIT BOARD PTT	
	8405297R01	PRINTED CIRCUIT BOARD MAIN	

Pos	Code No	Description	Qt


2
1
3
LS1
BLU
BLK
TO UNIVERSAL
CONNECTOR
ON RADIO
MAIN BOARD
RED
C1
30pF
VR1
C3
.022uF
L1
.29uH
P6 ON RADIO
2
MK1
WHT
E1
1
2
U1
C2
100pF
VR2
GRN
L2
.29uH
TO UNIVERSAL
CONNECTOR
ON RADIO
ACCESSORY
CONNECTOR
PURPLE/WHT
YEL/WHT
PTT
S1
PTT BOARD
AEPF-18891-0

ETN6001

PUBLIC SAFETY SPEAKER MICROPHONE

DESCRIPTION

The Model ETN6001 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 the portable radio.
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 is especially useful when the radio is worn on the belt and the speaker microphone is on the lapel or shoulder, as shown in Figure 1.

NOTE
Observe safety information in the radio operating instructions.

Figure 1

INSTALLING THE MICROPHONE

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

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

3. 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.

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

5. 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.).

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

OPERATION

1. 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 speaker.

2. 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.

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

HANDLING PRECAUTIONS

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

1. 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, earthgrounded 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.

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

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

4. 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.

5. 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 100 Kohm 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.

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

7. 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.

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

MAINTENANCE

Refer to the schematic diagram, the exploded view, and the part 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

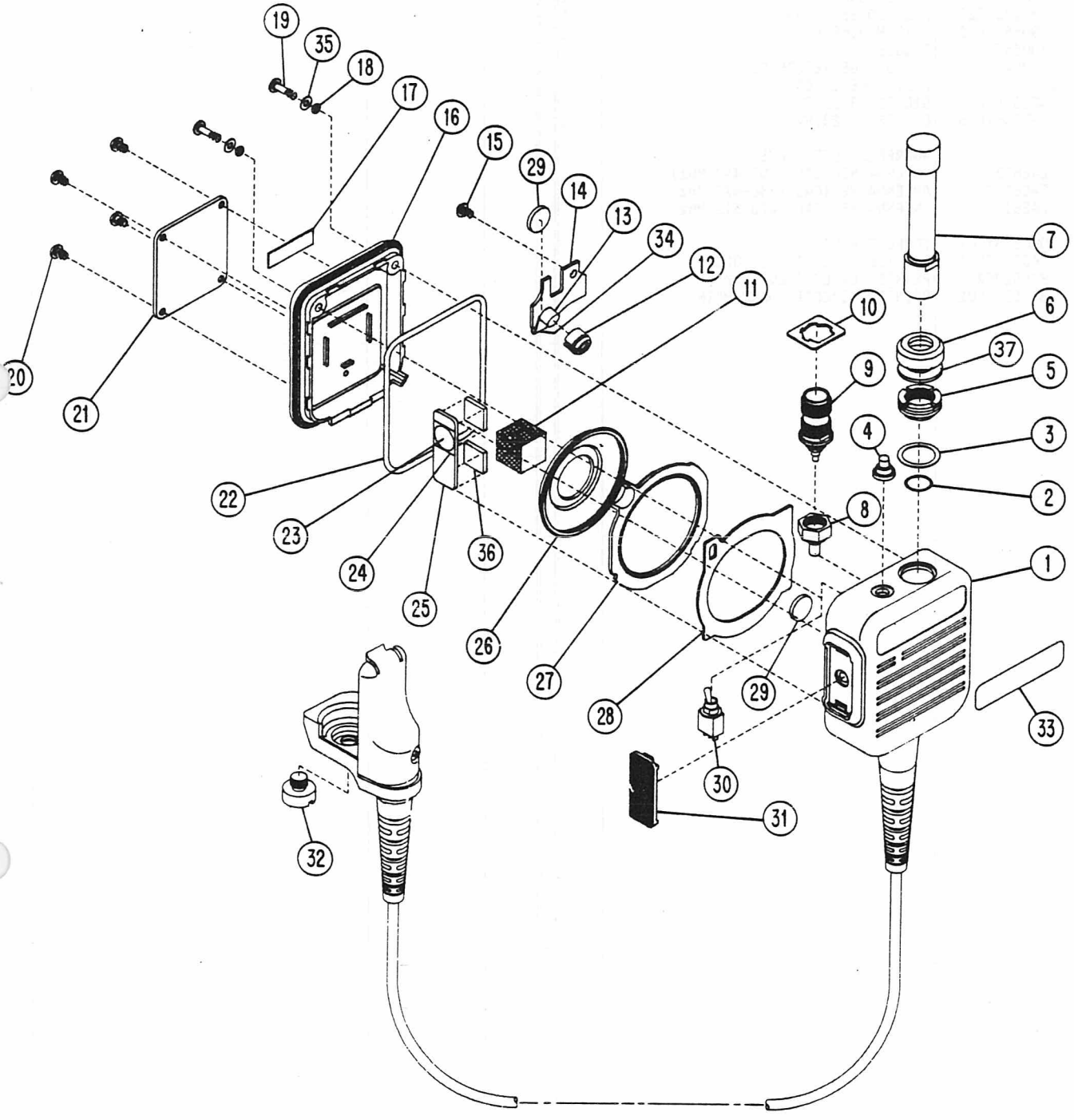
APPLICATION	TORQUE (IN.LBS.)	TORQUE (N-m)	TORQUE BIT NO.
Cover Screws	6	.68	6680321B78
PC Board Screw	4	.45	6680321B78
Velcro Pad Screws	4	.45	6680321B78
Toggle Switch Boot	3	.34	6680370B99
RF Connector Nut	20	2.27	6680371B01
Button-Head Screw	10	1.13	6680371B02
Accessory Conn. Capt. Screw	4	.45	6680321B78

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

DATE: 9/15/1988

Pos	Code No	Description	Qt
1	0105955P13	ASSEMBLY,HOUSING/CORD (NOT FIELD REPAIRABLE)	1
2	3205082E69	GASKET, O-RING	1
3	0405465C02	WASHER, PLASTIC	1
4	0205791P01	NUT, TOGGLE SEAL	1
5	0205326S01	NUT, ANTENNA	1
6	3205325S01	SEAL, WASHER	1
7	SEE NOTE	ANTENNA (MUST BE ORDERED SEPARATELY)	1
8	0205541C01	NUT, SPECIAL	1
9	SEE NOTE	CONNECTOR, RF	1
10	0405327S01	WASHER, BEARING	1
11	7582154D33	PAD, SPEAKER	1
12	1405490Q01	BOOT, MICROPHONE	1
13	SEE NOTE	MICROPHONE (MK1)	1
14	SEE NOTE	PRINTED CIRCUIT BOARD, MAIN	1
15	0300139047	SCREW, CUTTING	1
16	0105955P12	ASSEMBLY,COVER(NOT FIELD REPAIRABLE)	1
17	3305226K21	LABEL, KIT NUMBER	1
18	3205082E03	GASKET, O-RING	2
19	0382210E19	SCREW, COVER-CAPTIVE; #4-40	2
20	0300139939	SCREW, PAD RETAINER	4
21	7505385P01	PAD, HOOK	1
22	3205082E63	GASKET, O-RING	1
23	SEE NOTE	DOME, PTT (S1)	1
24	3205264L06	SEAL, PTT	1
25	SEE NOTE	PRINTED CIRCUIT BOARD, PTT	1
26	SEE NOTE	SPEAKER (LS1)	1
27	4305407R01	SPACER, SPEAKER	1
28	3205190R01	PAD, SEAL	1
29	7505136L03	PAD, SILICON SPONGE	2
30	SEE NOTE	SWITCH, TOGGLE (S2)	1
31	4505211R01	LEVER, PTT	1
32	0305329S01	SCREW BUTTON HEAD	1
33	3305269R01	LABEL, NAMEPLATE	1
34	SEE NOTE	PRINTED CIRCUIT, FLEXIBLE	1
35	0405465C01	WASHER, PLASTIC	1
36	1405424D04	INSULATOR	2
37	0405910D01	WASHER, INSULATOR	1
		NOTE: REFER TO ELECTRICAL PARTS LIST FOR PART NUMBER AND DESCRIPTION	

Pos	Code No	Description	Qt



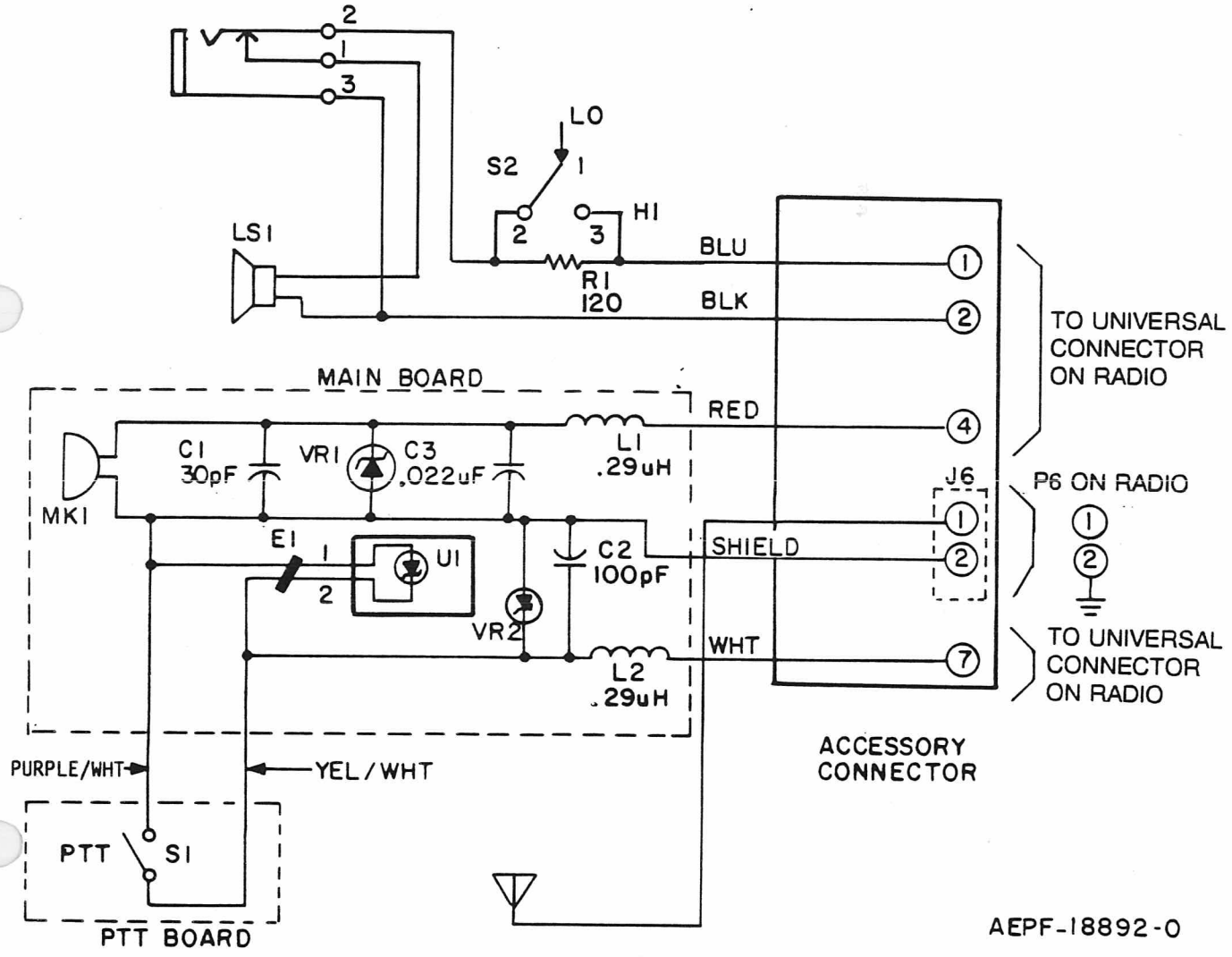
CQP7000 PUBLIC SAFETY SPEAKER MICROPHONE ETN6001
EXPLODED VIEW & MECHANICAL PART NUMBERS

M405.396/3

DATE: 9/15/1988

Pos	Code No	Description	Qt
C1	2105454G47	CAP 30pF N150	1
C2	2182877B55	CAP 100pF ±5% 63V	1
C3	2184008H19	CAP .022uF	1
E1	7605530M01	CORE FERRITE BEAD	1
L1	2482723H28	COIL RF CHOKE .29uH	1
L2	2482723H28	COIL RF CHOKE .29uH	1
LS1	5005910P03	SPEAKER 1 3/4"	1
MK1	5005227J02	MICROPHONE	1
R1	0611009C27	RES 120 ±5% 1/4W	1
S1	3905834K05	SWITCH DOME PTT	1
S2	4005680K04	TOGGLE	1
U1	5105469E48	IC VOLTAGE REFERENCE 2.5V TYPE LM285.Z2.5	1
VR1	4883461E26	DIO ZENER 23.8V	1
VR2	4883461E26	DIO ZENER 23.8V	1
		NONREFERENCED ITEMS	
	EAE6131	ANTENNA HELICAL (403-433 MHz)	
	EAE6132	ANTENNA HELICAL (438-470 MHz)	
	EAE6133	ANTENNA HELICAL (470-512 MHz)	
	0905261B01	CONNECTOR RF	
	8405213S01	PRINTED CIRCUIT FLEXIBLE	
	8405296R01	PRINTED CIRCUIT BOARD PTT	
	8405352S01	PRINTED CIRCUIT BOARD MAIN	

Pos	Code No	Description	Qt


2
1
3
LO
S2
1
2
3
HI
LS1
R1
120
BLU
BLK
TO UNIVERSAL
CONNECTOR
ON RADIO
MAIN BOARD
RED
C1
30pF
VR1
C3
.022uF
L1
.29uH
J6
P6 ON RADIO
MK1
E1
1
2
U1
C2
100pF
SHIELD
VR2
WHT
L2
.29uH
TO UNIVERSAL
CONNECTOR
ON RADIO
ACCESSORY
CONNECTOR
PURPLE/WHT
YEL/WHT
PTT
S1
PTT BOARD
AEPF-18892-0

COLOUR CODE/
CODE DES COULEURS/
FARBKODE

0	BK/BLK	BLACK	NOIR	SCHWARZ
1	BN/BRN	BROWN	MARRON	BRAUN
2	RD/RED	RED	ROUGE	ROT
3	OR/ORG	ORANGE	ORANGE	ORANGE
4	YW/YEL	YELLOW	JAUNE	GELB
5	GN/GRN	GREEN	VERT	GRÜN
6	BL/BLU	BLUE	BLEU	BLAU
7	VT/VIO	VIOLET	VIOLET	VIOLET
8	GY/GRY	GREY	GRIS	GRAU
9	WH/WHT	WHITE	BLANC	WEIβ

GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

Resistors(R)

Resistor

Resistor with fixed tap

Variable resistor

Resistor with movable tap (Potentiometer).

Varistor (voltage-dependent resistor)

Temperature-dependent resistor with negative temperature coefficient

Light-emitting diode (photosensitive resistor)

Temperature dependent resistor with positive temperature-coefficient.

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

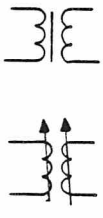
Coupled RF coils, air core

RF coil with adjustable core

Coil with tap.

Helical-coil.

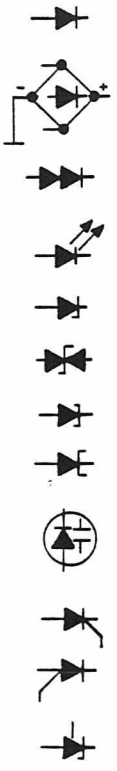
Transformers(T)



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)

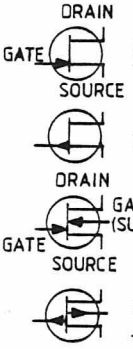
Transistor, PNP

Transistor, NPN

Light-sensitive transistor PNP

Unipolar transistor with N-type base

Junction Field Effect Transistors (JFET)



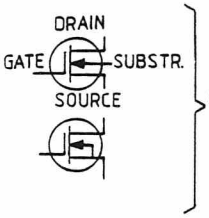
N-channel JFET

P-channel JFET

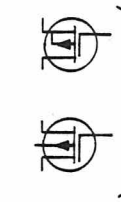
N-channel dual gate JFET

P-channel dual gate JFET

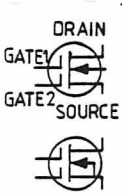
Insulated Gate Field Effect Transistors (IGFET or MOS)



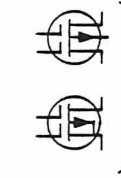
N-channel IGFET (MOS)



P-channel IGFET (MOS)



N-channel dual gate IGFET (MOS)

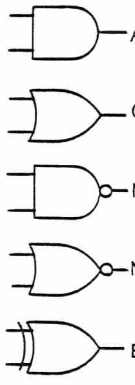


P-channel dual gate IGFET (MOS)

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



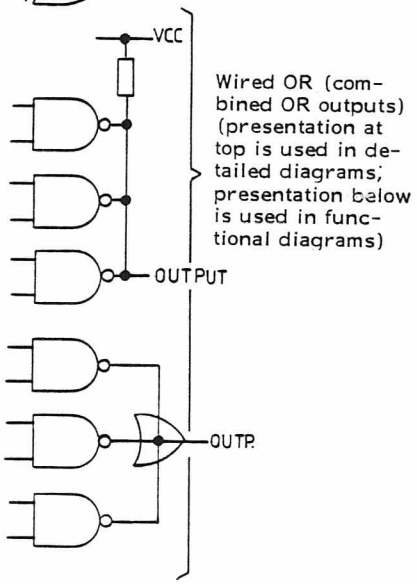
AND gate.

OR gate.

NAND gate.

NOR gate.

Exclusive OR gate.



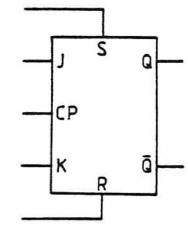
Wired OR (combined OR outputs) (presentation at top is used in detailed diagrams; presentation below is used in functional diagrams)

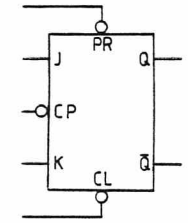
GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

Flip-flops

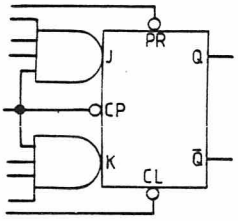
Abbreviations used:

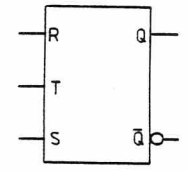
S =Set
R =Reset
CP=Clock pulse
PR=Preset
CL=Clear
T =Toggle

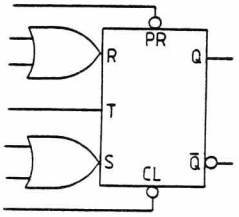




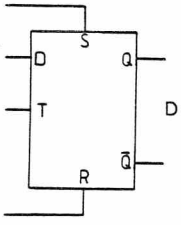
J-K Flip-Flops





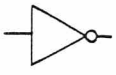


R-S Flip-Flops

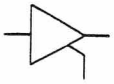


D Flip-Flop

Inverters

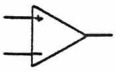


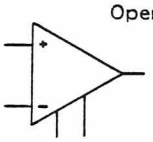
Inverter



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)

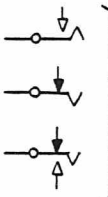
Change-over contact

Change-over contact centre off

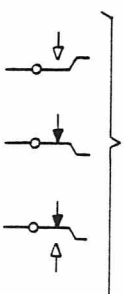
Make-before-break

Switches and Keys(S)

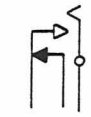
On/Off switch



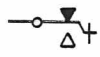
Locking keys or switches: push on, push off



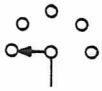
Non-Locking self-releasing keys or switches



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

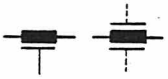
Circuit breaker

Batteries(B)

Battery one cell

Battery multi cell

Feedthrough Filters(Z)



Feedthrough filter

Ferrite Beads(FB)

Ferrite bead

Crystals(Y)

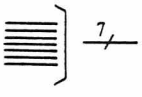
Crystal

Cables and Wires(W)

Usual conductor.

Three conductors

Eight conductors.



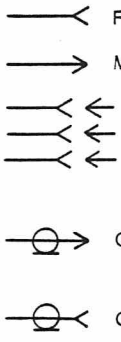
Shift from multiple-line to single-line presentation.

Screened cable.

Coaxial cable.

GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

Connectors(J and P)



Female (socket) connector.

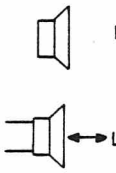
Male (plug) connector

Multi-wire connector.

Coaxial plug.

Coaxial socket.

Loudspeakers(LS)



Loudspeaker.

Loudspeaker-Microphone.

Telephones(TEL)

Telephone.

Single headphone.
(Earphone).

Double headphone.

Microphones(M)

Microphone.

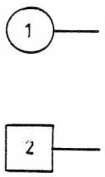
Meters etc.

Indicating instrument.

Balancing instrument.
(Galvanometer).

Basic letters
see DESIGN STANDARD
10.02.3.1 section 12.

Test Points



DC test point.

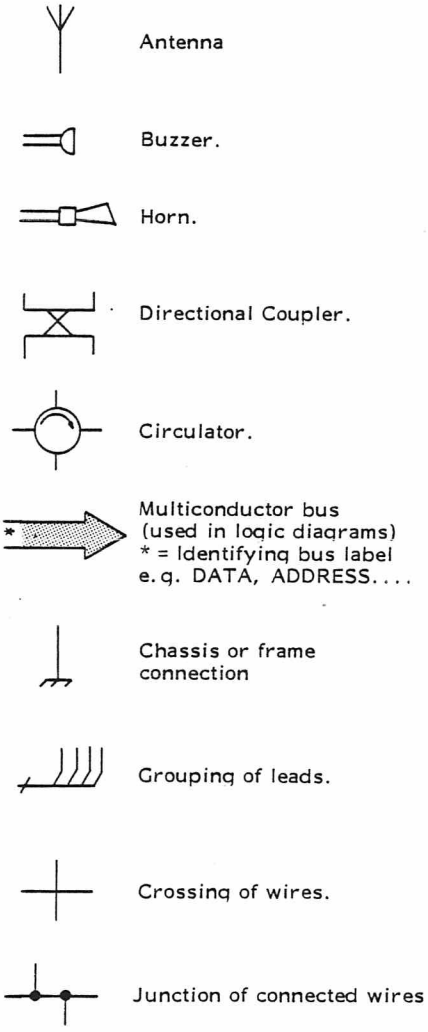
AC test point.

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