TECHNICAL MANUAL

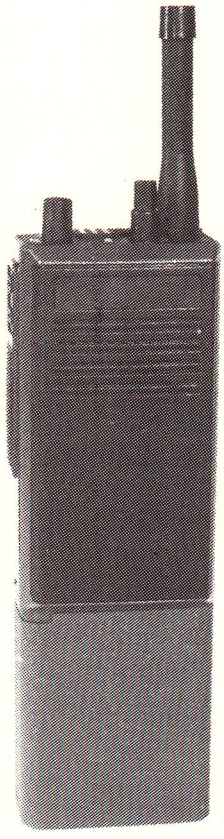
146 - 162 MHz
157 - 174 MHz

MOTOROLA

Storno

MOTOROLA HTX

STORNO CP1000



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HTX/CP1000 - VHF

TECHNICAL MANUAL

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MODEL NOMENCLATURE

MOTOROLA HTX/STORNO CP1000

The diagram below is a schematic description of the model configuration explaining the meaning of the different numbers and characters.

This schematic description should be used for decoding the models described on the following page.

LOCATION	TYPE OF UNIT	TX POWER	FREQ.	MODEL SERIES	FRONT ASSEMBLY	SQUELCH	CHANNEL SPACING	NO. OF CHAN'S	MODEL VARIA-TION
MS Cph.	H Hand held	3 2 W	3 VHF 146-174 MHz	UK Std.	D Without keypad or display	5 Trunking capab.	1 20/25 kHz	0 10 or more	0 Univer-sal
		4 4/5 W	4 UHF 403-470 MHz	PX Secure	E Display & 3 button keypad		5 12.5 kHz		
					K Display & full keypad				

MODEL CONFIGURATION

MOTOROLA HTX/STORNO CP1000 - VHF

The list below covers 10, 16 & 99 channel models in the frequency sub-bands: 146 - 162 MHz and 157 - 174 MHz. *

The individual frequencies of the radio do not appear from the model nomenclature. These frequencies are indicated on the test sheets delivered together with the radios.
If such test sheet is not present it should be noted that the frequencies are indicated on the board of the radio, too.

MODEL	MAX. POWER	CHAN. SPACING	STD./SECURE
FRONT I: WITHOUT KEYPAD OR DISPLAY			
MSH33UKD5500	2 W	12.5 kHz	Standard
MSH33UKD5100	2 W	20/25 kHz	Standard
MSH43UKD5500	5 W	12.5 kHz	Standard
MSH43UKD5100	5 W	20/25 kHz	Standard
MSH33PXD5100	2 W	25 kHz	Secure
MSH43PXD5100	5 W	25 kHz	Secure
FRONT II: WITH DISPLAY AND 3 BUTTON KEYPAD			
MSH33UKE5500	2 W	12.5 kHz	Standard
MSH33UKE5100	2 W	20/25 kHz	Standard
MSH43UKE5500	5 W	12.5 kHz	Standard
MSH43UKE5100	5 W	20/25 kHz	Standard
MSH33PXE5100	2 W	25 kHz	Secure
MSH43PXE5100	5 W	25 kHz	Secure
FRONT III: WITH DISPLAY AND FULL KEYPAD			
MSH33UKK5500	2 W	12.5 kHz	Standard
MSH33UKK5100	2 W	20/25 kHz	Standard
MSH43UKK5500	5 W	12.5 kHz	Standard
MSH43UKK5100	5 W	20/25 kHz	Standard
MSH33PXK5100	2 W	25 kHz	Secure
MSK43PXK5100	5 W	25 kHz	Secure

* The frequency sub-band 136 - 150.8 MHz is not yet available.

MOTOROLA HTX/STORNO CP1000

GENERAL DESCRIPTION

The frequency-synthesized Motorola HTX/Storno CP1000 Radio is an advanced design, microprocessor-based transceiver that incorporates the latest technology available in two-way radio communications. All channel frequencies and squelch codes are stored in an electrically erasable programmable read only memory (EEPROM), with all transmit and receive operations controlled by a microcomputer.
The functions provided by the radio are identified by the model and option numbers. Model and option numbers will be shown on the radio's customer information sheet, which is shipped with each new radio.

PHYSICAL DESCRIPTION

All operating controls, except the push-to-talk (PTT) switch, the monitor buttons, and the keypad (models with DTMF Option), are located on top of the radio. The PTT switch and monitor buttons are located on the left side of the radio (viewed from the front), and the keypad (if so equipped) is an integral part of the front cover.
The radio is small in size and weight, and constructed of a highly durable impact resistant, molded polycarbonate housing. O-rings and seals are utilized throughout the radio. All controls, including the PTT switch, the monitor buttons, and the keypad, are weather resistant. The microphone and speaker are covered with a special diaphragm to provide extra resistance against dirt, dust, and water intrusion. This proven rugged construction offers excellent protection against adverse environmental conditions.
The height of the radio varies with the size of the battery. All other dimensions are standard, except for those radios with a keypad option.

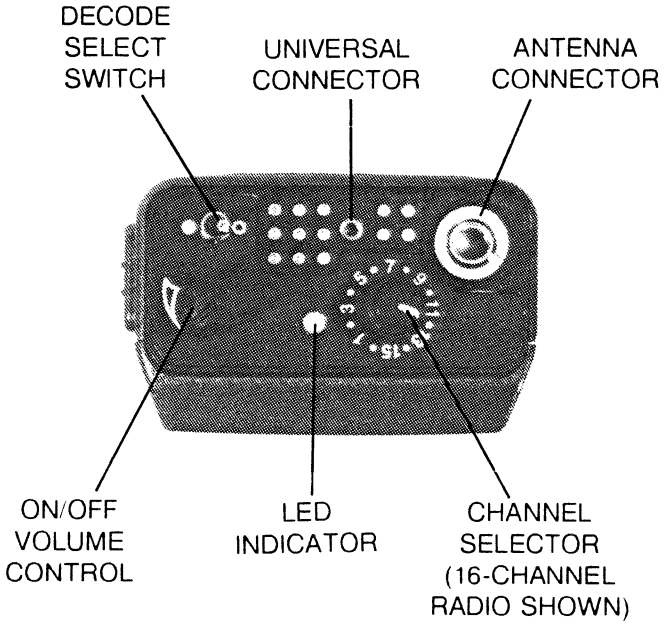

Figure 1. Top Panel Controls and Indicators

ELECTRICAL DESCRIPTION

Electrically, the radio can be divided into two basic sections: a transceiver board and a controller flexible circuit. The transceiver performs the transmit and receive functions, and the controller controls those functions.
The transceiver board includes an antenna switching circuit, a dual-conversion receiver, and a transmitter. The transmitter carrier and receiver first injection signals are generated by a common phase-locked loop (PLL) consisting of a voltage controlled oscillator (VCO) and a frequency synthesizer.
The controller flex assembly contains a microcomputer, an EEPROM which stores the channel frequencies and squelch codes, and an audio power amplifier IC that includes transmitter and receiver audio amplifiers. The controller flex also includes an audio filter IC which encodes and decodes (in conjunction with a microcomputer) PL and SELECT 5, adjusts and limits the audio level for correct transmitter deviation, and pre-emphasizes and de-emphasizes audio signals. Another circuit which is contained on the controller flex is a DC switch, which controls the radio's transmit and receive voltages.

PRINTED CIRCUIT BOARDS AND FLEXIBLE CIRCUITS

GENERAL

Functional circuits in the radio are contained on: (1) the Transceiver Board and (2) the Controller Flex.
Five flexible printed circuits eliminate all discrete wiring, except the switched B + wire to the transceiver board. Radios with keypad options have functional circuits contained on a board in the front cover.

TRANSCEIVER BOARD

The transceiver board is a two-layer printed circuit board containing the RF and I-F portions of the radio. Almost all components are mounted on the top side of this board.

CONTROLLER FLEX

The controller flex is packaged inside a protective flex carrier. It is a two-layer flexible printed circuit with the components surface-mounted on one side. When packaged in the flex carrier, it is folded in half with all the components on the outside.

INTERCONNECT FLEXES

The interconnect flexes are two-layer flexible printed circuits. These include:

- PTT/B + Flex
- Volume Pot Flex
- Frequency Switch Flex
- I-F Interconnect Flex
- Front Cover Flex
- DVP Flex

KEYPAD BOARD (OPTIONAL)

The keypad option board is a four-layer printed circuit board mounted in the radio's front cover. All components are surface mounted on one side of the board.

FEATURES

STANDARD FEATURES

The radio has an internal microphone and speaker, but can be operated with an optional external microphone and/or speaker. An external antenna connector and a top-mounted "universal connector" provide easy access for testing, and for attaching a wide variety of audio accessories. Radio models are available with up to 99 channels of carrier tone "Privat-Line" (PL), or SELECT 5 squelch operation.

Type of squelch is enabled on a per channel basis with one code pair available per radio. Two power output levels are offered: Medium power (2 watt) or high power (4 watt).
The battery pack slides on to the bottom of the radio and is held in place by a spring loaded catch. Batteries are available in two different sizes which correspond to the battery capacity: medium and high. The medium and high capacity batteries are available in standard and rapid charge rates. The different size batteries effect the operating time between charges as well as the overall height and weight of the radio.
A bicolor LED on the top of the radio serves as user feedback. The LED indicates when the radio is in transmit (continuous red), a low battery condition (flashing red), or channel busy (flashing green - coded squelch application only).

SPECIAL STANDARD FEATURES

FIELD PROGRAMMING

The radio utilizes a reprogrammable EEPROM codeplug, which permits operating characteristics to be changed without opening the radio. Programming is accomplished via a programming cable interface to a PC.

SELECT 5 CODED SQUELCH AND TONE PRIVATE-LINE CODED SQUELCH

Coded squelch allows only those calls with a radio's particular code to be heard, and can be enabled on a per channel basis. So a radio can have carrier squelch on some channels, SELECT 5 squelch on others, and Tone PL squelch on even others. You can choose from any of the standard European SELECT 5 Signalling formats and 42 Tone Private-Line codes.

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SPECIFICATIONS

MOTOROLA HTX/STORNO CP1000 - VHF

GENERAL

NOTE:

All batteries must be charged prior to use.
Use of chemicals (Detergents, alcohol, aerosol spray, petroleum products) may be harmful and damage the radio housing. We recommend a mild dishwashing soap for cleaning the exterior of the product.
O-ring seals must be properly lubricated and assembled to insure conformance to IP54 specifications for water intrusion.

Frequency Range:
146 - 162 MHz and
157 - 174 MHz

Power Supply:
Nickel-Cadmium Battery

Battery Drain, at 10 VDC:

	MSH33	MSH43
Standby:	*77 mA	*77 mA
Receive:	*210 mA	*210 mA
Transmit:	**710 mA	**1290 mA

*Add 8 mA with Remote Antenna
**Add 15 mA with Remote Antenna

Dimensions (H x W x D):

Radio only:	126.00 x 66.60 x 42.50 mm
Radio with battery:	
With Medium-Capacity Battery:	185.00 x 66.60 x 42.50 mm
With High-Capacity Battery:	200.00 x 66.60 x 42.50 mm

Weight:

Radio only:	469 g
Radio with battery (Nickel-Cadmium):	
With Medium-Capacity Battery:	708 g
With High-Capacity Battery:	776 g

TRANSMITTER

RF Output, at 10 Vdc	**MSH33**	**MSH43**
Nickel-Cadmium battery:	2.0 W	4.0 W

Modulation (Type 16F3):
For 12.5 kHz channel spacing: ±2.5 kHz for 100% modulation at 1000 Hz (min. ±2.0 kHz.)
For 20 kHz channel spacing: ±4 kHz for 100% modulation at 1000 Hz (min. ±3.2 kHz.)
For 25 kHz channel spacing: ±5 kHz for 100% modulation at 1000 Hz (min. ±4.0 kHz.)
Including PL-modulation for PL-models.

PL Modulation:
12.5 kHz channel spacing: max. ±500 Hz min. ±250 Hz
20 kHz channel spacing: max. ±800 Hz min. ±400 Hz
25 kHz channel spacing: max. ±1 kHz min. ±500 Hz

Audio Distortion:
Less than 5% at 1 kHz

Maximum Permissible Channel Separation:
8 MHz

Frequency Stability (-25°C to +55°C; +25°C ref.):
±.0002% (12.5 kHz Channel Spacing)
±.0002% (25/20 kHz Channel Spacing)

Spurious & Harmonic Frequencies:

Less than:	0.25 mW below 1 GHz
or	1.0 mW between 1 GHz - 4 GHz

FM Noise:
At least 40 dB below ±3.0 kHz deviation at 1000 Hz

RECEIVER

Audio Output:
Less than 5% distortion at 1 kHz into rated load

Second I-F Frequency:
450 kHz ± 1.5 kHz measured at M1

Sensitivity
Max. 1.0 uV EMF (20 dB SINAD Psophometrically weighted)

Noise Squelch Selectivity
Programmable

Maximum Permissible Channel Separation
8 MHz

Frequency Stability (-25°C to +55°C; +25°C Ref.):
±.0002% (12.5 kHz Channel Spacing)
±.0002% (25/20 kHz Channel Spacing)

Useable Bandwidth:
±2.5 kHz (12.5 kHz Channel Spacing)
±4 kHz (20 kHz Channel Spacing)
±5 kHz (25 kHz Channel Spacing)

Spurious Frequency Rejection:
More than 70 dB below carrier

Image Rejection:
More than 70 dB below carrier

Selectivity
More than 60 dB at ±12.5 kHz
More than 70 dB at ±20/25 kHz

Intermodulation:
More than 70 dB relative to sensitivity

Channel Spacing:
12.5/20/25 kHz

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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.

MOTOROLA HTX/STORNO CP1000

MAINTENANCE

1. INTRODUCTION

This section of the manual describes the disassembly and reassembly procedures, recommended repair procedures, special precautions regarding maintenance, and recommended test equipment. Each of these topics provides information vital to the successful operation and maintenance of the radio.

2. PREVENTIVE MAINTENANCE

The radio does not require a scheduled preventive maintenance program; however, periodic visual inspection and cleaning is recommended.

a. Inspection

Check that the external surfaces of the radio are clean, and that all external controls and switches are functional. A detailed inspection of the interior electronic circuitry is not needed or desired.

b. Cleaning

The following procedures describe the recommended cleaning agents and the methods to be used when cleaning the external and internal surfaces of the radio. External surfaces include the front cover, housing assembly, and battery case. These surfaces should be cleaned whenever a periodic visual inspection reveals the presence of smudges, grease, and/or grime. Internal surfaces should be cleaned only when the radio is disassembled for servicing or repair.

The only recommended agent for cleaning the external radio surfaces is a 0.5% solution of a mild dishwashing detergent, in water. The only factory recommended liquid for cleaning the printed circuit boards and their components is ISOPROPYL alcohol (70% by volume).

CAUTION

The effects of certain chemicals and their vapors can have harmful results on certain plastics. Aerosal sprays, tuner cleaners and other chemicals should be avoided.

(1) Cleaning External Surfaces

(a) Polycarbonate Surfaces

The detergent-water solution should be applied sparingly with a stiff, non-metallic, short-bristled brush to work all loose dirt away from the radio. A soft, absorbent, lintless cloth or tissue should be used to remove the solution and dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.

(b) Silverized Surfaces

A non-metallic, soft-bristled brush should be used to apply the detergent-water solution to silverized surfaces, and a second non-metallic soft-bristled brush (free of detergent or rinsed in clean water) should be used to remove the detergent-water solution.

Upon completion of the cleaning process, a soft, absorbent, lintless cloth or tissue should be used (with a blotting action) to dry the frame and covers. The blotting action will prevent damage to the silverized conductive coating.

(2) Cleaning Internal Circuit Boards and Components

Isopropyl alcohol may be applied with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas. The brush stroke should direct the dislodged material out and away from the inside of the radio.

Alcohol is a high-wetting liquid and can carry contamination into unwanted places if an excessive quantity is used. Make sure that controls or tunable components are not soaked with the liquid. Do not use high-pressure air to hasten the drying process, since this could cause the liquid to puddle and collect in unwanted places.

Upon completion of the cleaning process, use a soft, absorbent, lintless cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover, or back cover.

NOTE

Always use a fresh supply of alcohol and a clean container to prevent contamination by dissolved material (from previous usage).

3. DISASSEMBLY

Disassembly of the radio involves removal of the major components listed below, one at a time, in the sequence described in the following paragraphs.

NOTE

1. Several special tools are required to completely disassemble the radio. Refer to the "Tools, Test and Programming Equipment" section. Also refer to the "Torque and Tool Specifications Chart.
2. Before proceeding, make sure that the radio is turned off.

a. Battery Removal

To remove the battery from the radio, proceed as follows:

Step 1. Hold the radio with the front of the radio facing up.

Step 2. Disengage the battery latch from the battery by pushing and holding the latch towards the top of the radio.

Step 3. With the battery latch disengaged, slide the battery from left to right to remove it from the baseplate on the bottom of the radio housing.

b. Gaining Access to Internal Components

CAUTION

The radio contains complementary metal-oxide semiconductor (CMOS) devices, which are highly susceptible to damage in handling due to static discharge. The entire printed circuit board should be treated as static sensitive. Damage can be latent, resulting in failures occurring weeks or months later.

DO NOT attempt to disassemble the radio without first referring to the "Safe Handling of CMOS Devices" paragraph in this section

Step 1. Remove the battery as described in paragraph **a**.

Step 2. Remove the two screws from the back of the radio.

Step 3. Remove the two screws on the bottom of the radio (baseplate corners).

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

Step 5. Disconnect the speaker/microphone connector from the controller flex by grasping the speaker flex strain relief (near the plug) and pulling the plug straight out and away from the circuit board.

Step 6. Loosen the two captive screws on the bottom of the radio. Do not completely remove the captive screws from the baseplate.

Step 7. With a thumb and forefinger, grasp the antenna at its base and pull lightly to remove the frame assembly from the radio housing. Do not press the PTT switch during removal.

Step 8. Remove the antenna by unscrewing it counterclockwise.

Step 9. Remove the screw that secures the front shield to the controller carrier.

Step 10. Remove the front shield by pulling it straight out and away from the radio.

Step 11. Remove the four screws that secure the main back shield to the frame.

Step 12. Remove the main back shield by pulling it straight out and away from the radio.

c. Removing the Controller Assembly

Step 1. Perform steps 1 through 10 of paragraph **b**.

NOTE

Be careful to pull each connector straight out and away from the mating socket so as not to bend or break the connector pins.

Step 2. Disconnect the two connectors at the top of the controller.

Step 3. Disconnect the two bottom flex connectors by carefully sliding them away from the synthesizer.

Step 4. Lift the controller circuit (nearest the bottom of the radio) away from the radio just enough to gain access to the connector under the controller.

Step 5. Disconnect the connector under the controller.

Step 6. Lift the controller assembly totally away from the radio.

d. Gaining Access to the Controller Flexible Circuit

Step 1. Perform steps 1 through 7 of paragraph **c**.

Step 2. Along the top edge of the controller assembly (edge nearest speaker clearance indentation), gently pry the bottom shield away from the top flex carrier.

Step 3. Pull the bottom shield completely away from the top flex carrier and remove the controller flexible circuit.

e. Removing the Transceiver Board from the Frame

Step 1. Perform steps 1 through 7 of paragraph **c**.

Step 2. Remove the four screws that secure the main back shield, and remove the shield.

Step 3. Unsolder four contacts (two pins and one frame ground connection) located next to the screw (back, top-center of transceiver board), and the antenna ferrule located on the back, top-left corner of the transceiver board.

Step 4. Remove one screw (back, top-center of transceiver board) that secures the transceiver board to the frame.

Step 5. Unsolder and remove the red B+ wire (controller side of radio) from the On-Off / volume switch pot.

CAUTION

Always place the On-Off / Volume switch pot in the 'On' position before soldering to this switch, and return to the 'Off' position when finished soldering.

Step 6. Gently pull the transceiver circuit board straight out and away from the frame.

f. Removing the Control-Top Panel Components

Step 1. Perform steps 1 through 5 of paragraph **e**.

NOTE

All control-top panel components, except the antenna jack, are connected on two flexible circuits, which are connected together and should be removed as one unit.

Step 2. Remove the control knob(s) by pulling straight out and away from the control-top panel.

Step 3. The escutcheon is stuck to the top surface of the control-top panel with adhesive. Gently pry one corner of the escutcheon away from the control-top panel and then peel the escutcheon completely away. Notice that washer(s) are stuck on the back side of the escutcheon.

Step 4. Remove the hex nut and washer from the volume potentiometer.

Step 5 Remove the hex nut and washer from the frequency switch.

Step 6. Remove the spanner nut and washer from the PL switch.

Step 7. Pry the header (part of volume pot flex assembly) away from the universal connector pins.

Step 8. Unsolder the three legs of the LED and pull the flex away from the legs.

Step 9. Unsolder and remove the black wire (ground wire from header to frame) where it contacts the frame.

Step 10. The frequency switch flex connects to the PTT / B+ flex with five solder tabs located along the side of the frame near the monitor popple switches. Unsolder the five contact tabs, and with "solder- wick", remove the solder and separate the two flexes.

NOTE

A capacitor is placed across the last two tabs.

Step 11. Push the switch shaft(s) until clear of the mounting holes, and remove the flex circuits and control-top panel components away from the frame.

g. Removing the Control-Top Panel and LED

Step 1. Perform steps 1 through 8 of paragraph **f**.

Step 2. Unsolder the ground pin of the universal connector contacting the frame (near the antenna bushing).

Step 2a. Remove the screw and washer located near the antenna receptacle.

Step 2b. Gently pull the control-top panel away from the frame.

Step 2c. Push the LED and rubber boot out of the control-top panel, and pull the LED out of the rubber boot.

h. Removing the Battery Latch

Step 1. Perform steps 1 through 7 of paragraph **b**.

Step 2. Remove the ground contact screw that holds the negative battery contact. Be careful not to lose the lockwasher, contact, and rubber pad (under the contact).

Step 3. While holding the latch slide, carefully pull the baseplate assembly away from the housing.

Step 4. Carefully slide the latch out of the housing.

Step 5. Remove the exposed latch springs.

i. Removing the PTT / B+ Flex

Step 1. Perform steps 1 through 7 of paragraph **b**.

Step 2. Two corners of the PTT / B+ flex are soldered to the frame. Remove the solder, using "solder-wick".

Step 3. The PTT / B+ flex connects to the frequency switch flex with five solder tabs located along the top side of the frame near the PL switch. Unsolder the five contact tabs, and with "solder-wick", remove the solder and separate the two flexes.

NOTE

A capacitor is placed across the last two tabs.

Step 4. The PTT / B+ flex is stuck to the frame with adhesive. Carefully peel the PTT / B+ flex away from the frame.

4. REASSEMBLY

1. DO NOT attempt to reassemble the radio without first referring to the "Safe Handling of CMOS Devices" paragraph in this section of the manual.

2. DO NOT attempt to reassemble the radio without first referring to the approriate VHF or UHF service manual "TORQUE AND TOOL SPECIFICATIONS CHART".

3. Inspect all O-rings and replace if obvious damage exists.

a. Reinstalling the Battery Latch and Base Plate

Step 1. Insert the two springs into their proper holes, and replace the slide latch.

Step 2. Position the base plate and hold it firmly to compress the springs.

Step 3. Holding the base plate in place, install the negative battery contact, being sure that the rubber pad is in place in the cup of the contact.

Step 4. Reinstall the screw and lockwasher in the negative battery contact. Tighten the screw per the "TORQUE AND TOOL SPECIFICATIONS CHART".

b. Reinstalling the PTT / B+ Flex

Step 1. Position the PTT / B+ flex to the frame such that the five contact tabs line up with the corresponding tabs on the frequency switch flex. Note that a little oval hole in the corner of the flex (near the solder tabs) mates with a round dot on the frame.

Step 2. Press the flex to the frame. Note that two more places, holes in the flex correspond with dots on the frame.

Step 3. Resolder the five solder tabs connecting the PTT / B+ flex to the frequency switch flex.

NOTE

A capacitor is placed across the last two tabs.

Step 4. Resolder the two corners of the flex to the frame.

c. Reinstalling the LED and Control-Top Panel

Step 1. Insert the LED into the rubber boot such that the flat edge of the LED's base mates with the flat edge inside the boot.

Step 2. Insert the LED and boot into the control-top panel.

Step 3. Place the control-top panel on the frame.

Step 4. Reinstall the screw and washer located near the antenna receptacle, and tighten the screw per the "TORQUE AND TOOL SPECIFICATIONS CHART".

Step 5. Resolder the ground pin of the universal connector to the frame.

d. Reinstalling the Control-Top Panel Components

Step 1. Insert the switch shafts into the proper holes.

Step 2. Resolder the three LED legs to the frequency switch flex.

Step 3. Press the volume pot header on to the corresponding pins of the universal connector.

Step 4. Resolder the black ground wire to the frame.

Step 5. Resolder the five solder tabs of the frequency switch flex to the corresponding tabs of the PTT / B+ flex.

Step 6. Reinstall the PL switch washer and spanner nut, and tighten per the "TORQUE AND TOOL SPECIFICATIONS CHART".

Step 7. Reinstall the frequency switch and volume pot washers and hex nuts, and tighten each screw per the "TORQUE AND TOOL SPECIFICATIONS CHART".

Step 8. Reinstall the escutcheon.

Step 9. Reinstall the teflon washers on the frequency switch and volume pot shafts.

Step 10. Reinstall the switch knobs.

e. Reinstalling the Transceiver Board

Step 1. With the frame's backside laying down, and viewing the transceiver board from the solder side with the assembly upright, slightly spread the sides of the frame and slide the transceiver into the frame.

Step 2. Turn the unit over and resolder the loose end of the red B+ wire to the On-Off/Volume switch pot.

CAUTION

Always place the On-Off / Volume switch pot in the 'On' position before soldering to this switch, and return to the 'Off' position when finished soldering.

Step 3. Reinstall one screw (back, top-center of transceiver board) that secures the transceiver board to the frame, and tighten securely.

Step 4. Resolder four contacts (two pins and one frame ground connection) located next to the screw (back, top-center of transceiver board), and the antenna ferrule contact (back top-left corner of board).

Step 5. Press the main back shield (edges over the frame) flush to the transceiver board.

Step 6. Reinstall the four screws that secure the main back shield to the frame, and tighten each screw per the "TORQUE AND TOOL SPECIFICATIONS CHART".

g. Reassembling the Controller Assembly

CAUTION

Make sure that the flex insulator is installed around the controller flex before placing the controller flex into the carrier.

Step 1. With the outside surface of the carrier laying down, and the controller flex folded over align the holes in the flex with corresponding holes in the carrier, and place the flex into the carrier. Make sure that the P1 and P2 jack's grooves slide into the tabs of the carrier. Also, make sure that the J5 and J7 jack is seated properly in the carrier.

Step 2. Align the controller bottom shield to the controller flex and carrier. In the J5 and J7 jack area, slide the tab of the shield under the slot in the carrier, and press the bottom shield into place (sides of the bottom shield fit inside the sides of the carrier).

g. Reinstalling the Controller Assembly

NOTE

Be careful to push each connector straight into the mating socket so as not to bend or break the connector pins.

Step 1. Reconnect the connector under the controller, firmly seating the plug / jack connection.

Step 2. Reconnect the two bottom flex connectors, firmly seating both plug / jack connections.

Step 3. Reconnect the two top flex connectors, firmly seating both plug / jack connections.

Step 4. Press the controller into place (inside of frame sides).

Step 5. Reinstall front shield (shield edges fit inside the frame).

Step 7. Reinstall the screw that secures the front shield to the controller carrier, and tighten the screw per the "TORQUE AND TOOL SPECIFICATIONS CHART".

h. Final Reassembly

Step 1. Insert the internal radio unit into its housing, and tighten the two screws on the baseplate per the "TORQUE AND TOOL SPECIFICATIONS CHART".

Step 2. Reconnect the speaker / microphone connector, being careful to push the connector straight into the mating socket so as not to bend or break the connector pins.

Step 3. Reinstall the front cover.

Step 4. Reinstall the two screws on the bottom of the radio (baseplate corners), and tighten the screws per the "TORQUE AND TOOL SPECIFICATIONS CHART".

Step 5. Reinstall the two screws that secure the front cover to the housing, and tighten each screws per the "TORQUE AND TOOL SPECIFICATIONS CHART".

Step 6. Reinstall the antenna.

Step 7. Reinstall the battery.

5. SAFE HANDLING OF CMOS DEVICES

Complementary metal-oxide semiconductor (CMOS) devices are used in the radio. While the attributes of CMOS are many, their characteristics make them susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair. The following handling precautions are mandatory for CMOS circuits, and are especially important in low humidity conditions.

a. All CMOS devices must be stored or transported in conductive material so that all exposed leads are shorted together. CMOS devices must not be inserted into conventional plastic "snow" or plastic trays of the type that are used for storage or transportation of other semiconductor devices.

b. All CMOS devices must be placed on a grounded bench surface and the technicians must ground themselves prior to handling the devices. This is done most effectively by having the technician wear a conductive wrist strap in series with a 1M ohm resistor to ground.

c. Do not wear nylon clothing while handling CMOS circuits.

d. Do not insert or remove CMOS devices with power applied. Check all power supplies to be used for testing CMOS devices, and be certain that there are no voltage transients present.

e. When straightening CMOS device leads, provide ground straps for the apparatus used.

f. When standing, use a grounded soldering iron.

g. All power must be turned off in a system before printed circuit boards containing CMOS devices are inserted, removed, or soldered.

6. REPAIR PROCEDURES AND TECHNIQUES

a. Parts Replacement and Substitution

Special care should be taken to be as certain as possible that a suspected component is actually the one at fault. This special care will eliminate unnecessary unsoldering and removal of parts, which could damage or weaken other components or the printed circuit board itself.

When damaged parts are replaced, identical parts should be used. If the identical replacement component is not locally available, check the parts list for the proper part number and order the component from your service center.

b. Rigid Circuit Boards

The radio uses bonded multi-layer printed circuit boards. Since the inner layers are not accessible, some special considerations are required when soldering and unsoldering components. The printed through holes may interconnect multiple layers

of the printed circuit. Therefore, care should be exercised to avoid pulling the plated circuit out of the hole.

When soldering near the module socket pins, use care to avoid accidentally getting solder in the socket. Also, be careful not to form solder bridges between the module socket pins. Closely examine your work for shorts due to solder bridges. When removing modules with metal enclosures, be sure to desolder the enclosure ground tabs as well as the module pins.

c. Flexible Circuits

The flexible circuits are made from a different material than the rigid boards, and different techniques must be used when soldering. Excessive prolonged heat on the flexible circuit can damage the material. Avoid excessive heat and excessive bending.

To replace a component on a flexible circuit, grasp the edge of the flexible circuit with seizers near the part to be removed, and pull gently. Apply the tip of the soldering iron to the component connections while pulling with the seizers. Do not attempt to puddle out components. Prolonged application of heat may damage the flexible circuit.

7. TEST EQUIPMENT AND SERVICE AIDS

The following paragraphs describe the test equipment and service aids required for maintaining the radio.

Refer to Figure 1 for an illustration of trouble-shooting, test equipment, and programming set-up.

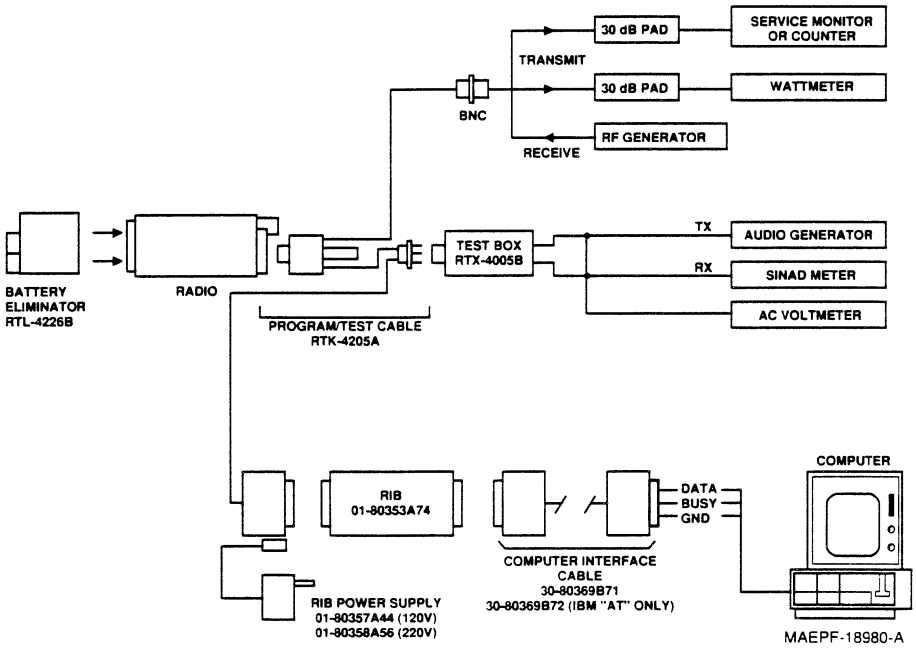


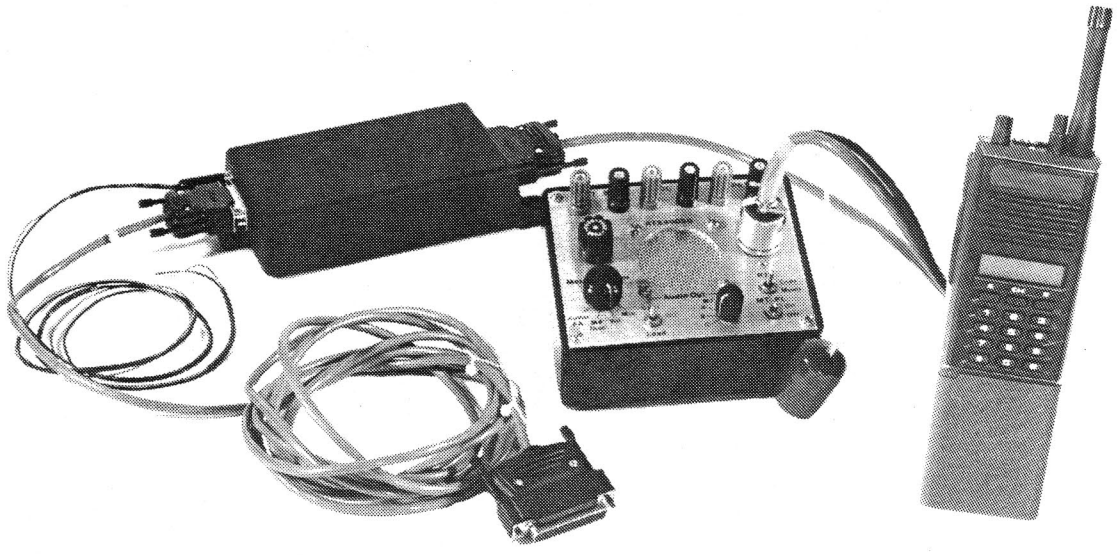
Figure 1. Troubleshooting, Test Equipment, and Programming Set-Up Detail

CHAPTER
CHAPITRE
KAPITEL

4

Storno
SERVICE INSTRUMENTS
AND SOFTWARE

TOOLS TEST AND PROGRAMMING EQUIPMENT

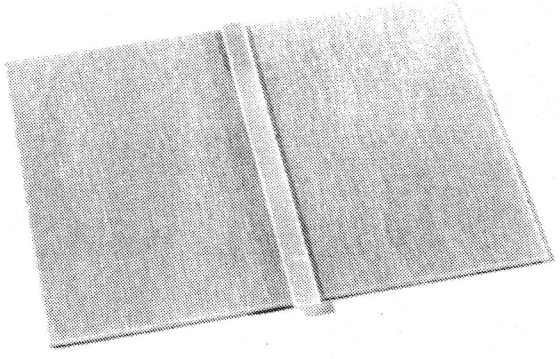


TOOLS

REN-4000A **CONTROLLER FLEX EXTENDER FIXTURE**

Allows access to all electrical points on the radio Controller Flex and the interior of the RF board for troubleshooting purposes. The Controller Flex is removed from the flex carrier assembly and then externally mounted on the fixture's P.C. board. Electrical interconnect between the fixture and the radio RF board is provided through two ribbon cables.

01-80370B92 **CONTROLLER FLEX HOLD DOWN FIXTURE**
Provides a secure mount for the radio Controller Flex when removing and replacing IC chip carriers and chip components using the RSX-4057A IC Removal/Reflow Station.

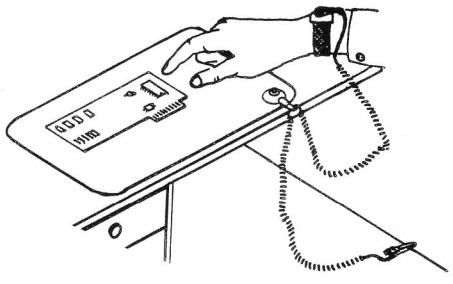


RTR-1500B **INFRA RED REWORK STATION**
Used for removal of surface mounted devices.

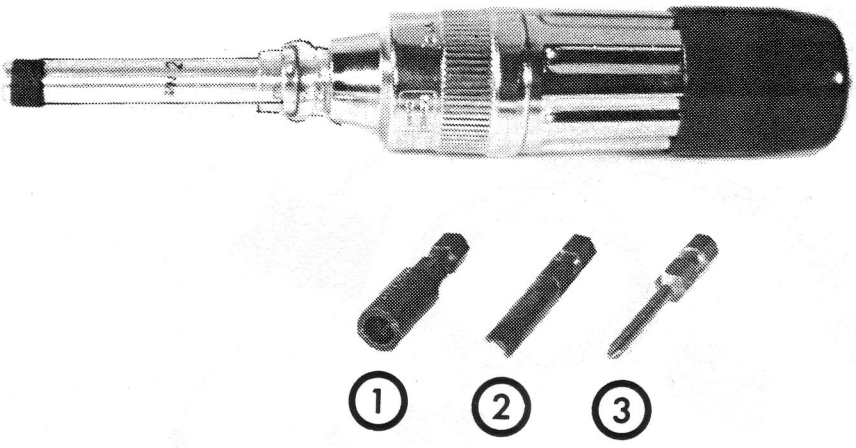
ANTI-STATIC PROTECTION MATERIAL
Used during all radio assembly and disassembly procedures.

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.



RSX-4043A **TORQUE SCREWDRIVER**
Handle for bits:



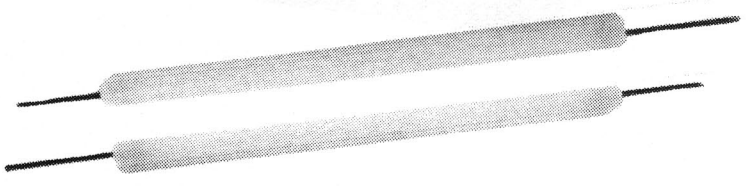
- bits described below:

55-05717E01 **HEXSOCKET BIT** (1)
Removes nuts on volume and rotary switch.

66-80370B95 **SPANNER BIT** (2)
For use on toggle switch spanner nut.

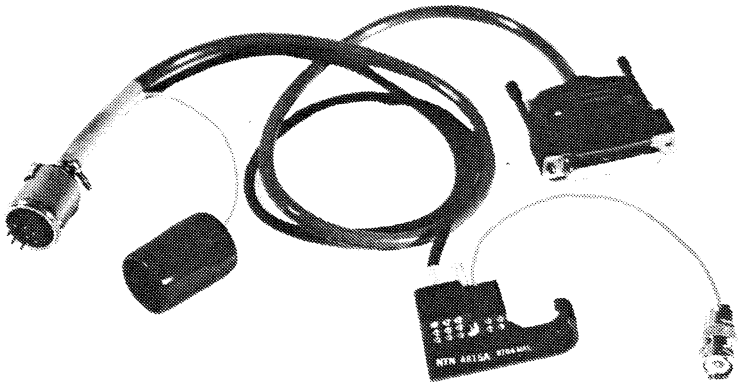
66-80321B86 **PHILIPS BIT** (3)
For removal of radio screws.

66-05106N01 **TUNING TOOL**
For use on tunable coils and potentiometers.

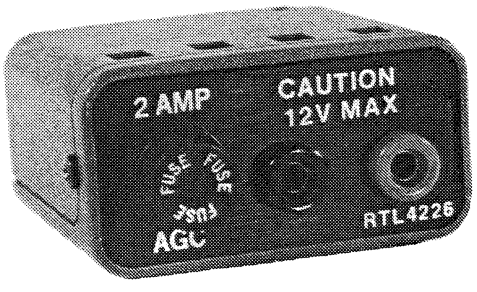


TEST EQUIPMENT

RTK-4205A **PROGRAMME TEST CABLE**
Connects radio to RTX-4005B Test Box and RIB for programming and testing of the radios.

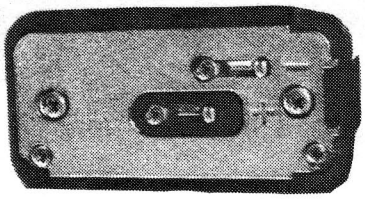


RTL-4226B **BATTERY ELIMINATOR**
Replaces the battery pack during radio servicing of all radio models. The power supply input is overvoltage protected to 12 V DC maximum supply voltage. Reverse supply polarity protection and input fuse protection are also provided.



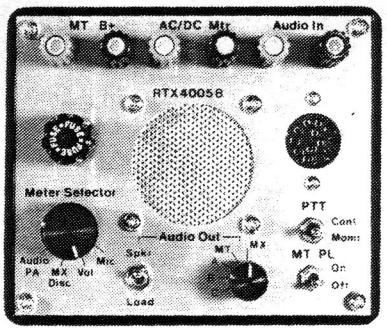
15-80384B40 BATTERY ADAPTER

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



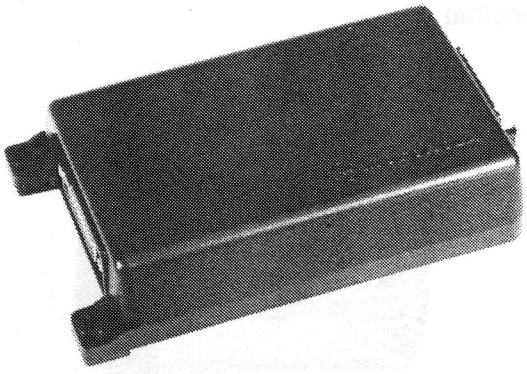
RTX-4005B PORTABLE TEST SET

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 the radio. The Test Set is used in conjunction with the RTK-4205B Program/Test Cable.

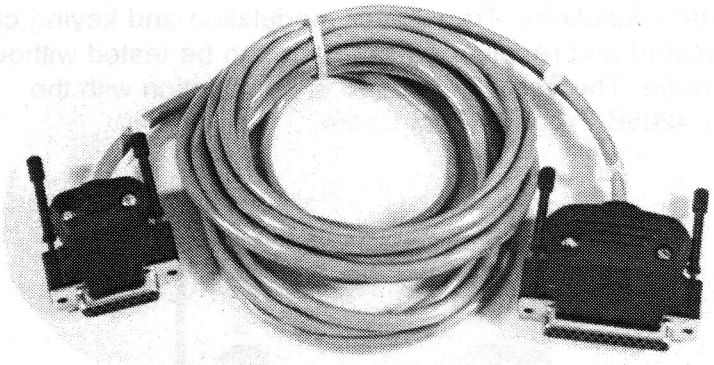


PROGRAMMING EQUIPMENT

01-80353A74 RADIO INTERFACE BOX (RIB)
Voltage level shifter to enable communications between the radio and the computer's RS232 Serial Communications Adaptor.

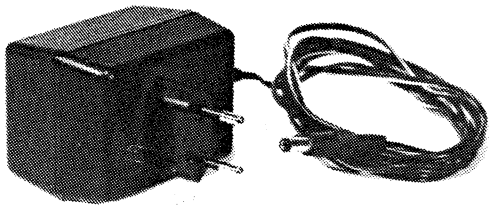


30-80369B71/ COMPUTER INTERFACE CABLES
30-80369B72 Used to Connect the computer's Asynchronous Serial Communications adapter to the RIB (01-80353A74). Use B72 for the IBM PC AT. All other IBM models use B71.



0180358A56 **POWER SUPPLY FOR RIB**
220 V Euro Plug.

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



95D5097-00 **FIELD PROGRAMMER KIT**
Containing programmer manual and 5 1/4" disk. For changing frequencies, options and electronically tuneable parameters.

TORQUE AND TOOL SPECIFICATIONS CHART

MOTOROLA HTX/STORNO CP1000

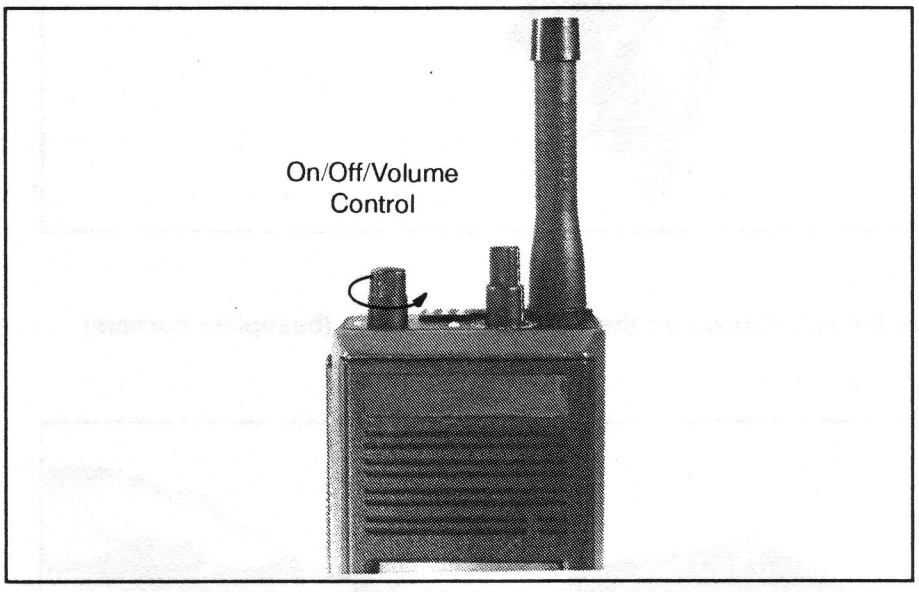
DESCRIPTION	SIZE	PART NUMBER	QTY.	RETIGHTEN WITH RSX-4043A TORQUE SCREWDRIVER AND BIT NO.	TORQUE IN N/METER INT'L.	CHAPT.7, DIA.NO.: M405.719 EXP.VIEW NUMBER
Control Top Antenna Bushing Spanner		0205765L02	1	6680370B90	1.36	68
Volume Pot Nut	0.75x8x1.6	0205629L01	1	5505717E01	0.57	58
Freq. Switch Nut	0.75x8x1.6	0205629L01	1	5505717E01	0.57	58
Toggle Switch Spanner		020516Q01	1	6680370B95	0.45	56
Control Top Screw	4-40x3/16"	0300136785	1	6680321B79	0.57	71
Housing Battery Contact Screws	2-56x5/32"	0300139982	2	6680321B86	0.34	19
Bottom Front Cover Screws	2-56x1/4"	0300140041	2	6680321B86	0.34	20
Baseplate to Frame Screws	4-40 (captive)	0305941K01	2	6680321B79	0.57	23
Front Cover Post Screws	4-40x5/16"	0305137Q01	2	6680321B79	0.57	33
Controller Front Shield Screw	2-56x5/16"	0300136772	2	6680321B86	0.23	91
RF Board Back Shield Screws	2-56x5/16"	0300136772	4	6680321B86	0.34	48
RF Board Screw	2-56x1/8"	0300136772	1	6680321B86	0.34	not shown
PA Heatsink to PCB (VHF,2-W)	2-56x3/16"	0300136771	2	6680321B86	0.34	not shown
PA Heatsink to PCB (VHF,5-W)	2-56x3/16"	0300136771	1	6680321B86	0.34	not shown
PA to Heatsink (VHF,2-W)	2-56x5/32"	0300139685	1	6680321B86	0.34	not shown
PA to Heatsink Nut (VHF,5-W)	1/4		1		0.57	not shown
PA Heatsink to PCB (UHF)	2-56x3/16"	0300136771	2	6680321B86	0.34	not shown
Synthesizer Casting Screw	2-56x3/16"	0300136771	2	6680321B56	0.45	not shown
Front Cover Speaker/Mic Tab Screws		0305073P02	1	6680321B86	0.23	94

DISASSEMBLY PROCEDURE

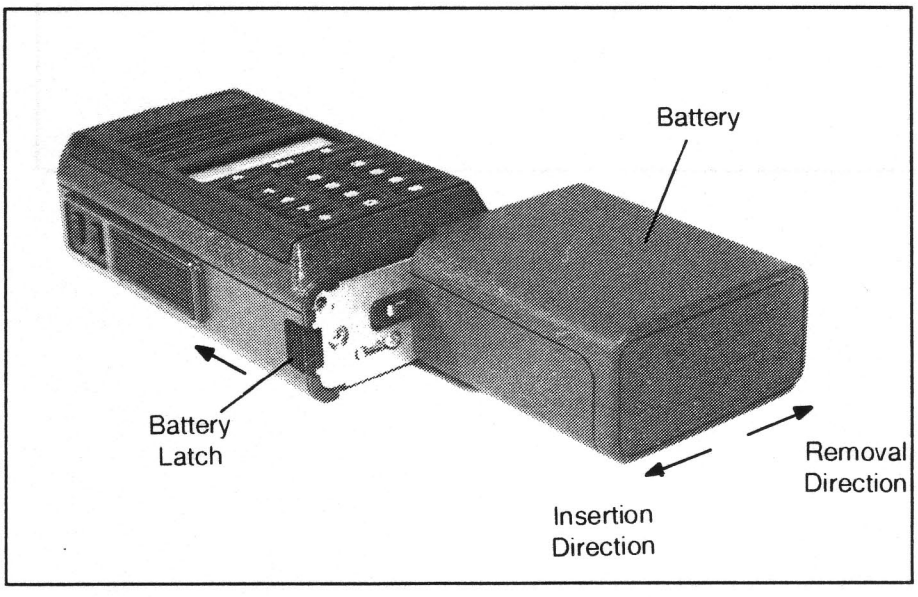
MOTOROLA HTX/STORNO CP1000

1. **Turn off the radio**

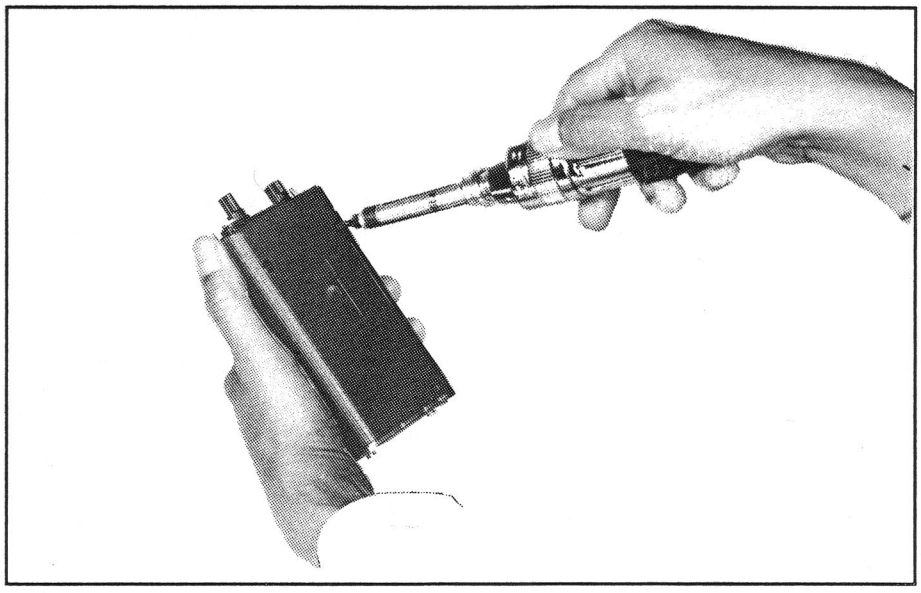
by rotating the on/off-volume control knob fully counter clockwise until you hear a click. Remove the universal connector cover or any accessory connected to the radio before beginning disassembly.



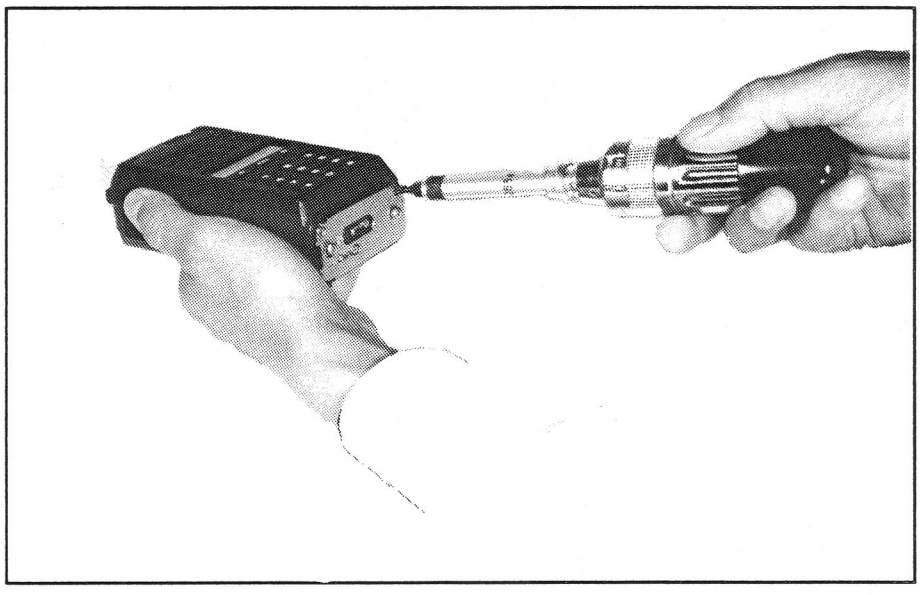
2. **Remove the battery:**
While pushing the spring-loaded battery latch towards the top of the radio, slide the battery away from the latch, removing it from the baseplate on the bottom of the radio.



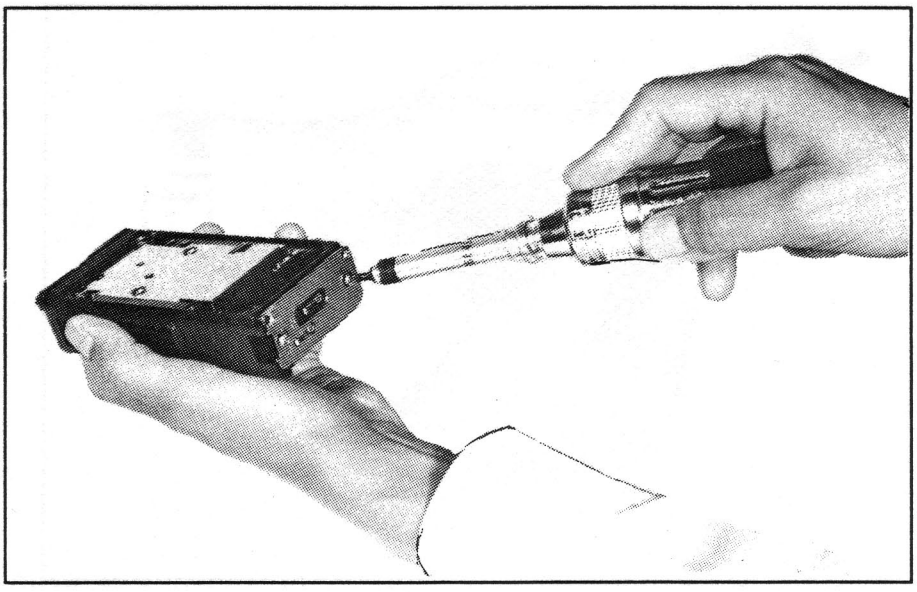
3. Remove the two screws from the back of the radio.



4. Remove the two screws on the bottom of the radio (baseplate corners).

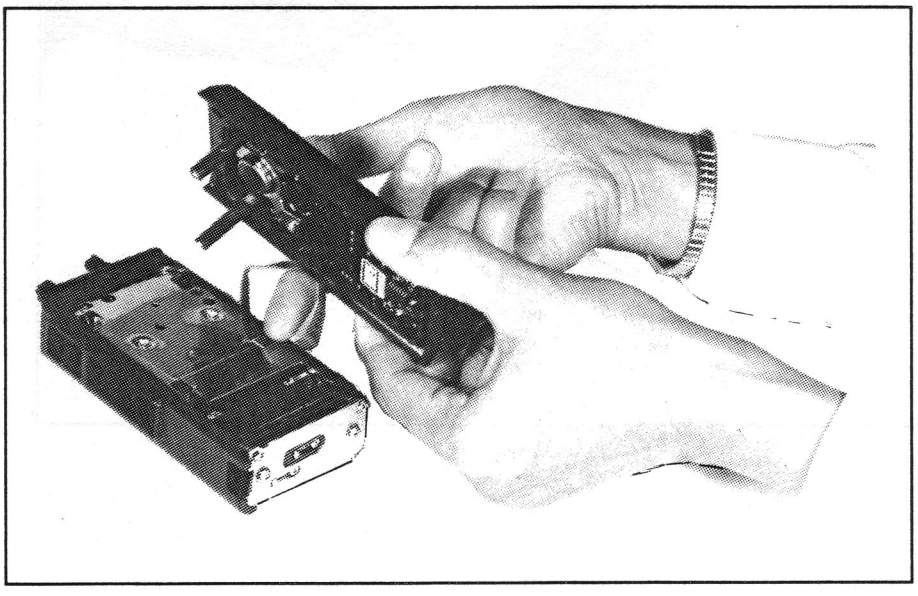


5. **Loosen the two captive screws on the bottom of the radio,**
(middle of each end of baseplate).
Do not completely remove the captive screws from the baseplate.

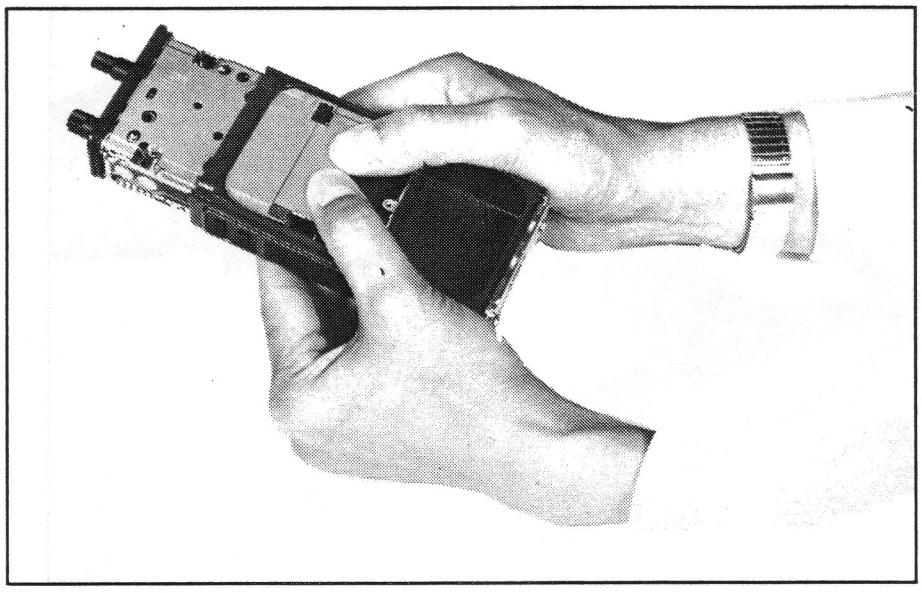


6. **Lift the front cover from the radio housing**
being careful not to pull against the speaker/microphone wires.

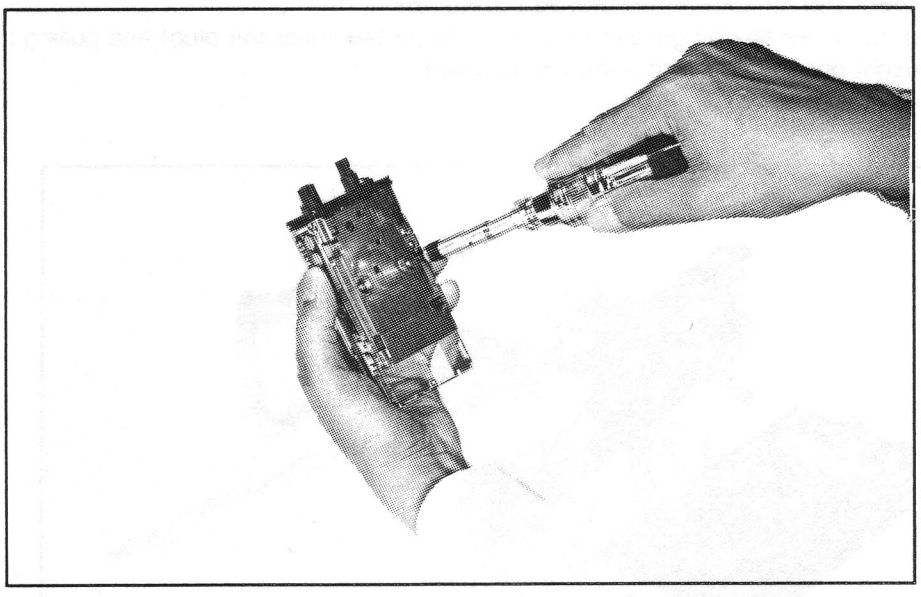
7. **Disconnect the speaker/microphone connector**
from the controller flex by grasping the microphone flex (near the plug) and pulling the plug straight out and away from the circuit board.



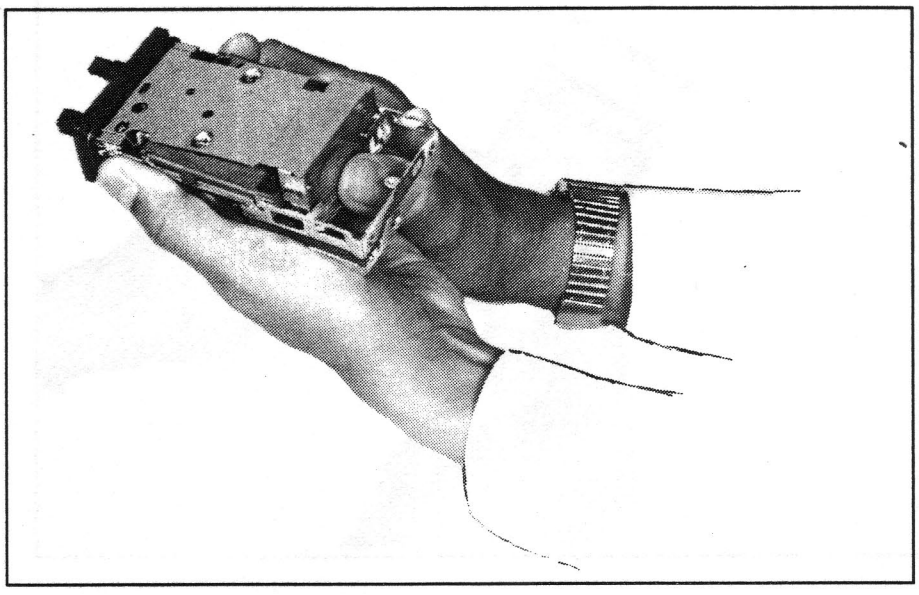
8. **Remove the frame assembly**
with a thumb and forefinger, grasp the antenna at its base and pull lightly to remove the frame assembly from the radio housing. Do not press the PTT switch during removal.



9. **Remove the screws that secures the front shield.**



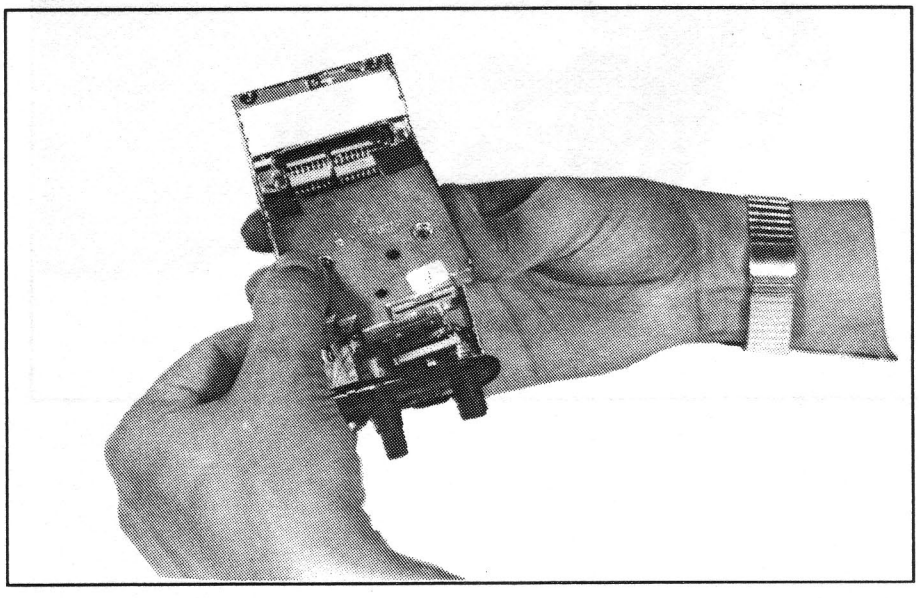
10. **Remove the front shield**
by pulling it straight out and away from the radio.



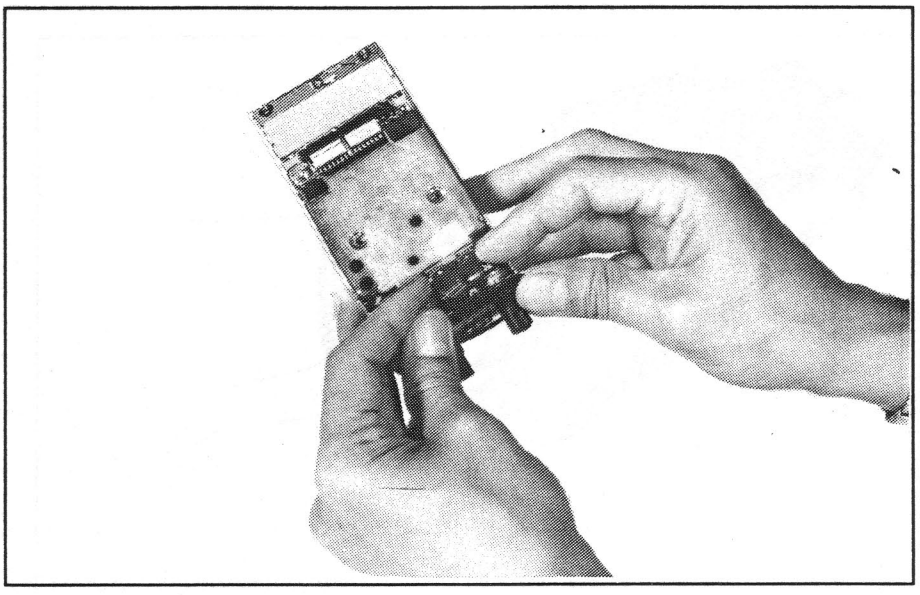
11. **Remove the controller circuit as follows:**
Remove the controller from the frame.

NOTE

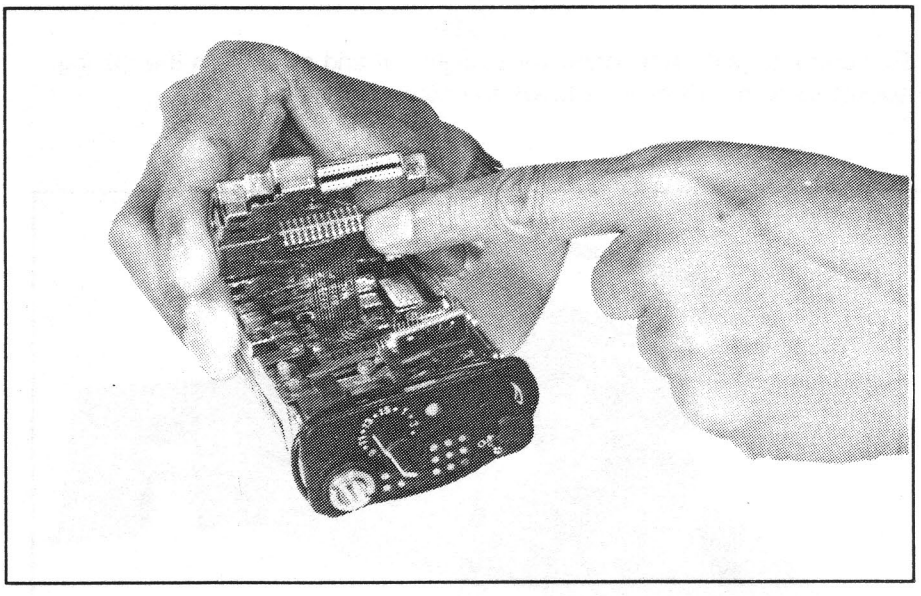
Be careful to pull each connector straight out and away from the mating socket so as not to bend or break the connector pins.



- Disconnect the 2 bottom flex connectors by carefully sliding them away from the bottom of the radio.



- Lift the controller circuit (nearest the bottom of the radio) away from the radio just enough to gain access to the connector under the controller.



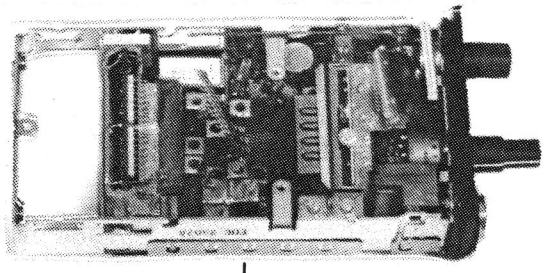
- Disconnect the connector under the controller.

- Disconnect the 2 connectors at the top of the controller.

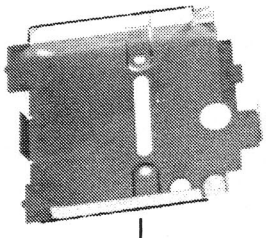
CAUTION

REFER TO "CMOS" PRECAUTIONS, PART OF SAFETY INFORMATION SECTION

- Lift the controller totally away from the radio.

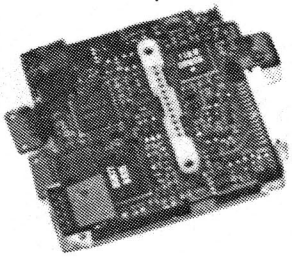


Transceiver
Component side

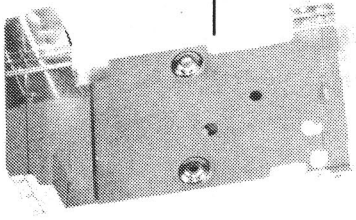


Controller shield

Controller flex



Front housing shield



NOTE

Refer to the Exploded View Diagram if further disassembly is necessary.

12. Assemble the radio in the reverse order of disassembly, making certain:

- to avoid damage to the flex circuits, connectors, and connector pins when reinserting the controller.
- not to depress the PTT switch when sliding the circuit board back into the housing.

CAUTION
Inspect the frame O-ring and control head O-ring. Replace if obvious damage exists.

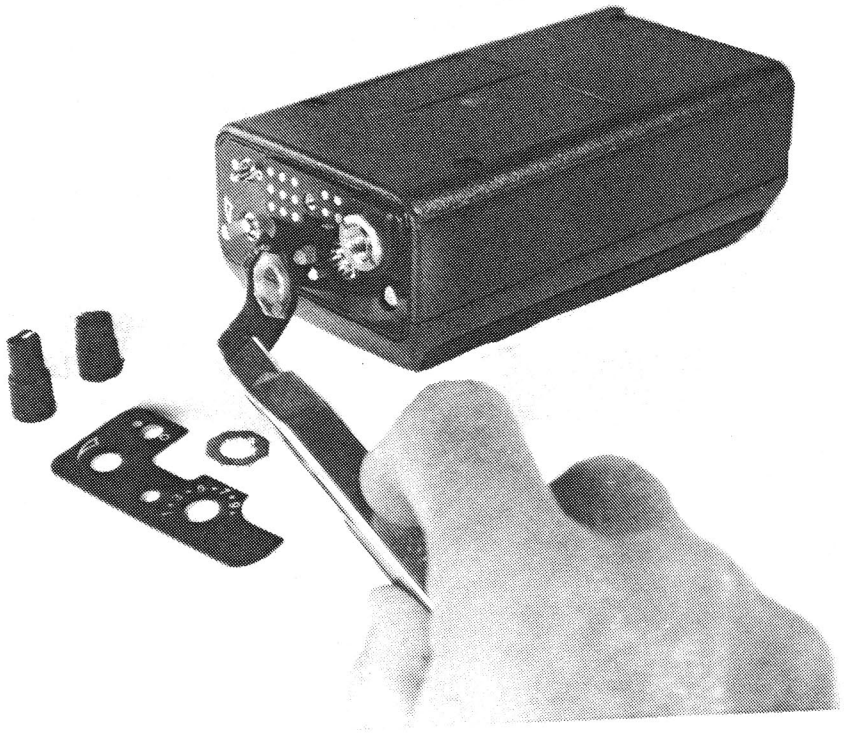
ESCUTCHEON REPLACEMENT

The escutcheon mounted on the radio top can contain either 10 or 16 positions for the channel selector turn-knob.

10-position escutcheon: P/N 1305676R19
10-position programmable washer: P/N 0405218Q03
16-position escutcheon: P/N 1305676R20

To replace a 16-position channel selector with a 10-channel selector follow the procedure below:

1. Remove the volume knob, the channel knob, and the two washers.
2. Remove the old escutcheon, e.g with the edge of a scalpel/knife.
3. When mounting a 10-position channel selector a programmable washer must be mounted under the channel knob so that the turn-knob is blocked at the position 10.
4. Mount the new escutcheon with glue.
5. Remount the washers and the two knobs.



CHAPTER
CHAPITRE
KAPITEL

5

RADIO FUNCTIONAL TESTS (@ 10 Vdc)

MOTOROLA HTX/STORNO CP1000

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 ≥4.0 kHz and ≤5.0 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.
20 dB SINAD Psophometric	Same as above,except set monitor to measure SINAD	Set to open squelch	Set to speaker load	Reduce RF level to achieve 20 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.

ALIGNMENT

MOTOROLA HTX/STORNO CP1000 - VHF

THIS RADIO HAS BEEN FACTORY ALIGNED AND DOES NOT REQUIRE ANY ADJUSTMENTS.

Realignment may be required if components are replaced or have aged, or if any transmitter/receiver frequencies are changed. If it is necessary to realign the radio, perform the following procedures:

1. When using the RTX-4005 test box, place the MT PL switch in the OFF position.

2. Remove the battery and front cover as described in the "DISASSEMBLY PROCEDURE".

3. Refer to the Test Set-Up Detail and connect the test equipment and Programmer/Tuner to the radio as illustrated.

4. Connect a DC power supply to the battery eliminator and attach the battery eliminator to the radio.

5. Adjust the power supply for 10.0 VDC. Set current limit to 2.0 A.

6. Turn the radio off then on to reinitialise the radio.

7. Frequency Adjust (Synthesizer). Terminate the program/test cable (RTK-4205), RF lines (pins 10 and 12), through a 30 dB pad to a frequency counter or service monitor. Set the radio's frequency switch to any channel. Key the radio using the external PTT switch. Compare the frequency reading on the counter (or service monitor) to the customer frequency assigned to that channel. The frequency difference should be less than ±750 Hz. Adjust R129 if the frequency difference is more than ±750 Hz.

8. Perform either the "RECEIVER ALIGNMENT" procedure or "TRANSMITTER ALIGNMENT" procedure or both procedures as required.

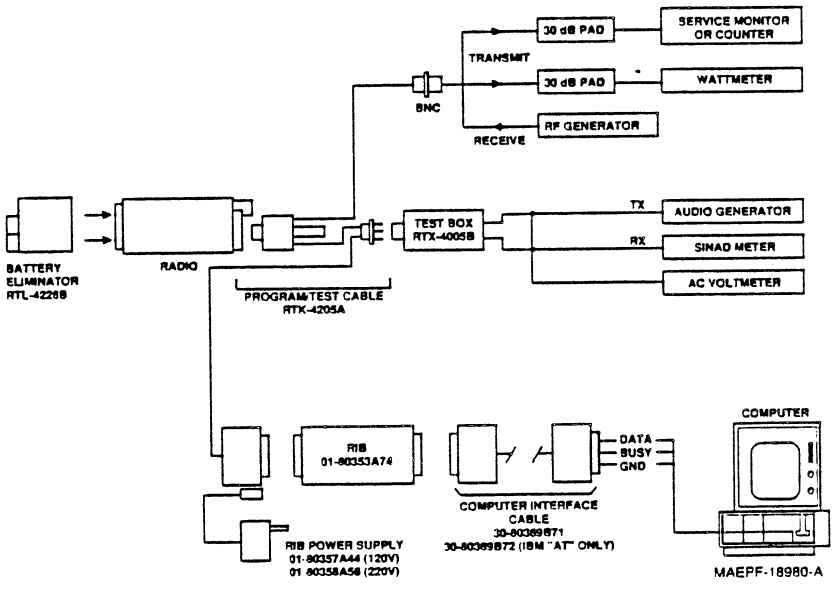


Figure 1. Troubleshooting, Test Equipment, and Programming Set-Up Detail

TRANSMITTER ALIGNMENT

PRELIMINARY ADJUSTMENTS:

1. Terminate the program/test cable (RTK-4205), RF lines (pins 10 and 12), to a power meter through a 30 dB pad.

2. Make all measurements at the Program Test Cable (pins 10 and 12), with radio keyed through the external PTT switch.

3. Program new customer frequencies (if necessary)

POWER OUTPUT ADJUSTMENTS:

STEP	ADJUST	FOR	USING	NOTE
1	Check power output on all channels. NOTE: You must dekey before changing channels for the synthesizer to change frequencies. Set the frequency switch to the channel with the lowest output power			
2	C120 P.A.Trimmer capacitor (on U102)	Maximum power output with least current drain	RF Wattmeter and Ammeter	Reading should be greater than rated RF power output, with current drain less than 840 mA (2-W-Models), or less than 1575 mA (4-W-Models.) **Note:** Two possible peaks, choose peak with least current drain. Adjust from component side.
3	Check remaining channels	Same power and current readings obtained in STEP 2	RF Wattmeter and Ammeter	
4	Repeat steps 1 through 3 if necessary.			

DEVIATION ADJUSTMENT

1. Terminate the program/test cable (RTK-4205) through a 30 dB pad to a service monitor (or deviation meter).

2. Place the METER SELECTOR switch on the RTX-4005 test box to the MIC position. Insert a 1 kHz tone at the AUDIO IN port of the test box. Use an AC voltmeter to monitor the voltage at the AC/DC METER port of the test box. Using the PTT switch on the RTX-4005 box to key the radio, adjust the level of the 1 kHz tone until 45 mV is present at the AC/METER port. Dekey the radio.

3. Connect the program/test cable to the Radio Interface Box (RIB). Use the Programmer/Tuner to read the radio.

4. If the radio requires a change in frequency or options, make the appropriate changes to the personality file and program the radio.

5. Enter the SERVICE menu from the main menu. Select the TUNE CHANNEL option.

6. Select the channel by SET CHANNEL and ±.

7. Proceed to the TRANSMIT DEV PARAMETER position of the TUNE CHANNEL screen

8. Press and hold down the PTT switch on the RTX-4005 to continuously key the radio.

9. Press the ± keys to tune for a peak deviation as shown in the table below for the radio's appropriate channel spacing.

10. Release the PTT switch on the RTX-4005 to dekey the radio

11. Proceed to the REF DEV PARAMETER position of the TUNE CHANNEL screen.

12. Disconnect the 1 kHz tone from the AUDIO IN port on the RTX-4005

13. Press and hold down the PTT switch on the RTX-4005 to continuously key the radio.

14. Press the ± keys to tune for a peak deviation as shown in the table below for the radio's appropriate channel spacing.

15. Release the PTT switch on the RTX-4005 to dekey the radio.

16. Reconnect the 1 kHz tone to the AUDIO IN port of the RTX-4005.

17. Repeat steps 6-16 for all channels to be tuned.

18. Exit from the TUNE CHANNEL menu and program the radio.

19. With the 1 kHz tone applied, check the total transmit deviation to the range shown in the table below. Repeat the above procedure to retune any of the channels if necessary.

20. The programmer disables normal transmit (5-tone or PL encode) while on the REF DEV PARAMETER operation, and forces the radio to encode 30 Hz PL regardless of radio settings.

21. If any changes to the deviation levels were necessary, the radio must be reprogrammed.

CH SPACING	VCO MODULATION		REF MODULATION
	STEP 9	STEP 19	STEP 14
25 kHz	4.5-4.8 kHz	4-5 kHz	670-730 Hz
20 kHz	3.5-3.8 kHz	3.2-4 kHz	590-650 Hz
12.5 kHz	2.25-2.40 kHz	2-2.5 kHz	300-350 Hz

NOTE

While in the TUNE CHANNEL Screen, changes to the deviation settings are made in the radio's RAM. If the radio is dekeyed during the deviation adjustment, the radio's original information will be returned to RAM.
To place the programmer settings back into RAM, press either the ENTER, +, or - key.

RECEIVER ALIGNMENT

PRELIMINARY ADJUSTMENTS:

1. Coils L2 and L13 are tuned at the factory for a 30 MHz bandwidth and should never need retuning. Coils L1 and L2 adjust an 8 MHz window anywhere across the 30 MHz bandwidth. Perform the "Receiver Check" to determine if "RECEIVER ALIGNMENT" (tuning any portion of the receiver) is necessary.

2. Connect the program/test cable (RTK-4205) to the Radio Interface Box (RIB). Use the Programmer/Tuner to read the radio.

3. When using the RTX-4005 test box, place the AUDIO OUT switch in the B position to set for proper speaker loading. Place the meter selector in the AUDIO PA position for receiver tests.

4. Connect the RF cable of the test cable to an RF generator or service monitor.

RECEIVER CHECK:

1. Use the Programmer/Tuner to program for new customer frequencies, if necessary.

2. Set the RF generator (or service monitor) for the appropriate frequency at a 1 mV level with a 1 kHz tone modulated at 3 kHz deviation.

3. Connect the AC/DC METER port of the RTX-4005 to an AC voltmeter. Adjust the volume potentiometer (R140) for an AC voltmeter reading of 4.47 Vrms.

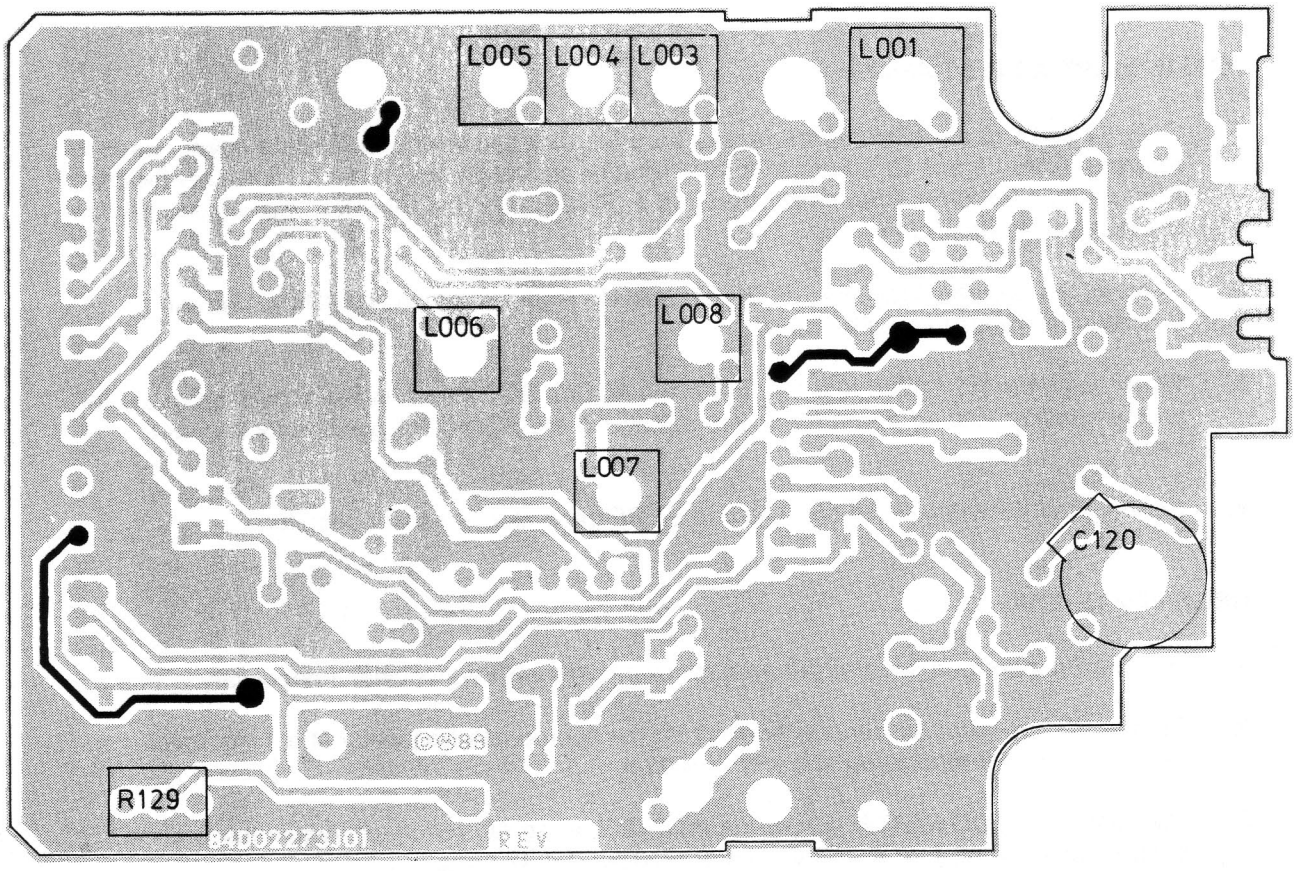
4. Connect a SINAD meter with psophometric filter to the AC/DC METER port of the RTX-4005.

5. Reduce the RF level until 20 dB of SINAD is obtained; record the RF level reading. Depress the monitor button while taking this measurement to ensure that the radio is not squelched. Also temporarily disconnect the test cable from the RIB to ensure that computer noise does not affect the measurement.

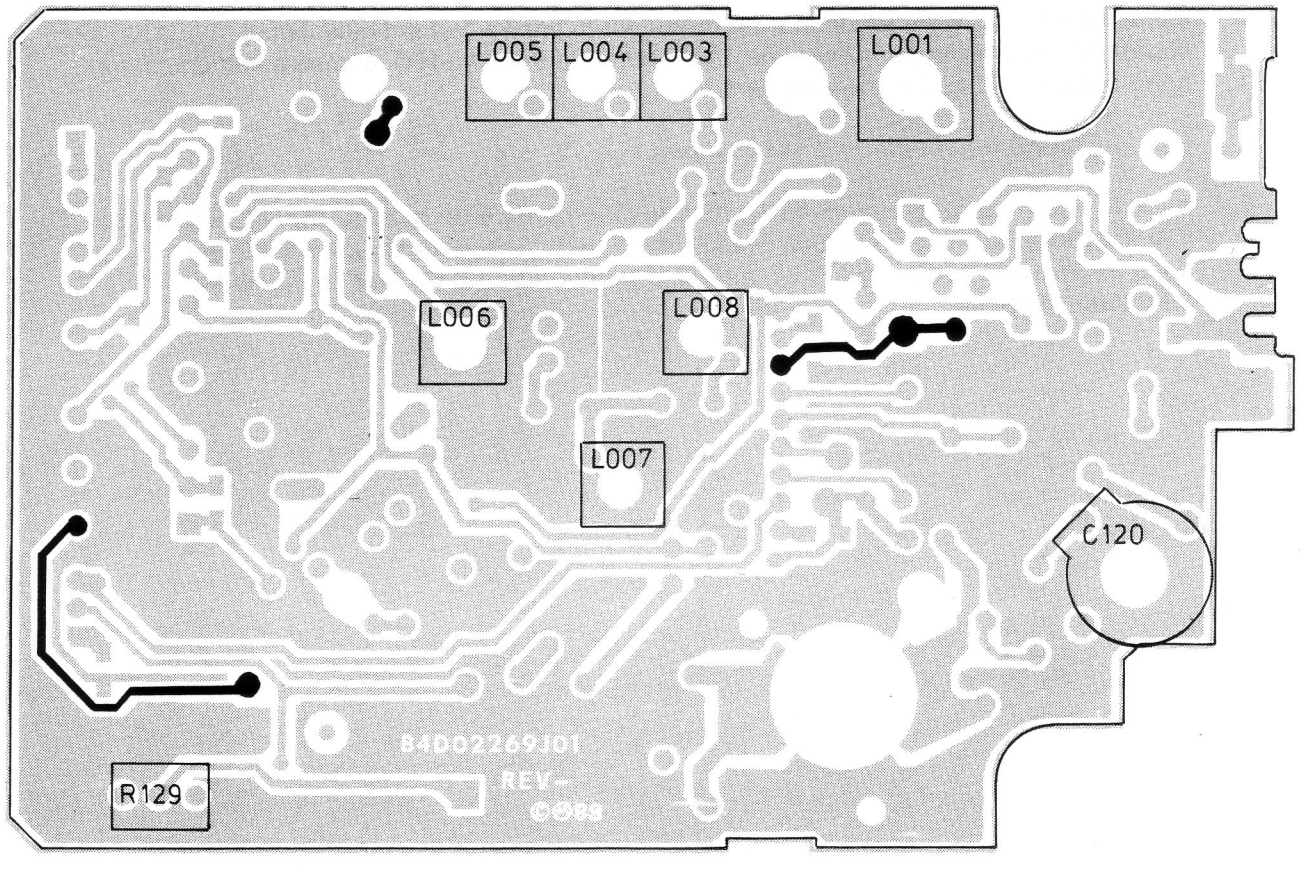
6. Perform SINAD measurement on all channels.

7. If the RF level required to produce 20 dB SINAD is 1.0 uV EMF or less, DO NOT REALIGN THE RECEIVER; instead, proceed directly to "Squelch Sensitivity/Check Adjustment." If the RF required to produce 20 dB SINAD is greater than 1.0 uV EMF, perform the "Receiver Alignment."

2 WATT RADIOS



5 WATT RADIOS

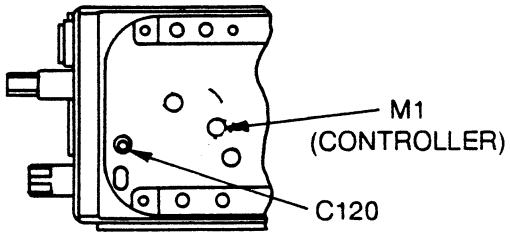


RECEIVER ALIGNMENT BACK END:

NOTE

The receiver back end coils L6, L7, and L8, and the receiver front end coils L1, L3, L4, and L5 are factory tuned to cover the entire bandsplit and should not need retuning. Should the RF amp, mixer, crystal filters, I-F module, or accompanying parts need replacing, it may be necessary to perform the following tuning procedure:

M1 METERING POINT LOCATION (CONTROLLER)



NARROW BANDWIDTH (6 MHz OR LESS)

1. Tune coils L1, and L3 through L8 flush with the solder side (size 2) of the PC board.
2. Set the radio to the highest customer receive frequency, then adjust the RF generator or service monitor for the appropriate frequency.
3. With an AC voltmeter, monitor M1 on the controller flex and adjust the RF level so that the AC voltage can be read at M1. During the following procedure, adjust the RF level to keep the AC voltage at M1 within the range of the voltmeter.
4. Adjust L3, then L5 for the maximum AC voltage level at M1.
5. Set the radio to the lowest customer receive frequency, then adjust the RF generator or service monitor to the appropriate frequency and level.
6. Adjust L4, then L1 for the maximum AC voltage level at M1.
7. Perform the "Receiver Alignment (Back End)" procedure and then the "Receiver Check."

WIDE BANDWIDTH (5 - 8 MHz)

8. For wide bandwidth tuning, coils L1 and L2 must be peaked at a frequency that is located ±0.1 MHz from the center of the specified customer frequencies. If no such frequency is specified, it will be necessary to program a temporary tune frequency. (Make sure that the highest and lowest customer frequencies are not changed for a radio with more than 2 channels. If the radio has 2 channels, program the lowest frequency channel for the center frequency.) Program the radio for this frequency if necessary. Set the channel switch for this center frequency.

9. Tune coils L1 and L2 to the top of the coil form. This will be the position where the slugs are nearest to the flex carrier.

10. With an AC voltmeter, monitor M1 on the controller flex. Set the service monitor to the appropriate frequency and adjust the RF level so that the AC voltage can be read at M1. During the following procedure, adjust the RF level to keep the AC voltage at M1 within the range of the voltmeter.

11. Peak coil L1 for maximum AC voltage at M1. Select the peak where the coil's slug is closest to the flex carrier assembly.

12. Peak coil L2 for maximum AC voltage at M1. Select the peak where the coil's slug is 2losest to the flex carrier assembly. For a 2 channel radio, reprogram the lowest frequency channel before going to step 13.

13. Set the channel switch to the lowest customer frequency. Repeak coil L2 for maximum AC voltage at M1. Select the peak where the coil's slug is closest to the flex carrier assembly.

14. Set the channel switch to the highest customer frequency. Repeak coil L1 for maximum AC voltage at M1. Select the peak where the coil's slug is closest to the flex carrier assembly.

15. Perform steps 2 through 7 of the "Receiver Check" procedure, then repeat the "Wide Bandwith" procedure, if necessary.

16. Program the radio back to the specified customer frequency, if necessary.

RECEIVER ALIGNMENT (BACK END/INJECTION FILTER):

NOTE

The receiver back end coils L9, L10, and L11, and the injection filter coils L12 and L13 are factory tuned for 30 MHz and should not need retuning. Should the mixer, crystal filter, IF modules, or accompanying back end parts need replacing, it will be necessary to perform the back end procedure.

SQUELCH SENSITIVITY CHECK/ADJUSTMENT

1. Use the Programmer/Tuner to read the radio, then proceed to the ALIGNMENT and SERVICE AIDS menu from the main menu. Next, select the TUNE RADIO operation.

2. Set the frequency switch for the channel determined to have the poorest sensitivity on the "Receiver Check." Place the decode select switch to the carrier squelch position.

3. Connect an AC voltmeter to the AC/DC METER port of the RTX-4005.

4. Set the RF generator or service monitor for the appropriate frequency and no modulation. Reduce the RF level to a minimum, then turn the RF off.

5. Depress the monitor button on the side of the radio and adjust the noise level for 2.2 Vrms. Make a note of the level on the dB scale. This will be the reference level for quieting measurements.

6. Proceed to the SQUELCH TUNING PARAMETERS position in the TUNE RADIO screen.

7. Turn the RF of the generator or service monitor on at the minimum possible level. Increase the RF level until squelch break occurs. Note the quieting level at squelch break. If squelch break occurs between 8 and 14 dB of quieting proceed directly to step 15. If the quieting level is not within the 8 to 14 dB range, continue on with step 13.

8. Press the ± key to adjust the tone squelch setting to 0. Adjust the RF level for 8 dB of quieting.

9. Holding the RF level constant, press the + key to increment the tone squelch setting one step at a time until the radio squelches. This will be the tone squelch setting.

10. Exit from the TUNE RADIO and SERVICE menu.

11. If the squelch settings required modification, program the radio.

TEST & PROGRAMMING SET-UP

EXAMPLE

CHAPTER
CHAPITRE
KAPITEL

6

DIAGRAMS AND PARTS LISTS OVERVIEW

MOTOROLA HTX/STORNO CP1000 - VHF

SCHEMATIC AND CIRCUIT BOARD NOTES

MOTOROLA HTX/STORNO CP1000

GENERAL DIAGRAM NOTES

- Unless otherwise stated, resistances are in ohm (k = 1000), capacitances less than 1 are in microfarad, and capacitances 1 or greater are in picofarad.
- DC Voltages are measured from point indicated to chassis ground using DC Multimeter or equivalent. Transmitter measurements should be made with a 0.29 uH RF Choke in series with voltage probe to prevent circuit loading.
- Interconnect tie point legend:

(B) CONTROLLER FLEX B +

(M1) METERING POINTS M1, M2, M3, M4, M5

(R) RECEIVE 10 V

(R5) RECEIVE 5 V

[S] TO SYNTHESIZER BOARD

(T) TRANSMIT 10 V

(T5) TRANSMIT 5 V

(G1) TO UNIVERSAL CONNECTOR

[M] MOTHER BOARD

VOLTAGE OVERLAY AND WAVEFORM NOTES

Note 1. All DC Voltages made via a 0.29 uH RFC.

Note 2. All AC Voltage readings in dBm are made via a 1 pF capacitor into the 50 ohm adapter of an RF mV meter. RX readings are made with -20 dBm carrier signal into remote port. TX readings made with remote port into 50 ohm.

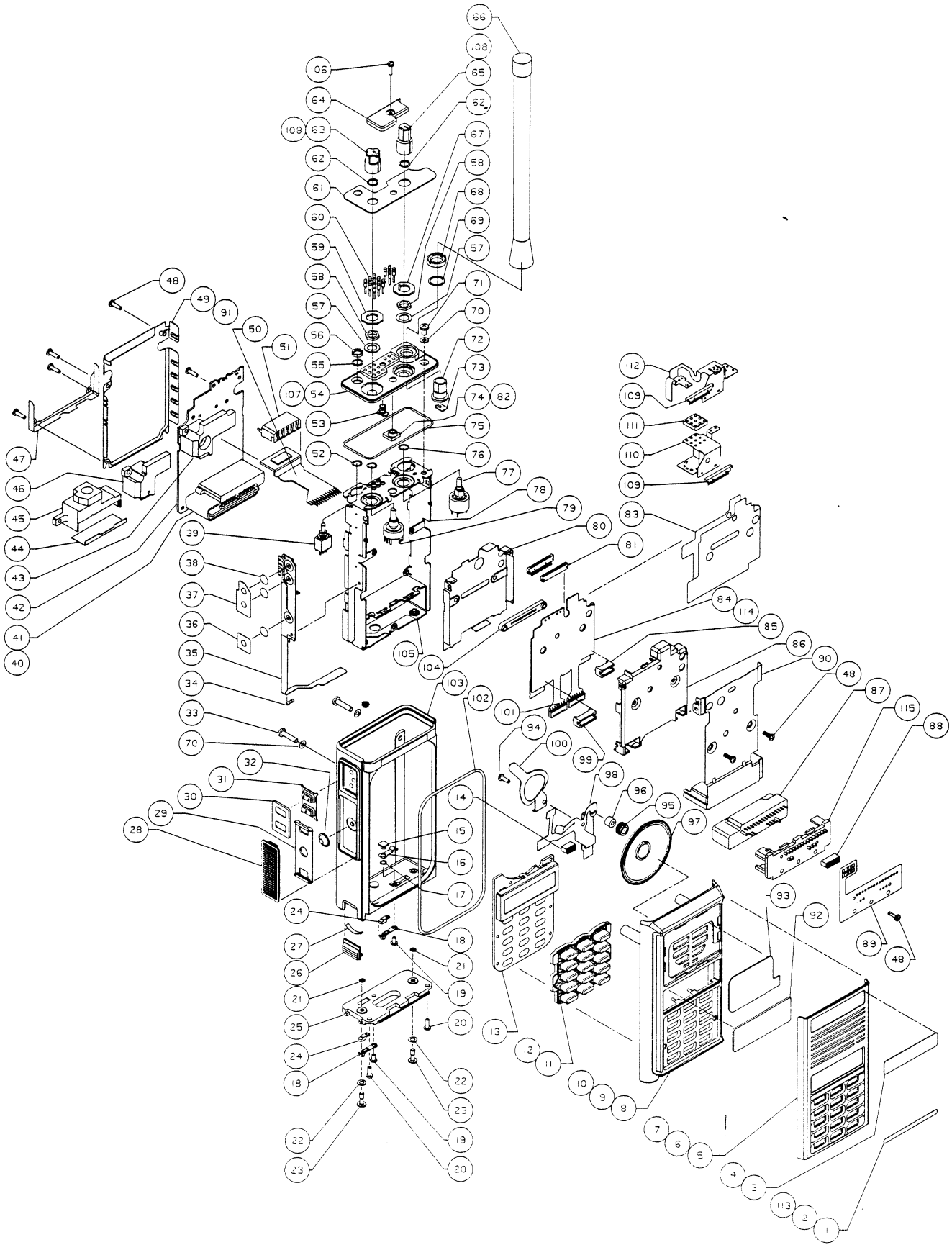
Note 3. All AC Voltage readings in mV are made via a high impedance RF mV meter.

Note 4. These readings obtained by S/C Base of Q102 to ground.

Note 5. This reading is obtained by putting a 47 ohm resistor across C31/L13 to reduce low injection feed through.

MECHANICAL PARTS LIST FOR HTX/CP1000

Pos	Code No.	Description	Qt
01	3305787T04	LABEL, GRAPHIC (15 KEY)	1
02	3305787T02	LABEL, GRAPHIC (15 KEY BLANK)	1
03	3305787T01	LABEL, LOGO (MOTOROLA)	1
04	3305787T03	LABEL, LOGO (STORNO)	1
05	1305708T01	GRILLE, 15 KEY	1
06	1305708T02	GRILLE, 3 KEY	1
07	1305708T03	GRILLE, PLAIN	1
08	1505707T01	COVER, FRONT 15 KEY	1
09	1505707T02	COVER, FRONT 3 KEY	1
10	1505707T03	COVER, FRONT PLAIN	1
11	7505705T01	KEYPAD, 15 KEY	1
12	7505705T02	KEYPAD, 3 KEY	1
13	5105898J34	DISPLAY MODULE	1
14	0905887T01	CONN, SPKR FLEX 2 X 6F	1
15	4605945K05	CONTACT STUD, BATTERY	1
16	3905127Q01	CONTACT, B+	1
17	3205082E24	GASKET, O-RING	1
18	3905453Q01	CONTACT, BATTERY POWER	2
19	0300139982	SCREW, PH.PN.HD.#2-56 X 5/32"	2
20	0300140041	SCREW, PH.PN.HD.#2-56 X 1/4"	2
21	3205082E03	GASKET, O-RING	2
22	0400009761	LOCKWASHER, SPLIT #4	2
23	0305941K01	SCREW,PH.PN.HD. #4-40 CAPTIVE	2
24	0705932T01	SUPPORT, CONTACT	2
25	6405709T01	BASE PLATE	1
26	5505536P01	LATCH	1
27	4105775Q01	SPRINT, BATTERY LATCH	1
28	4505535P01	LEVER, PTT	1
29	4205534P01	RETAINER, PTT	1
30	6405186Q01	PLATE MONITOR	1
31	3805187Q01	BUTTON, MONITOR	1
32	3805236Q01	ACTUATOR, PTT	1
33	0305137Q01	SCREW, PH.PN.HD. #4-40 X 1/2"	2
34	6505663R03	FUSE, 5 AMP	1
35	8405711T01	PCB, PTT FLEX	1
36	3205231Q01	SEAL, DOME (PTT)	1
37	3205196Q01	SEAL, DOME (MONITOR)	1
38	3905834K04	CONTACT, SNAP DOME	1
39	4005101Q02	SWITCH, PL TOGGLE	1
40	-----	PLUG, (VCO)	1
41	1505533P01	HOUSING, VCO	1
42	-----	TYPICAL CIRCUIT BOARD (R.F.)	1
43	2605532P01	HEAT SINK PA H. POWER (VHF)	1
44	2605161Q01	SHIELD, UHF HEATSINK	1
45	2605570P01	HEAT SINK (UHF)	1
46	2605578P01	HEAT SINK PA L. POWER (VHF)	1
47	2605123S01	SHIELD, BACK	1
48	0300136772	SCREW, PH.BND.HD.#2-56 X 5/16"	8
49	2605775R01	SHIELD, MAIN BACK	1
50	8405126U01	PCB, IF MODULE FLEX	1
51	2605494R01	SHIELD, IF MODULE	1
52	3205141Q03	GASKET, O-RING	1
53	4605159Q01	STUD, INSERT	1
54	0105951N41	ASM.TOP CONTROLPANEL 16-CHANNEL	1
		INCLUDES ITEMS 107,53,60 & 72	1
55	0405162Q01	WASHER, FLAT, TOGGLE	1
56	0205163Q01	NUT, SPANNER, TOGGLE	1
57	0405162Q02	WASHER, FLAT;VOL.POT.,FREQ.SW.	1
58	0205629L01	NUT, HEX;VOL.POT.,FREQ.SW.	1
59	0405534R01	WASHER, FLAT OCTAGONAL	1
60	3902243J01	PIN, CONTACT	1
61	1305676R18	ESCUTCHEON (10-FREQ.RADIOS)	1
	1305676R19	ESCUTCHEON (16-FREQ.RADIOS)	1
62	0405676R18	WASHER, FLAT	2
63	3605120Q01	KNOB, VOL	1
64	1505102S01	COVER, DUST	1
65	3605677R01	KNOB, FREQ	1
66	-----	ANTENNA	1
67	0405218Q02	WASHER, PROGRAMMABLE	1
68	0205571R02	NUT, SPANNER	1
69	0405216L04	WASHER, FLAT	1
70	0484345A06	WASHER, SEAL	1
71	0300136785	SCREW, PH.PH.HD. #4-40 X 3/16"	1
72	4305577S01	BUSHING, ANTENNA	1
73	-----	LUG, ANTENNA	1
74	3205157Q01	SEAL, LED	1
75	3205157Q02	GASKET, O-RING (PANEL)	1
76	3205082E01	GASKET, O-RING (FREQ., VOL.)	1
77	4005265Q02	SWITCH, FREQUENCY	1
78	0705710T01	FRAME	1
79	1805100Q03	SWITCH/POT, ON-OFF/VOLUME	1
80	2605716T01	SHIELD, CONTOLLER	1
81	0905467R01	JACK, 15 PIN	2
82	4805729G24	LED, BICOLOR	1
83	1405889T01	INSULATOR, CONTROLLER	1
84	8402206J01	CONTROLLER FLEX	1
85	2805888T01	CONN, CONTROLLER 2 X 6M	1
86	1505718T01	HOUSING, CONTROLLER CASTING	1
87	-----	DVP MODULE	1
88	0905887T02	CONN. DVP 2 X 9F	1
89	8405717T01	PCB, DVP FLEX	1
90	2605715T01	SHIELD, FRONT HOUSING	1
91	1405511R01	INSULATOR, BACK SHIELD	1
92	6105451Q02	WINDOW LCD (LENS)	1
93	3505714T01	FLET, SPEAKER	1
94	0305073P	SCREW, #2 THREAD FORMING	1
95	1405874T01	MIC. BOOT (STORNO)	1
96	5005227J01	MICROPHONE, ELECTRET	1
97	5005269T04	SPEAKER, 28 OHMS	1
98	8405712T01	PCB, SPEAKER MIC. FLEX	1
99	2805888T02	CONN, DVP 2 X 9M	1
100	4205713T01	RETAINER, SPEAKER	1
101	0905577P01	JACK 7 PIN	2
102	3205082E76	O-RING, FRONT COVER	1
103	1505706T01	HOUSING	1
104	0105959M27	HEADER, CONTROLLER	1
105	4305170Q01	INSERT, FRAME	1
106	0305103S01	SCREW, #2 CAPTIVE	1
107	6405158Q02	PANEL, CTRL TOP	1
108	4205123Q02	CLIP, KNOB	1
109	0905467R01	JACK 15 PIN MALE	2
110	8405122S01	PCB, VOL.POT.FLEX	1
111	1405147Q01	HEADER, UNIVERSAL CONNECTOR	1
112	8405741R01	PCB. VOL.POT. FLEX	1
113	3305787T05	LABEL, GRAPHIC (3 KEY)	1
114	2605---	SHIELD, CONTROLLER FLEX	1
115	6402430J01	PANEL, DVP	1



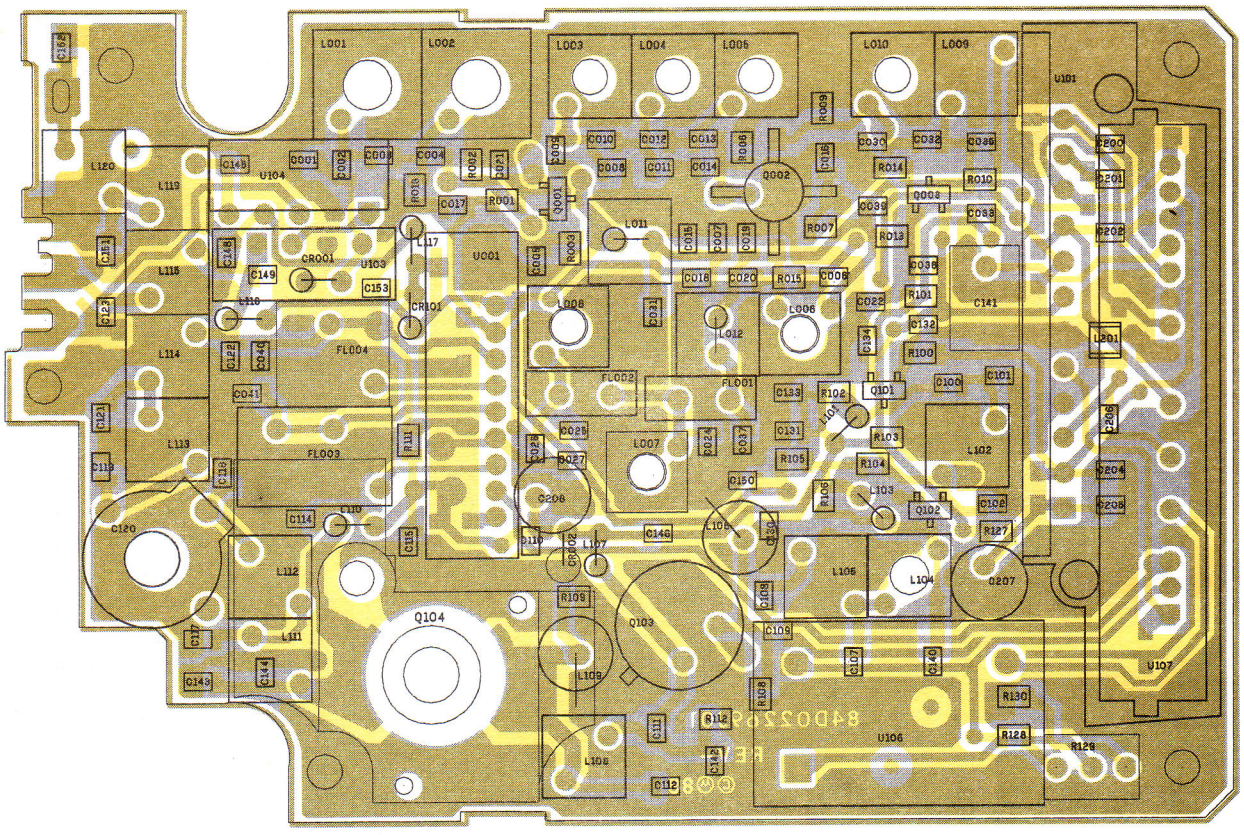
HTX/CP1000
EXPLODED VIEW & PART NUMBERS

DOC.ISSUE 10.04.89

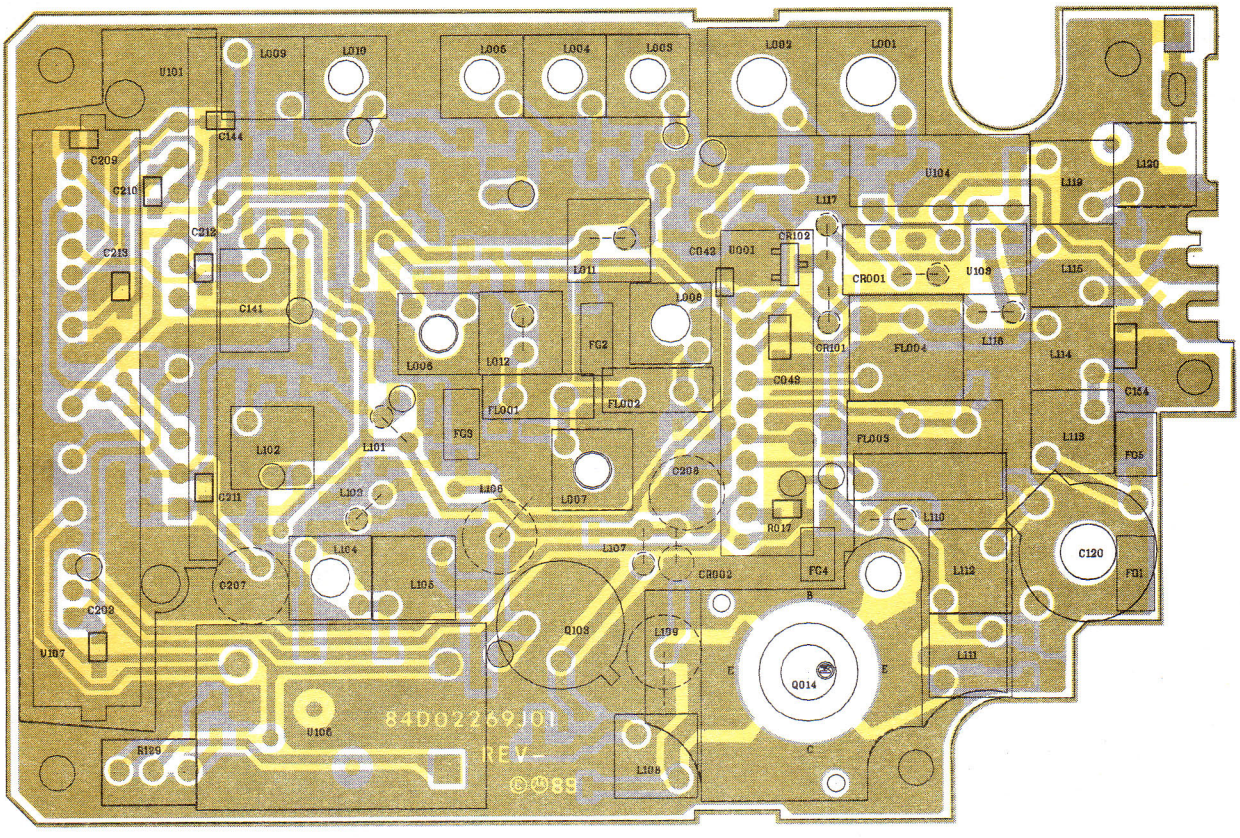
M405.719

HIGH POWER 5 WATT

COMPONENT SIDE



SOLDER SIDE

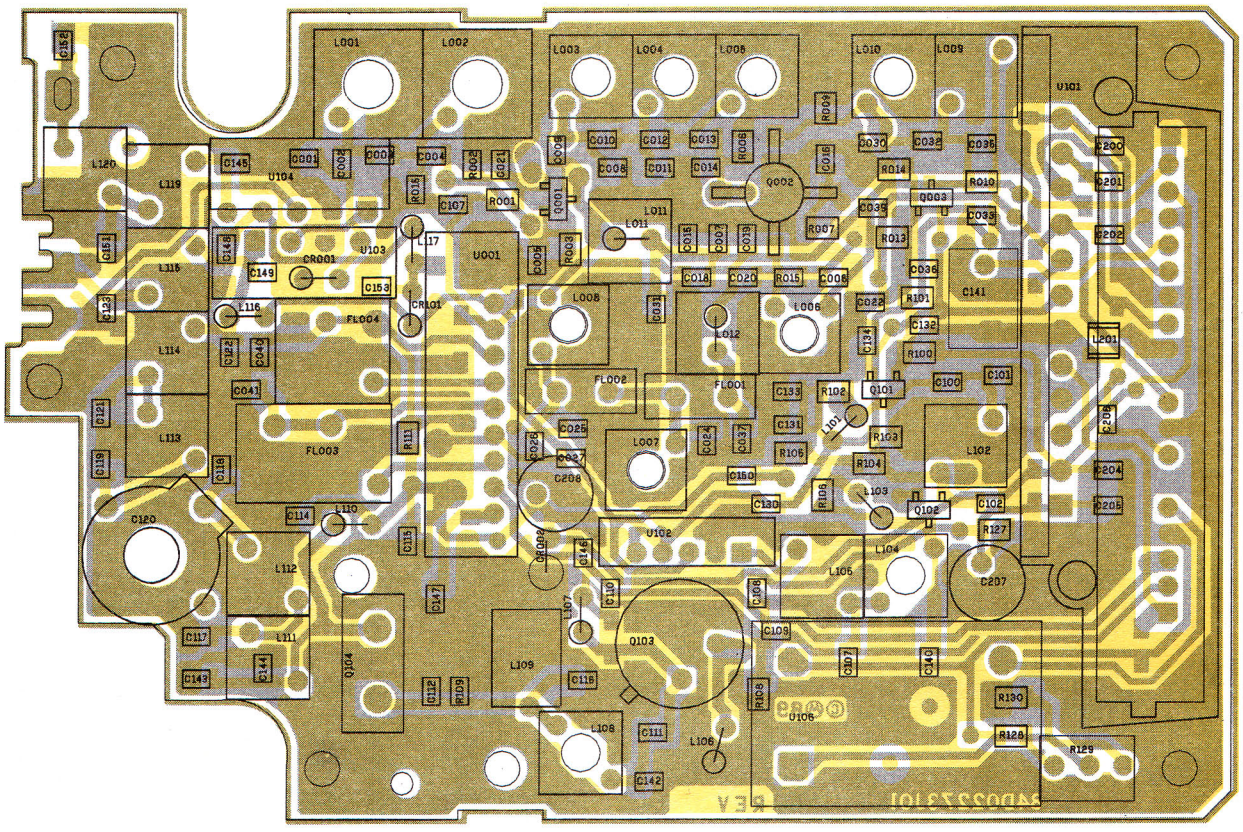


HTX/CP1000
VHF TRANSCEIVER BOARD 2 WATT & 5 WATT
COMPONENT LAYOUT

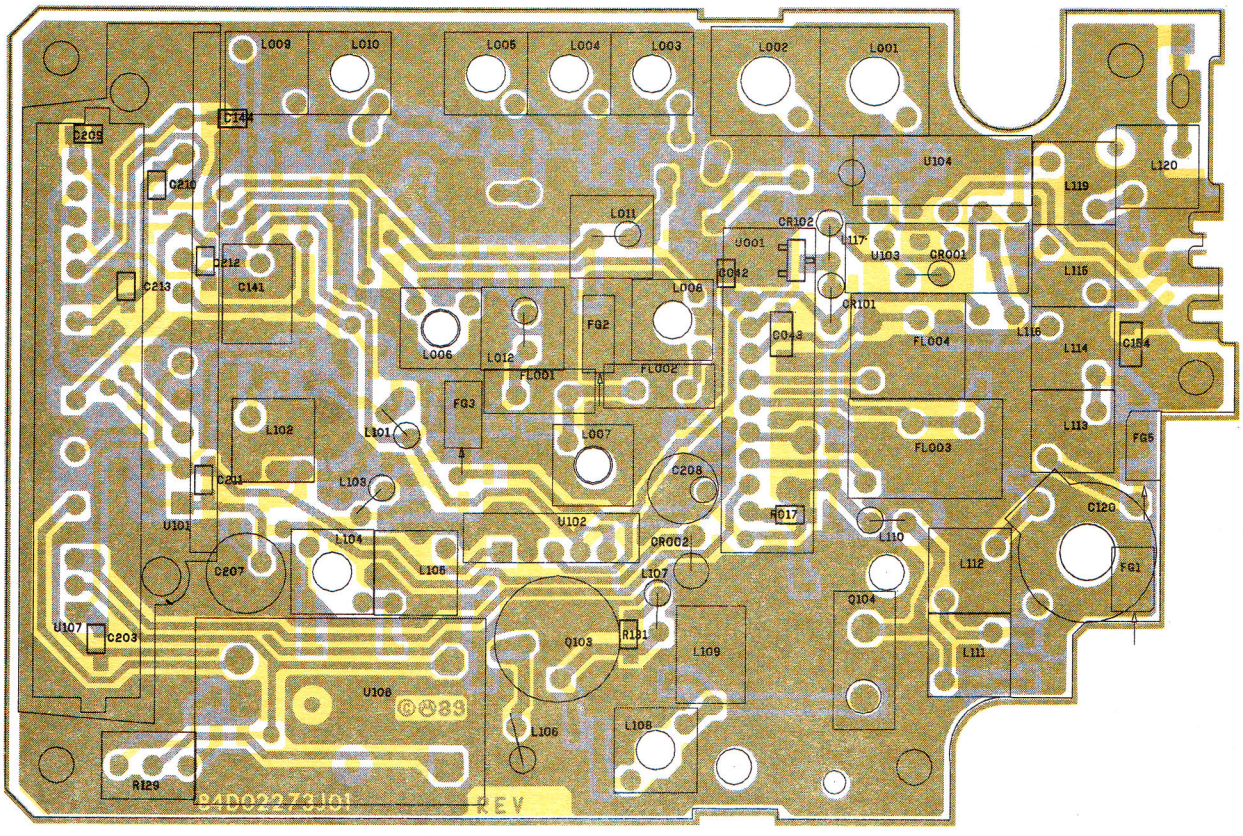
D405.494

LOW POWER 2 WATT

COMPONENT SIDE



SOLDER SIDE



DOC. ISSUE 09.28.89

ITEM NO.	FREQUENCY	CHANNEL SPACING	OUTPUT POWER
EUD4105A	146 - 162MHz	12.5kHz	2 WATT
EUD4106A	146 - 162MHz	20/25kHz	2 WATT
EUD4107A	146 - 162MHz	12.5kHz	5 WATT
EUD4108A	146 - 162MHz	20/25kHz	5 WATT
EUD4109A	157 - 174MHz	12.5kHz	2 WATT
EUD4110A	157 - 174MHz	20/25kHz	2 WATT
EUD4111A	157 - 174MHz	12.5kHz	5 WATT
EUD4112A	157 - 174MHz	20/25kHz	5 WATT

* USAGE DEPEND ON BANDSPIT OR MODEL

▲ 2 WATT ONLY

● 5 WATT ONLY

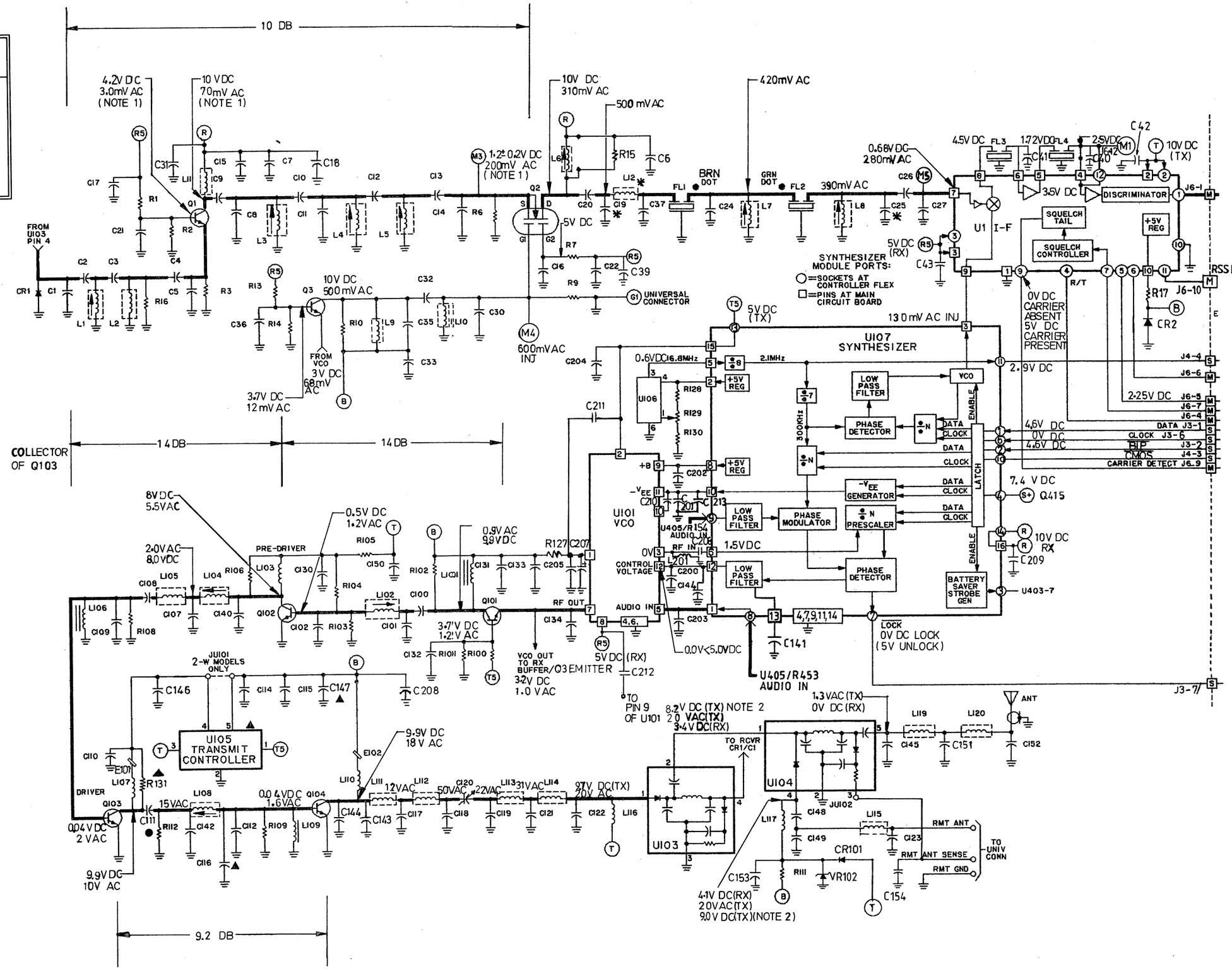
□ MOTHERBOARD

○ TO FLEX

NOTE 1: 7mV FROM SIGNAL GEN. LEVEL BASE OF Q3 SHORTED TO GROUND.

NOTE 2: BASE OF Q101 SHORTED TO GROUND.

L12 AND CORRESPONDING CAN IS ONLY USED IN 12.5kHz CHANNEL SPACING RADIOS. IN 20/25kHz RADIOS A JUMPER IS USED.



HTX/CP1000

VHF TRANSCEIVER BOARD 2 WATT & 5 WATT SCHEMATIC DIAGRAM

D405.495

PARTS LIST FOR HTX/CP1000, VHF TRANSCEIVER BOARD, 5 WATT

Pos	Code No.	Description		Qt
	EUD4107A	146-162MHz, 12.5kHz, 5W, (A)		
	EUD4108A	146-162MHz, 20/25kHz, 5W, (B)		
	EUD4111A	157-174MHz, 12.5kHz, 5W, (C)		
	EUD4112A	157-174MHz, 20/25kHz, 5W, (D)		
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C001	2113740A23	CAP CHIP 6.2PF NP0	C	1
C001	2113740A39	CAP CHIP 27PF ±5%	D	1
C001	2113740A42	CAP CHIP 36PF ±5%	A,B	1
C002	2113740A21	CAP CHIP 5.6PF ±2.5PF	C	1
C002	2113740A27	CAP CHIP 8.2PF ±0.25PF	D	1
C002	2113740A37	CAP CHIP 22PF ±5%	A,B	1
C003	2113740A11	CAP CHIP 2.2PF ±0.25PF	C	1
C003	2113740A13	CAP CHIP 2.7PF ±2.5PF	D	1
C003	2113740A19	CAP CHIP 4.7PF ±0.25PF	A,B	1
C004	2113740A32	CAP CHIP 13PF ±5%	C	1
C004	2113740A34	CAP CHIP 16PF ±5%	D	1
C004	2113740A35	CAP CHIP 18PF ±5%	A,B	1
C005	2113740A33	CAP CHIP 15PF	A	1
C005	2113740A34	CAP CHIP 16PF ±5%	C,D	1
C006	2113741A43	CAP CHIP 8200PF 0805		1
C008	2113740A23	CAP CHIP 6.2PF ±0.25PF		1
C009	2113740A75	CAP CHIP 680PF ±5%	A,B,D	1
C009	2113741A17	CAP CHIP 680PF ±5%	C	1
C010	2113740A03	CAP CHIP 1.0PF ±0.25PF		1
C011	2113740A23	CAP CHIP 6.2PF ±0.25PF	A,B	1
C011	2113740A24	CAP CHIP 6.8PF ±0.25PF	C,D	1
C012	2113740A03	CAP CHIP 1.0PF ±0.25PF		1
C013	2113740A31	CAP CHIP 12PF ±5%	A,B	1
C013	2113740A32	CAP CHIP 13PF ±5%	C,D	1
C014	2113740A29	CAP CHIP 10PF/C1	A,B	1
C014	2160520S02	CAP CHIP 11PF .25PF NP0	C,D	1
C015	2113741A43	CAP CHIP 8200PF 0805		1
C016	2113740A75	CAP CHIP 680PF ±5%	A,B,D	1
C016	2113741A17	CAP CHIP 680PF ±5%	C	1
C017	2113740A75	CAP CHIP 680PF ±5%	A,B,D	1
C017	2113741A17	CAP CHIP 680PF ±5%	C	1
C018	2113741A43	CAP CHIP 8200PF 0805		1
C019	2113740A17	CAP CHIP 3.9PF ±0.25PF	B,D	1
C019	2160523F22	CAP CHIP 39PF N220	A	1
C019	2160523F44	CAP CHIP 43PF N220 5%	C	1
C020	2113740A23	CAP CHIP 6.2PF ±0.25PF	A	1
C020	2113740A27	CAP CHIP 8.2PF ±0.25PF	C	1
C020	2113741A21	CAP CHIP 1000PF ±5%	B,D	1
C021	2113740A75	CAP CHIP 680PF ±5%	A,B,D	1
C021	2113741A17	CAP CHIP 680PF ±5%	C	1
C022	2113741A43	CAP CHIP 8200PF 0805		1
C024	2113740A17	CAP CHIP 3.9PF ±0.25PF	B,D	1
C024	2113740A35	CAP CHIP 18PF ±5%	A,C	1
C026	2113740A35	CAP CHIP 18PF ±5%	D	1
C026	2113740A40	CAP CHIP 30PF ±5%	A,C	1
C027	2113740A31	CAP CHIP 12PF ±5%	B,D	1
C027	2113740A40	CAP CHIP 30PF ±5%	A,C	1
C030	2113740A21	CAP CHIP 5.6PF ±2.5PF	A,B	1
C030	2113740A27	CAP CHIP 8.2PF ±0.25PF	C,D	1
C031	2113740A75	CAP CHIP 680PF ±5%	A,B,D	1
C031	2113741A17	CAP CHIP 680PF ±5%	C	1
C032	2113740A05	CAP CHIP 1.2PF ±2.5PF		1
C033	2113740A75	CAP CHIP 680PF ±5%	A,B,D	1

Pos	Code No.	Description		Qt
C033	2113741A17	CAP CHIP 680PF ±5%	C	1
C035	2113740A23	CAP CHIP 6.2PF ±0.25PF	A,B	1
C035	2113740A27	CAP CHIP 8.2PF ±0.25PF	C,D	1
C036	2113740A75	CAP CHIP 680PF ±5%	A,B,D	1
C036	2113741A17	CAP CHIP 680PF ±5%	C	1
C037	2160523F15	CAP CHIP (TC) 10PF N220	A,C	1
C039	2113741A43	CAP CHIP 8200PF 0805		1
C042	2113740A67	CAP CHIP 330PF ±5%		1
C043	2113741B49	CAP CHIP 15000PF		1
C100	2113740A08	CAP CHIP 1.6PF ±2.5PF	C,D	1
C100	2113740A10	CAP CHIP 2.0PF ±0.25PF	A,B	1
C101	2113740A33	CAP CHIP 15PF	C,D	1
C101	2113740A34	CAP CHIP 16PF ±5%	A	1
C101	2113740A36	CAP CHIP 20PF ±5%	B	1
C102	2113740A35	CAP CHIP 18PF ±5%	A	1
C102	2113740A38	CAP CHIP 24PF ±5%	B	1
C102	2113740A40	CAP CHIP 30PF ±5%	C,D	1
C107	2113740A49	CAP CHIP 56PF ±5%	C,D	1
C107	2113740A51	CAP CHIP 68PF ±5%	A,B	1
C108	2113740A67	CAP CHIP 330PF ±5%		1
C109	2113740A40	CAP CHIP 30PF ±5%	A,B	1
C109	2113740A41	CAP CHIP 33PF ±5%	C,D	1
C110	2160521G37	CAP CHIP 100NF +80% -20%		1
C111	2113740A43	CAP CHIP 39PF ±5%	C,D	1
C111	2113740A44	CAP CHIP 43PF ±5%	A,B	1
C112	2113740A54	CAP CHIP 91PF ±5%		1
C114	2113740A67	CAP CHIP 330PF ±5%	A,B	1
C114	2160521G37	CAP CHIP 100NF +80% -20%	C,D	1
C115	2113740A67	CAP CHIP 330PF ±5%	C,D	1
C115	2160521G37	CAP CHIP 100NF +80% -20%	A,B	1
C117	2113740A52	CAP CHIP 75PF ±5%	C,D	1
C117	2113740A53	CAP CHIP 82PF ±5%	A,B	1
C118	2113740A31	CAP CHIP 12PF ±5%	A,B	1
C118	2113740A32	CAP CHIP 13PF ±5%	C,D	1
C119	2113740A27	CAP CHIP 8.2PF ±0.25PF	C,D	1
C119	2113740A31	CAP CHIP 12PF ±5%	A,B	1
C120	2005568P01	CAP TRIMMER 5.5 - 65PF		1
C121	2113740A42	CAP CHIP 36PF ±5%	C,D	1
C121	2113740A43	CAP CHIP 39PF ±5%	A,B	1
C122	2113740A33	CAP CHIP 15PF		1
C123	2113740A35	CAP CHIP 18PF ±5%	C,D	1
C123	2113740A36	CAP CHIP 20PF ±5%	A,B	1
C130	2113740A67	CAP CHIP 330PF ±5%	C,D	1
C130	2113741A33	CAP CHIP 3300PF ±5%	A,B	1
C131	2113740A67	CAP CHIP 330PF ±5%		1
C132	2113740A67	CAP CHIP 330PF ±5%	C,D	1
C132	2113740A75	CAP CHIP 680PF ±5%	A,B	1
C134	2113740A18	CAP CHIP 4.3PF ±2.5PF	C,D	1
C140	2113740A15	CAP CHIP 3.3PF ±2.5PF		1
C141	0860101B37	CAP 0.47UF MET.POLYEST.	B,C,D	1
C142	2113740A39	CAP CHIP 27PF ±5%	C,D	1
C142	2113740A44	CAP CHIP 43PF ±5%	A,B	1
C143	2113740A34	CAP CHIP 16PF ±5%	C,D	1
C143	2113740A35	CAP CHIP 18PF ±5%	A,B	1
C144	2113740A67	CAP CHIP 330PF ±5%		1
C145	2113740A32	CAP CHIP 13PF ±5%	C,D	1
C145	2113740A34	CAP CHIP 16PF ±5%	A,B	1
C148	2113740A67	CAP CHIP 330PF ±5%		1
C149	2113740A33	CAP CHIP 15PF	C,D	1

PARTS LIST FOR HTX/CP1000, VHF TRANSCEIVER BOARD, 5 WATT

Pos	Code No.	Description	Qt
C149	2113740A35	CAP CHIP 18PF ±5% A,B	1
C150	2113740A67	CAP CHIP 330PF ±5%	1
C151	2113740A43	CAP CHIP 39PF ±5% A,B	1
C151	2113740A46	CAP CHIP 47PF ±5% C,D	1
C152	2113740A33	CAP CHIP 15PF C,D	1
C152	2113740A35	CAP CHIP 18PF ±5% A,B	1
C153	2113740A67	CAP CHIP 330PF ±5%	1
C154	2113741B49	CAP CHIP 15000PF	1
C200	2113741A25	CAP CHIP 1500PF ±5%	1
C201	2113741A25	CAP CHIP 1500PF ±5%	1
C202	2113741A25	CAP CHIP 1500PF ±5%	1
C203	2113740A67	CAP CHIP 330PF ±5%	1
C204	2160521G37	CAP CHIP 100NF +80% -20% A,B,C	1
C205	2113740A67	CAP CHIP 330PF ±5%	1
C206	2113740A67	CAP CHIP 330PF ±5%	1
C207	2305458G12	CAP TANT 33UF 16V	1
C209	2113741A21	CAP CHIP 1000PF ±5%	1
C210	2113741A25	CAP CHIP 1500PF ±5%	1
C211	2113741A25	CAP CHIP 1500PF ±5%	1
C212	2113741A25	CAP CHIP 1500PF ±5%	1
C213	2113741A25	CAP CHIP 1500PF ±5%	1
CR			
01	4883654H01	DIODE SILICONE	1
01	4883654H08	DIODE SLCN	1
02	4805490G02	DIODE RECT SIL	1
102	4805129M61	DIODE ZENER 18V	1
FL1	4805245J19	FILTER XTAL A,C	1
FL1	4805245J20	FILTER XTAL 53.55-13.5B B,D	1
FL2	4805245J19	FILTER XTAL A,C	1
FL2	4805245J20	FILTER XTAL 53.55-13.5B B,D	1
FL3	9105685Q12	FILTER CER. SFG450EN B,D	1
FL3	9105725Q03	FILTER CER. CFW450 A,C	1
FL4	9105685Q11	FILTER CER. SFG450DN B,D	1
FL4	9105726Q04	FILTER CER. CFU450G A,C	1
L001	0105952P18	COIL CAN L1+L2 CAN ASSY	1
L001	2405669G12	COIL CAN 4 1/2T SPACE YELLOW A,B,D	1
L001	2405669G13	COIL CAN 5 1/2T GREEN SPACE C	1
L002	0105952P18	COIL L1+L2 CAN ASSY	1
L002	2405669G30	COIL CAN 4 1/2T SPACE YELLOW A,B,D	1
L002	2405669G31	COIL CAN 5 1/2T C	1
L003	2405523P18	COIL CAN 8 1/2T CLOSE (AL SLUG)	1
L004	2405523P18	COIL CAN 8 1/2T CLOSE (AL SLUG)	1
L005	2405523P18	COIL CAN 8 1/2T CLOSE (AL SLUG)	1
L006	2405063H09	COIL CAN 0.6UH ±16%TUN.TOKO B,D	1
L006	2405063H13	COIL CAN 1.2UH ±16%TUN.TOKO A,C	1
L007	2405063H05	COIL CAN 0.4 ±16% TUN.TOKO A,C	1
L007	2405063H13	COIL CAN 1.2UH ±16%TUN.TOKO B,D	1
L008	2405063H05	COIL CAN 0.4 ±16%TUN.TOKO A,C	1
L008	2405063H09	COIL CAN 0.6UH ±16%TUN.TOKO B,D	1
L009	2405523P09	COIL CAN 4 1/2T SPACE,5MM C,D	1
L009	2405523P10	COIL CAN 5 1/2T SPACE,5MM A,B	1
L010	2405523P08	COIL CAN 3 1/2T SPACE,5MM C,D	1
L010	2405523P09	COIL CAN 4 1/2T SPACE,5MM A,B	1
L011	2482723H38	COIL CHOKE RF 1.2UH	1
L012	2505129Q02	COIL CHOKE, 1.2 UH. PREC. A,C	1
L101	0105951P49	COIL CHOKE-BEAD ASSY A,B	1
L102	2405523P28	COIL CAN 6 1/2T SPACE 5MM	1

Pos	Code No.	Description	Qt
L103	2482723H38	COIL CHOKE RF 1.2UH	1
L104	2405523P32	COIL CAN 9 1/2T CLOSE, 5MM	1
L105	2405523P07	COIL CAN 2 1/2T SPACE, 5MM	1
L106	2405913C01	COIL FERRITE BEAD, 3T	1
L107	0105951P48	COIL CHOKE-BEAD ASSY	1
L108	2405559P09	COIL CAN 1 1/2T, AIR WOUND	1
L109	2405913C01	COIL FERRITE BEAD, 3T	1
L110	0105951J48	COIL CHOKE-BEAD ASSY	1
L111	2405559P08	COIL CAN 1 1/2T, AIR WOUND	1
L112	2405559P11	COIL CAN, 4 1/2T.AIR WOUND A,B	1
L112	2405559P21	COIL 4 1/2T AIRW. COIL CAN C,D	1
L113	2405559P01	COIL CAN 6 1/2T. AIR WOUND A,B	1
L113	2405559P02	COIL CAN 5 1/2T. AIR WOUND C,D	1
L114	2405559P01	COIL CAN 6 1/2T. AIR WOUND A,B	1
L114	2405559P02	COIL CAN 5 1/2T. AIR WOUND C,D	1
L115	2405559P01	COIL CAN 6 1/2T. AIR WOUND A,B	1
L115	2405559P02	COIL CAN 5 1/2T. AIR WOUND C,D	1
L116	2482723H38	COIL CHOKE RF 1.2UH	1
L117	2482723H38	COIL CHOKE RF 1.2UH	1
L119	2405559P01	COIL CAN 6 1/2T. AIR WOUND A,B	1
L119	2405559P02	COIL CAN 5 1/2T. AIR WOUND C,D	1
L120	2405559P01	COIL CAN 6 1/2T. AIR WOUND A,B	1
L120	2405559P02	COIL CAN 5 1/2T. AIR WOUND C,D	1
L201	2405452C70	COIL CAN ELEC	1
Q001	4805218N08	TSTR SOT	1
Q002	4805452G08	DUAL GATE MOSFET 3SK74	1
Q003	4805218N09	TSTR SOT	1
Q101	4805218N09	TSTR SOT	1
Q102	4805218N09	TSTR SOT	1
Q103	4805474G37	TSTR NPN DRIVER MRF227	1
Q104	4805474G33	TSTR PA MRF2628	1
R001	0660076A67	RES CHIP 5600 5% 1/10W	1
R002	0660076A87	RES CHIP 39K 5% 1/10W	1
R003	0660076A59	RES CHIP 2700 5% 1/10W	1
R006	0660076A49	RES CHIP 1000 5% 1/10W	1
R007	0660076A73	RES CHIP 10K 5% 1/10W	1
R009	0660076A45	RES CHIP 680 5 1/10W	1
R010	0660076A56	RES CHIP 2000 5 1/10W	1
R013	0660076A71	RES CHIP 8200 ±5% 1/10W	1
R014	0660076A84	RES CHIP 30K 5% 1/10W	1
R015	0660076A71	RES CHIP 8200 ±5% 1/10W A,C	1
R015	0660076A61	RES CHIP 3.3K+/-5% 0.1W B,D	1
R016	0660076A31	RES CHIP 180 5% 1/10W B	1
R017	0660076A25	RES CHIP 100 5% 1/10W	1
R100	0660076A71	RES CHIP 8200 ±5% 1/10W	1
R101	0660076A84	RES CHIP 30K 5% 1/10W	1
R102	0660076A59	RES CHIP 2700 5% 1/10W C,D	1
R102	0660076A65	RES CHIP 4700 ±5% 1/10W A,B	1
R103	0660076A69	RES CHIP 6800 5% 1/10W	1
R104	0660076A82	RES CHIP 24K ±5 1/10W	1
R105	0660076A26	RES CHIP 110 5 1/10W A,B	1
R105	0660076A32	RES CHIP 200 5% 1/10W C,D	1
R106	0660076A65	RES CHIP 4700 ±5% 1/10W C,D	1
R106	0660076A73	RES CHIP 10K 5% 1/10W A,B	1
R108	0660076A23	RES CHIP 82 5 1/10W	1
R109	0660076A09	RES CHIP 22 5% 1/10W A,B	1
R109	0660076A17	RES CHIP 47 5 1/10W C,D	1
R111	0660076A46	RES CHIP 750 5% 1/10W	1
R112	0660076A29	RES CHIP 150 5 1/10W	1

PARTS LIST FOR HTX/CP1000, VHF TRANSCEIVER BOARD, 5 WATT

Pos	Code No.	Description	Qt
R127	0660076A29	RES CHIP 150 5 1/10W	1
R128	0660076A71	RES CHIP 8200 ±5% 1/10W	1
R129	1805559S02	RES POT 50K MULTITURNS	1
R130	0660076A87	RES CHIP 39K 5% 1/10W	1
U001	5102001J42	ODIN IF MOD VHF B,D	1
U001	5102001J54	ODIN IF MOD VHF 12.5 KHZ A,C	1
U101	5102001J56	ODIN VHF HS VCO MOD VCO C,D	1
U101	5102001J57	ODIN VCO MOD 01J57 A,B	1
U103	5105822P51	VHF ANT. SWITCH MODULE	1
U104	5105729E93	ANT. SELECT SWITCH	1
U106	5105729E52	REF. OSCILLATOR B,D	1
U106	5105729E72	REF. OSCILLATOR A,C	1
U107	5102001J44	ODIN SYNTHESIZER VHF	1
		NON REFERENCED ITEMS	
	0105953P95	PA SHIELD ASSY B,C,D	1
	0105957N35	IF SHIELD ASSY	1
	0200007007	NUT 8-32X1/4X3/32 HEX STL CA	1
	0300136771	SCREW 2-56 X 3/16	3
	0705196A04	BOOT	2
	0705766R01	RUBBER SUPPORT	5
	1400861196	INSULATOR TRNSTR	1
	1405496R01	INSULATOR	1
	2605116S01	PA SHIELD	1
	2605494R01	SHIELD IF MODULE	1
	2605524P01	CAN, 5MM A,C	2
	2605524P03	CAN	8
	2605532P01	HEATSINK 5W	1
	2605696R01	SHIELD, ANT SWITCH	1
	2683379H01	HEAT SINK	1
	3905509R02	CONTACT	7
	7505295B07	PAD	2
	7505695R01	PAD OSCILLATOR	1
	7683960B01	FERRITE BEAD	1
	7683960B04	FERRITE BEAD A,B	1
	8402269J01	PCB VHF HIGH POWER ODIN	1

Pos	Code No.	Description	Qt

PARTS LIST FOR HTX/CP1000, VHF TRANSCEIVER BOARD, 2 WATT

Pos	Code No.	Description		Qt
	EUD4105A	146-162MHz, 12.5kHz, 2W	(A)	
	EUD4106A	146-162MHz, 20/25kHz, 2W	(B)	
	EUD4109A	157-174MHz, 12.5kHz, 2W	(C)	
	EUD4110A	157-174MHz, 20/25kHz, 2W	(D)	
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C001	2113740A23	CAP CHIP 6.2PF ±0.25PF	C	1
C001	2113740A39	CAP CHIP 27PF ±5%	D	1
C001	2113740A42	CAP CHIP 36PF ±5%	A,B	1
C002	2113740A21	CAP CHIP 5.6PF ±0.25PF	C	1
C002	2113740A27	CAP CHIP 8.2PF ±0.25PF	D	1
C002	2113740A37	CAP CHIP 22PF ±5%	A,B	1
C003	2113740A11	CAP CHIP 2.2PF ±0.25PF	C	1
C003	2113740A13	CAP CHIP 2.7PF ±2.5PF	D	1
C003	2113740A19	CAP CHIP 4.7PF ±0.25PF	A,B	1
C004	2113740A32	CAP CHIP 13PF ±5%	C	1
C004	2113740A34	CAP CHIP 16PF ±5%	D	1
C004	2113740A35	CAP CHIP 18PF ±5%	A,B	1
C005	2113740A33	CAP CHIPACITOR 15PF	A,B	1
C005	2113740A34	CAP CHIP 16PF ±5%	C,D	1
C006	2113741A43	CAP CHIP 8200PF 0805		1
C008	2113740A23	CAP CHIP 6.2PF ±0.25PF		1
C009	2113740A75	CAP CHIP 680PF ±0.25PF	A,B	1
C009	2113741A17	CAP CHIP 680PF ±0.25PF	C,D	1
C010	2113740A03	CAP CHIP 1.0PF ±0.25PF		1
C011	2113740A23	CAP CHIP 6.2PF ±0.25PF	A,B	1
C011	2113740A24	CAP CHIP 6.8PF ±0.25PF	C,D	1
C012	2113740A03	CAP CHIP 1.0PF ±0.25PF		1
C013	2113740A31	CAP CHIP 12PF ±5%	A,B	1
C013	2113740A32	CAP CHIP 13PF ±5%	C	1
C013	2113740A32	CAP CHIP 13PF ±5%	D	1
C014	2113740A29	CAP CHIP 10PF/C1	A,B	1
C014	2160520S02	CAP CHIP 11PF .25PF NPO	C,D	1
C015	2113741A43	CAP CHIP 8200PF 0805		1
C016	2113740A75	CAP CHIP 680PF ±0.25PF	A,B	1
C016	2113741A17	CAP CHIP 680PF ±0.25PF	C,D	1
C017	2113740A75	CAP CHIP 680PF ±0.25PF	A,B	1
C017	2113741A17	CAP CHIP 680PF ±0.25PF	C,D	1
C018	2113741A43	CAP CHIP 8200PF 0805		1
C019	2113740A17	CAP CHIP 3.9PF ±0.25PF	B,D	1
C019	2160523F22	CAP CHIP 39PF N220	A	1
C019	2160523F44	CAP CHIP 43PF N220 5%	C	1
C020	2113740A23	CAP CHIP 6.2PF ±0.25PF	A	1
C020	2113740A27	CAP CHIP 8.2PF ±0.25PF	C	1
C020	2113741A21	CAP CHIP 1000PF ±5%	B,D	1
C021	2113740A75	CAP CHIP 680PF ±0.25PF	A,B	1
C021	2113741A17	CAP CHIP 680PF ±0.25PF	C,D	1
C022	2113741A43	CAP CHIP 8200PF 0805		1
C024	2113740A17	CAP CHIP 3.9PF ±0.25PF	B,D	1
C024	2113740A35	CAP CHIP 18PF ±5%	A,C	1
C026	2113740A35	CAP CHIP 18PF ±5%	B,D	1
C026	2113740A40	CAP CHIP 30PF ±5%	A,C	1
C027	2113740A31	CAP CHIP 12PF ±5%	B,D	1
C027	2113740A40	CAP CHIP 30PF ±5%	A,C	1
C030	2113740A21	CAP CHIP 5.6PF ±2.5PF	A,B	1
C030	2113740A27	CAP CHIP 8.2PF ±0.25PF	C,D	1
C031	2113740A75	CAP CHIP 680PF ±0.25PF	A,B	1
C031	2113741A17	CAP CHIP 680PF ±0.25PF	C,D	1
C032	2113740A05	CAP CHIP 1.2PF ±2.5PF		1
C033	2113740A75	CAP CHIP 680PF ±0.25PF	A,B	1
C033	2113741A17	CAP CHIP 680PF ±0.25PF	C,D	1
C035	2113740A23	CAP CHIP 6.2PF ±0.25PF	A,B	1
C035	2113740A27	CAP CHIP 8.2PF ±0.25PF	C,D	1
C036	2113740A75	CAP CHIP 680PF ±0.25PF	A,B	1
C036	2113741A17	CAP CHIP 680PF ±0.25PF	C,D	1
C037	2160523F15	CAP CHIP (TC) 10PF N220	A,C	1
C039	2113741A43	CAP CHIP 8200PF 0805		1
C042	2113740A67	CAP CHIP 330PF ±0.25PF		1
C043	2113741B49	CAP CHIP 15000PF		1
C100	2113740A10	CAP CHIP 2.0PF ±0.25PF		1
C101	2113740A32	CAP CHIP 13PF ±5%	C	1
C101	2113740A35	CAP CHIP 18PF ±5%	D	1
C101	2113740A36	CAP CHIP 20PF ±5%	A,B	1
C102	2113740A37	CAP CHIP 22PF ±5%	C	1
C102	2113740A37	CAP CHIP 22PF ±5%	D	1
C102	2113740A40	CAP CHIP 30PF ±5%	A,B	1
C107	2113740A46	CAP CHIP 47PF ±5%	C	1
C107	2113740A48	CAP CHIP 51PF ±5%	A,B	1
C107	2113740A49	CAP CHIP 56PF ±5%	D	1
C108	2113740A67	CAP CHIP 330PF ±0.25PF		1
C109	2113740A36	CAP CHIP 20PF ±5%	C	1
C109	2113740A41	CAP CHIP 33PF ±5%	D	1
C109	2113740A42	CAP CHIP 36PF ±5%	A,B	1
C110	2160521G37	CAP CHIP 100NF +80% -20%		1
C111	2113740A42	CAP CHIP 36PF ±5%	C	1
C111	2113740A43	CAP CHIP 39PF ±5%	D	1
C111	2113740A46	CAP CHIP 47PF ±5%	A,B	1
C114	2113740A67	CAP CHIP 330PF ±0.25PF		1
C115	2160521G37	CAP CHIP 100NF +80% -20%		1
C117	2113740A46	CAP CHIP 47PF ±5%	C,D	1
C117	2113740A49	CAP CHIP 56PF ±5%	A,B	1
C118	2113740A33	CAP CHIPACITOR 15PF	C,D	1
C118	2113740A36	CAP CHIP 20PF ±5%	A,B	1
C119	2113740A36	CAP CHIP 20PF ±5%	C,B	1
C119	2113740A37	CAP CHIP 22PF ±5%	A,B	1
C120	2005568P01	CAP TRIMMER 5.5 - 65PF		1
C121	2113740A42	CAP CHIP 36PF ±5%	C	1
C121	2113740A42	CAP CHIP 36PF ±5%	D	1
C121	2113740A43	CAP CHIP 39PF ±5%	A,B	1
C122	2113740A32	CAP CHIP 13PF ±5%	C,D	1
C122	2113740A35	CAP CHIP 18PF ±5%	A,B	1
C123	2113740A35	CAP CHIP 18PF ±5%	C	1
C123	2113740A35	CAP CHIP 18PF ±5%	D	1
C123	2113740A36	CAP CHIP 20PF ±5%	A,B	1
C130	2113740A67	CAP CHIP 330PF ±0.25PF		1
C131	2113740A67	CAP CHIP 330PF ±0.25PF		1
C132	2113740A67	CAP CHIP 330PF ±0.25PF		1
C133	2160521G37	CAP CHIP 100NF +80% -20%		1
C140	2113740A14	CAP CHIP 3.0PF ±2.5PF	A,B	1
C140	2113740A15	CAP CHIP 3.3PF ±2.5PF	C,D	1
C141	0860101B37	CAP POLY METALL. 0.47UF		1
C142	2113740A35	CAP CHIP 18PF ±5%	D	1
C142	2113740A36	CAP CHIP 20PF ±5%	C	1
C142	2113740A38	CAP CHIP 24PF ±5%	A,B	1
C143	2113740A29	CAP CHIP 10PF/C1	C,D	1
C143	2113740A31	CAP CHIP 12PF ±5%	A,B	1
C144	2113740A67	CAP CHIP 330PF ±0.25PF		1
C145	2113740A32	CAP CHIP 13PF ±5%	C,D	1

PARTS LIST FOR HTX/CP1000, VHF TRANSCEIVER BOARD, 2 WATT

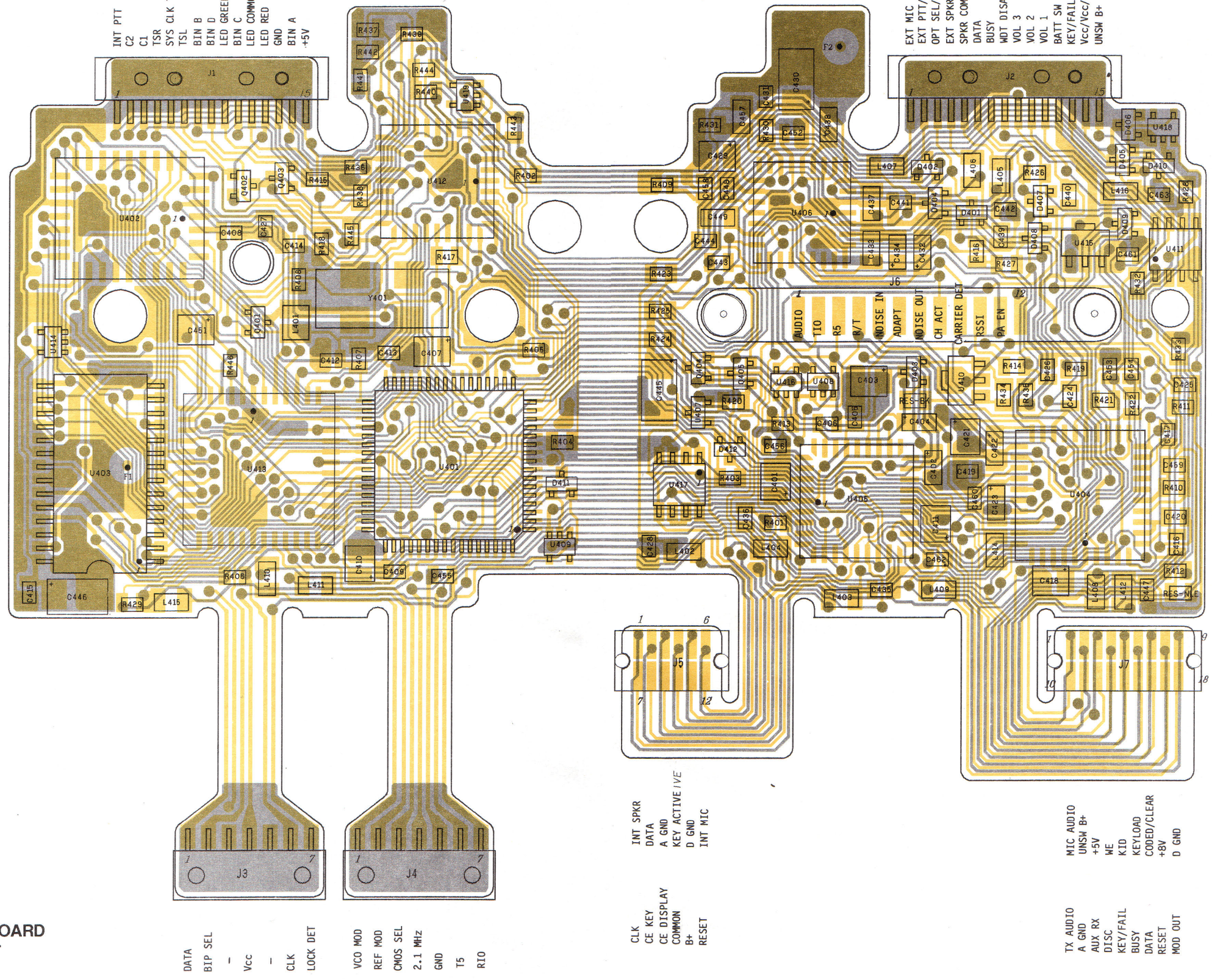
Pos	Code No.	Description		Qt
C145	2113740A34	CAP CHIP 16PF ±5%	A,B	1
C146	2113740A67	CAP CHIP 330PF ±0.25PF		1
C147	2113740A67	CAP CHIP 330PF ±0.25PF		1
C148	2113740A67	CAP CHIP 330PF ±0.25PF		1
C149	2113740A32	CAP CHIP 13PF ±5%	C,D	1
C149	2113740A35	CAP CHIP 18PF ±5%	A,B	1
C150	2113740A67	CAP CHIP 330PF ±0.25PF		1
C151	2113740A43	CAP CHIP 39PF ±5%	A,B	1
C151	2113740A46	CAP CHIP 47PF ±5%	C,D	1
C152	2113740A33	CAP CHIP 15PF	C,D	1
C152	2113740A35	CAP CHIP 18PF ±5%	A,B	1
C153	2113740A67	CAP CHIP 330PF ±0.25PF		1
C154	2113741B49	CAP CHIP 15000PF		1
C200	2113741A25	CAP CHIP 1500PF ±5%		1
C201	2113741A25	CAP CHIP 1500PF ±5%		1
C202	2113741A25	CAP CHIP 1500PF ±5%		1
C203	2113740A67	CAP CHIP 330PF ±0.25PF		1
C204	2160521G37	CAP CHIP 100NF +80% -20%		1
C205	2113740A67	CAP CHIP 330PF ±0.25PF		1
C206	2113740A67	CAP CHIP 330PF ±0.25PF		1
C207	2305458G12	CAP TANT 33UF 16V	A,C,D	1
C209	2113741A21	CAP CHIP 1000PF ±5%		1
C210	2113741A25	CAP CHIP 1500PF ±5%		1
C211	2113741A25	CAP CHIP 1500PF ±5%		1
C212	2113741A25	CAP CHIP 1500PF ±5%		1
C213	2113741A25	CAP CHIP 1500PF ±5%		1
CR				
001	4883654H08	DIODE SLCN	A,B,C	1
002	4805490G02	DIODE RECT SILICONE	A,B,C	1
101	4883654H01	DIODE SILICONE	A,B,C	1
102	4805129M61	DIODE ZENER 18V		1
FL01	4805245J19	XTAL FILTER	A,C	1
FL01	4805245J20	XTAL FILTER 53.55-13.5B	B	1
FL02	4805245J19	XTAL FILTER	A,C	1
FL02	4805245J20	XTAL FILTER 53.55-13.5B	B	1
FL03	9105685Q12	CER FILTER SFG450EN	B,D	1
FL03	9105725Q03	CER FILTER CFW450F	A,C	1
FL04	9105685Q11	CER FILTER SFG450DN	B,D	1
FL04	9105726Q04	CER FILTER CFU450G	A,C	1
L001	2405669G12	COIL 4 1/2T SPACE YEL.	A,B,D	1
L001	2405669G13	COIL5 1/2T GREEN SPACE	C	1
L002	2405669G30	COIL 4 1/2T SPACE YEL.	A,B,D	1
L002	2405669G31	COIL 5 1/2T	C	1
L003	2405523P18	COIL 8 1/2T CLOSE (AL SLUG)		1
L004	2405523P18	COIL 8 1/2T CLOSE (AL SLUG)		1
L005	2405523P18	COIL 8 1/2T CLOSE (AL SLUG)		1
L006	2405063H09	COIL 0.6UH ±16% TUNABLE	B,D	1
L006	2405063H13	COIL 1.2UH ±16% TUNABLE	A	1
L006	2405063H13	COIL 1.2UH ±16% TUNABLE	C	1
L007	2405063H05	COIL 0.4 ±16% TUNABLE	A,C	1
L007	2405063H13	COIL 1.2UH ±16% TUNABLE	B,D	1
L008	2405063H05	COIL 0.4 ±16% TUNABLE	A,C	1
L008	2405063H09	COIL 0.6UH ±16% TUNABLE	B,D	1
L009	2405523P09	COIL 4 1/2T SPACE 5MM	C,D	1
L009	2405523P10	COIL 5 1/2T SPACE 5MM	A,B	1
L010	2405523P08	COIL, 3 1/2T SPACE 5MM	C,D	1
L010	2405523P09	COIL 4 1/2T SPACE 5MM	A,B	1
L011	2482723H38	CHOKE RF 1.2UH		1
L012	1000000519	JUMPER WIRE	B,D	1

Pos	Code No.	Description		Qt
L012	2505129Q02	CHOKE 1.2 UH.PRECISION	A,C	1
L101	2482723H28	COIL RF .29 UH YEL		1
L102	2405523P28	COIL 6 1/2T SPACE 5MM		1
L103	2482723H38	CHOKE RF 1.2UH		1
L104	2405523P32	COIL 9 1/2T CLOSE 5MM		1
L105	2405523P07	COIL 2 1/2T SPACE 5MM		1
L106	2405913C01	FERRITE BEAD 3T		1
L107	0105951P49	CHOKE-BEAD ASSY	A,B,C	1
L108	2405523P07	COIL 2 1/2T SPACE 5MM		1
L109	2405913C01	FERRITE BEAD 3T		1
L110	0105951N35	CHOKE-BEAD ASSY(0.085UH)	C	1
L110	0105951P48	CHOKE-BEAD ASSY	A,B	1
L111	2405559P07	COIL 2 1/2T AIR WOUND		1
L112	2405559P11	COIL 4 1/2T. AIR WOUND		1
L113	2405559P01	COIL 6 1/2T. AIR WOUND	A,B	1
L113	2405559P02	COIL 5 1/2T. AIR WOUND	C,D	1
L114	2405559P01	COIL 6 1/2T. AIR WOUND	A,B	1
L114	2405559P02	COIL 5 1/2T. AIR WOUND	C,D	1
L115	2405559P01	COIL 6 1/2T. AIR WOUND	A,B	1
L115	2405559P02	COIL 5 1/2T. AIR WOUND	C,D	1
L116	2482723H38	CHOKE RF 1.2UH		1
L117	2482723H38	CHOKE RF 1.2UH		1
L119	2405559P01	COIL 6 1/2T. AIR WOUND	A,B	1
L119	2405559P02	COIL 5 1/2T. AIR WOUND	C,D	1
L120	2405559P01	COIL 6 1/2T. AIR WOUND	A,B	1
L120	2405559P02	COIL 5 1/2T. AIR WOUND	C,D	1
L201	2405452C70	COIL ELEC		1
Q001	4805218N08	TSTR SOT LMMBR1983		1
Q002	4805452G08	DUAL GATE MOSFET 3SK74	A,B,C	1
Q003	4805218N09	TSTR SOT		1
Q101	4805218N09	TSTR SOT		1
Q102	4805218N09	TSTR SOT		1
Q103	4805474G37	TSTR NPN DRIVER MRF227	A,B,C	1
R001	0660076A67	RES CHIP 5600 5% 1/10W		1
R002	0660076A87	RES CHIP 39K 5% 1/10W		1
R003	0660076A59	RES CHIP 2700 5% 1/10W		1
R006	0660076A49	RES CHIP 1000 5% 1/10W		1
R007	0660076A73	RES CHIP 10K 5% 1/10W		1
R009	0660076A45	RES CHIP 680 5% 1/10W		1
R010	0660076A56	RES CHIP 2000 5% 1/10W		1
R013	0660076A71	RES CHIP 8200 ±5% 1/10W		1
R014	0660076A84	RES CHIP 30K 5% 1/10W		1
R015	0660076A61	RES CHIP 3.3K±5% 0.1W	B,D	1
R015	0660076A71	RES CHIP 8200 ±5% 1/10W	A,C	1
R016	0660076A31	RES CHIP 180 5% 1/10W	B	1
R016	0660076A43	RES CHIP 560 5% 1/10W	D	1
R017	0660076A25	RES CHIP 100 5% 1/10W		1
R100	0660076A71	RES CHIP 8200 ±5% 1/10W		1
R101	0660076A84	RES CHIP 30K 5% 1/10W		1
R102	0660076A65	RES CHIP 4700 ±5% 1/10W		1
R103	0660076A68	RES CHIP 6200 5 1/10W		1
R104	0660076A79	RES CHIP 18K 5% 1/10W	C,D	1
R104	0660076A84	RES CHIP 30K 5% 1/10W	A,B	1
R105	0660076A25	RES CHIP 100 5% 1/10W	A,B,C	1
R105	0660076A32	RES CHIP 200 5% 1/10W	D	1
R106	0660076A67	RES CHIP 5600 5% 1/10W		1
R108	0660076A17	RES CHIP 47 5% 1/10W		1
R109	0660076A17	RES CHIP 47 5% 1/10W	A,B,D	1
R109	0660076A18	RES CHIP 51 5% 1/10W	C	1

PARTS LIST FOR HTX/CP1000, VHF TRANSCEIVER BOARD, 2 WATT

Pos	Code No.	Description		Qt
R111	0660076A46	RES CHIP 750 5% 1/10W		1
R127	0660076A29	RES CHIP 150 5% 1/10W		1
R128	0660076A71	RES CHIP 8200 ±5% 1/10W		1
R129	1805559S02	RES POT 50K MULTITURNS		1
R130	0660076A87	RES CHIP 39K 5% 1/10W		1
U001	5102001J42	IF MOD VHF	B,D	1
U001	5102001J54	IF MOD VHF 12.5 KHZ	A,C	1
U101	5102001J56	VHF HS VCO	C,D	1
U101	5102001J57	IF MOD VHF 12.5 KHZ	A,B	1
U103	5105822P51	VHF ANT. SWITCH MODULE	A,B,C	1
U104	5105822P64	VHF STD/RMT ANT SEL	A,B,C	1
U106	5105729E52	REF. OSCILLATOR	D	1
U106	5105729E72	REF. OSCILLATOR	A,B,C	1
U107	5102001J44	SYNTHESIZER VHF	A,B,C	1
		NON REFERNCED ITEMS:		
	0105952P18	L1+L2 CAN ASSY		2
	0105953P95	PA SHIELD ASSY		1
	0105956M65	HEATSINK PA.ASSY		1
	0105957N35	IF SHIELD ASSY		1
	0300136771	SCREW 2-56 X 3/16		4
	0705196A04	BOOT		2
	0705766R01	RUBBER SUPPORT		4
	1400861196	INSULATOR TRNSTR		1
	2605524P01	CAN 5MM		2
	2605524P03	CAN		7
	2605696R01	SHIELD ANT SWITCH		1
	2605820D07	CAN 7MM	D	2
	2683379H01	HEAT SINK		1
	3700132026	HT SHRINK TUBING	A,B,C	
	3700132626	TBG HEAT SHRINKABLE 3/32	A,C	
	3905509R02	CONTACT		6
	7505295B07	PAD		2
	7505695R01	PAD OSCILLATOR		1

Pos	Code No.	Description	Qt



HTX/CP1000
CONTROLLER FLEX BOARD
COMPONENT LAYOUT

D405.503

ETN2305A
DOC. ISSUE 09.28.89

HTX/CP1000
CONTROLLER FLEX BOARD
D405.504

ETN2305A
DOC. ISSUE 09.28.89

PARTS LIST FOR CONTROLLER FLEX BOARD ETN2305A

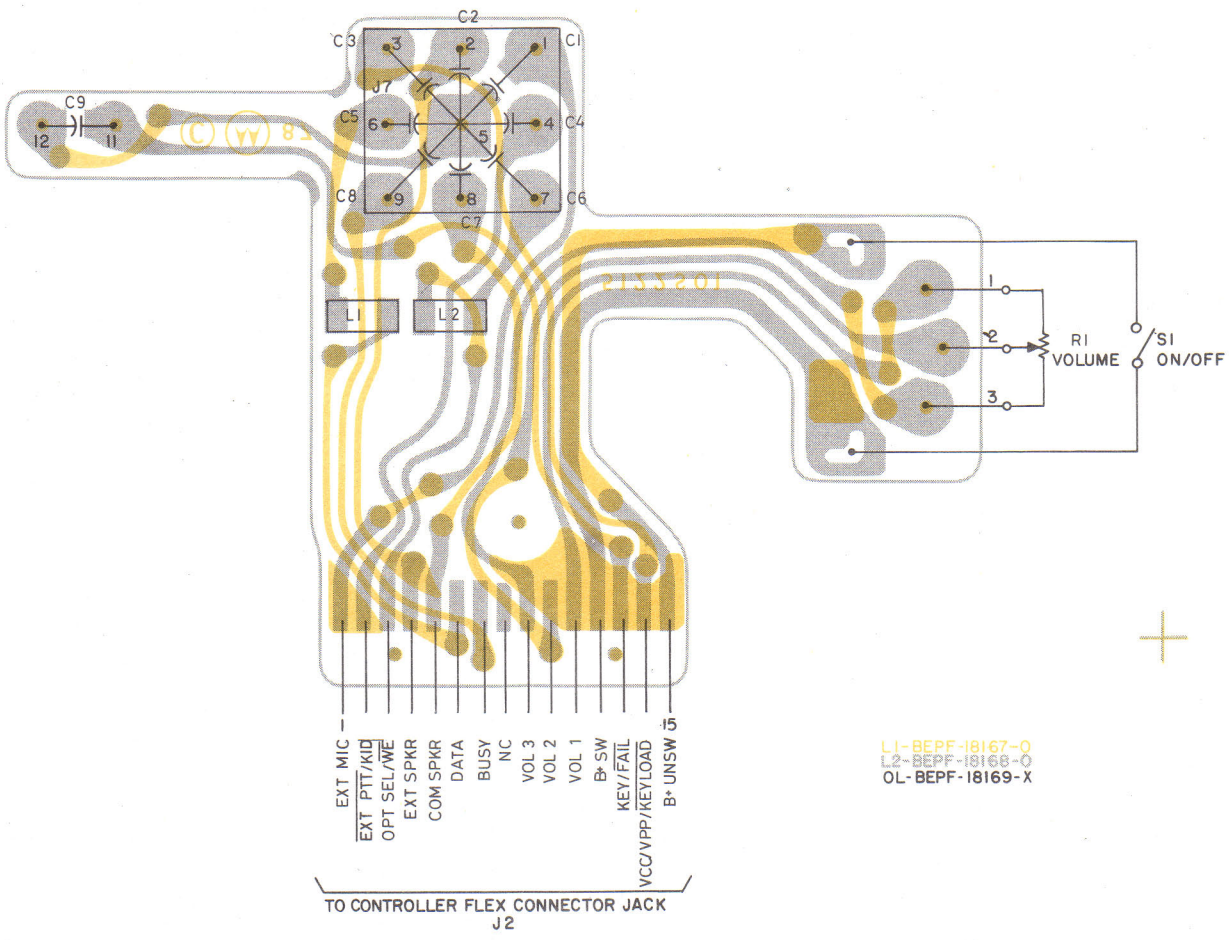
Pos	Code No.	Description	Qt
C401	2360562A28	TANT CAP 4.7U 10V	1
C402	2360562A13	TANT CAP 1.0UF 16V	1
C403	2362998B16	CAP 3.3UF	1
C404	2360562A07	0.47 UF 25V TANT CAP (T & R)	1
C405	2160521G37	CHIP CAP 100NF +80% -20%	1
C406	2160521G37	CHIP CAP 100NF +80% -20%	1
C407	2360562A28	TANT CAP 4.7U 10V	1
C408	2160521G37	CHIP CAP 100NF +80% -20%	1
C409	2160521G37	CHIP CAP 100NF +80% -20%	1
C410	2360562A28	TANT CAP 4.7U 10V	1
C411	2360562A28	TANT CAP 4.7U 10V	1
C412	2113740A29	CHIP CAPACITORS 10PF/C1	1
C413	2113740A31	CHIP CAPACITORS 12PF ±5%	1
C414	2113741A45	CHIP CAPACITORS 10000PF	1
C415	2160521G37	CHIP CAP 100NF +80% -20%	1
C416	2160521G37	CHIP CAP 100NF +80% -20%	1
C417	2160521G37	CHIP CAP 100NF +80% -20%	1
C418	2360562A28	TANT CAP 4.7U 10V	1
C419	2160521G37	CHIP CAP 100NF +80% -20%	1
C420	2160521G37	CHIP CAP 100NF +80% -20%	1
C421	2360562A21	0605139G06 TANT CAP (T & R)	1
C422	2360562A07	0.47 UF 25V TANT CAP (T & R)	1
C423	2360562A13	TANT CAP 1.0UF 16V	1
C424	2160521G37	CHIP CAP 100NF +80% -20%	1
C425	2113741A33	CHIP CAPACITOR 3300PF ±5%	1
C426	2113741A53	CHIP CAPACITORS 22000PF	1
C427	2160521G37	CHIP CAP 100NF +80% -20%	1
C428	2113740A59	CHIP CAPACITORS 150PF ±5%	1
C429	2360562A28	TANT CAP 4.7U 10V	1
C430	2360562A43	TANT CAP 10UF 16V	1
C431	2113741A45	CHIP CAPACITORS 10000PF	1
C432	2360562A13	TANT CAP 1.0UF 16V	1
C433	2160521H43	CHIP CAP 330NF +80%-20%	1
C434	2360562A13	TANT CAP 1.0UF 16V	1
C435	2113740A59	CHIP CAPACITORS 150PF ±5%	1
C436	2113740A59	CHIP CAPACITORS 150PF ±5	1
C437	2160521H43	CHIP CAP 330NF +80%-20%	1
C438	2360562A13	TANT CAP 1.0UF 16V	1
C439	2113740A59	CHIP CAPACITORS 150PF ±5%	1
C440	2160521G37	CHIP CAP 100NF +80% -20%	1
C441	2113740A59	CHIP CAPACITORS 150PF ±5%	1
C442	2113740A59	CHIP CAPACITORS 150PF ±5%	1
C443	2160521G37	CHIP CAP 100NF +80% -20%	1
C444	2160521G37	CHIP CAP 100NF +80% -20%	1
C445	2360562A43	TANT CAP 10UF 16V	1
C446	2360562A43	TANT CAP 10UF 16V	1
C447	2113740A59	CHIP CAPACITORS 150PF ±5%	1
C448	2113741A37	CHIP CAPACITORS 4700PF ±5%	1
C449	2113741B61	CHIP CAPACITOR 47NF ±5%	1
C451	2360562A28	TANT CAP 4.7U 10V	1
C452	2113741A45	CHIP CAPACITORS 10000PF	1
C453	2113741A39	CHIP CAPACITORS 5600PF ±5%	1
C454	2113741A31	CHIP CAPACITORS 2700PF ±5%	1
C455	2113741A21	CHIP CAPACITORS 1000PF ±5%	1
C456	2113741A21	CHIP CAPACITORS 1000PF ±5%	1
C457	2113741B61	CHIP CAPACITOR 47NF ±5%	1
C458	2113741A53	CHIP CAPACITORS 22000PF	1
C459	2113741A05	CHIP CAP 220PF ±5%	1
C460	2113740A59	CHIP CAPACITORS 150PF ±5%	1

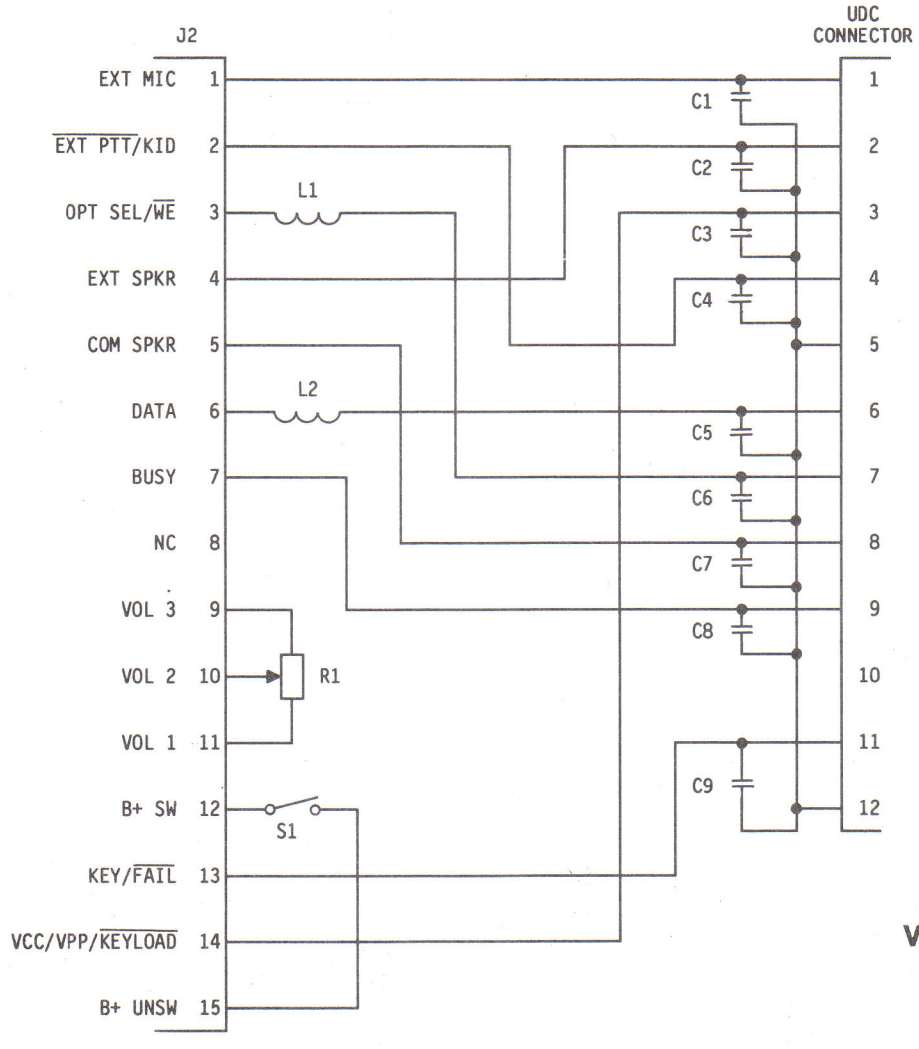
Pos	Code No.	Description	Qt
C461	2113741A45	CHIP CAPACITORS 10000PF	1
C462	2113740A59	CHIP CAPACITORS 150PF ±5%	1
D401	4880140L09	ZENER DIODE 6.2V	1
D402	4880140L09	ZENER DIODE 6.2V	1
D403	4805129M12	DIODE SOT23	1
D404	4880140L09	ZENER DIODE 6.2V	1
D405	4805129M12	DIODE SOT23	1
D406	4805140L20	ZENER DIODE 15V	1
D407	4880140L09	ZENER DIODE 6.2V	1
D408	4880140L09	ZENER DIODE 6.2V	1
D409	4880140L09	ZENER DIODE 6.2V	1
D410	4880236E08	DIODE DUAL SOT 2	1
D411	4880236E08	DIODE DUAL SOT 2	1
D412	4880236E08	DIODE DUAL SOT 2	1
J1	0905467R01	SOCKET 15 POSTN	1
J2	0905467R01	SOCKET 15 POSTN	1
J3	0905577P01	SOCKET 7 POSITION	1
J4	0905577P01	SOCKET 7 POSITION	1
J5	2805878S03	CONN CONTRL 2X6M	1
J7	2805878S04	CONN DVP 2X9M	1
L401	2462585A40	CHOKE 33UH	1
L402	2462575A01	CHOKE 0.39UH	1
L403	2462575A01	CHOKE 0.39UH	1
L404	2462575A01	CHOKE 0.39UH	1
L405	2462575A01	CHOKE 0.39UH	1
L406	2462575A01	CHOKE 0.39UH	1
L407	2462575A01	CHOKE 0.39UH	1
L408	2462575A01	CHOKE 0.39UH	1
L409	2462575A01	CHOKE 0.39UH	1
L410	2462575A01	CHOKE 0.39UH	1
L411	2462575A01	CHOKE 0.39UH	1
L412	2462575A01	CHOKE 0.39UH	1
L413	2462575A01	CHOKE 0.39UH	1
L414	2462575A01	CHOKE 0.39UH	1
L415	2462575A01	CHOKE 0.39UH	1
L416	2462575A01	CHOKE 0.39UH	1
Q401	4805218N03	SOT TRANS (148G13/128M58)	1
Q402	4805128M12	TSTR BCW 60B (RH) (869826)	1
Q403	4805128M12	TSTR BCW 60B (RH) (869826)	1
Q404	4805128M94	TRANS PNP SOT (T & R)	1
Q405	4805128M94	TRANS PNP SOT (T & R)	1
R401	0660078J80	RES CHIP 49.9K 1%	1
R402	0660076A73	RES CHIP 10K 5% 1/10W	1
R403	0660076A43	RES CHIP 560 5% 1/10W	1
R404	0660076A49	RES CHIP 1000 5% 1/10W	1
R405	0660076B01	RES CHIP 100K ±5% 1/8W	1
R406	0660076A65	RES CHIP 4700 ±5% 1/10W	1
R407	0660076B25	RES CHIP 1M 5% 1/10W	1
R408	0660076A65	RES CHIP 4700 ±5% 1/10W	1
R409	0660076E77	RES CHIP 15K 1%	1
R410	0660076E89	RES CHIP 47K 1% 1/8 (T&R)	1
R411	0660076A61	CHIP RES 3.3K+/-5% 0.1W	1
R412	0660078J80	RES CHIP 49.9K 1%	1
R413	0660076A95	RES CHIP 82K 5% 1/10W	1
R414	0660076B01	RES CHIP 100K ±5% 1/8W	1
R415	0660076A27	RES CHIP 120 5 1/8W	1
R416	0660076E80	RES CHIP 20K ±1 1/10W	1
R417	0660076A29	RES CHIP 150 5 1/10W	1
R418	0660076A59	RES CHIP 2700 5% 1/10W	1

PARTS LIST FOR CONTROLLER FLEX BOARD ETN2305A

Pos	Code No.	Description	Qt
R419	0660076A49	RES CHIP 1000 5% 1/10W	1
R420	0660076A65	RES CHIP 4700 ±5% 1/10W	1
R421	0660076A49	RES CHIP 1000 5% 1/10W	1
R422	0660076A49	RES CHIP 1000 5% 1/10W	1
R423	0660076A56	RES CHIP 2000 5% 1/10W	1
R424	0660076A25	RES CHIP 100 5% 1/10W	1
R425	0660076A56	RES CHIP 2000 5% 1/10W	1
R426	0660076A73	RES CHIP 10K 5% 1/10W	1
R427	0660076A73	RES CHIP 10K 5% 1/10W	1
R428	0660076A49	RES CHIP 1000 5% 1/10W	1
R429	0660076A65	RES CHIP 4700 ±5% 1/10W	1
R430	0660076E65	RES CHIP 4.7K 1%	1
R431	0660076E94	RES CHIP 75K 1 1/8W (T&R)	1
R432	0660076E95	RES CHIP 82K 1 1/8W (T&R)	1
R433	0660076E77	RES CHIP 15K 1%	1
R434	0660076E95	RES CHIP 82K 1 1/8W (T&R)	1
R435	0660076E71	RES CHIP 8.2K 1%	1
R436	0660076B01	RES CHIP 100K ±5% 1/8W	1
R437	0660076B01	RES CHIP 100K ±5% 1/8W	1
R438	0660076B01	RES CHIP 100K ±5% 1/8W	1
R439	0660076B01	RES CHIP 100K ±5% 1/8W	1
R440	0660076B01	RES CHIP 100K ±5% 1/8W	1
R441	0660076B01	RES CHIP 100K ±5% 1/8W	1
R442	0660076B01	RES CHIP 100K ±5% 1/8W	1
R443	0660076B01	RES CHIP 100K ±5% 1/8W	1
R444	0660076B01	RES CHIP 100K ±5% 1/8W	1
R445	0660076B01	RES CHIP 100K ±5% 1/8W	1
R446	0660076A65	RES CHIP 4700 ±5% 1/10W	1
U401	5105431L48	UP 68HC11A8	1
U402	5105462G48	EE FLASH PROM	1
U403	5105469E92	RAM	1
U404	5105165R77	C/C TEST 65R77	1
U405	5105226P68	36 PIN C/C 26P68	1
U406	5105165R65	C/C TEST 65R65	1
U407	4805218N48	TRANSISTOR WITH RES DTC114	1
U408	4802233J05	DUAL PNP TRANS WITH RES.	1
U409	4805921T02	DUAL TRANSISTOR FMC2	1
U410	5160880B01	CMOS 5V REG SOT-89	1
U411	5105469E65	IC VLTG REGLTR	1
U412	5105414S42	ODIE GATE ARRAY	1
U413	5105414S43	SNIF GATE ARRAY	1
U414	5105461G61	SINGLE NAND TC7SOOF	1
U415	5160880B01	CMOS 5V REG SOT-89	1
U416	4805921T03	DUAL TRANSISTOR FMG2	1
U417	5105469E65	IC VLTG REGLTR	1
U418	4805921T02	DUAL TRANSISTOR FMC2	1
U419	4805921T04	DUAL TRANSISTOR FMC1	1
Y401	4802297J03	SMD OSC 7.3728MHZ	1

Pos	Code No.	Description	Qt





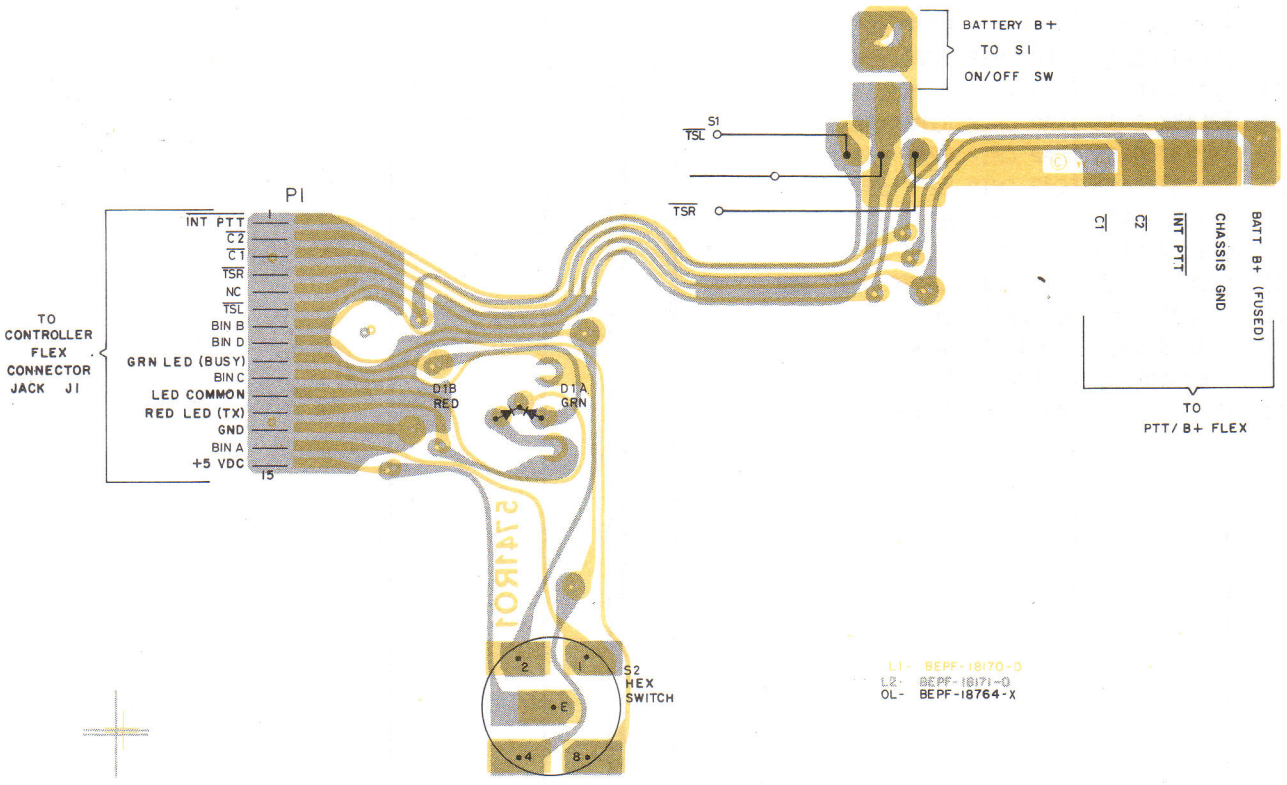
VOL. POT FLEX

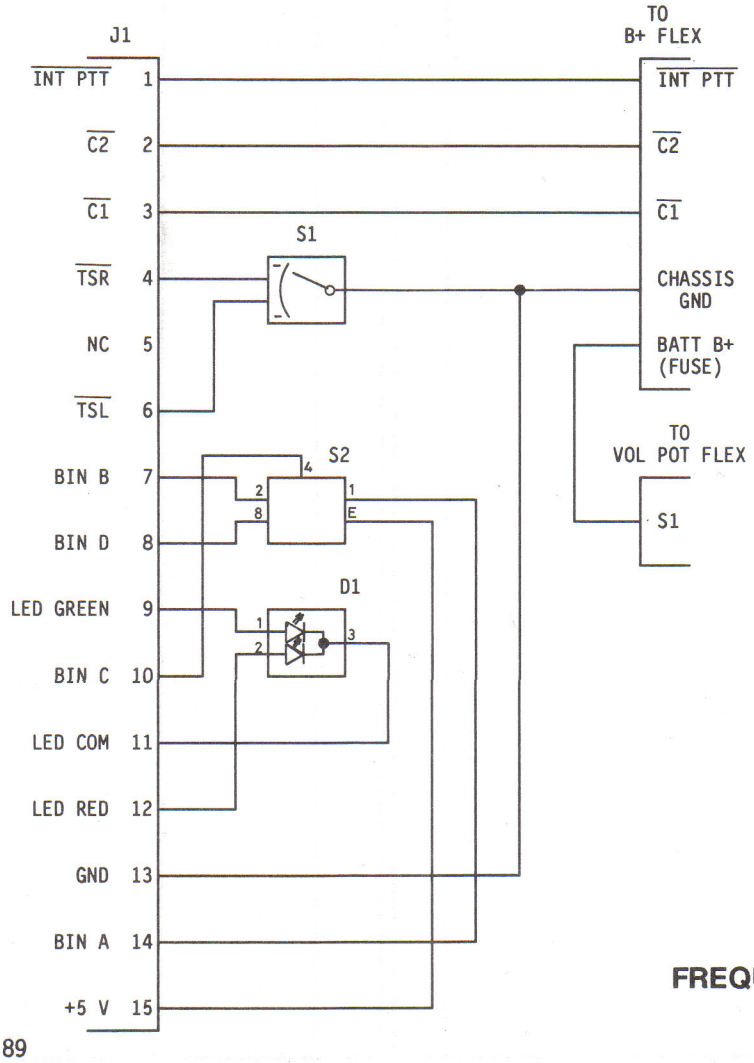
D405.506

PARTS LIST FOR HTX/CP1000, VOLUME POT FLEX

Pos	Code No.	Description	Qt
C1	2113740A53	CAP CHIP 82PF ±5%	1
C2	2113740A53	CAP CHIP 82PF ±5%	1
C3	2113740A53	CAP CHIP 82PF ±5%	1
C4	2113740A53	CAP CHIP 82PF ±5%	1
C5	2113740A53	CAP CHIP 82PF ±5%	1
C6	2113740A53	CAP CHIP 82PF ±5%	1
C7	2113740A53	CAP CHIP 82PF ±5%	1
C8	2113740A53	CAP CHIP 82PF ±5%	1
C9	2105454G38	CAP CER 33P 5% N150 63V	1
L1	2462575A01	CHOKE 0.39UH	1
L2	2462575A01	CHOKE 0.39UH	1
R1	1805100Q03	VOLUME POT 5K	1
S1		PART OF ITEM R1	

Pos	Code No.	Description	Qt





FREQUENCY SWITCH FLEX

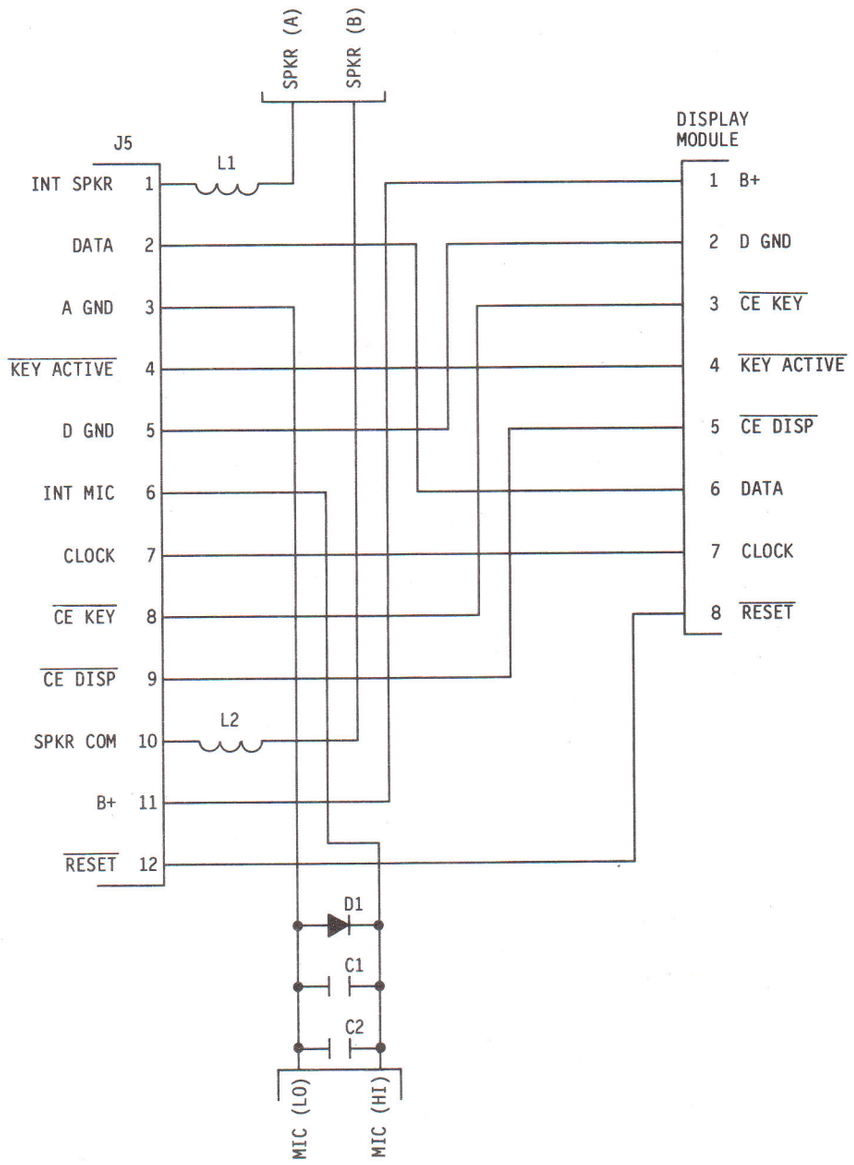
D405.507

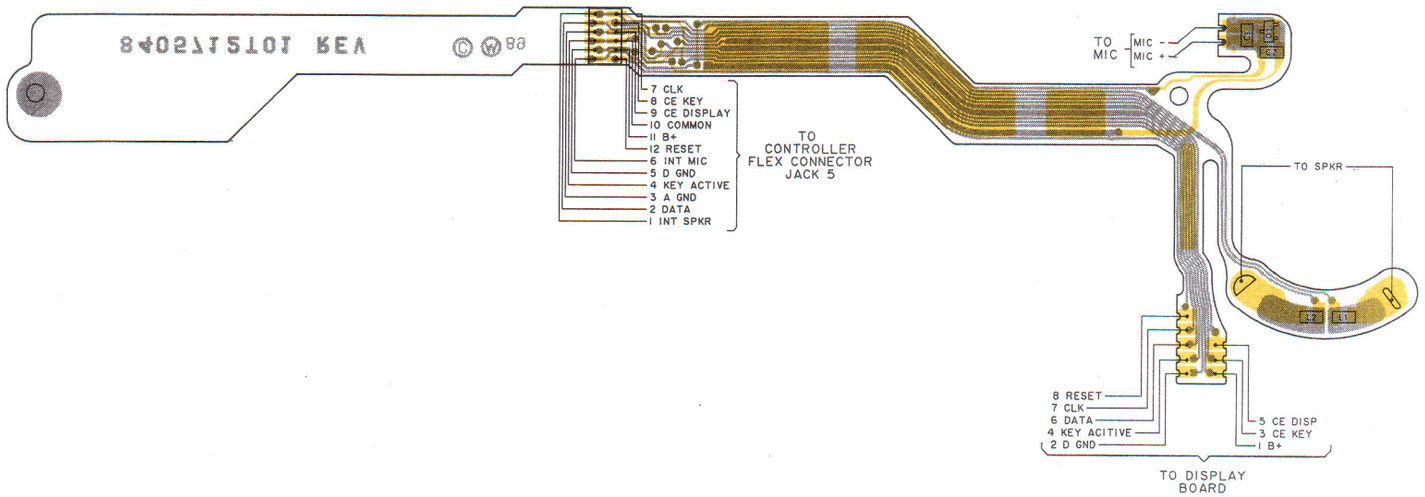
DOC. ISSUE 10.05.89

PARTS LIST FOR HTX/CP1000, FREQUENCY SWITCH FLEX

Pos	Code No.	Description	Qt
D1	4805729G24	LED BICOLOR	1
S1	4005101Q01	TOGGLE SWITCH	1
S2	4005265Q02	16 POS HEXIDECIMAL SWITCH	1

Pos	Code No.	Description	Qt

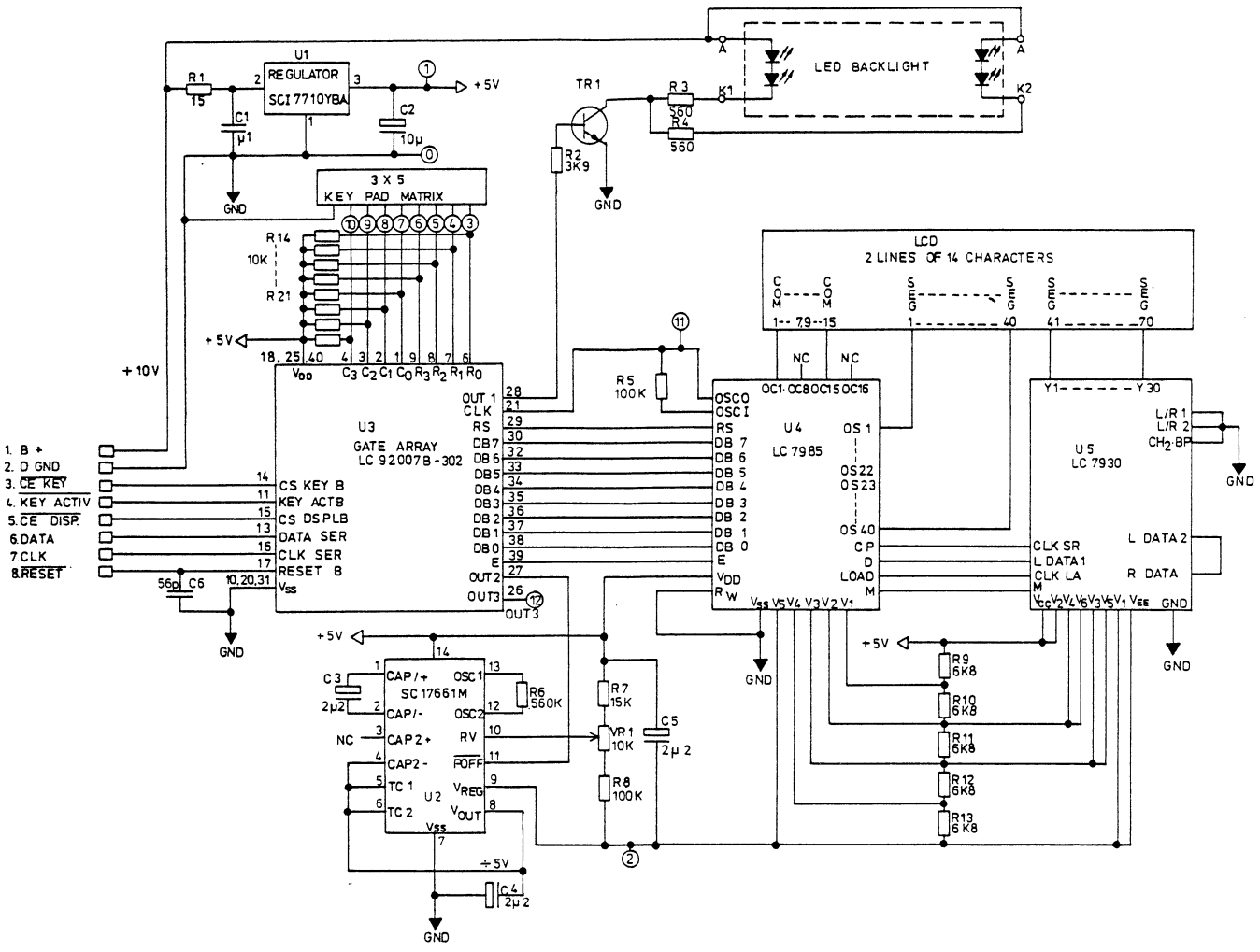


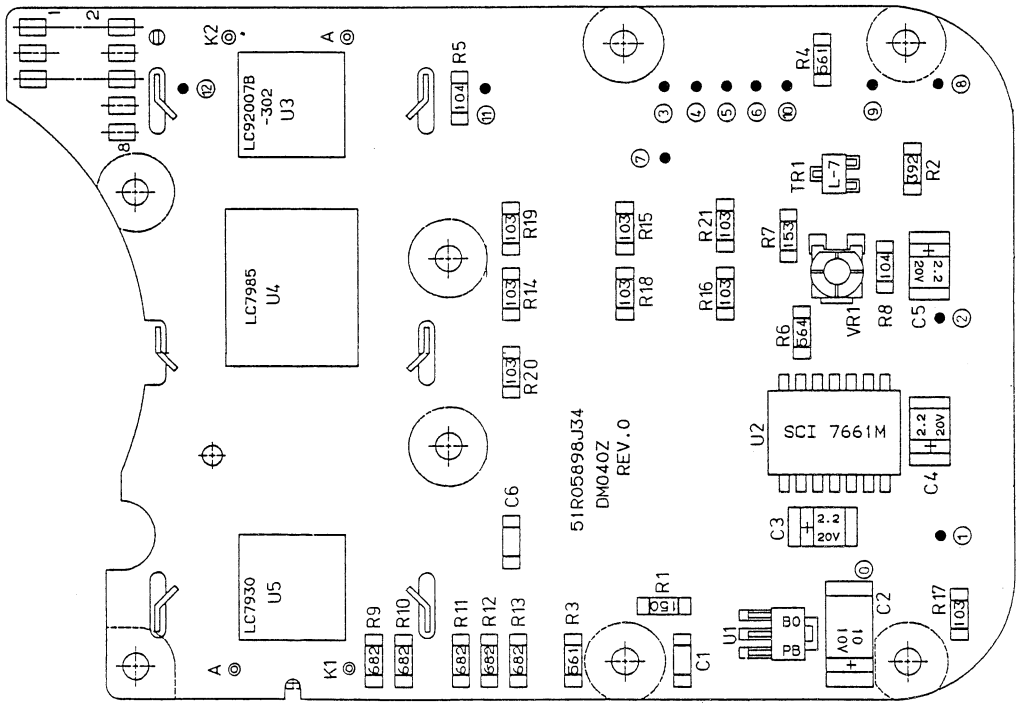


DOC. ISSUE 10.05.89

SPEAKER MIC. FLEX

D405.508





NOTE: THE INDIVIDUAL COMPONENTS ARE NOT REPLACEABLE

DOC.ISSUE 10.04.89

DISPLAY MODULE FOR HTX/CP1000
SCHEMATIC DIAGRAM & COMPONENT LAYOUT

D405.514

GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

Resistors(R)

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

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

Insulated Gate Field Effect Transistors (IGFET or MOS)

- DRAIN / GATE / SUBSTR. / SOURCE — N-channel IGFET (MOS)
- P-channel IGFET (MOS)
- DRAIN / GATE1 / GATE2 / SOURCE — 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

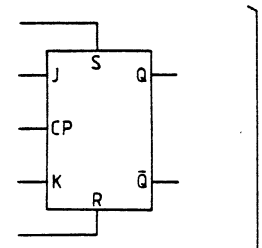
- AND gate.
- OR gate.
- NAND gate.
- NOR gate.
- Exclusive OR gate.
- VCC / OUTPUT — Wired OR (combined OR outputs) (presentation at top is used in detailed diagrams; presentation below is used in functional diagrams)
- OUTP.

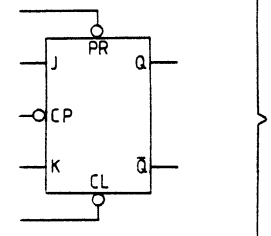
GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

Flip-flops

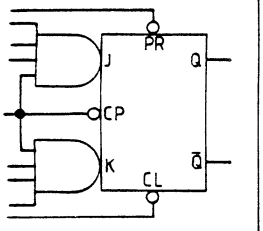
Abbreviations used:

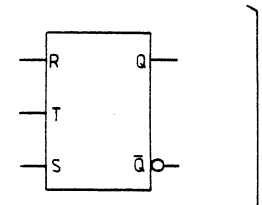
S =Set
R =Reset
CP=Clock pulse
PR=Preset
CL=Clear
T =Toggle

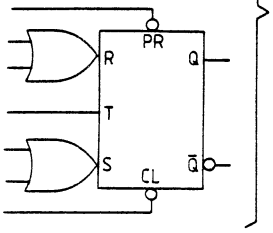




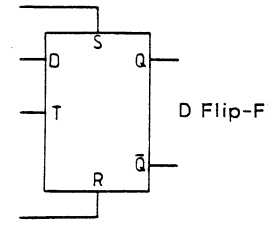
J-K Flip-Flops





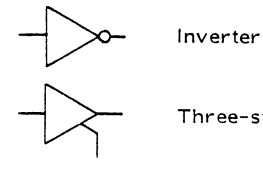


R-S Flip-Flops



D Flip-Flop

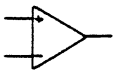
Inverters

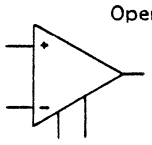


Inverter

Three-state driver

Operational Amplifiers





Operational amplifiers.

Relays(K)

Single-coil relay

Dual-coil relay

Polarized relay

Slow-acting relay

Slow-release relay

Relay with change-over contacts

Contacts

Open contact (make)

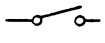
Closed contact (break)

Change-over contact

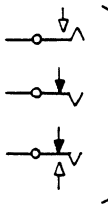
Change-over contact centre off

Make-before-break

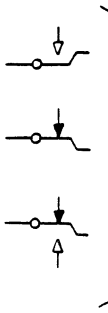
Switches and Keys(S)



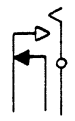
On/Off switch



Locking keys or switches: push on, push off

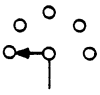


Non-Locking self-releasing keys or switches



Make-before-break

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



Rotary switch.

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

Lamps(V)

Indicator Lamp.

Neon Lamp

Fuses and Cut-outs(F)

Fuse

Circuit breaker

Batteries(B)

Battery one cell

Battery multi cell

Feedthrough Filters(Z)

Feedthrough filter

Ferrite Beads(FB)

Ferrite bead

Crystals(Y)

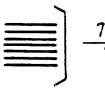
Crystal

Cables and Wires(W)

Usual conductor.

Three conductors

Eight conductors.



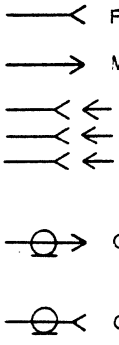
Shift from multiple-line to single-line presentation.

Screened cable.

Coaxial cable.

GRAPHICAL SYMBOLS USED IN CIRCUIT DIAGRAMS

Connectors(J and P)



Female (socket) connector.

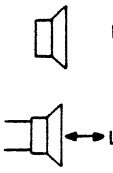
Male (plug) connector

Multi-wire connector.

Coaxial plug.

Coaxial socket.

Loudspeakers(LS)



Loudspeaker.

Loudspeaker-Microphone.

Telephones(TEL)

Telephone.

Single headphone. (Earphone).

Double headphone.

Microphones(M)

Microphone.

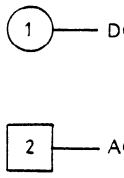
Meters etc.

Indicating instrument.

Balancing instrument. (Galvanometer).

Basic letters see DESIGN STANDARD 10.02.3.1 section 12.

Test Points



DC test point.

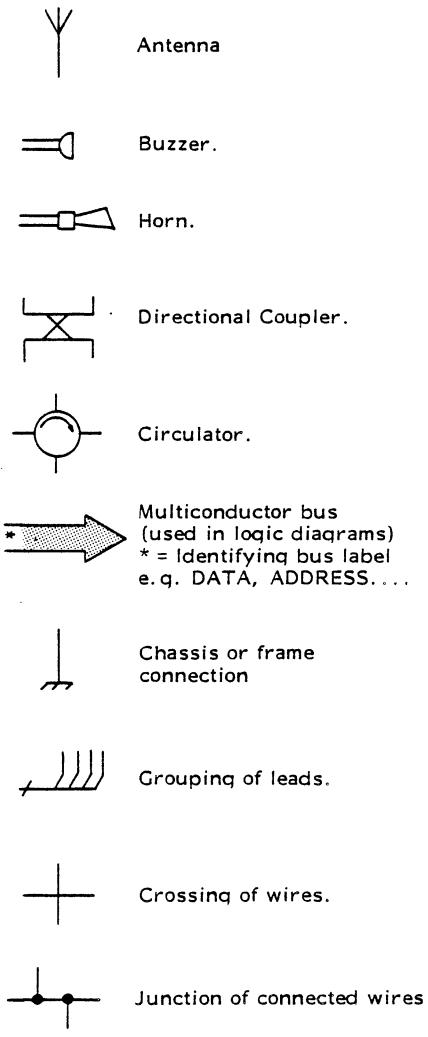
AC test point.

Replaceable Connections(W)

Cross-field connection. (jumper).

Strap.

Miscellaneous



Antenna

Buzzer.

Horn.

Directional Coupler.

Circulator.

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

Chassis or frame connection

Grouping of leads.

Crossing of wires.

Junction of connected wires

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