

SABER™

SECURENET™

Handie-Talkie® Portable Radios
403-512 MHz



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SPECIFICATIONS

GENERAL	TRANSMITTER	RECEIVER
<p>FREQUENCY RANGE: 403-433MHz BANDSPLITS: 440-470MHz (High Power Models) 458-490MHz (High Power Models) 482-512MHz</p> <p>POWER SUPPLY: Rechargeable Nickel-Cadmium Battery or Primary Battery</p> <p>BATTERY VOLTAGE: Nominal: 7.5Vdc Range: 6 to 9Vdc</p> <p>TEMPERATURE RANGE Operating: -30°C to +60°C Storage: -40°C to +85°C</p> <p>DIMENSIONS (HXWXD) Less Battery: 4.42"x2.94"x1.18" (112.27x74.67x29.97 mm) With Light-Capacity Battery: 6.68"x2.94"x1.18" (169.67x74.67x29.97 mm) With Medium-Capacity Battery: 7.56"x2.94"x1.18" (192.02x74.67x29.97 mm) With Ultra-High-Capacity Battery: (or Primary Battery) 8.32"x2.94"x1.18" (211.33x74.67x29.97 mm)</p> <p>WEIGHT NON-KEYPAD Less Battery: 12.22 oz. (347 g) With Light-Capacity Battery: 18.63 oz. (529 g) With Medium-Capacity Battery: 23.87 oz. (678 g) With Ultra-High-Capacity Battery: 25.49 oz. (724 g)</p> <p style="text-align: right;">KEYPAD</p> Less Battery: 12.57 oz. (357 g) With Light-Capacity Battery: 18.98 oz. (539 g) With Medium-Capacity Battery: 24.23 oz. (688 g) With Ultra-High-Capacity Battery: 25.85 oz. (734 g)	<p>RF POWER OUTPUT Low-Power Models: 1-2 Watts High-Power Models: 2-5 Watts</p> <p>FREQUENCY STABILITY (-30°C to +60°C; +25°C REF): ±.0003%</p> <p>MODULATION: Types 20K0F3E (±5kHz for 100% 20K0F1D modulation @ 1000Hz) 20K0F2D</p> <p>FM HUM AND NOISE (COMPANION RECEIVER): -40dB</p> <p>SPURIOUS EMISSION (CONDUCTED AND RADIATED) 1.0W: -67dBc 2.0W: -70dBc 5.0W: -74dBc</p> <p>AUDIO DISTORTION: 3% Maximum</p> <p>AUDIO FREQUENCY RESPONSE: +1,-3dB (6dB/OCTAVE PRE-EMPHASIS; 300-3000Hz)</p> <p>MAXIMUM FREQUENCY SEPARATION: Full Bandsplit (NO DEGRADATION)</p>	<p>SENSITIVITY 20dBQ: 0.4uV Max. 12dBS: 0.35uV Max. Squelch (Programmable)</p> <p>USEABLE BANDWIDTH±5kHz:</p> <p>SELECTIVITY Adjacent channel: -75dB Fourth channel: -80dB</p> <p>INTERMODULATION: -72dB</p> <p>FM HUM AND NOISE: -40dB</p> <p>FREQUENCY STABILITY (-30°C to +60°C; +25°C REF.): ±.0002%</p> <p>AUDIO SPL (AT 30 cm WITH RATED AUDIO): Weighted, 300-3000Hz 90dB Nominal (Non-Submersible) 87dB Nominal (QXK Models)</p> <p>RATED AUDIO OUTPUT: 500mW (At less than 5% distortion)</p> <p>CHANNEL SPACING: 25kHz</p> <p>MAXIMUM FREQUENCY SEPARATION: Full Bandsplit (NO DEGRADATION)</p>
SECURENET		
<p>SCRAMBLE TYPE: Digital ENCRYPTION METHOD: Multi-Register, Non-Linear Combiner ENCRYPTION KEY INITIALIZATION: Random ENCRYPTION KEY GENERATION: External, Hand-Held, Microprocessor-Controlled Key loader Volatile Electronic Memory</p> <p>KEY STORAGE: NUMBER OF KEYS PER RADIO: One ANALOG-TO-DIGITAL CONVERSION: Continuously-Variable Slope Delta Modulation (CVSD) VOICE SAMPLE RATE: 12 Kilobits/Second</p>		

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE

MODEL CONFIGURATION

FACTORY I.D.	POWER LEVEL	FREQ.	SUBMERSIBLE	KEYPAD	DISPLAY
H34QXN7139AN	1W-2W	440-470MHz	No	None	None
H44QXN7139AN	2W-5W	403-512MHz	No	None	None
H34YXN7139AN	1W-2W	440-470MHz	Yes	None	None
H44YXN7139AN	2W-5W	403-512MHz	Yes	None	None
H34QXJ7139AN	1W-2W	448-470MHz	No	3x1	LCD
H44QXJ7139AN	2W-5W	403-512MHz	No	3x1	LCD
H34QXK7139AN	1W-2W	448-470MHz	No	3x5	LCD
H44QXK7139AN	2W-5W	403-512MHz	No	3x5	LCD

FCC DESIGNATIONS

2-Watt Models.....AZ489FT4714

5-Watt Models.....AZ489FT4715

SPECIALIZED TOOLS AND TEST EQUIPMENT

SERVICE AIDS

NTN4720A	SECURENET Bypass Module
REN-4001A•	Housing Eliminator
RPX-4665A	Field Modification Kit/RTX-4005A
RSX-4043A	Rotatorq Tool
RTK-4203A	Program/Test Cable
RTL-4208A	RF Coax Probe
RTL-4224A	Battery Eliminator
RTL-4238A	SABER RF Cable (RTL-4200A to Radio)
RTX-4005B	Portable Products Test Set
TKN8506A	Keyload Cable (Hand-Held Keyloader to Radio)
0180358A60	Keyload Cable (RTL-4200A to Radio)
0180370B85 thru B86	Ungar Table Fixtures
0180386A81	Micro-Tip Soldering Iron
0180386A82	Static Protection Kit
5880348B33	SMA-BNV Adaptor (for Probe RTL-4200A)
6680321B79	Phillips-Head Rotatorq Bit
6680334B48 thru B52	Ungar Service Heads
6680370B88	Frequency and On/Off Switch Spanner Nut Rotatorq Bit
6680370B89	Baseplate Spanner Nut Rotatorq Bit
6680370B90	Antenna Bushing Spanner Nut Rotatorq Bit
6680385A11	Module Extractor
6680387A59	Leadless Component Extractor
6680387A64	Heat Controller With Safety Stand
8407668M01	Display Extender Cable

•If Housing Eliminator RTL4225A is used, it will not be possible to keyload a SABER SECURENET Radio through the cable.

TEST EQUIPMENT

R-1053A	Dual-Trace Oscilloscope
R-2045D	Communications Systems Analyzer with Secure Voice Option
S-1339A	RF Millivoltmeter
S-1347D	Power Supply
RTL-4223A	Charger Tester
RTK-4237A	Battery Tester

FIELD PROGRAMMING EQUIPMENT


CURRENT DRAINS (See Note)

		SABER I	SABER I AND III
STANDBY		90	93
RECEIVE		220	223
H44 MODELS:	5-WATT	3300	3300
	2-WATT	2100	2100
H34 MODELS:	2-WATT	1400	1400
	1-WATT	1200	1200

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

CLEANING

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

	CAUTION
<i>Never allow any alcohol- or solvent-based product to contact any plastic or rubber radio part.</i>	

- Clean internal surfaces with water-activated optical wipes.

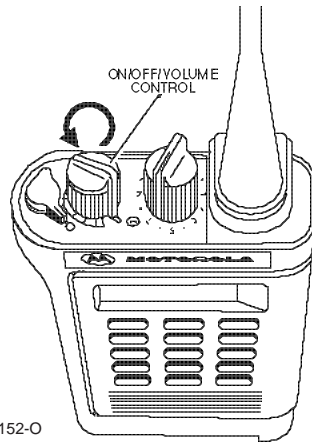
RELATED PUBLICATIONS AVAILABLE SEPARATELY

SABER I SECURENET OPERATING INSTRUCTIONS	68P81045C60
SABER II SECURENET OPERATING INSTRUCTIONS	68P81045C65
SABER III SECURENET OPERATING INSTRUCTIONS	68P81048C40
SECURENET SERVICE MANUAL (VHF)	68P81045C70
SECURENET THEORY/ MAINTENANCE MANUAL.....	68P81045C85
FIELD PROGRAMMER USER'S GUIDE.....	68P81044C65

DISASSEMBLY/REASSEMBLY PROCEDURES

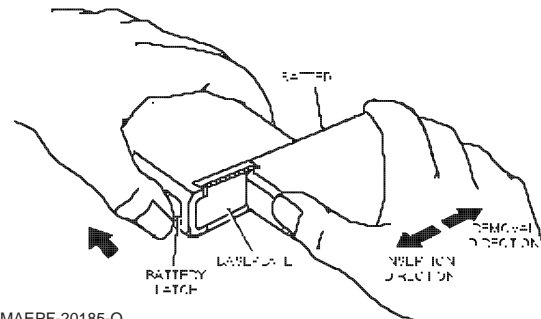
I. DISASSEMBLY

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



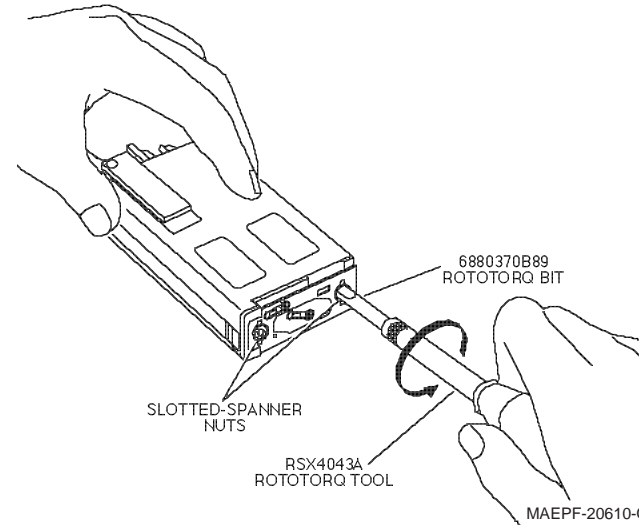
MAEPF-24152-O

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



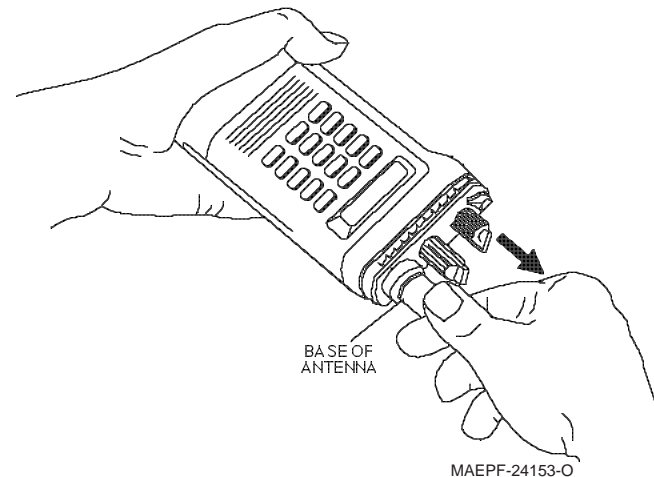
MAEPF-20185-O

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



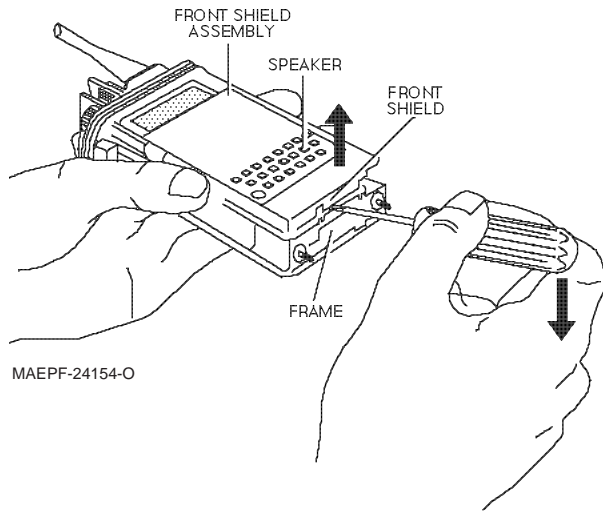
MAEPF-20610-O

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

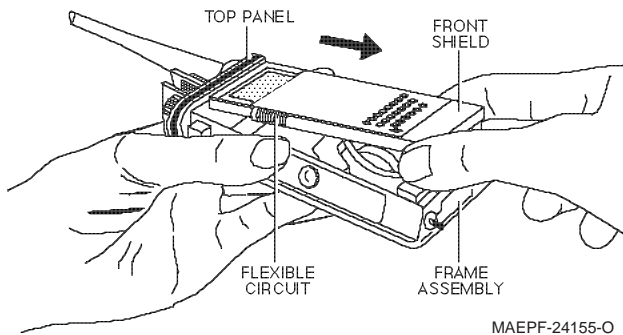


MAEPF-24153-O

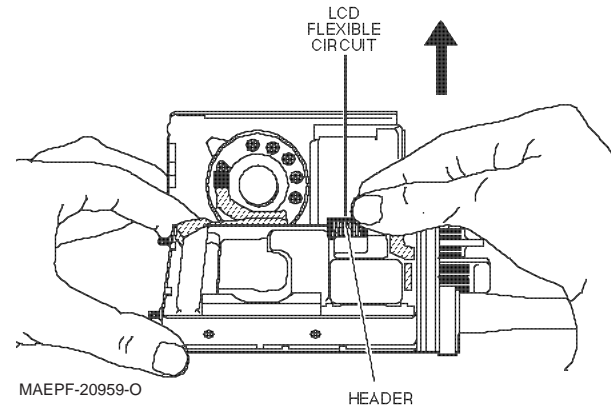
- E. With the speaker facing upward, **remove the front shield assembly** by inserting a thin screwdriver blade between the frame and the bottom of the front shield, and prying gently upward on the front shield until it is disengaged from the frame.



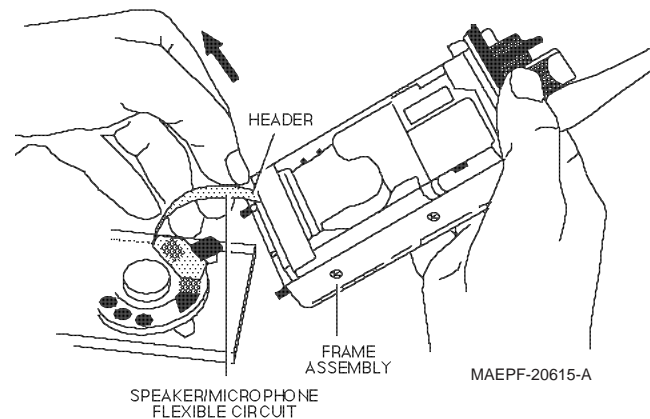
- F. **Lift the front shield assembly** away from the bottom of the frame assembly, then pull it out from under the plastic top panel. Be careful not to pull against the flexible circuits connecting the front shield to the frame assembly.



- G. *ON SABER II AND SABER III RADIOS ONLY:* **Disconnect the LCD interconnect flexible circuit** from the frame assembly by pulling the header straight out and away from the main printed circuit board.



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



CAUTION

Refer to "SERVICING MAJOR SUBASSEMBLIES" (Section II) and the appropriate exploded view diagrams at the back of this manual before attempting further dis-

II. SERVICING MAJOR SUBASSEMBLIES

A. Baseplate

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

B. Housing Assembly

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

C. Control Top Panel

- The control top panel is fastened to the frame by the on/off/volume and frequency switches, and two self-tapping screws; it should be removed from the frame only if absolutely necessary. If repair is required, always start the screws into the control top panel by hand before tightening them with a torque wrench; this will help avoid cross-threading and stripping of the plastic panel.
- The on/off/volume and frequency knobs are 2-part kits; each kit consists of a knob and an insert. Once an insert is removed, it cannot be used again; there-

escutcheon. A new frequency knob and insert must be used each time this change is made.

NOTE

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

D. LCD/Front Shield Assembly

- The LCD assembly can be replaced on SABER II and III radio PC board assemblies, but the instructions on the replacement kit's instruction sheet must be strictly followed.
- The microphone boot must be properly oriented and seated in the front shield **before** the microphone is pressed into place.

E. Backshield Assembly

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

F. Circuit Boards and Modules

- All modules plug into sockets on the main circuit board.
- Some modules are fastened to the main board and frame with screws; remove these screws before attempting to unplug a module. **Never** substitute any screw.
- Several of the modules are designed to be removed with a standard DIP extractor tool (OK-1 or equivalent). Always use the extractor tool when removing these modules to avoid damaging their leads.
- Some modules have guide pins to assist in insertion or removal. Pressure may be applied to these guide pins to aid removal of a module if, and only if, it is distributed evenly over all guide pins on the module. *Applying all the force to a single guide pin will cause severe damage to the module.*
- The U900 module is not serviceable

- When electrically testing and/or probing the main circuit board with the back shield removed, always use the three finger screws on the SABER housing eliminator service aid to provide grounding to VCO synthesizer module U300 (two places), and the rf ground clip (one place).
- When removing the main circuit board from the frame assembly, do the following:
 1. Remove the back shield assembly.
 2. Unplug the PTT/controls flexible circuit.
 3. Remove power amplifier module U202.
 4. Remove the two main compression connector screws.
 5. Lift the board at the bottom and pull out from under the control top panel.
- The rf and ground contacts at the top of the main circuit board are exposed when the board is removed from the frame. Special care must be taken to avoid accidental damage to these contacts.

G. Frame Assembly

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

H. Dual-Function Switch (S801) and Actuator Assembly

- Before removing the switch, remove the knob by gently separating the two arms of the switch bracket (located between the switch and the main O-ring seal) and pulling upward on the knob.
- Before reinserting the knob, ensure that the slot in the switch is properly aligned with the blade on the knob's shaft.

- When the knob is properly inserted, the arms of the switch bracket will snap into position (approximately 0.2 inches apart), the knob will not be loose in the switch bracket, and the bracket will hold the switch firmly against the inside of the top control panel. If this is not the case, replace the switch bracket.

III. REASSEMBLY

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

- that the speaker/microphone connector (and the LCD interconnect header on SABER II and III radios) is correctly aligned so that no twisting or pinching of the flexible circuit occurs when the front shield is reattached to the frame assembly.
- that the two extended tabs at the top of the front shield are properly inserted into the slots between the frame and the control top panel.
- to tighten all hardware loosened or removed during disassembly per the torque specifications listed in the Torque Specifications table. Use recommended torque driver (Motorola RSX4043A Rotatorq Tool or equivalent).
- that there is no foreign material on the main O-ring or stud seals.



CAUTION

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

- to properly orient the completed frame assembly before inserting it into the radio housing.
- *that the PTT switch and monitor button are not depressed while the frame is being inserted into the housing.*

TORQUE SPECIFICATIONS

APPLICATION	TORQUE (IN.LBS.)	TORQUE (N-m)	TORQUE BIT NO.
Antenna Bushing Spanner Nut	20	2.27	6680370B90
Back Shield to Frame Screws	> 2.8	0.28	6680321B79
Bottom Connector to Frame Screws	> 2.8	0.28	6680321B79
Frequency Switch Spanner Nut	8	0.91	6680370B88
All Module Screws	> 2.8	0.28	6680321B79
Power Contact Screws	> 2.8	0.28	6680321B79
Slotted-Spanner Nut (Baseplate)	- 6	0.45	6680370B89
Top Panel to Frame Screws	2	0.23	6680321B79
Volume Pot Spanner Nut	8	0.91	6680370B88

SECURENET RADIO FUNCTIONAL TESTS @ 7.5Vdc)

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) ≤150 Hz Mid-Band)
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.	Input a 1kHz tone @ ≈50 mVrms to radio's microphone (through test box). PTT continuous	Listen for 1kHz tone from monitor. Deviation should be ≥4.0kHz and ≤5.0kHz - (for 25kHz) ≥3.0kHz and ≤4.0kHz - (for 20kHz)
CODED VOICE MODULATION	Load monitor with same key used in radio. Select proper algorithm and DEVIATION test with SECURE COM TEST MENU on screen.	Set to channel corresponding to freq. and power level under test. With key loaded, set radio to coded mode.	Same as above.	Listen for decoded 1kHz tone from monitor. Deviation should be ≥3.5kHz and ≤4.5kHz. (for 25kHz) ≥2.5kHz and ≤3.5kHz - (for 20kHz)
RECEIVE PERFORMANCE				
RATED AUDIO	Set to GENERATOR ; frequency to radio receive frequency; 1 mV rf output; 1kHz modulation; 3kHz 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.
12dB SINAD	Same as above, except set	Set to open squelch	Set to speaker load	Reduce rf level to achieve

INSERT DIAGRAMS
(L1) CEPF-17668-O (20% RED, 133 LINE)
(L6) CEPF-17669-O (20% BLK, 133 LINE)
(OL) CEPF-17670-O (100% BLK.)
R.T. 50%

6 LAYER CIRCUIT BOARD COPPER DETAIL VIEWING
COPPER STEPS AT EDGE OF BOARD IN FIGURE
LAYER SEQUENCE.

