TRICOM
RESEARCH INC.

OPERATOR'S MANUAL
TCR-HHR-05 TACTICAL HANDHELD RADIO COMMUNICATIONS SET

DOCUMENT # 90400-01233

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Revision	Description	Date
P1	Preliminary Release	2 Nov 2015
P2	Updated Table 1-2 to remove CD call out	19 May 2016
P3	Updated Figure 1-5 to correct cable description	15 June 2016

Note: The latest version of this manual can be downloaded from our website at http://www.tricomresearch.com/downloads.html.

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ABBREVIATIONS AND GLOSSARY

AGC	Automatic gain control
ALC	Automatic level control
AM	Amplitude modulation
ANT	Antenna
ANW2	Advanced Networking Wideband Waveform
BPS	Bits per second
CT	Cipher text
CW	Continuous wave
COMSEC	Communications security
dB	Decibel
dBm	Decibel referenced to 1 milliwatt (0 dBm = 1 mW)
FM	Frequency modulation
Hz	Hertz
IW	Integrated Waveform
JITC	Joint Interoperability Test Center (DISA)
kHz	Kilohertz
LED	Light emitting diode
LNA	Low Noise Amplifier
LOS	Line of sight
MHz	Megahertz
mW	Milliwatt
PT	Plain text
PTT	Push to Talk
RCV	Receive
ROIP	Radio Over IP
SATCOM	Satellite Communications
SF	Single Frequency
SRW	Soldier Radio Waveform
UHF	Ultra-high frequency
VDC	Volts, direct current
VSWR	Voltage standing wave ratio
W	Watt
WB	Wideband
XMT	Transmit

Safety Summary

The following are general safety precautions that are not related to specific procedures. These precautions do not appear elsewhere in this manual. You must read and understand these precautions before replacing, disassembling, or performing maintenance on the TCR-HHR-05 Tactical Handheld Radio Communications Set.

DO NOT SERVICE OR ADJUST ALONE

Maintenance and operating personnel should not perform electrical or power measurements, power-up, or servicing without the immediate presence of another person capable of rendering aid.

RESUSCITATION

Personnel working with or near high voltages shall be familiar with the methods of artificial respiration.

STANDARD GOOD PRACTICES

Personnel shall observe all standard practices when installing, replacing, operating, and testing equipment (i.e., dry hands and clothing, remove personal jewelry, use rubber mats and other insulating devices, etc.).

WARNING

Incorrect reassembly may result in a risk of electric shock or fire. To reduce risk of electric shock, unplug the unit from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.

CAUTION

Use of an attachment not recommended or sold by the manufacturer may result in risk of fire, electric shock, or personal injury.

To reduce risk of damage to electric plug or cord, pull by plug rather than cord when disconnecting TCR-HHR-05.

Make sure cords are positioned so that they will not be stepped on, tripped over, or otherwise subjected to damage or stress.

Do not operate the unit with damaged cable or connector. Replace damaged cables or connectors immediately.

Do not operate the unit if it has received a sharp blow, been dropped, or otherwise damaged in anyway; take it to a qualified serviceman.

Do not disassemble the unit; take the unit to a qualified serviceman when service or repair is required.

CHAPTER 1

GENERAL INFORMATION AND SAFETY INSTRUCTIONS

1. INTRODUCTION.

This manual has been prepared by Tricom Research for the purpose of providing the user all the information necessary to operate the TCR-HHR-05 Tactical Handheld Radio Communications Set.

a. Chapter 1 – General Information - provides safety and important information about the TCR-HHR-05 Tactical Handheld Radio Communications Set.

b. Chapter 2 – Operation - provides information necessary for operating the TCR-HHR-05 and theory of operating procedures describing how the TCR-HHR-05 accomplishes its intended purpose.

c. Chapter 3 – Maintenance and Warranty Information- provides information regarding TCR-HHR-05 preventive care and corrective maintenance procedures.

The TCR-HHR-05 is a tactical handheld radio communications system supporting four Harris AN/PRC-152 or four AN/PRC-148 series multi-band tactical radio nets with integrated power amplifiers as part of a man portable tactical radio system or as required within other platform configurations such as vehicular or shipboard communications systems.

1.1. Safety Precautions.

This manual contains important safety and operating instructions for the TCR-HHR-05, review the Safety Summary at the beginning of this Technical Manual.

Use of an attachment not recommended or sold by Tricom Research may result in risk of fire, electric shock, or personal injury.

Make sure cords are positioned so that they will not be stepped on, tripped over, or otherwise be subjected to damage or stress.

Do not operate the system with a damaged cable or connector, replace it immediately.

1.2. Physical Description.

The TCR-HHR-05 contains a pair of dual monolithic power amplifiers (two TCR-MBA-50 WB power amplifiers in a single assembly) with an integrated RF switch that provides proper RF routing to the antenna based on the mode of operation selected on the PA's front panel (SAT, LOS or WB); each dual power amplifier assembly has a dedicated power supply. The front panel of each power amplifier has been remoted and integrated with the radio's power adapter/mount for easy access. The system is contained within a rugged, water proof (when lid is closed and secured) thermoplastic transit case designed to withstand the harsh conditions encountered in the tactical communications environment. All connections to electrical power, data (USB and KDU only with optional cable adapters), audio and RF input/output are contained in an external jack panel located on the rear side of the unit (Refer to Figure 1-6). Temperature controlled integrated fans provide air cooling for the internal components.

1.3. Specifications.

TCR-HHR-05 Technical Specifications are provided in Table 1-1. Refer to the TCR-MBA-50 WB Operator's Manual for more detailed information on its technical specifications.

Table 1-1 Technical Specifications of the TCR-HHR-05

Frequency Range	30–512 MHz (applicable to all four TCR-MBA-50 WB Power Amplifiers)
RF Output Power	25/50 Watts (applicable to all four TCR-MBA-50 WB Power Amplifiers)
Input VSWR	<1.5:1 (applicable to all four TCR-MBA-50 WB Power Amplifiers)
Input/Output Impedance	50 Ohms (nominal, applicable to all four TCR-MBA-50 WB Power Amplifiers)
Harmonics	–60 dBc (typical, applicable to all four TCR-MBA-50 WB Power Amplifiers)
Rx/Tx Isolation	Antenna location and frequency dependent
AC Input Range	90-264 VAC, 47-440 Hz
Size	
Length	21.7 inches
Width	14.1 inches
Height	8.9 inches
Weight	59 lbs without radios
Operating Temperature	–30°C to 60°C
Environmental	Splash Proof/Rain Resistant (when lid is closed and secured)
Construction	Thermo Plastic Case

1.4. Equipment Provided.

The TCR-HHR-05 system contains the equipment listed in Table 1-2.

Table 1-2 TCR-HHR-05 Equipment Included

Equipment	Part Number	Quantity
TCR-HHR-05 Tactical Handheld Radio Communications Set	11000-00831	1
TCR-HHR-05 Quick Reference Guide	90400-01230	1
TCR-HHR-05 Operator's Manual	90400-01233	1
AC Power Input Cable	77500-00614	1
USB Cable (for PA remote control and radio data)	77500-00450	1
TCR-SPK-02 Dual Net Amplified Speaker	11000-00771	2
TCR-SPK-02 Speaker Interface Cable	77500-00615	2
Dual Net Handset	79000-00503	2

Tricom P/N 79000-00503 Tricom P/N 77500-00450 Tricom P/N 11000-00771

Figure 1-1 Equipment provided (Dual Net Handset, USB Cable, and Dual Net Speaker)

Figure 1-2 AC Power Cable (Included) Tricom P/N 77500-00614

Table 1-3 AC Power Cable Pinout

CONNECTION		
73200-00704	77216-96011	73100-00598
A	WHITE	A
B	GREEN	B
C	BLACK	C

Figure 1-3 Speaker Cable (Included) Tricom P/N 77500-00615

Table 1-4 Speaker Cable Pinout

CONNECTION			
73100-00584	77624-00001		73200-00683
8, EXT_GND	PAIR 2	SHIELD	1
6, RADIO B IN		BROWN	2
7, PTT_B		BLACK	3
5, TX_B	PAIR 3	WHITE	4
4, TX_A		BLACK	5
2, RADIO A IN	PAIR 4	BLUE	6
3, PTT_A		BLACK	7
1, EXT_GND		SHIELD	8
9, BIAS_A			9, NC
10, BIAS_B			10, NC
11, 28VDC	PAIR 6	GREEN	11
12, GND		BLACK	12
13			13, NC
14			14, NC
15			15, NC

Figure 1-4 AN/PRC-152 KDU/USB Adapter Cable (Optional) Tricom P/N 77500-00621

Table 1-5 AN/PRC-152 KDU/USB Adapter Cable Pinout

CONNECTION				
73100-00584	**CABLE 4**	73100-00585 (KDU)	**CABLE 5**	73100-00585 (USB)
1	BLACK	1		
2	ORANGE	2		
3	GREEN	7		
4	BROWN	6		
5	YELLOW	5		
6	BLUE	4		
7	RED	3		
12			RED	7
13			WHITE	5
14			GREEN	1
15			BLACK	4
8,9,10,11				

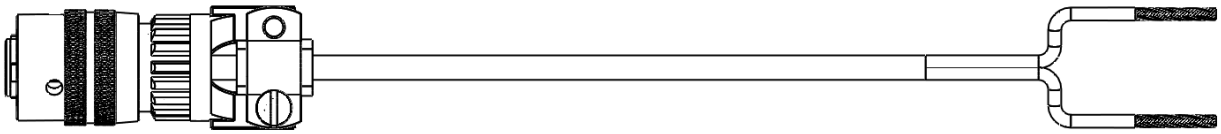

Figure 1-5 Auxiliary Power Output Jack DC Cable (1 included) (Tricom P/N 77500-00649

Table 1-6 Auxiliary Power Output Jacks (5 VDC and 24 VDC) Pinout

CONNECTION	
A	RED
B	BLACK

1.5 Controls, Connectors and Indicators.

Figure 1-6 TCR-HHR-05 Egress Panel

Table 1-7 TCR-HHR-05 Egress Panel

1	RAD4 Antenna Port	12	RAD1 Antenna Port
2	RAD4 USB Data Interface	13	Auxiliary 24 VDC Output (2A)
3	RAD4 KDU Interface	14	Auxiliary 24 VDC Output (2A)
4	RAD3 KDU Interface	15	AC Power Input Jack
5	RAD3 USB Data Interface	16	RAD1 Handset
6	RAD3 Antenna Port	17	RAD1/RAD2 Speaker Jack
7	RAD2 Antenna Port	18	RAD2 Handset Jack
8	RAD2 USB Data Interface	19	RAD3 Handset Jack
9	RAD2 KDU Interface	20	RAD3/RAD4 Speaker Jack
10	RAD1 KDU Interface	21	RAD4 Handset Jack
11	RAD1 USB Data Interface		

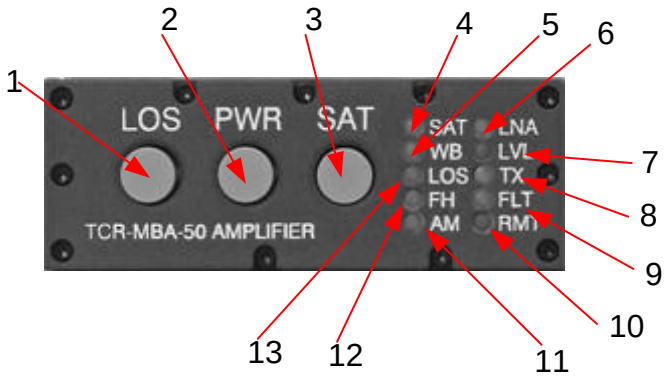

Figure 1-7 TCR-MBA-50 WB Power Amplifier Front Panel

Table 1-8 TCR-HHR-05 Power Amplifier Front Panel

1	LOS Mode Select Button (toggles between FM, AM, SINCGARS, HAVE QUICK, WB and WB FH LOS modes)	8	Transmit LED Indicator
2	Power ON/OFF, RF Power Level and LED Brightness Adjust Button	9	Fault LED Indicator
3	UHF SATCOM Mode Select Button (toggles between SATCOM LNA OFF and SATCOM LNA ON modes)	10	Remote LED Indicator
4	SATCOM Mode LED Indicator	11	AM Mode LED Indicator
5	WB Mode LED Indicator	12	Frequency Hopping Mode LED Indicator
6	SATCOM LNA ON Indicator	13	Line of Sight LED Mode Indicator
7	LED Indicator not used		

Refer to TCR-MBA-50 WB Operator's Manual for detail information on the operation of the Power Amplifier.

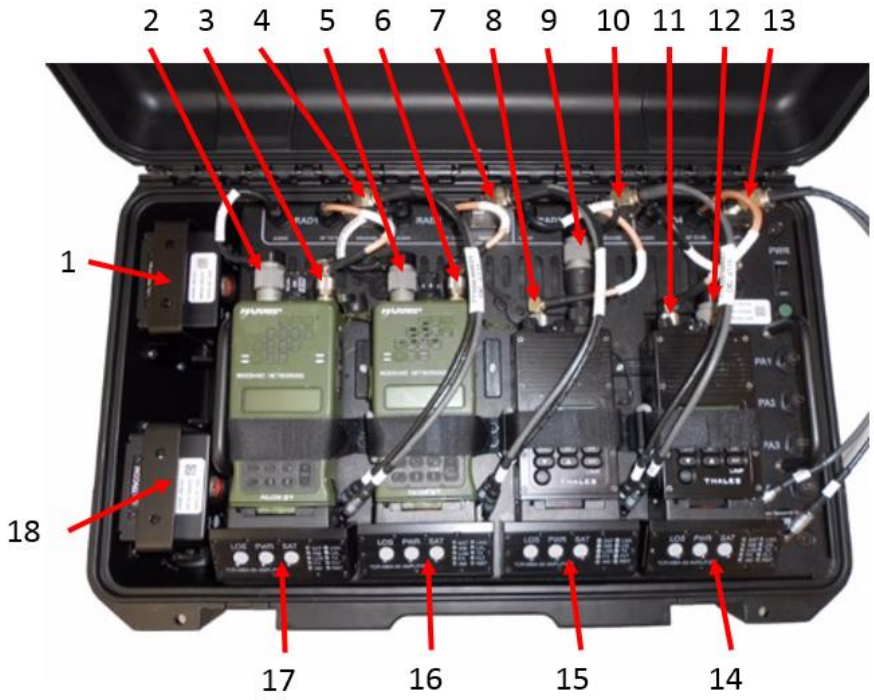

Figure 1-8 TCR-HHR-05 System Components

Table 1-9. TCR-HHR-05 System Components.

1	TCR-SPK-02 Dual Net Amplified Speaker	10	RAD3 Data Cable Adapter (Optional)
2	RAD1 Audio Cable	11	RAD4 RF Cable
3	RAD1 RF Cable	12	RAD4 Audio Cable
4	RAD1 Data Cable Adapter (Optional)	13	RAD4 Data Cable Adapter (Optional)
5	RAD2 Audio Cable	14	RAD4 Radio Mount/PA Control Assembly
6	RAD2 RF Cable	15	RAD3 Radio Mount/PA Control Assembly
7	RAD2 Data Cable Adapter (Optional)	16	RAD2 Radio Mount/PA Control Assembly
8	RAD3 RF Cable	17	RAD1 Radio Mount/PA Control Assembly
9	RAD3 Audio Cable	18	TCR-SPK-02 Dual Net Amplified Speaker

Figure 1-9 TCR-HHR-05 Controls and Indicators

Table 1-10 TCR-HHR-05 Controls and Indicators

1 Auxiliary 5 VDC Output Power (6 A)	6 PA3 USB Interface (used for remote control)
2 Main Power Switch/Circuit Breaker	7 PA4 USB Interface (used for remote control)
3 Power ON LED Indicator	8 Handles (used to remove and replace Main Assembly)
4 PA4 USB Interface (used for remote control)	9 AN/PRC-148 Radio Spacers (5 places)
5 PA2 USB Interface (used for remote control)	

CHAPETR 2

OPERATING INSTRUCTIONS

2. INTRODUCTION.

This chapter will list in chronological order the steps necessary to operate the TCR-HHR-05 safely and efficiently.

2.1. System Setup. Refer to Figures 2-1 for a system block diagram of the TCR-HHR-05.

2.1.1 Position the AN/PRC-148 radio spacers in the horizontal position for AN/PRC-148 radio applications or in the vertical position for AN/PRC-152 radio applications.

2.1.2 Move the radio/PA control mounts to the vertical position and install radios.

2.1.3 Move the mounted radios down until they rest on the base plate for the AN/PRC-152 radios or on the radio spacers for the AN/PRC-148 radios.

2.1.4 Connect the audio, RF and data cables to each radio.

2.1.5 Secure the radios with the straps provided.

2.1.6 Connect AC power cord to the AC power input jack.

2.1.7 Connect the speaker cables to the speaker ports on the rear egress panel.

2.1.8 Connect the dual net speaker (TCR-SPK-02) to the speaker cables.

2.1.9 Connect the dual net handset to the handset connector on the speakers.

2.1.10 Connect data cables as necessary (only USB and KDU interfaces are provided). Optional data interface cable adapters are required for data interfaces.

2.1.11 Connect antenna cables to the appropriate antenna port.

2.1.12 If applicable, connect power cable to the self-steering SATCOM antenna to the 24 VDC output jack on the egress panel.

2.1.13 If applicable, connect power cable to Radio Over IP router to the 5 VDC output jack located on the base plate adjacent to the main power switch.

CAUTION

- Lid must remain open during operation for adequate cooling
- 25 watt mode is recommended for normal SATCOM operation
- Ensure antenna attached is rated up to 50 watts
- Ensure there is adequate antenna and frequency separation to avoid cosite interference
- For best thermal performance, use PA1/PA3 for nets with the highest duty cycle and PA2/PA4 for nets with the lowest duty cycle

2.2. System Operation. Refer to the radio and power amplifier manuals for setup and operations instructions of these components.

2.2.1 Turn on the main power switch and verify that the green power indicator is illuminated.

2.2.2 Turn on power to all radios and power amplifiers.

2.2.3 Select the appropriate net on each radio and ensure that the radio's power output setting is at least 2 watts (5 watts recommended).

2.2.4 Select the appropriate mode of operation (SAT, LOS or WB) and power setting on each power amplifier.

2.3. Power Amplifier Remote Control. Refer to paragraphs 3-6-7 and Appendix A for instructions on how to control the power amplifier remotely using the USB interface provided for each PA**.**

2.4. Radio Over IP (ROIP) Operation. The TCR-HHR-05 provides 5 VDC at 6 Amps (located on the top panel next to the main power switch) and individual handset jacks (located on the rear egress panel) to facilitate the interface and operation of the BASICS ROIP Gateway from Vocality. Refer to the BASICS operator's manual for setup and operation of the TCR-HHR-05 for voice over IP.

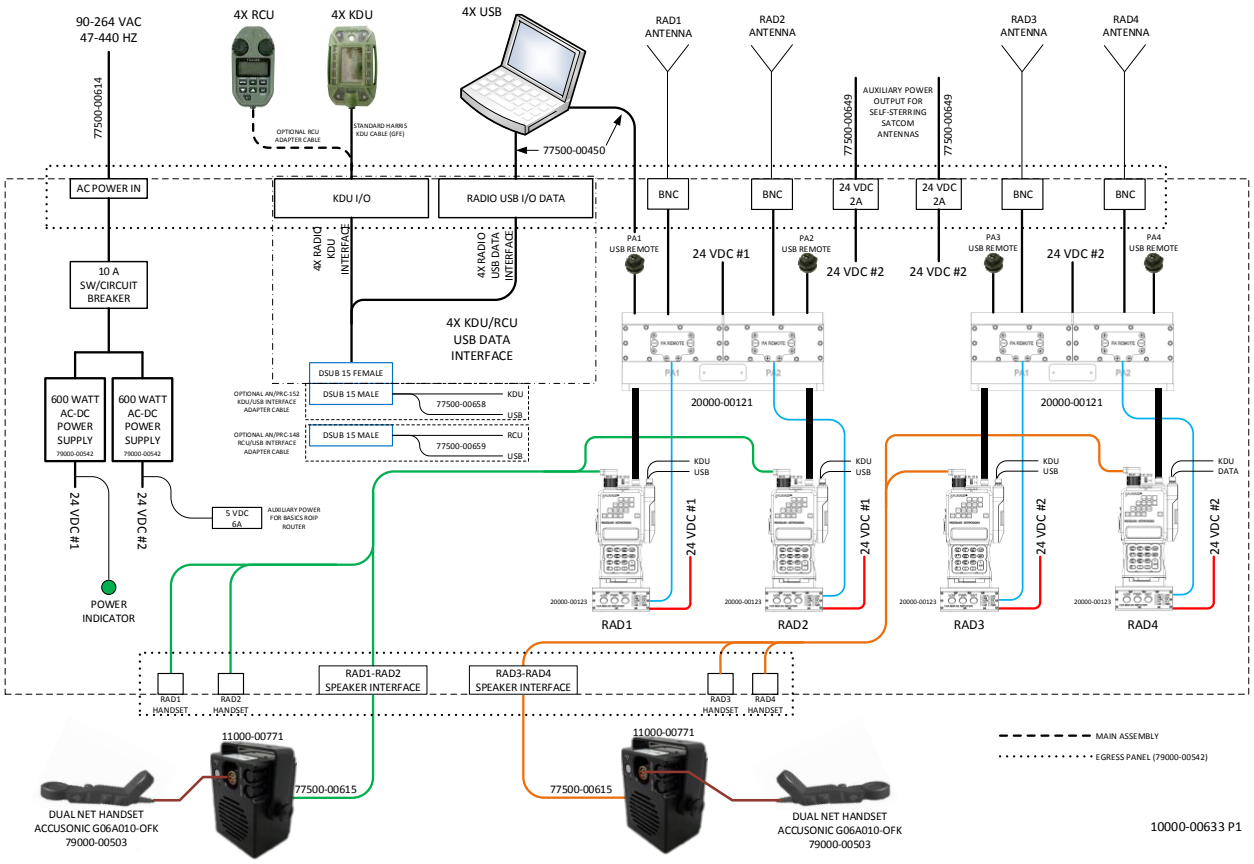

Figure 2-1 TCR-HHR-05 Signal Flow Block Diagram.

CHAPTER 3

MAINTENANCE AND WARRANTY INFORMATION

3. INTRODUCTION.

This chapter provides procedures for maintenance of the TCR-HHR-05 Tactical Handheld Radio Communications Set.

3.1. Preventive Maintenance.

All maintenance procedures are in the subsequent sections.

3.1.1. Dirt and Dust.

All external components to the TCR-HHR-05 can be cleaned with a water dampened non-abrasive cloth and allowed to air dry or wipe dry with a clean dry non-abrasive cloth.

3.1.2. Oil and Grease.

All external components of the TCR-HHR-05 can be cleaned with a mild soap/water solution using a non-abrasive cloth. Rinse with water dampened non-abrasive cloth and allowed to air dry or wipe dry with a clean dry non-abrasive cloth.

3.1.3. Visual Inspections.

Regular inspection of all cables should be performed to ensure that they are free from damage (i.e., cuts or kinks in outer cable jacket, bent pins, or corrosion). Ensure that the fan assembly under the case is free from obstructions that there are no signs of damage to the protective stainless steel mesh.

3.1.4. Self-Test.

Regularly check the TCR-HHR-05 for faults. There is no built in system self-test; however, the system components can be checked individually to ensure they meet all their specifications.

3.1.5. Power Out Checks.

It is recommended that power out should be checked on the TCR-MBA-50 WB power amplifier occasionally to prevent any performance degradation to the TCR-HHR-05 Tactical Handheld Radio Communications Set.

a. Hook up a watt meter in line with the external antenna port under test.
b. Turn the TCR-HHR-05 and watt meter on and place the watt meter in FWD power.
c. Setup the radio for the net under test (RAD1-RAD4) for a minimum of 2 watts (5 watts recommended), FM at 300 MHz and the PA for the appropriate mode under test (LOS, SAT, WB) key up RAD2 and verify that the watt meter reads the power level specified in Table 3-1.
e. Turn off and disconnect the watt meter and return the TCR-HHR-05 to normal configuration.

Table 3-1. Power Output Test

MODE	POWER OUTPUT (WATTS)
SAT	10, 15, 25, 35, 50
LOS	25, 50
WB	20

3.2. Corrective Maintenance.

The TCR-HHR-05 has limited user serviceable parts. Table 3-2 contains a list of serviceable parts that may be obtained from Tricom Research. Units requiring corrective maintenance should be sent to Tricom Research for repair. Contact information is provided in section 3.4.

Table 3-2. TCR-HHR-05 Equipment Parts List

Equipment	Part Number
Dual Power Amplifier Assembly	20000-00121
PA Remote/Radio Mount Assembly	20000-00123
600 Watt AC Power Supply Assembly	79000-00542
Auxiliary Power Cable	77500-00649
AC Power Input Cable	77500-00614
USB Cable (for PA remote control and radio data)	77500-00450
TCR-SPK-02 Dual Net Amplified Speaker	11000-00771
TCR-SPK-02 Speaker Interface Cable	77500-00615
Dual Net Handset	79000-00503

3.3. Warranty Maintenance.

WARRANTY STATEMENT

Tricom Research warrants to its customers that the products it manufactures and sells will be free from defects in materials and workmanship for a period of one (1) year.

This warranty shall not apply to any defect, failure, or damage caused by improper use or inadequate maintenance and care. Tricom Research shall not be obligated to provide service under this warranty to repair, service, or modify these products.

In order to obtain service under this warranty, customers must return the failed unit to Tricom Research with a description of the failure, contact information (in case questions arise and to speed up processing of guarantee claims), and a return shipping address. Tricom Research will return any failed unit at Tricom Research's cost.

NOTE

THIS WARRANTY DOES NOT APPLY TO ANY EQUIPMENT AND/OR ACCESSORIES NOT SUPPLIED BY TRICOM RESEARCH AS PART OF THE TCR-HHR-05 SYSTEM SUCH AS BATTERIES, RADIOS AND ANY CABLES NOT SUPPLIED WITH THE SYSTEM.

3.4. Contact Information.

Please call (949) 250-6024 to obtain an RMA number prior to returning any failed unit(s):

Tricom Research, Inc.
17981 Sky Park Circle
Suite M
Irvine, California 92614
Phone: (949) 250-6024
Fax: (949) 250-6023
Email: info@tricomresearch.com
www.tricomresearch.com

RMA requests may be submitted on-line at: http://www.Tricomresearch.com/rma_form.html