

TECHNICAL MANUAL

**OPERATOR'S AND UNIT MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)**

**SPACE HEATER, CONVECTIVE
NSN 4520-01-431-8927**



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**HEADQUARTERS, DEPARTMENT OF THE ARMY
29 JANUARY 2002**

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DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 29 January 2002

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FOR

SPACE HEATER, CONVECTIVE (SHC)

NSN 4520-01-431-8927

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter together with DA Form 2028 (Recommended Changes to Publications and Blank Forms), located in the back of this manual, directly to: Commander, U.S. Army Soldier and Biological Chemical Command, ATTN: AMSSB-RIM-E(N), Kansas Street, Natick, MA 01760-5052. You may also send in your recommended changes via electronic mail directly to amssb-rim-e@natick-army.mil. A reply will be furnished to you. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

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HOW TO USE THIS MANUAL

This manual contains General Information, Operating Instructions, Operator Preventive Maintenance Checks and Services (PCMS), Troubleshooting, and Maintenance/Repair instructions for the Convective Space Heater.

Chapter 1 contains introductory information on the SHC and its associated equipment as well as a Theory of Operation. Chapter 2 includes operating instructions under usual and unusual conditions. Chapter 3 contents include operator troubleshooting, PMCS, and service procedures. Chapter 4 contains Unit Maintenance instructions. Chapter 5 contains Direct Support Maintenance instructions. Chapter 6 contains references and other supporting information. Chapter 6 also includes the Repair Parts and Special Tools List (RPSTL) which identifies those parts or tools which are unique to the operation and maintenance of this equipment.

Manual Organization and Page Numbering System. The manual is divided into six major chapters that detail the topics mentioned above. Within each chapter are work packages covering a wide range of topics. Each work package is numbered sequentially starting at page 1. The work package has its own page numbering scheme and is independent of the page numbering used by other work packages. Each page of a work package has a page number of the form XXXX YY-ZZ where XXXX is the work package number (e.g. 0010 is work package 10) and YY is the revision number for that work package and ZZ represents the number of the page within that work package. A page number such as 0010 00-1/2 blank means that page 1 contains information but page 2 of that work package has been intentionally left blank.

Text and Illustrations. Descriptive text and procedures are always accompanied by one or more illustrations. The text or procedure will be annotated with find numbers such as "(1)" that correspond to a specific callout on the illustration. In this technical manual, the descriptive text or procedure will always precede the illustration. Therefore, when reading a section in the manual, always look for the accompanying illustration to follow the section.

Finding Information. The Table of Contents permits the reader to find information in the manual quickly. The reader should start here first when looking for a specific topic. The Table of Contents lists the topics contained within each chapter and the Work Package Sequence Number where it can be found.

Example: If the reader were looking for instructions on "Preventive Maintenance Checks and Services", which is an Operator Maintenance topic, the Table of Contents indicates that Operator Maintenance information can be found in Chapter 4. Scanning down the listings for Chapter 4, "Preventive Maintenance Checks and Services" information can be found in WP 0010 00 (i.e. Work Package 10).

An Alphabetical Index can be found at the back of the manual, and lists specific topics with the corresponding work package.

**SPACE HEATER, CONVECTIVE (SHC)
GENERAL INFORMATION**

SCOPE

Type of Manual. Operator's, Unit, and Direct Support Maintenance, including RPSTL.

Part Number and Equipment Name. Part Number 5-13-5600 U.S. Army Modular Command Post System Space Heater, Convective.

Purpose of Equipment. Heats a modular command post system (Tent) or other equivalent enclosure.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, Functional Users Manual for The Army Maintenance Management System; DA Pam 738-75 1, Functional Users Manual for The Army Maintenance Management System - Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

For destruction procedures for materiel, refer to TM 750-244-3.

PREPARATION FOR STORAGE OR SHIPMENT

See unit maintenance instructions (WP 0042) for procedures that insure safe storage or shipment of the heater.

OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS.

Shortened nomenclature is used in this manual to make procedures easier for you to read. A cross-reference between the shortened nomenclature and the official nomenclature is shown in the following table.

Table 1. Nomenclature Reference

Manual Nomenclature	Official Nomenclature
Heater	U.S. Army Modular Command Post System Space Heater, Convective
Tent	Modular Command Post System

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your heater needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to Commander, U.S. Army Soldier and Biological Chemical Command, ATTN: AMSSB-RIM-E(N), Kansas Street, Natick, MA 01760-5052. We will send you a reply.

SAFETY, CARE, AND HANDLING

General Safety

While in operation, the heater presents a potential burn and carbon monoxide hazard. Proper precautions should be observed while operating the heater.

Observe all warning and caution notes that appear before each maintenance operation. Refer also to the Warning Summary.

Handling



WARNING

The Space Heater Convective weighs approximately 74 pounds (33.6 kg) without accessories. Two persons must carry the unit, lifting with legs, not back, to prevent injury.



WARNING

DO NOT MOVE THE HEATER ASSEMBLY WHILE ANY OF THE ADVISORY LIGHTS ARE LIT.

Small, portable, shelter heaters of this type are not designed to be moved during operation or before purge cycles are complete. Serious injury, burns, or death can occur if the heater assembly is moved while operating or before the HEATER ON/ON-HOLD advisory light goes OFF indicating the end of operation, post purge, and cool down cycle completion.

During operation, some metal components of the heater assembly, such as the debris grill on the outlet duct, the upper and lower heater housing assemblies, combustion exhaust pipe, etc., can cause severe burn injuries if contact with bare skin occurs.

During heater operation, air leaving the HEATED AIR OUTLET of the heater and passing through outlet duct with louver may exceed 220°F. Make sure tent personnel are aware of burn hazards and equipment hazards presented by the heated air and the louver.

Combustible material must be kept at least 2 feet away from the sides of the heater during operation.

Do not attempt service procedures on a burner that has recently been in operation. Let the burner cool down before performing these procedures to avoid the possibility of serious burns.

CORROSION PREVENTION AND CONTROL (CPC)

Corrosion Prevention and Control of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of the materials may be a corrosion problem.

If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of key words such as "rust," "deterioration," "corrosion," or "cracking" will insure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA Pam 738-750.

LIST OF ABBREVIATIONS/ACRONYMS

AAL	Additional Authorization List	MAC	Maintenance Allocation Chart
AMP	Ampere	MAX	Maximum
BII	Basic Issue Item	MCPS	Modular Command Post System
^o C	Degrees Celsius	mm	millimeter
CAGEC	Commercial And Government Entity Code	MSDS	Material Safety Data Sheet
CFM	Cubic Feet per Minute	MTOE	Modified Table of Org and Equipment
cm	Centimeter	MWO	Modification Work Order
COEI	Component of End Item	NBC	Nuclear, Biological, Chemical
CPC	Corrosion Prevention Control	N-m	Newton Meters
DC	Direct Current	PMCS	Preventive Maintenance Checks and Services
ea	Each	POL	Petroleum, Oil and Lubricant
EIR	Equipment Improvement Recommendation	QD	Quick Disconnect
^o F	Degrees Fahrenheit	Qty	Quantity
gal	Gallons	Ref	Reference
GFE	Government Furnished Equipment	Reqd	Required
hr	Hour	RPSTL	Repair Parts and Special Tools List
IAW	In Accordance With	TEG	Thermoelectric Generator
ID	Inside Diameter	TMDE	Test, Measurement, Diagnostic Equipment
Illus	Illustrated / Illustration	TOE	Table of Organization and Equipment
in	Inches	U/I	Unit of Issue
in.-lb	Inch-pound	U/M	Unit of Measure
Kg	Kilogram	UOC	Usable On Code
L	liter	V	Volt
lbs	Pounds	VDC	Volt Direct Current
lb-ft	Pound-foot	WP	Work Package

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

The Modular Command Post System (MCPS), hereafter referred to as the tent, require a heat source. This heater fulfills the need for an independent, powerful, self-powered, self-sustaining, self-regulating, self-diagnostic heater.

The heater is set up for operation outside the tent. If operation inside the tent is desired, the optional items in WP 0002 are required. The tent control assembly (with controls, visual advisory lights, and an audible alarm) must be mounted inside the tent and a control cable (remote) used to connect the tent control assembly to the heater.

The operation of the heater is controlled by the ON-OFF switch, the LOWER-HIGHER control knob (both located on the control assembly), and the heater control assembly (located within the heater itself).

Manual movement of the ON/OFF switch to the ON position will cause the heater to automatically execute a series of steps that lead to heater operation. Manual movement of the ON/OFF switch to the OFF position will cause the heater to automatically execute a safe and orderly shutdown.

The status of the heater assembly can be determined by looking at the advisory lights on the tent control assembly or by listening to the audible alarm. These lights and the related audible alarm are controlled by the heater control assembly, which monitors the normal operation of heater, and, when an abnormal operating condition is detected, cause the heater to shut off. Also, when an abnormal operating condition is detected, the SYSTEM FAULT advisory light and the integral audible alarm are activated and pulse out the following SYSTEM FAULT diagnostic codes:

Table 2. System Fault Diagnostic Codes

Number of Pulses and Audible Tones	System Fault
1	LOW VOLTAGE
2	COMBUSTION BLOWER
3	LOSS OF FLAME
4	BURNER MAINTENANCE
5	GLOW PLUG
6	TEG OVER TEMPERATURE
7	OVER VOLTAGE
8	TIP-OVER
9	FIN TEMP SENSOR
10	TENT OVER TEMPERATURE

The proper fuels to use at various ambient temperatures are listed in the table below.

Table 3. Approved Fuels At Various Temperatures

Ambient Temperature	Specification	Military Symbol
Above +20°F (-6,7°C)	VV-F-800	DF-2
Above -25°F (-33.3°C)	VV-F-800	DF-1
Above -25°F (-33.3°C)	MIL-T-83 133	JP-5
Above -60°F(-51.1°C)	VV-F-800	DF-A
Above -60°F(-51.1°C)	MIL-T-83133	JP-8

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CHAPTER 1

**DESCRIPTION AND
THEORY OF OPERATION**

SPACE HEATER, CONVECTIVE

SPACE HEATER, CONVECTIVE (SHC)
LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The following are the major components of the Space Heater, Convective. A brief description of the function of each component and its location is detailed below.

IN-TENT CONTROLLER ASSEMBLY (1). The in-tent control assembly (1) contains the operator controls and advisory lights for the heater. The in-tent control assembly is a remotely wired, splashproof box that can be easily attached to the tent framework. The in-tent controller assembly is only intended for use inside the tent.

IN-TENT CONTROLLER CABLE ASSEMBLY (2). An in-tent controller cable assembly (2) is used to connect the in-tent controller assembly to the heater.

BATTERY PACK ASSEMBLY (3). The battery pack assembly consists of a 12-volt battery (3) with an electrical heating element. The battery pack assembly location is clearly marked and is located in a recess (4) below the lower housing assembly. Two fuse holders (5) carrying 20 amp fuses are incorporated into the side of the battery pack. Two spare fuses (6) are located at the breathable air inlet end of the heater.

The battery is used for burner ignition, and to power the control system until the thermoelectric generator (TEG) generates power. The battery is recharged during heater operation by the TEG. Depending on battery condition and temperature, the battery has a approximate 30-minute recharge time.

If battery temperatures are below 40°F (4.4°C), it is electrically heated by the heating element. When the battery reaches 60°F (15.6°C), the heating element is shut off by the controller. When battery heat is called for, only excess power is used for heating the tent.

COMBUSTION AIR INLET ASSEMBLY (7). The combustion air inlet assembly (7) is connected to the combustion air blower located inside the heater and is the source of outside air used for combustion by the burner assembly.

UPPER HOUSING ASSEMBLY (8). The upper housing assembly (8) consists of a compartment cover assembly having certain hardware and electrical wiring and connections mounted on it.

LOWER HOUSING ASSEMBLY (9). The frame and heater housing are welded together to form the lower housing assembly (9).

FUEL SOLENOID VALVE ASSEMBLY (10). The fuel solenoid valve assembly (10) has a normally closed valve which opens to allow fuel to enter the heater when the ON/OFF switch is in the ON position. The solenoid valve is closed when the switch is turned OFF or if heater control assembly detects a SYSTEM FAULT condition. This solenoid is independent of the fuel pump assembly described below.

FUEL QUICK DISCONNECT (11). A fuel quick disconnect (11) is located at the inlet side of the fuel solenoid valve assembly (10). This military style male fitting has a protective dust cap (12) chained to it for use when the heater is not connected to the fuel supply.

OPERATING INSTRUCTIONS PLATE. Operating instructions plate (13) is provided on the in-tent control assembly (1).

AIR SUPPLY DUCT WITH DEBRIS GRILL (14). The air supply duct with debris grill (14) conducts air from the tent to heater assembly for warming. This duct is 10.5 inches in diameter and has a debris grill (15) to prevent accidental entry of foreign objects into the heater assembly. A strap is used to connect the

duct to the heater inlet. Note that upon initial shipment, the debris grill is not installed in the duct. The debris grill must be installed in the duct prior to using the heater IAW WP 0005.

An airflow direction arrow tag (**16**) is permanently attached to the duct indicating that the flow of air moves from the debris grill end of the duct to the open end that connects to the heater.

AIR RETURN DUCT WITH DEBRIS GRILL (17).



WARNING

Do not touch the metal debris grill of the air return duct while the heater is running. During heater operation the metal debris grill and the heated air coming from it can be as hot as 220°F (104°C). Touching the metal debris grill may result in serious burns.

The air return duct with debris grill (**17**) conducts heated (breathable) air from the heater assembly to tent. This duct is 10.5 inches in diameter and has a debris grill (**18**) to prevent accidental entry of foreign objects into the heater assembly. A strap is used to connect the duct to the heater outlet duct adapter. Note that upon initial shipment, the debris grill is not installed in the duct. The debris grill must be installed in the duct prior to using the heater IAW WP 0005.

An airflow direction arrow tag is permanently attached to the duct indicating that the flow of air moves from the open end that connects to the heater to the debris grill end of the duct that is installed in the tent duct tunnel.

ACCESSORY BAG (18). An accessory bag is provided to permit stowage of all loose Space Heater Convective items such as the air inlet and return ducts, in-tent controller assembly and cable, battery charger, gravity feed adapter, fuel hose, and fuel can stand.



