TECHNICAL MANUAL

OPERATOR'S, UNIT AND
DIRECT SUPPORT MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST)
FOR

PRECISION HEATER, FUL–KONTROL MODEL TS-61510 AU–1

NSN 6640-00-970-6620

This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and the content requirements normally associated with Army technical manuals. This technical manual does, however, contain all essential information required to operate and maintain the equipment.

Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
28 SEPTEMBER 1990

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SUPPLEMENTARY INTRODUCTORY MATERIAL

1–1. Maintenance Forms and Records.

Department of the Army forms and procedures used for equipment maintenance will be those described by DA Pam 738–750, The Army Maintenance Management System.

1–2. 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 letters, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028–2 located in the back of this manual, directly to: Commander, U.S. Army Troop Support Command, ATTN: AMSTR–MCTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished to you.

1–3. Destruction of Army Material to Prevent Enemy Use.

Refer to TM 750-244-3 for instructions covering the destruction of Army Material to prevent enemy use.

1-4. Administrative Storage of Equipment.

a. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exists. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period appropriate maintenance records will be kept.

b. Before placing equipment in administrative storage, current preventive maintenance checks and services should be completed. Shortcomings and deficiencies should be corrected, and all modification work orders (MWO's) should be applied.

c. Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers and other containers may be used.

Type HA, Camp Non-Bump, H, RH, and Ful-Kontrol Heaters

CAT. NOS. 61510, 61520, 61526, 61527,
61528, 61529, 61560, 61561, AND 61600

Introduction

Your satisfaction and safety are important to PRECISION SCIENTIFIC and a complete understanding of this unit is necessary to attain these objectives.

As the ultimate user of this apparatus, it is your responsibility to understand its proper function and operational characteristics. This instruction manual should be thoroughly read and all operators given adequate training before attempting to place this unit in service. Awareness of the stated cautions and warnings, and compliance with recommended operating parameters--together with maintenance requirements--are important for safe and satisfactory operation. The unit should be used for its intended application; alterations or modifications will void the Warranty.

> **WARNING:** As a routine laboratory precaution, always wear safety glasses when working with this apparatus.

This product is not intended, nor can it be used, as a sterile or patient connected device. In addition, this apparatus is not designed for use in Class I, II, or III locations as defined by the National Electrical Code.

Unpacking and damage

Save all packing material if apparatus is received damaged. This merchandise was carefully packed and thoroughly inspected before leaving our factory. Responsibility for its safe delivery was assumed by the carrier upon acceptance of the shipment; therefore, claims for loss or damage sustained in transit must be made upon the carrier by the recipient as follows:

Visible Loss or Damage: Note any external evidence of loss or damage on the freight bill, or express receipt, and have it signed by the carrier's agent . Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor your damage claim. The form required to file such a claim. will be supplied by the carrier.

Concealed Loss or Damage: Concealed loss or damage means leas or damage which does not become apparent until the merchandise has been unpacked and inspected. Should either occur, make a written request for inspection by the carrier's agent within 15 days of the delivery date; then file a claim with the carrier since the damage is the carrier's responsibility.

By following these instructions carefully, we guarantee our full support of your claim to be compensated for loss from concealed damage.

DO NOT -- FOR ANY REASON -- RETURN THIS UNIT WITHOUT FIRST OBTAINING AUTHORIZATION. In any correspondence to PRECISION SCIENTIFIC please supply the nameplate data, including catalog number and serial number.

General information

These instructions encompass the models listed below with their specific electrical characteristics:

Cat. No.	Description	volts	Watts	Amps
61510	"HA'* Heater	120	550	4.5
61520	Camp Non-Bump Heater (AC/DC)	120	500	4.2
61526	"'H" Heater	120	550	4.5
61527	"H" Heater	240	550	2.2
61528	"H'" Heater	120	750	7.2
61529	"H" Heater	240	750	3.6
61560	"RH" Heater	120	550	4.5
61561	"RH" Heater	240	550	2.2
61600	"Ful-Kontrol" Heater	120	750	7.2

SAFETY CONSIDERATIONS AND WARNINGS:

The following guidelines are presented to supplement the existing safety rules enforced by your company:

1) Safety glasses should be worn by the operator and by anyone in the vicinity who could be struck by liquid samples which might splash on them in the heating process.

2) It is recommended that a fire extinguisher of Halon 1211 (at least a 5-lb. tank size) be placed conveniently in reach of the operator to protect against sample fires which might occur.

3) Service or circuit testing should be attempted only by a qualified person who has been trained with regard to the potential danger of working with live electrical circuitry.

WARNING: Disconnect the unit from the power source whenever replacing electrical components.

4) Insulated gloves should be used when handling the glassware around the heater.

5) The heater should not be used without its refractory top. No apparatus should touch the heater coil.

NOTE: The glassware recommended for use with these heaters are 500 or 800 ml Kjedahl flasks, or 500 to 1000 ml round bottom flasks.

Explanation of controls

Heater Selection:

"HA" heaters (Catalog No. 61510) - The "HA" heater is a heating element and refractory only, without housing and line cord. Its application is for customer-designed special setups.

"Camp Non-Bump" heater (Catalog No. 61520) - The "Camp Non-Bump" heater has a nickel, chromium heater coil mounted in a circular recess of a porcelain refractory. This heater is designed to prevent local scorching of heat sensitive materials. Its power source can be either alternate current (AC) or direct current (DC).

Type "H" heaters (Catalog Nos. 61526, 61527, 61528, and 61529) - There is no control on the type "H" heaters because they are single-heat units; just plug them in.

WARNING: Be sure to unplug the unit after use.

Type '*RH"' heaters (Catalog Nos. 61560 and 61561)- The rheostat control on the "RH" heaters can be easily set for desired wattage from 0 to 550 watts by rotating the linear control knob which is referenced from 0 to 100 for repeat settings.

EXPLANATION OF CONTROLS (Contd.)

Ful-Kontrol heater (Catalog No. 61600) The Ful-Kontrol heater is a stepless auto-transformer for variable heat control from 0 to 750 watts. The reference heater dial is conveniently marked from 0 to 100. The numbers are strictly for reference to repeat set–tings. To increase the heat, turn dial counterclockwise; to decrease heat , turn dial clockwise.

Installation

Conveniently locate the heater so that there is plenty of clearance above and around and so that there are no flam-mable situations which might occur.

WARNING: Do not locate heater under any flammable mate-rial when installing--fire may result.

Electrical Connections: Important
(Please Read Carefully)

Before installing this unit, it should be determined that the power supply receptacle is properly polarized and grounded.

As delivered, it is supplied with a standard three-wire polarized line cord and plug for operation on 120 volts, single phase, 50/60 Hertz (no line cord with Cat. No. 61510 or 61520).

WARNING: DO NOT, under any circumstances, cut or remove the third (ground) prong from the power cord. DO NOT use a two-prong adapter plug.

Determine the total amount of current presently being used by other apparatus connected to the circuit that will be used for this apparatus.

It is critical that the added current demand and other equipment on the cir-cuit not exceed the rating of the fuse or circuit breaker, in use, on this circuit.

CAUTION: Be sure that the power supply is of the same voltage as specified on the nameplate.

PARTS LIST FOR HA, CAMP-NON BUMP, H, RH, & FUL-KONTROL HEATERS
CATALOG NOS. 61510, 61520, 61526, 61527, 61528, 61529, 61560, 61561,
AND 61600

PART NO.	QTY.	PARTS FOR "HA" HEATER #61510
61820	1	REFRACTORY TOP, PORCELAIN
61850	1	LOWER REFRACTORY WITH HEATER, 120V, 550W
61870		HEATER ELEMENT ONLY
61896	1	RADIATION SHIELD, TRANSITE
		PARTS FOR CAMP NON-BUMP HEATER #61520
509506	1	REFRACTORY TOP, PORCELAIN
515901	1	HEATER ELEMENT ONLY
		PARTS FOR TYPE "H" HEATERS #61526, -27, -28, & 61529
67576	1	DOVETAIL CLAMP
353034	1	LINE CORD & PLUG, 120V, 3 COND. (61526 & 61528)
353016	1	LINE CORD & PLUG, 240V, 3 COND. (61527)
353035	1	LINE CORD & PLUG, 240V, 3 COND. (61529)
61820	1	REFRACTORY TOP, PORCELAIN
61896	1	RADIATION SHIELD, TRANSITE
61850	1	LOWER REFRACTORY WITH HEATER, 120V, 550W (FOR 61526)
61870	1	HEATER ELEMENT ONLY
61851	1	LOWER REFRACTORY WITH HEATER, 240V, 550W (FOR 61527)
61871	1	HEATER ELEMENT ONLY
61856	1	LOWER REFRACTORY WITH HEATER, 120V, 750W (FOR 61528)
61876	1	HEATER ELEMENT ONLY
61857	1	LOWER REFRACTORY WITH HEATER, 240V, 750W (FOR 61529)
61877	1	HEATER ELEMENT ONLY

PART NO.	QTY.	PARTS FOR TYPE RH HEATERS #61560 & 61561
67576	1	DOVETAIL CLAMP
353034	1	LINE CORD & PLUG, 120V, 3 COND.
353035	1	LINE CORD & PLUG, 240V, 3 COND.
61820	1	REFRACTORY TOP, PORCELAIN
531557	1	RADIATION SHIELD
61850	1	LOWER REFRACTORY WITH HEATER, 120V, 550W (FOR 61560)
61870	1	HEATER ELEMENT ONLY
527715	1	RHEOSTAT ASSEMBLY (FOR 61560 ONLY)
61851	1	LOWER REFRACTORY WITH HEATER, 240V, 550W (FOR 61561)
61871	1	HEATER ELEMENT ONLY
527716	1	RHEOSTAT ASSEMBLY (FOR 61561 ONLY)

PARTS LIST (CONTD.)

PART NO.	QTY.	PARTS FOR FUL-KONTROL HEATER # 61600
67576	2	DOVETAIL CLAMP
353034	1	LINE CORD & PLUG, 120V, 3 COND.
61820	1	REFRACTORY TOP, PORCELAIN
531557	1	RADIATION SHIELD
220005	1	KNOB, CONTROL
61856	1	LOWER REFRACTORY WITH HEATER, 120V
61876	1	HEATER ELEMENT ONLY
225086	1	TRANSFORMER, POWER, OHMITE VT8, 120V, OR STACO, 120V
225087	1	CONTACT BRUSH, FOR OHMITE VT8 #225086
225234	1	CONTACT BRUSH, FOR STACO #225086
225074	1	*CONTACT BRUSH, FOR VARIAC #225073
225076	1	*CONTACT BRUSH, FOR POWERSTAT #225075
		ACCESSORIES FOR ALL HEATERS ABOVE:
61824	1	REFRACTORY, PORCELAIN, 1-1/4 DIA. OPENING
61825	1	REFRACTORY, PORCELAIN, 1-1/2 DIA. OPENING
61832	1	REFRACTORY, PORCELAIN, 1 DIA. OPENING
61834	1	REFRACTORY, PORCELAIN, 2 DIA. OPENING
61836	1	REFRACTORY, PORCELAIN, 2-3/4 DIA. OPENING
61838	1	REFRACTORY, PORCELAIN, 3-1/2 DIA. OPENING

* DISCONTINUED - STILL AVAILABLE.

Exclusive Precision® Warranty

PRECISION SCIENTIFIC warrants its products against defects in material or in workmanship, when used under appropriate conditions and in accordance with appropriate operating instructions for a period of no less than one (1) year from the date of delivery of the products.

Sole obligation of PRECISION SCIENTIFIC shall be to repair or replace at our option, FOB factory or locally, without charge, any part(s) that prove defective within the warranty period, provided the customer notifies PRECISION SCIENTIFIC promptly and in writing of any such defect. Compensation for labor by other than PRECISION SCIENTIFIC employees will not be our obligation. Part(s) replacement does not constitute an extension of the original warranty period.

PRECISION SCIENTIFIC MAKES NO WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, AS TO THE DESIGN, SALE, INSTALLATION, OR USE OF ITS PRODUCTS, AND SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS.

PRECISION SCIENTIFIC will not assume responsibility for unauthorized repairs or failure as a result of unauthorized product modifications, or for repairs, replacements, or modifications negligently or otherwise improperly made or performed by persons other than PRECISION SCIENTIFIC employees or authorized representatives.

While our personnel are available to advise customers concerning general applications of all manufactured products, oral representations are not warranties with respect to particular applications and should not be relied upon if inconsistent with product specifications or the terms stated herein.

In any event, the terms and conditions contained in PRECISION SCIENTIFIC formal sales contracts shall be controlling; and any changes must be in writing and signed by an authorized executive of PRECISION SCIENTIFIC.

All defective components will be replaced without charge one (1) year from the date of delivery. There will be no charge for labor if the apparatus is returned to the factory prepaid.

Conditions and qualifications of the warranty statement shall prevail at all times.

TELEPHONE AREA CODE 312 227-2660

TITLE: PARTS LIST PRECISION TYPE H, RH, AND FUL-KONTROL HEATERS
CATALOG NOS. 61526, 61527, 61528, 61529, 61560, 61561, 61600

PART NO.	QTY	PARTS FOR TYPE H HEATERS #61526, 27, 28, & 29
67576	1	DOVETAIL CLAMP
353014	1	LINE CORD & PLUG, 120V, 3 COND, (61526 & 61528)
353016	1	LINE CORD & PLUG, 240V, 3 COND (61527 & 61529)
61820	1	REFRACTORY, TOP
61896	1	RADIATION SHIELD
61850	1	CLAY AND HEATER ASSEM 120V, 550W, (FOR 61526)
61870	1	HEATER ELEMENT ONLY
61851	1	CLAY AND HEATER ASSEM, 240V, 550W, (FOR 61527)
61871	1	HEATER ELEMENT ONLY
61856	1	CLAY AND HEATER ASSEM, 120V, 750W, (FOR 61528)
61876	1	HEATER ELEMENT ONLY
61857	1	CLAY AND HEATER ASSEM, 240V, 750W, (FOR 61529)
61877	1	HEATER ELEMENT ONLY
		PARTS FOR TYPE RH HEATERS #61560 & 61
67576	1	DOVETAIL CLAMP
353034	1	LINE CORD & PLUG, 120V, 3 COND.
353035	1	LINE CORD & PLUG, 240V, 3 COND.
61820	1	REFRACTORY TOP
531557	1	RADIATION SHIELD
61850	1	CLAY AND HEATER ASSEM, 120V, 550W, (FOR 61560)
61870	1	HEATER ELEMENT ONLY
527715	1	RHEOSTAT ASSEMBLY (FOR 61560 ONLY)
61851	1	CLAY AND HEATER ASSEM. 240V, 550W, (FOR 61561)
61871	1	HEATER ELEMENT ONLY
527716	1	RHEOSTAT ASSEMBLY (FOR 61561 ONLY)
		PARTS FOR FUL-KONTROL HEATER #61600
67576	2	DOVETAIL CLAMP
353014	1	LINE CORD & PLUG, 120V, 3 COND.
61820	1	REFRACTORY, TOP
531557	1	RADIATION SHIELD
220005	1	KNOB, CONTROL
61856	1	CLAY AND HEATER ASSEM 120V.
61876	1	HEATER ELEMENT ONLY
225086	1	TRANSFORMER, POWER, OHMITE VTS, 120V.
225073	1	*TRANSFORMER, POWER, VARIAC V-5, 120V.
225075	1	*TRANSFORMER, POWER, POWERSTAT, 120V.
225087	1	CONTACT BRUSH, FOR OHMITE VT8 #225086
225074	1	**CONTACT BRUSH, FOR VARIAC #225073
225076	1	**CONTACT BRUSH, FOR POWERSTAT #225075
		ACCESSORIES FOR ALL HEATERS ABOVE
61824	1	REFRACTORY, PORCELAIN, 1 1/4 DIA, OPENING
61825	1	REFRACTORY, PROCELAIN, 1 1/2 DIA. OPENING
61832	1	REFRACTORY, HEAT-ROC, 1 DIA. OPENING
61834	1	REFRACTORY, HEAT-ROC, 2 DIA. OPENING
61836	1	REFRACTORY, HEAT-ROC, 2 3/4 DIA. OPENING
61838	1	REFRACTORY, HEAT-ROC, 3 1/2 DIA. OPENING

*USED ON OLDER UNITS-DISCONTINUED AND NO LONGER AVAILABLE, USE #225086 WHICH IS INTERCHANGEABLE.

**DISCONTINUED - STILL AVAILABLE

APPENDIX A

REFERENCES

A–1. Scope. This appendix contains all forms, pamphlets and technical manuals referenced in both the Air mobile and Semitrailer mounted Laboratories.

A–2. Forms.

Recommended Changes to Publications . . . . . DA Form 2028
DA Form 2028–2
Quality Deficiency Report . . . . . SF 368
Equipment inspection and Maintenance Work Sheet . . . . . DA Form 2404
Hand Receipts . . . . . DA Form 2062

A-3. Field Manuals.

Petroleum Testing Facilities:
Laboratories and Kits . . . . FM 10–72
inspecting and Testing Petroleum Products . . . . FM 10–70
ASTM Test Method Supplement to . . . .FM 10–92C1/C2

A-4. Technical Manuals.

Atlas-Copco Compressor, ... TM 10-4310-392-13&P
Alcor Jet Fuel Thermal Oxidation Tester Operating
and Maintenance Manual . . . . . TM 10-6635-210-13&P
Bacharach Gas Alarm and Calibration Data . . . . . TM 10-6665-297-13&P
Brother Portable Typewriter . . . . . TM 10–7430–218–13&P
Chemtrix Field Ph Meter . . . . . TM 10-6630-237-13&P
Elkay Manufacturing 30 GPH Cooler . . . . . TM 10-4130-240-13&P
Emcee Micro-Separometer . . . . . TM 10-6640-222-13&P
Foxboro Pressure Recording Gauge . . . . . TM 10-6685–365–13&P
Gammon Aqua Glo Water Detector ... . TM 10-6640-221-13&P
Gammon Mini Monitor Fuel Sampling Kit . . . . . TM 10-6630-230-13&P
Jelrus Burn-Out Furnace . . . . . TM 10-6640-231-13&P
Koehler Cleveland Open Tester . . . . . TM 10-6630-236-13&P
Koehler Cloud and Pour Point Chamber . . . . . TM 10-6630-238-13&P
Koehler Copper Strip Corrosion Bomb Bath . . . . . TM 10-6640-220-13&P
Koehler Distillation Apparatus . . . . . TM 10-6630-233-13&P
Koehler Dropping Point Apparatus . . . . . TM 10-6635-211-13&P
Koehler Electric Pensky-Martins Tester . . . . . TM 10-6630-231-13&P
Koehler Foaming Characteristics Determination Apparatus . . . . . TM 10-6640-228-13&P
Koehler Kinematic Viscosity Bath . . . . . TM 10-6630-239-13&P
Koehler Tag Closed Cup Flash Tester . . . . . TM 10-6630-235-13&P
Lab-Line Explosion Proof Refrigerator . . . . . TM 10-6640-219-13&P
Lily Freezer . . . . . TM 10-6640-234-13&P
Millipore OM 39 Filter Holder . . . . . TM 10-6640-225-13&P
Millipore Vacuum Pump . . . . . TM 10-6640-217-13&P
Ohaus Harvard Trip Balance . . . . . TM 10-6670-278-13&P
Precision Gas-oil Distillation Test Equipment . . . . . TM 10-6630-219-13&P
Precision General Purpose Water Bath . . . . . TM 10-6640-229-13&P

Precision High Temperature Bronze Block Gum Bath . . . . . TM 10-6630-234-13&P
Precision General Purpose Ovens . . . . . TM 10-6640-218-13&P
Precision Heater Instruction Manual and Parts List . . . . . TM 10-6640-223-13&P
Precision Oxidation Stability Bath . . . . . TM 10-6640-232-13&P
Precision Pensky–Martens Flash Testers . . . . . TM 10-6630-231-13&P
Precision Reid Vapor Pressure Bath . . . . . TM 10-6640-226-13&P
Precision Slo–Speed Stirrer . . . . . TM 10-6640-224-13&P
Precision Universal Centrifuge . . . . . TM 10-6640-230-13&P
Precision Universal Penetrometer . . . . . TM 10-6640-228-13&P
Sargent–Welch Vacuum Pump..... . . . . TM 10-4310-391-13&P
Sartorious Analytical Balance . . . . . TM 10-6670-277-13&P
Scotsman Cuber . . . . . TM 10-6640-227-13&P
Soltec VOM-Multimeter . . . . . TM 10–6625–3127–13&P
Teel Self–Priming Centrifugal Pump . . . . . TM 10-6640-217-13&P
Teel Submersible Pump . . . . . TM 10-4320-320-13&P
Texas instrument TI–5030II Calculator . . . . . TM 10–7420–210–13&P

A–5. Pamphlets.

The Army Maintenance Management System (TAMMS) . . . . . DA Pam 738–750

A-6. Miscellaneous Publications.

The Army Integrated Publishing and Printing Program . . . . . AR 25–30
Laboratory, Airmobile, Aviation Fuel . . . . . MIL–L–52733A(ME)
Apparatus, instruments, Chemicals, Furniture, and Supplies for Industrial,
Clinical, College and Government Laboratories . . . . . Fisher Scientific Laboratories Catalog
Petroleum–Petrochemical Testing Equipment . . . . . Precision Scientific Catalog

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B–1. General.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B–2. Maintenance Functions. Maintenance functions will be limited to and defined as follows:

a. *Inspect.* To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. *Test.* To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. *Service.* Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. *Adjust.* To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. *Align.* To adjust specified variable elements of an item to bring about optimum or desired performance.

f. *Calibrate.* To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of knob accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. *Remove/Install.* To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. *Replace.* To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the third position code of the SMR code.

i. *Repair.* The application of maintenance services, ‘including fault location/troubleshooting,[2] removal/installation, and disassembly/assembly procedures,[3] and maintenance actions,[4] to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. *Overhaul.* That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e, DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. *Rebuild.* Consists of those services/actions necessary for the restoration of unserviceable equipment to a like–new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

B–3. Explanation Of Columns In The MAC, Section II.

a. Column I. Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be “00.”

b. Column 2. Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3. Maintenance Function. Column 3 lists the functions to be performed on the item listed in column 2. (For a detailed explanation of these functions, see paragraph B–2.)

d. Column 4. Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/ assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

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[1] Services–inspect, test, service, adjust, align, calibrate, and/or replace.

[2] Fault locate/troubleshoot - the process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3] Disassemble/assemble - encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i. e., assigned an SMR code) for the category of maintenance under consideration.

[4] Actions - welding, grinding, riveting, straightening, facing, remachining, and/or resurfacing.

c . . . . . Operator/Crew
0 . . . . . Unit Maintenance
F . . . . . Direct Support Maintenance
H . . . . . General Support Maintenance
D . . . . . Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remark. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in section IV.

B-4. Explanation Of Columns In Tool And Test Equipment Requirements, Section III.

a. Column I, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, section II, column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B–5. Explanation Of Columns In Remarks, Section IV.

a. Column I, Reference Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
01	HEATER, FUL-KONTROL	INSPECT REPLACE REPAIR	0.1	 0.1 1.0				 1,2	

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

MAINTENANCE ALLOCATION CHART

(1) TOOL/TEST EQUIP. REF CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NSN	(5) TOOL NUMBER
1	0	TOOL KIT, GENERAL AUTOMOTIVE	5180-00-177-7033	(50980) SC 5180-90-CL-N26
2	0	MULTIMETER, 0-500V	6625-00-691-2453	

SECTION IV. REMARKS

NOT APPLICABLE

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

NOT APPLICABLE

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

NOT APPLICABLE

APPENDIX E

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

NOT APPLICABLE

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

THOMAS F. SIKORA
Brigadier General, United States Army
The Adjutant Genera)

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER: TM 10-6640-223-13&P

PUBLICATION DATE: 28 Sep 1990

PUBLICATION TITLE: Precision Heater, Ful-Kontrol

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
81		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the Other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

JOHN DOE, PFC (268) 317-7111

SIGN HERE JOHN DOE

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DRSTS-M Overprint 1, 1 Nov 80

P S --IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

REVERSE OF DA FORM 2028-2
REVERSE OF DRSTS-M OVERPRINT 2,
1 NOV 80

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THEN. . JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 046570-000