TECHNICAL MANUAL

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

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.

Koehler INSTRUMENT COMPANY, INC.

Product Bulletin

PRODUCT: Dropping Point of Lubricating Grease

Dropping Point Apparatus
- Conforms to ASTM D566, FTM791-1421 and related specifications

Performs dropping point determinations for quality control and classification of lubricating greases. Equipped with 400 ml oil bath, 1/40 hp stirrer, heater and dropping point assembly. Includes chromium plated grease cup, test tube with cup support indentations, thermometer depth gauge, polished metal rod and cork ring guide. Bath rests on a 550W stepless control heater with reference dial and refractory top plate.

SPECIFICATIONS

Conforms to the specifications of:

ASTM D566, FTM 791-1421, IP 132,
DIN 51801, ISO 2176

Temperature Range: Ambient to 350°F

Heater Range: 0-550W

DIMENSIONS 1 x w x h, in. (cm)

5 x 5 x 30 7/8 (13 x 13 x 78)

1595 SYCAMORE AVE.. BOHEMIA. NY 11716 ≺516-589-3800

SHIPPING INFORMATION

Net Weight: 20 lbs (9.1 kg)
Shipping Weight: 28 lbs (12.7 kg)
Dimensions: 20" x 16" x 15"
(51 x 41 x 38 cm)

ORDERING INFORMATION

Supplied with connecting hardware and drilled thermometer corks. Order thermometers separately.

Catalog No.	Description
K19490	Dropping Point Apparatus 115V 50/60 Hz
K19491	Dropping Point Apparatus 220-240V 50/60 Hz

Accessories and Replacement Parts

K19492 Test Tube with Indentations

K19493 Top Cork

K194EA Grease Cup

K194E6 Polished Metal Rod

K194E7 Cup Plug Gauge
Per Figure 1, ASTM D566
and Figure l-E-7, ASTM D2265

K19499 Cork Ring Guide

250-000-02F ASTM 2F Thermometer
Range: 20 to 580°F

250-000-02C ASTM 2C Thermometer
Range: -5 to 300°C

Koehler INSTRUMENT COMPANY, INC.

Product Bulletin

High Temperature Dropping Point Apparatus

- Conforms to ASTM D2265 specifications

- Solid aluminum block design for testing at elevated temperatures

- Holds six dropping point assemblies

Complete six-unit dropping point apparatus with aluminum block oven for determinations over a wide temperature range. Precision machined block oven accommodates six test tubes and has viewing ports with fluorescent backlighting for easy viewing of grease cups. Oven is equipped with a 700W cartridge heater and precise solid state control for operation at temperatures of up to 750 + 1°F (399 + 0.50C). Easy to use controller has a 10-turn control dial for fine adjustment and repeat setting.

SPECIFICATIONS

Capacity: Six sample tubes

Temperature Range: Ambient to 750°F (399°C)

Controller Sensitivity: ± 1°F (±0.5°C)

Heater Range: 0-700W

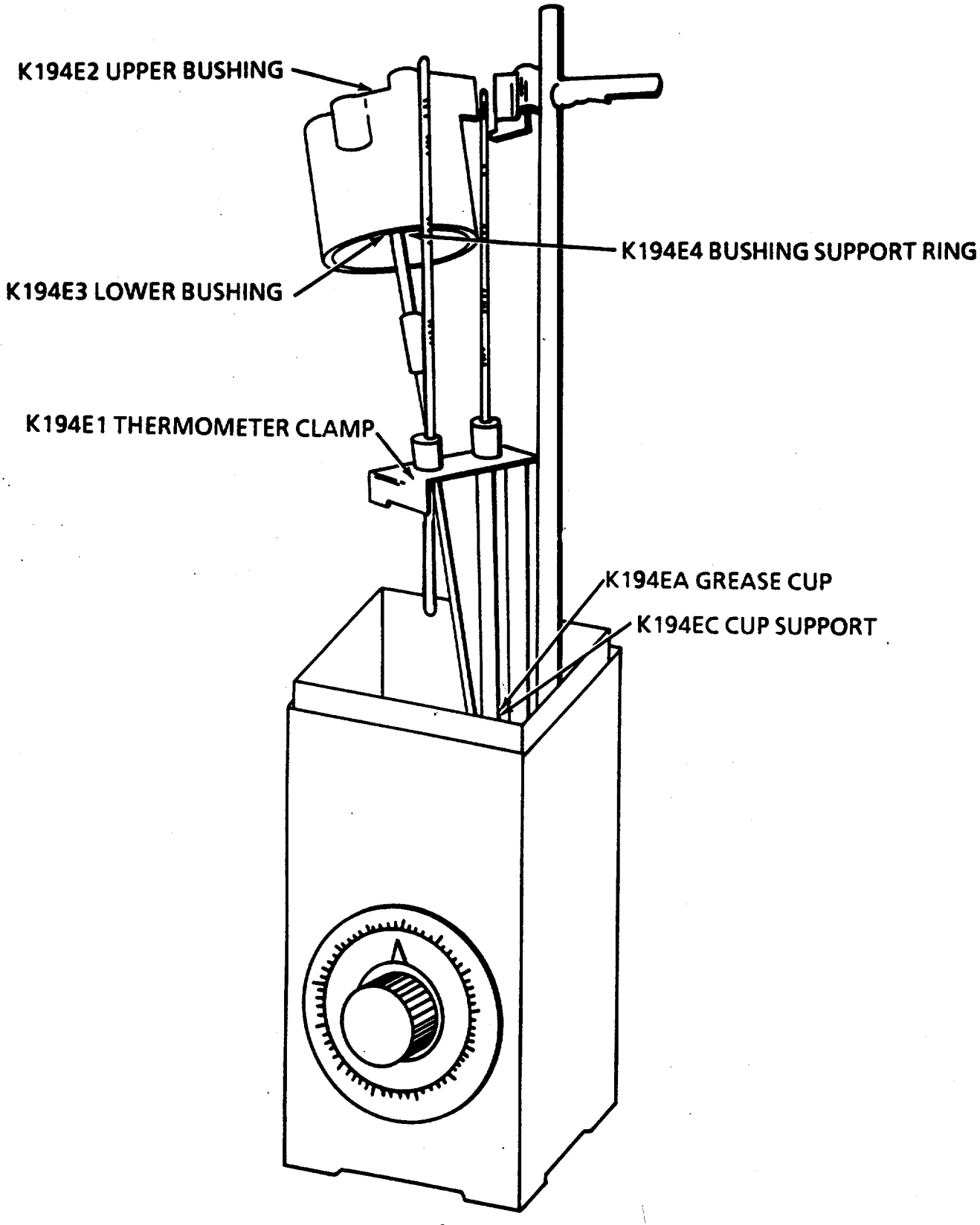
DIMENSIONS 1 x w x h, in. (cm)

11 1/2 x 9 x 14 (30 x 23 x 36)

SHIPPING INFORMATION

Net Weight: 24 lbs (10.9 kg)
Shipping Weight: 29 lbs (13.1 kg)
Dimensions: 20" x 16" x 15" (51 x 41 x 38 cm)

1595 SYCAMORE AVE., BOHEMIA. NY 11716 ◁ 516-589-3800



KOEHLER D19400 HIGH TEMPERATURE DROPPING POINT APPARATUS 115V 50/60HZ

ORDERING INFORMATION

Supplied with thermometer depth gauge, polished metal rod and six (6) dropping point assemblies consisting of test tube, grease cup, thermometer clamp, upper and lower bushings, and bushing support ring. Order thermometers separately.

Catalog No.	Description
K19400	High Temperature Dropping Point Apparatus 115V 50/60 Hz
K19410	High Temperature Dropping Point Apparatus 220-240 50/60 Hz

Accessories and Replacement Parts

K194EA Grease Cup

K194EB Test Tube, 13 x 100 mm

K194EC Cup Support

K194E1 Thermometer Clamp

K194E2 Upper Bushing

K194E3 Lower Bushing

K194E4 Bushing Support Ring

K194E5 Thermometer Depth Gauge

K194E6 Polished Metal Rod

K194E7 Cup Plug Gauge
Per Fig. 1, ASTM D566
and Fig. 1-E-7, ASTM D2265

250-000-03F ASTM 3F Thermometer
Range: 20 to 760°F

250-000-03C ASTM 3C Thermometer
Range: -5 to 400°C

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 10-4640-228-13&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 10-6625-217-13&P
Teel Self-Priming Centrifugal Pump ..... TM 10-6640-217-13&P
Teel Submersible Pump ..... TM 10-4320-320-13&P

Texas Instrument TI-503011 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.

l. *Repair*. The application of maintenance services, including fault location/troubleshooting,2 removal/installation, and disassembly/assembly procedures,3and maintenance actions4 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:

---

[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 identifies maintenance significant (i.e., assigned SMR code) for the category of maintenance under consideration.

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

C ..... Operator/Crew
O ..... 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. Remarks*. 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 9. 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 P. 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 TEST EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
01	APPARATUS, DROPPING POINT	INSPECT REPLACE REPAIR	0.1	 0.5 1.0				1, 2	A

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

FOR

MAINTENANCE ALLOCATION CHART

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

SECTION IV. REMARKS

REFERENCE CODE	REMARKS
A	Repair limited to replacement of transformer or heating elements if deemed economical.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

SECTION I. INTRODUCTION

C-1. **Scope**.

This appendix lists components of end item and basic issue items for the Dropping Point Apparatus to help you inventory items required for safe and efficient operation.

C-2. **General**.

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. *Section II. Components of End Item*. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. *Section III. Basic Issue Items*. These are the minimum essential items required to place the Jet Fuel Thermal Oxidation Tester in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the shelter during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. **Explanation of Columns.**

The following provides an explanation of columns found in the tabular listings:

a. *Column (1) - Illustration Number (Illus Number).* This column indicates the number of the illustration in which the item is shown.

b. *Column (2) - National Stock Number.* Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. *Column (3) - Description*. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGEC (in parentheses) followed by the part number.

d. *Column (4) - Unit of Measure (U/M).* Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. *Column (5) - Quantity required (QTY RQR).* Indicates the quantity of the item authorized to be used with/on the equipment.

SECTION II. COMPONENTS OF END ITEM

(1) Illus	(2) National Stock Number	(3) Description CAGEC And Part Number	Usable On Code	(4) U/M	(5) Qty
		THERMOMETER RANGE: 20-760° F (23035) 250-000-3F		EA	1
		THERMOMETER RANGE: -5 TO 400° C (23035) 250-000-3C		EA	1

SECTION III. BASIC ISSUE ITEMS

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 General

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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 milliliters = .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

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