TECHNICAL MANUAL

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

MILLIPORE VACUUM PUMP

MODEL OM 109

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.

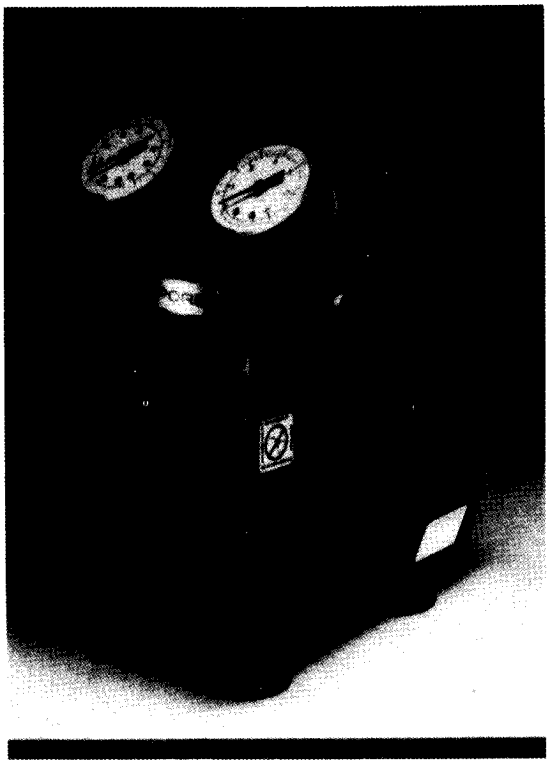
b. Before placing equipment in administrative storage, current preventive maintenance checks and services should be completed. Shortcomings and deficiencies should be corrected, and all modification work orders (MWO's) should be applied.

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.

OPERATION AND

MAINTENANCE INSTRUCTIONS

OM 109



Vacuum Pressure Pump, 115V, 60Hz

Vacuum Pressure Pump, 115V, 60 Hz
Cat. No. XX55 000 00

Vacuum Pressure Pump, 220/240V, 50 Hz
Cat. No. XX55 220 50

Vacuum Pressure Pump, 100V, 50/60 Hz
Cat. No. XX55 100 00

MILLIPORE

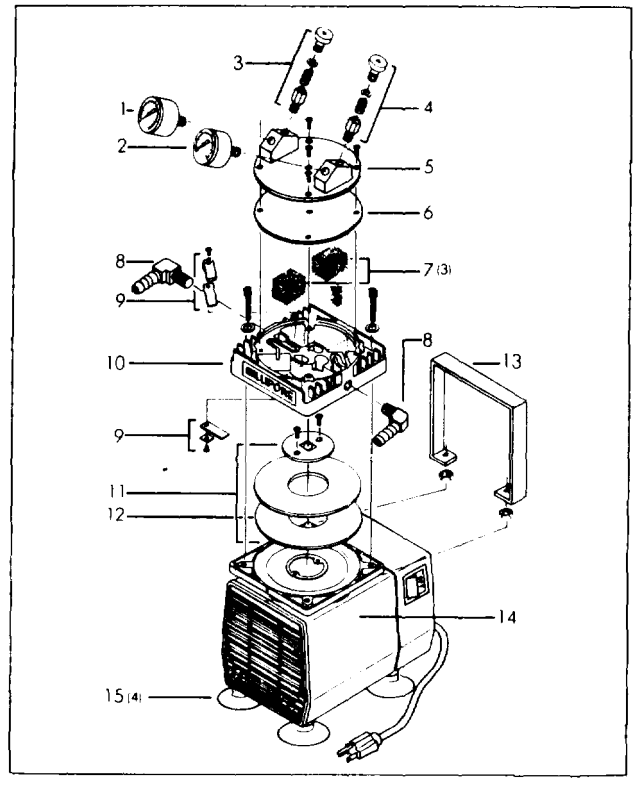


Fig. 1. Pump Components

PUMP COMPONENTS

(1)	Pressure Gauge 0–100 psi	(08071)	P 17434
(2)	Vacuum Gauge 0–30" Hg	(08071)	P 17441
(3)	Pressure Regulator	(08071)	P 17436
(4)	Vacuum Regulator	(08071)	P 17435
(5)	Pump Head	No Part Number	
(6)	Hypalon Head Gasket	No Part Number	
(7)	Filter Element/Filter Mufflers	No Part Number	
(8)	Hose Adapters(s)	(08071)	P17437
(9)	Stainless Steel Leaf–Valves	Supplied with Service Kit	
(10)	Pump Body	No Part Number	
(11)	Diaphragm/Armalon – Cover Assembly	(08071)	P 17440
(12)	Neoprene Diaphragm	(08071)	P 17438
(13)	Carrying Handle	No Part Number	
(14)	Motor Unit	No Part Number	
(15)	Rubber Foot–Cup(s)	(08071)	P 17433
Service Kit (Incl. (7), (9), (11))		(08071)	P 17439

FUNCTION

Portable AC-powered source of vacuum (to 365 mm/ 25''Hg) or pressure (to 4.2 kg/cm^2/60 psig) for filtration and other continuous or intermittent laboratory use. The motor and pump are permanently lubricated. Operating noise is low and is further minimized by rubber-cup mounts, and inlet and outlet filter/muffler silencers. All internal surfaces of the pump (except the stainless steel leaf–valves) are Teflon–coated to prevent possible corrosion of the aluminum surfaces. The neoprene diaphragm is also protected with an Armalon cover to prevent attack by chemicals or solvent vapors, thus prolonging its use. However, to prevent excessive amounts of liquids or mist from entering the pump (which could cause faulty or erratic operation) a water trap should be used in conjunction with the pump (please note Fig. 2).

OPERATION

The Millipore Vacuum/Pressure Pump is boxed in a condition ready for use. However prior to start-up, please observe the following:

1. Select appropriate hose to be used for desired mode of operation. For pressure, select tubing with a 3/1 6“ to 1/4’ I. D., and wall thickness/wall reinforcement to withstand pressures in excess of 80 psig.

   For vacuum, select tubing that will withstand vacuum up to 27” Hg.

2. If using the vacuum mode, and carrying out vacuum filtration of liquids, set up a vacuum–flask water trap between the filter holder and the pump unit as shown in Fig. 2.

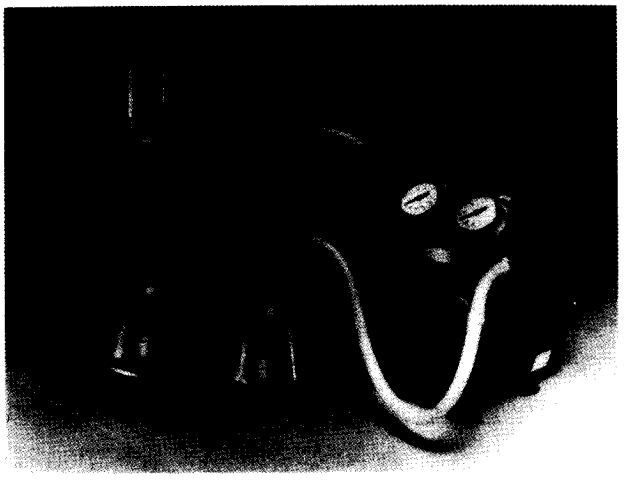


Fig. 2. Second side arm flask connected in series keeps liquid droplets or water vapor out of pump.

3. Prepare desired equipment or filter holder to be employed with pump, then plug electrical cord into the desired electrical receptacle (AC 100V, 115V, 220/240V, depending upon the pump used).

4. Turn on motor by pressing switch mounted on the side of pump unit. Ensure that the pump is under no load when starting, otherwise the pump may not function. If this situation should arise while using the vacuum mode simply break vacuum and after pump begins operation, reconnect tubing and commence vacuum operation. If the pump is used to pressurize a system and this situation occurs, disconnect tubing from tank or equipment to be pressured, and when pump begins operation, reconnect tubing.

5. If the pump works against an initial load for a long enough period of time, the thermal overload switch may shut off motor. If this occurs, allow pump to cool (for approximately 10 minutes] and re–start pump without a load. Once the pump is in operation, reconnect tubing to equipment to be evacuated or pressurized and continue operation.

6. Ensure that the temperature in which the pump is to be operated is above 40 “F, otherwise the unit will not function.

CAUTION

This pump is not explosion proof, therefore observe the necessary precautions in areas where explosion hazards may be present and/or when using combustible liquids or vapors In conjunction with the operation of the pump.

M A I N T E N A N C E

Under normal operating conditions, and employing proper handling and maintenance procedures, the Millipore Vacuum/Pressure Pump should provide many hours of trouble–free operation. However, it is wise to observe the following recommendations and instructions to achieve the best results with this unit.

1. Unless advised in specific instances, do not lubricate any of the parts with oil, grease or petroleum products, or clean with acids, caustics, or chlorinated solvents. Although well protected with an Armalon cover, be careful to keep the diaphragm from contacting any petroleum product of hydrocarbons. It can affect the service life of the pump.

2. If a drop in vacuum or pressure is observed after many hours of operation, it may be due to a partial clogging of the polyurethane filters. To clean or replace the filters (and/or the rubber gasket) remove the two gauges from the top plate. Next, remove the five phillips screws.

   The filters (3) and gasket are located beneath the top plate in the pump head. Remove the filters and wash with 1, 1, 1, tricloroethane (chlorothene) and/or blow off and replace, when dry, in correct position. If damaged, replace with new units from Service Kit. Clean the Hypalon gasket with water; dry, and replace in proper postion.

3. To replace the diaphragm, remove the four socket cap screws from the head of the pump. The diaphragm is held in place by two phillips head screws. Remove screws, retainer plate, and the diaphragm. The diaphragm will fit in any postion on the connecting rod. Replace the plate and the two phillips head screws, Torque to 30 inch–pounds.

CAUTION

Do not raise any burrs or nicks on the heads of these screws. These burrs could cause damage to the inlet valve.

4. To replace the inlet and/or outlet leaf–valve, remove the slotted machine screw that holds each valve in place. The stainless steel inlet and outlet valves are interchangeable. Clean them with water. When replacing the outlet valve, note that there is a retaining bar near the machine screw hole. This retaining bar holds the valve in position. When replacing the inlet valve, note that the valve holder is marked with an X in one corner. This X should be in the lower right hand corner toward the inlet of the-air chamber. Replace the head and tighten the socket head screws to 100 inch-pounds of torque.

5. Do not attempt to replace the connecting rod or motor bearings. If after cleaning the unit and/or in–stalling a new Service Kit, the unit still does not operate properly, contact Millipore Corporation, Technical Services or Order Service Department.

SPECIFICATIONS

Materials: Die cast aluminum body and pump-head, Armalon+covered neoprene diaphragm, Hypalon head-gasket, polyurethane filters, and high grade S.S. leaf valves. All internal pump surfaces are Teflon-coated.

Power: Shaded-pole, Single phase, 1/8 HP, 115V 60 Hz AC, 100V, 50/60 Hz AC, or 220/240V 50 Hz AC, depending on model.

This pump is not explosion proof.

Connections: 3-conductor (grounded] cord and plug. Tapered 1/4” inlet and outlet hose connectors. Cord for 220V unit is European coded.

Dimensions: 7 5/8”L (20cms) X 7 1/8”W (18cms) X 11"H (28cms) overall.

Weight: Approximately 20 lb (9 Kg) boxed.

Flow Rates: Air flows at different vacuum and pressure settings are given below. For vacuum operation, pump exit pressure is 1 atmosphere (14.7 psi).

Vacuum	–mm Hg	0*	127	254	381	508	635	
	–inHg	0	5	10	15	20	25	
Flow	–LPM	31	24	18	14	6	0.6	
	–CFM	1.2	0.83	0.64	0.50	0.20	0.02	
Pressure	–kg/cm^2	0*	0.7	1.4	2.1	2.8	3.5	4.2
	–psig	0	10	20	30	40	50	60
Flow	–LPM	31	24	20	16	11	7	2.8
	–CFM	1.1	0.86	0.7	0.55	0.40	0.25	0.10

* no restriction: thumbscrew fully unscrewed

TECHNICAL INFORMATION

For further information call our Technical Services
Department toll–free at 800-225-1380
In Western States 800-632-2708
In Massachusetts 617–275-9200
in Canada 800-268-4881
in Alaska& Hawaii 415–952-9200
Outside of the U. S.A., contact your nearest Millipore office or agent listed in the Millipore catalogue.

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

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, [1]including fault location/troubleshooting,[2] removal/installation, and disassembly/assembly procedures? 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 1, 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 SMR code) for the category of maintenance under consideration.

[4] Actions - welding, grinding, riveting, straightening, facing, remarching, 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 1, 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 1, 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	PUMP, VACUUM	INSPECT	0.2						
		REPLACE		1.0				1	A
		REPAIR		1.0	2.0			2	B

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR MAINTENANCE ALLOCATION CHART

(1) TOOL/TEST EQUIP. REF CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NSN	(5) TOOL NUMBER
1	O.	TOOL KIT, GENERAL AUTOMOTIVE	5180-00-177-7033	(50980) sc 5180-90-CL-N26
2	O, F	SHOP EQIUIPMENT, AUTOMOTIVE AND REPAIR: COMMON #1 (LESS POWER)	4910-00-754-0654	(19204) SC 4910-95-CL-A24

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	Replacement of parts is limited to gauges, regulators, hose adapters, handle and foot clamps.
B	Repair is limited at organization level to replacement of filter elements, leaf values, and diaphragm. These parts are available in service kit # P17439 provided by the manufacturer.

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

Section I. INTRODUCTION

E-1. Scope. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (except medical, class V, repair parts, and heraldic items).

E-2. Explanation of Columns.

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., Use cleaning compound, item 5, appendix C).

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Unit Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name, and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) in parentheses followed by the part number.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
	C	9150-00-273-8663	LUBRICATING OIL, VACUUM PUMP: MIL-L-83767, TYPE II	QT

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	PUBLICATION DATE	PUBLICATION TITLE
TM 10-6640-217-13&P	28 Sept. 1990	MILLIPORE VACUUM PUMP

BE EXACT. PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	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. Clenge 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 8-16 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 (269) 317-7111

SIGN HERE John Doe
JOHN DOE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

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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DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

COMMANDER
U.S. ARMY TROOP SUPPORT COMMAND
ATTN: AMSTR-MCTS
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MO 63120-1798

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 10-6640-217-13&P	28 Sept. 1990	MILLIPORE VACUUM PUMP

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

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

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE

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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 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

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