TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT
SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL

TOPOGRAPHIC SUPPORT SYSTEM
INFORMATION SECTION
MODEL ADC-TSS-13
NSN: 6675-01-105-5762

THIS MANUAL TOGETHER WITH TM 5-6675-324-14-1 SUPERSEDES TM 5-6675-324-14 DATED 15 SEPTEMBER 1983

HEADQUARTERS, DEPARTMENT OF THE ARMY

3 SEPTEMBER 1985

WARNING

HIGH VOLTAGE is used in this equipment. DEATH ON CONTACT or severe injury may result if personnel fail to observe safety precautions.

Do not be misled by the term LOW VOLTAGE. Low voltage can cause serious injury or death.

Test procedures requiring the operator or maintenance personnel to investigate equipment or restore casualties with interlocks disconnected or covers removed may result in DEATH ON CONTACT if personnel fail to observe safety precautions.

Voltages in switches and circuit breaker panels may result in DEATH ON CONTACT if personnel fail to observe safety precautions.

Failure to ground the section or equipment may result in DEATH ON CONTACT if personnel fail to observe safety procedures.

For Artificial Respiration refer to FM 21-11.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Wear solvent-impermeable gloves and eye/face protective equipment when using solvent. Do not use near open flame or excessive heat. Flash point of solvent is 100° F to 138° F (38° C to 59° c).

WARNING

Rotating and spinning equipment may snag loose clothing, hair or jewelry resulting in SEVERE PERSONNEL INJURY.

WARNING

Attempting to move overweight or top heavy equipment that is unsecured may result in SEVERE PERSONNEL INJURY. Always have sufficient personnel and equipment to accomplish the task

INTRODUCTION

This manual is divided into two volumes:

Volume 1, TM 5-6675-324-14-1 consists of Chapters 1 through 4 and Index 23.
Volume 2, TM 5-6675-324-14-2 consists of Chapters 5 through 10, Appendixes A through E, Glossary and Index.

The Appendixes and Glossary in Volume 2 are applicable to both volumes.

CHANGE

NO. 2

HEADQUARTERS
DEPARTMENTS OF THE ARMY
WASHINGTON, D.C., 25 MAY 1992

Operator's, Organizational, Direct Support
and General Support Maintenance Manual

TOPOGRAPHIC SUPPORT SYSTEM
INFORMATION SECTION
MODEL ADC-TSS-13
NSN 6675-01-105-5762

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TM 5-6675-324-2,3 September 1985 is changed as follows

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Remove pages	Insert pages
C-1andC-2	C–1 and C-2

2. Retain this sheet in front of manual for reference purposes.

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General, United States Army
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MILTON H. HAMILTON
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Operator's, Organizational, Direct Support
and General Support Maintenance Manual

TOPOGRAPHIC SUPPORT SYSTEM
INFORMATION SECTION
MODEL ADC-TSS-13
NSN: 6675-01-105-5762

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Remove pages	Insert pages
intro	intro
9-11 through 9-14	9-11 through 9-14
B-5 through B-11/B-12	B-5 through B-11/B-12
C-1 and C-2	C-1 and C-2
C-5 and C-6	C-5 and C-6
C-9 through C-15/C-16	C-9 through C-15/C-16
D-1/D-2	D-1/D-2
E-1 through E-10	E-1 through E-10
---	E-11/E-12

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TECHNICAL MANUAL

NO. 6675-324-14-2

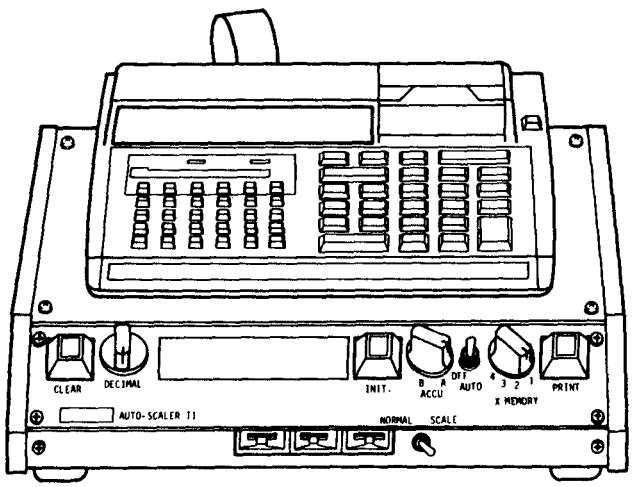
HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 3 September 1985

Operator's, Organizational, Direct Support and General Support Maintenance Manual

TOPOGRAPHIC SUPPORT SYSTEM
INFORMATION SECTION
MODEL ADC-TSS-13
NSN: 6675-01-105-5762

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support Command, ATTN:AMSTR-MCTS, 4300 GoodfellowBoulevard, St. Louis, M063120-1798. A reply will be furnished directly to you.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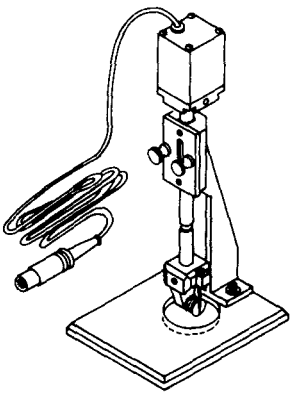
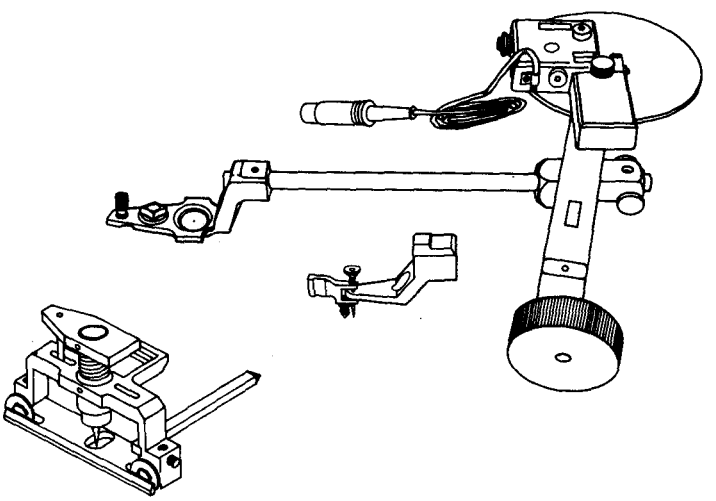
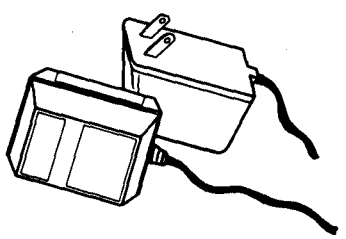
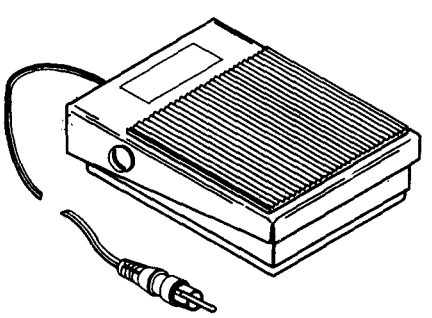
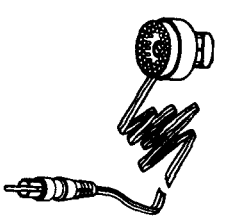
NORMAL SCALE











CHAPTER 5

QUANTITY PROCESSING SYSTEM (QPS)

Section I INTRODUCTION

5-1. GENERAL INFORMATION.

5-1.1 Scope.

a. Model Number and Equipment Name. Model L2501 Quantity Processing System (QPS) .

b. Purpose of Equipment. To provide electronic estimation, in proper units and scale, of area, perimeter, distance, and volume of geographic shapes found on maps, drawings and aerial photographs.

5-1.2 Reference Information. Numerical values shown on the Calibration Records Sheet, which is supplied with your QPS, must be used to successfully operate the equipment.

5-1.3 Glossary

Constant	Factor used to convert electronic measurement counts of the planimeter or linear measuring probe, to desired unit of measurement.
Contour	Closed loop on contour map. Indicates height by interval.
Contour Interval	Difference in elevation of two consecutive contour lines.
Contour Method	Estimates volume of fill or cut from its contours.
cut	Excavation or depression-like formation.
Daylighted Contour	Point or edge where cut becomes fill or fill becomes cut.
Fill	Embankment or hilly formation.

Planimeter	Instrument that provides data used to estimate area of geometric shape by tracing its boundary line.
QPS	Quantity Processing System
R_L or R_2	Alinement reading of linear measuring probe representing total number of pulse counts emitted by probe, per unit of length.
R_T or R_1	Alinement reading of planimeter representing total number of pulse counts derived by measuring area described by a test rule.
Scale Ratio	Ratio between given distance on map or drawing to corresponding distance on ground.
Slope	Natural or artificial incline or slant of ground.
Subroutine	Distinct routine or program. Part of larger routine or program that will perform its own distinct functions when used.
Test Rule	Device used to aline planimeter and obtain a constant factor.
μ	Resolution factor for linear measuring probe or planimeter at specified tracer arm length. Represents smallest area or length measuring instrument can measure. Measuring instrument emits single pulse count for each unit.

5-2. EQUIPMENT DESCRIPTION.

5-2.1 Equipmentnt Characteristics. Capabilities and Features. Provides electronic estimation, in scale, of area, perimeter, distance, and volume of geometric shapes on maps, drawings, aerial photographs etc. The equipment has the following capabilities and features.

a. Calculator provides for data storage and manipulation.

b. Automatically estimates distance, area, or volume as measuring instrument is moved.

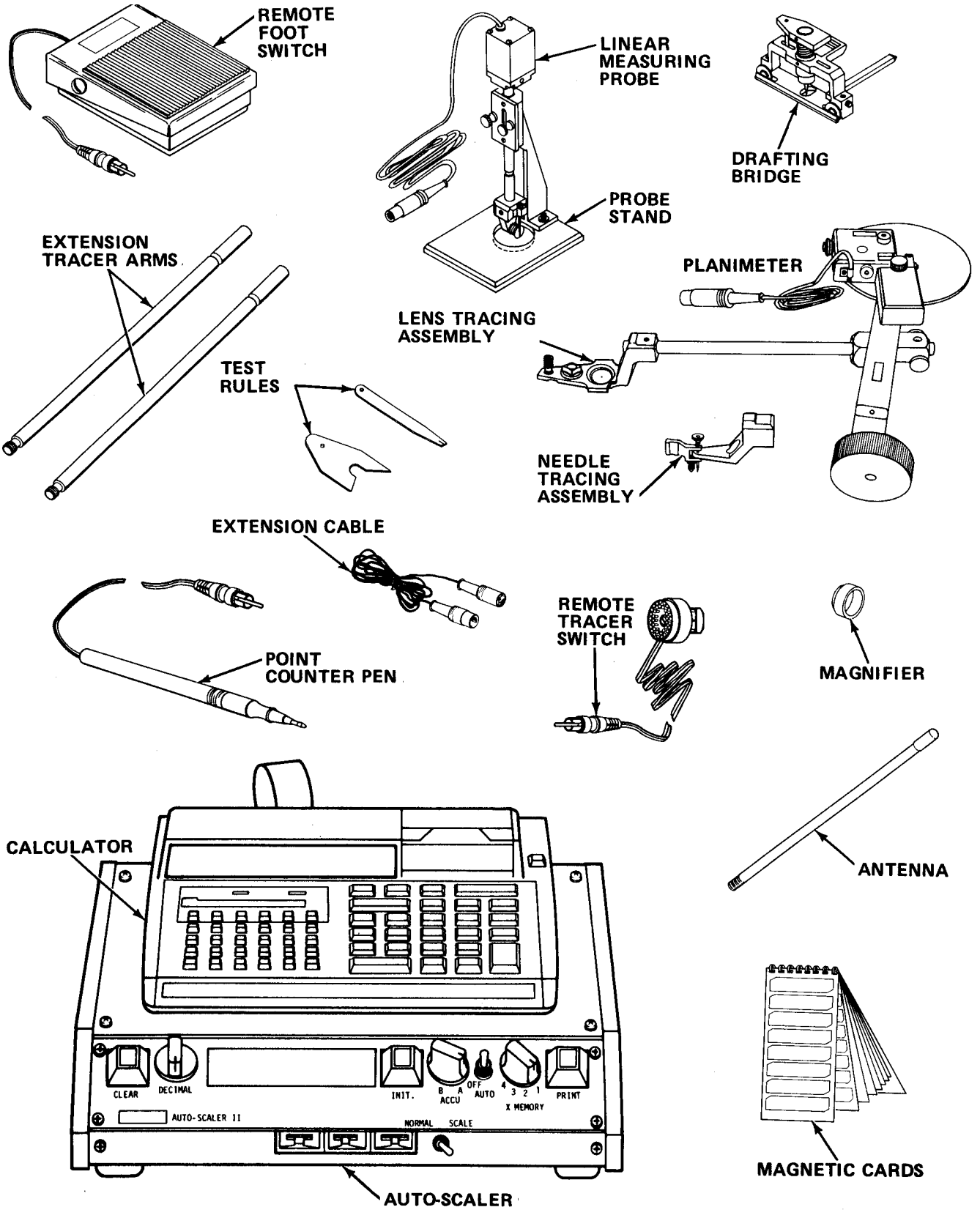
c. Displays results of measurement in proper scale and units.

d. Prints measurement automatically or on command.

e. Planimeter provides for measurement of surface area and volume.

f. Linear measuring probe provides for measurement of distances.

5-2.2 Location and Description of Major Components.



REMOTE FOOT SWITCH. Enables operator to remotely control four auto-scaler functions: Print, Clear, Actuate, or Initiate.

LINEAR MEASURING PROBE. Hand held or stand held measuring instrument. Measures distance.

PROBE STAND. Metal stand that holds linear measuring probe to secure its fixed" position during measurements.

DRAFTING BRIDGE. Provides mount for planimeter encoder for use during measurements or detailed layout work.

PLANIMETER. Wheel mounted measuring instrument. Measures surface area and volume.

LENS TRACING ASSEMBLY. Assembly mounted on end of planimeter tracer arm. Traces lines by centering with a small dot printed on center of lens.

NEEDLE TRACING ASSEMBLY. Assembly mounted on end of planimeter tracer arm. Used to provide polar compensation in tracing measurements.

REMOTE TRACER WITCH. Mounted on planimeter or drafting bridge. Enables operator to remotely control four auto-scaler functions: Print, Clear, Actuate, or Initialize. Provides remote operation of auto-scaler command switches.

MAGNIFIER. Placed over lens of lens tracing assembly to improve visibility of fine lines.

ANTENNA. Holds signal cables out of way of planimeter.

PREPROGRAMMED CARDS. Magnetic cards containing instructions to calculate, store, print, and display measurement input.

MAGNETIC CARDS. Blank cards used for recording original programs.

AUTO-SCALER. Counts pulses from measuring instruments. Displays count. Interfaces with calculator.

CALCULATOR. Calculates measurements according to program data. Displays results of measurements. Prints measurement results.

POINT COUNTER PEN. Pen that contains transducer. Pen emits one pulse for each stroke (count) made during count measurement.

EXTENSION CABLE. Used with planimeter to extend its reach.

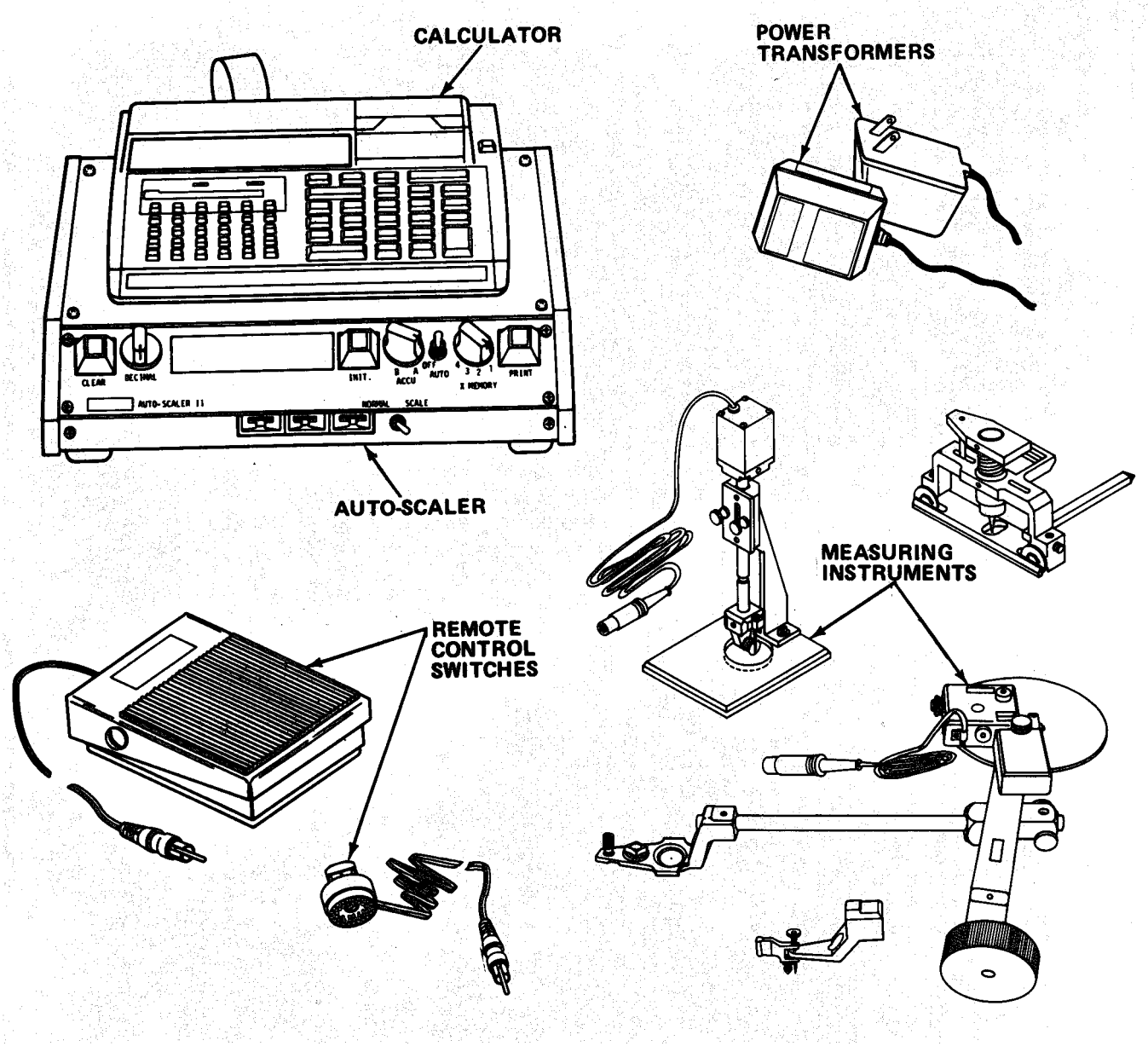
TEST RULES. Metal plates of specific lengths. Used for alinement and testing of planimeter.

EXTENSION TRACER ARMS. Extend reach of planimeter tracing assembly.

5-2.3 Eqipment Data.

Quantity Processing System	
Total Weight	251bs (11.4 kg)
Power Requirements	
Calculator	110 V, 60 HZ
Auto-Scaler	110 V, 60 HZ
Linear Measuring Probe	
Weight	0.25 lb (0.11 kg)
Smallest measurable length	0.0014 in. (0.0356 mm)
Planimeter	
Weight	12 lbs (5.4 kg)
Maximum reach of tracer arm	45 in. (114.3 cm)
Smallest measurable length	0.002 in. (0.051 mm)
Smallest measurable area	0.0017 $in.^2$ (.011 cm^2)
Calculator	
Weight	2.5 lbs (1.14 kg)
Number of memory register	26
Program length	224 steps max
Operating time with battery	3 to 6 hours max
Battery Charge Time	6 hours (calculator off) 17 hours (calculator on)

5-3. TECHNICAL PRINCIPLES OF OPERATION. The QPS consists of five major components which interface with each other. The calculator and auto-scaler can be used independently from the system. When used as a total system, the QPS can provide advanced measurement capabilities. The five major components of the QPS are the measuring instruments, auto-scaler, calculator, remote control switches and power transformers.



5-3.1 Measuring Instruments Provide an approximate measurement of a line or area by translating the movement of measuring instruments during tracing into electronic pulses. Measurement pulses (counts) are emitted as long as the measuring instrument is moving. The pulses (counts) are sent to the auto-scaler. There are four measuring instruments: planimeter, linear measuring probe, point counter pen and drafting bridge.

a. Planimeter. Used to trace the perimeter or boundary line of a plane figure. Pulses emitted during tracing are sent to the auto-scaler and counted. The count is then used in calculating the estimated area or volume measurement of the figure.

b. Linear measuring probe. Used to measure the length (distance) of curved or straight lines. The linear measuring probe emits pulses per unit of length measured. The pulses are sent to the auto-scaler and counted. The count is then used in calculating the estimated length or distance of line measured.

c. Point counter pen. Used to count items of a similar type found on a map, blueprint, plan, etc. Each time the point counter pen is stroked in counting, the transducer in the pen emits a signal pulse which is sent to the auto-scaler for totaling.

d. Drafting bridge. A layout instrument and mount for the encoder of the planimeter. When the encoder is moved from the planimeter and mounted on the drafting bridge, it can be used for linear measurement and detailed layout work.

5-3.2 Auto-Scaler. Processes pulses emitted by measuring instruments. The pulses are input into the rear of the auto-scaler through the applicable input jack (E_1, E_2, or POINT COUNT). There are two modes of entry to the auto-scaler, NORMAL and SCALE. This is determined by the NORMAL/SCALE switch. When switch is on NORMAL, pulses bypass the scaler circuit and are applied to the decade up/down counter. When the switch is on SCALE, pulses are first input into the scaler circuit before counting. The auto-scaler has five functional components: scaler, decade up/down counter, LED display, calculator interface circuit, and command switches.

a. Scaler. Enables operator to perform a scale reduction of the pulse count. When activated by NORMAL/SCALE switch, the scaler uses a correction constant to divide input pulses. The correction constant is input by setting dials. Pulses are then sent to the decade up/down counter.

b. Decade up/down counter. Counts pulses received from the measuring instruments or scaler circuit. It counts up or down, depending on the direction that the measuring instrument is moved. The pulse count is continuously output to the calculator interface circuit and scaler LED display.

c. LED display. Displays current total of the decade up/down counter. The decimal place for the display is controlled by the DECIMAL switch.

d. Calculator interface circuit. Converts the pulse count into data compatible with the calculator and then transmits it through a ribbon cable to the calculator. Converts and transmits signals from the command switches. When switch is on AUTO, data is automatically and continuously transmitted to the calculator. When switch is on MAN, data is transmitted only when the PRINT command is received from the PRINT X command switch on the calculator.

e. Command switches. Control the operating modes of the auto-scaler, data transmission, and remote operation of the calculator. There are six command switches: CLEAR, PRINT, INIT, X MEMORY, MAN/AUTO, and ACCU.

(1) CLEAR. Command is sent to clear LED display on calculator and LED display and decade up/down counter on auto-scaler.

(2) PRINT. Command sent to signal calculator to implement instructions of subroutine E, stored in memory, which prints the pulse count data. PRINT also initiates transmission of that data for printing when auto-scaler is in MAN.

(3) INIT. Command sent to signal calculator to implement subroutine D, which resets memory data registers for the next set of data.

(4) X MEMORY. Has four settings: 1, 2, 3, and 4. Tells the calculator which primary register memory location (1, 2, 3, or 4), and its contents, is to be used in calculations.

(5) MAN/AUTO. Determines the mode of data transmission for the auto-scaler.

(6) B/ACCU/A/OFF. Controls the operating status of the decade up/down counter. There are four possible settings: OFF, A, ACCU, and B. OFF turns the auto-scaler OFF. A enables the decade up/down counter to increment the count, B enables it to decrement the count, and ACCU freezes the decade up/down counter at its current total.

5-3.3 Calculator. Performs manipulations and calculations on pulse count data, prints results and intermediate steps in the proper units on command, and stores data and programs. There are six functional parts: memory, logic circuitry, keyboard, LED display, magnetic card reader, and printer.

a. Memory. Stores pulse count data, constants, results of calculations, and subroutines containing programmed instructions (for using pulse count data and constants). In order to use the QPS, the programs with instructions for performing calculations are entered into the calculator memory. The memory is divided into three parts: automatic memory stack, storage registers, and program memory.

b. Automatic memory stack. Has four available locations (X, Y, Z, and T) which are used by the operator and the calculator in performing calculations. The logic circuitry uses the automatic memory stack in performance of its instructions and to store intermediate results of calculations.

c. Storage registers. Used to store special numbers such as pulse counts and constants. Each register can hold one constant number or command. Primary register R_1 is directly connected to the calculator interface circuitry in the auto-scaler. Contents of storage registers are affected only by the keyboard or program command. The INIT signal begins a program which commands the calculator to clear the storage registers. The storage registers are divided into two parts: 16 primary registers and 9 secondary registers. The primary registers contain data and constants that need to be readily available and accessible for use. The MEMORY 1, 2, 3, or 4 signal is a release command for the contents of the corresponding primary register, R_1, R_2, R_3, or R_4. The remaining 12 primary registers are only used when operating programs. The secondary registers contain data that is not immediately needed. They are only accessible through the use of the special command key P ≶ S.

d. Program memory. Stores the instructions of a complete program or subroutine. Programs and subroutines are entered into the memory either manually, keyed in from the keyboard, or from a preprogrammed magnetic card. The programs are recalled by command each time new information must be processed. A subroutine automatically processes data and implements recorded instructions.

e. Logic circuitry. Performs all calculations, commands, and data and signal transfers. The logic circuitry is the interface for all external inputs, including auto-scaler signals, and directs all operations of the calculator.

f. Keyboard. Gives operator direct access and control of the calculator operation. Pressing a key results in the corresponding command or signal being sent to the logic circuitry and memory. The keyboard has two modes: PRGM (program) and RUN. In PRGM, all keystroke signals are entered into the memory and sent to the logic circuitry which identifies the location on the keyboard of the function, letter, or number the keystroke signal represents. In RUN, all keyboard signals are sent to the logic circuitry for implementation or transfer.

g. LED display. Displays last entry mode into calculator or contents of any memory register when commanded. Also provides all the visual indications of error conditions that may exist and the key code of each step of a program when being entered or run.

h. Magnetic card reader. Used to store programs and subroutines on magnetic cards. Reads and loads contents of preprogrammed cards into calculator memory.

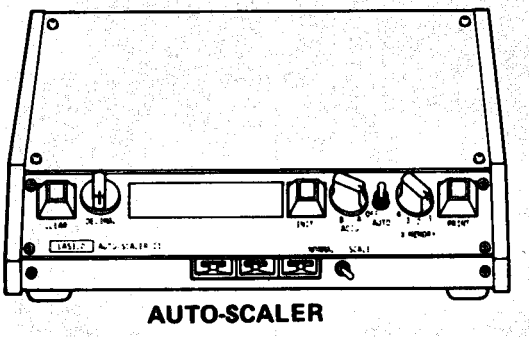
i. Printer. Provides hard copy of any data, calculation results, or program steps.

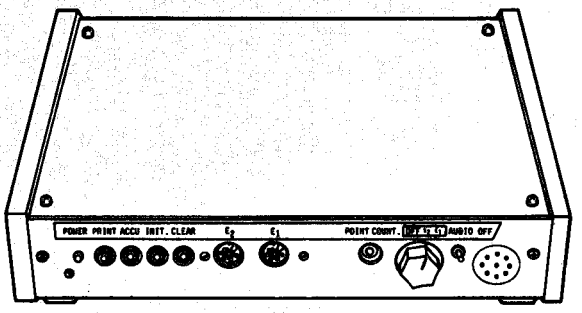
5-3.4 Remote Control Switches The planimeter pushbutton remote tracer switch and foot switch enable the operator to remotely activate two of four possible signals: CLEAR, PRINT, INIT, or ACCU. The signals that the switches control depend on which input jacks the switches are plugged into.

5-3.5 Power Transformers. Converts ac power to dc power on the auto-scaler. The calculator uses ac power.

Section II OPERATING INSTRUCTIONS

5-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.

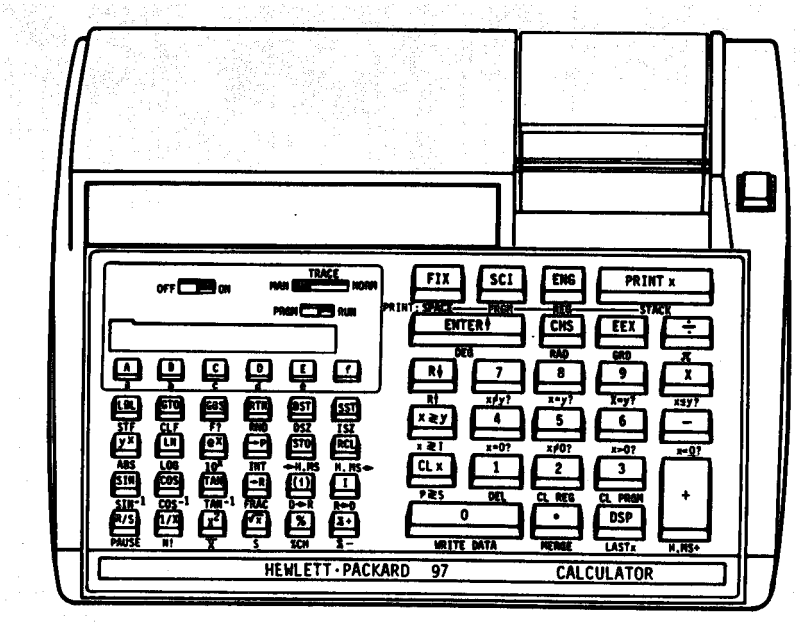




Key	Control or Indicator	Function
	CLEAR button	Clears all displays and memories.
	DECIMAL switch	Selects position of decimal point in auto-scaler display.
	LED indicator light	Indicates when pulse count is positive.
	LED display	Displays current pulse count total.
	SCALE dials	Inputs three most significant figures of constant into scaler.
	NORMAL/SCALE	In NORMAL, pulse count is not scaled.
		In SCALE, activates internal scaling circuit.
	INIT button	Sends initialize command signal to calculator.

Key	Control or Indicator	Function
	B/ACCU/A/OFF	Controls pulse counter: A: Count UP B: Count down ACCU : Freeze count OFF: Turns auto-scaler off.
	MAN/AUTO switch	Controls pulse count sent to calculator. MAN count is sent when PRINT is activated. AUTO count is sent automatically.
	X MEMORY switch	Selects memory register 1, 2, 3, or 4 to be used in calculator.
	PRINT swith	Sends print command to calculator and auto-scaler.
	POWER supply jack	Input for power trans-former plug.
	PRINT input jack	Input for remote tracer switch or foot switch plug, used to activate print command.
	ACCU input jack	Input for foot switch or remote tracer switch plug used to activate actuate command.
	INIT input jack	Input for foot switch plug used to activate initialize command.
	CLEAR input jack	Input for foot switch plug used to activate clear command.
	E_2 encoder socket	Input for linear measuring probe.
	E_1 encoder socket	Input for planimeter.
	POINT COUNT input jack	Input for point counter Den.

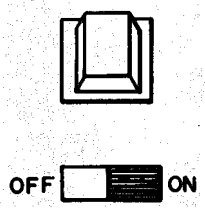
Key	Control or Indicator	Function
	OFF/E_2/E_1 switch	Selects input from linear measuring probe, planimeter, or turns on input.
	AUDIO/OFF switch	Used to turn audio alarm on or off.
	Audio alarm	Emits audible tone each time pulse (stroke count) is received from point counter pen.



CALCULATOR

NOTE

Numbers, letters, symbols, and words that are on top of the calculator keys will be boxed throughout the text.



LED Display	Displays numbers or message.
Paper Advance Button	Advances printer paper.
OFF/ON Switch	Turns calculator on or

Key	Control or Indicator	Function
MAN TRACE NORM	MAN/TRACE/NORM switch	Selects operating mode for printer. MAN : Print only when commanded. TRACE : Prints intermediate and final calculations as they are performed. NORM : Prints entry-by-entry records of entries and commands.
PRGM RUN	PRGM/RUN switch	Selects operating mode of calculator. RUN : Operates normally. PRGM : Used to manually enter program.
f	Function prefix key	Shifts next keystroke to activate function written beneath a key.
ENTER↑ **DEG**	Enter/Degrees key	ENTER↑ : Value in X-register is stored in Y-register. DEG : Instructs calculator that units for all angles and trig calculations will be in degrees.
PRINT X PRINT:STACK	Print X/Stack key Print/Stack	PRINT X : Value of display is printed. STACK : Used to print contents of entire automatic memory stack.

Key	Control or Indicator	Function
[FIX] PRINT: SPACE	FIX/SPACE key	[FIX] : Fixes decimal point of LED display to one position. SPACE : Instructs printer to advance paper one line.
[ENG] PRINT:REG	Engineering Notation/ Register key	[ENG] Instructs LED display to display all numbers in engineering notation. PRINT:REG : Instructs printer to print contents of all primary storage registers.
[CHS] RAD	Change Sign/Radians key	[CHS] : Change sign of number or exponent in X-register (LED display). RAD : Instructs calculator that units for all angles and trig calculations will be in radians.
[EEX] GRD	Exponents/grads key	[EEX] : Numbers keyed in after pressing [EEX] are to be displayed as exponents of 10. GRD : Instructs calculator that units for all angles and trig calculations will be in grads.
El π	Divide arithmetic/π key	[÷] : Divides number in Y-register by number in X-register. π : Enters value of pi into X-register.

Key	Control or Indicator	Function
[x] X≤Y?	Multiply arithmetic/X≤Y? key	q : Multiplies number in Y-register by number in X-register. X≤Y? : Used in program. Compares numbers in X- and Y-memories. If X is less than or equal to Y, next step in program is performed. If X is not less than or equal to Y test is negative and calculator skips next step in program.
[-] X<0?	Subtract arithmetic/X<0? key	q : Subtracts number in X-memory from number in Y-memory. X<0? : Used in programs to compare number in X-register to 0. If X is less than 0, calculator performs next program step. If X is not less than 0, calculator skips next program step.
El H.MS+	Add arithmetic/Hours, Minutes, Seconds key	[+] Adds number in X-register to number in Y-register. H.MS+ : Adds hours, minutes, and seconds, or degrees, minutes and seconds in the Y-register to those displayed in the X-register.
[R↓] R↑	R↓/R↑ roll stack key	[R↓]: Instructs calculator to roll down contents of automatic memory stack (X, Y, Z, and T) into X-register. Each time new number is displayed, old one moves to top of stack. First value moved is in Y-register.

Key	Control or Indicator	Function
		R↓: Instructs calculator to roll up contents of automatic memory stack (X, Y, Z, and T) into X-register, starting with number in T-register.
X≷Y X≷I	X≷Y/X≷I manipulation key	X≷Y : Interchanges numbers in X- and Y-memory registers. X≷I : Interchanges numbers in X- and I-memory registers.
CL X P ≷ S	Clear X/P≷S key	CL X : Clears contents of X-memory register (LED display) to zero. P≷S : Interchanges contents of primary memory registers with contents of secondary memory registers.
0 WRITE DATA	0/Write Data key	q : Enters number 0 into X-memory register (LED display). WRITE DATA : If a magnetic card is passed through the card reader immediately after this operation, the contents of the storage registers are recorded on the card.
. MERGE	Decimal Point/Merge key	q : Enters decimal point in desired position in X-memory (LED display) register. MERGE : Merges, rather than overwrites, data on program from magnetic card with data or program in calculator.

Key	Control or Indicator	Function
[1] DEL	l/Delete key	q : Enters number 1 into desired position in X register (LED display). DEL : Deletes current instructions from program memory. All subsequent instructions moved up one step.
[2] CL REG	2/Clear register key	[2] : Enters number 2 into desired position in X-register (LED display). CL REG : Clears contents of all primary memory registers.
[3] CL PRGM	3/Clear program key	q : Enters number 3 into desired position in X-register (LED display). CL PRGM : (In PRGM) Clears calculator's program memory down to all [R/S] (Run/Stop) instructions, and clears all flags. Sends calculator to step 000 and instructs it to operate in [FIX 2] and DEG mode.
[6] X = 0 ?	6/X = 0? key	[6] : Enters number 6 into desired position in X-register (LED display). X = 0 ? : Used in program. Compares number in X-memory register to 0. If X is greater than 0, calculator executes next program step. If X is 0 or less than 0, calculator skips next program step and executes the following step.

Key	Control or Indicator	Function
7 **X≠Y?**	**7/X≠Y?** key	7 **:** Enters number 7 into desired position in X-register (LED display). **X≠Y? :** If X is not equal to Y, calculator skips one step before continuing program.
8 **X=Y?**	8/X=Y? key	8 **:** Enters number 8 into desired position in X-register (LED display). **X=Y?:** If X equals Y, calculator will execute next instruction in program.
4 X.0?	4/X=0? key	4 **:** Enters number 4 into desired position in X-register (LED display). **X=0? :** Compares number in X-register to 0. If X equals 0, calculator executes next program step. If X is not 0, calculator skips next step and executes the following step.
5 **X≠0?**	**5/X≠0?** key	5 **:** Enters number 5 into desired position in X-register (LED display). **X≠0? :** Compares number in X-register to o. If X is not 0, calculator executes next program step. If X is 0, calculator skips next step and executes the following step.

Key	Control or Indicator	Function
[9] X=y?	9/X=Y? Key	[9] : Enters number 9 into desired position in X-register (LED display). X=Y? : Compares number in X-register to Y-register. If X is equal to Y, calculator executes next program step. If not, it skips the next step and executes the following step.
[A] a [B] b [C] c [D] d [E] e	A/a through E/e NOTE Small letter labels a through e are called with [f] prefix key.	Used to assign user-defined labels. With calculator in PRGM, pressing [LBL] and label key or [LBL], [f], and label key assigns that label to routine or subroutine within a program. In RUN, calculator searches program memory for that label. Calculator begins execution of program memory at that point. [GTO] or [GSB] followed by label key or [f], label key: Calculator stops execution, searches memory for designated label, and begins execution there.

Key	Control or Indicator	Function
LBL STF	Label/Set Flag key	LBL : In PRGM, enters label designation A /a through E /e or 0 through 9 into program step. In RUN, calculator searches program memory for designated label and begins execution there. STF : Followed by flag designation 0, 1, 2, or 3, sets designated flag.
GTO CLF	Go to/Clear flag key	GTO : When calculator is in PRGM, GTO followed by 0 three digit step number sets calculator to three digit step number of program memory. No instructions are executed. When calculator is in RUN, GTO folllowed by . and three-digit step number sets calculator to three-digit step number of program memory. No instructions are executed. In RUN, followed by label designator q /a through E/e or 0 through 9, sends calculator to first designated label in memory. CLF : Followed by flag designation 0, 1, 2, or 3, clears designated flag.

Key	Control or Indicator	Function
[RCL] H.MS →	Recall/Hours, Minutes, Seconds key	[RCL] : Followed by address of memory register, places value of that register into X-register (LED display). H.MS →: Converts hours, minutes, seconds, or degrees, minutes, seconds displayed in X-register to decimal hours or degrees.
[SIN] SIN^{-1}	Sin/Arc Sine trig key	[SIN] : Computes sine of number in X-register. SIN^{-1} : Computes arc sine of number in X-register.
[COS] COS^{-1}	Cosine/Arc Cosine trig key	[COS] : Computes cosine of number in X-register. COS^{-1} : Computes arc cosine of number in X-register.
[(i)] D→R	Register / D→R key	[(i)] : Subtracts 1 from contents of storage register specified by value in I. Skips one step if value is then 0. D → R: Converts degrees displayed in X-register to radians.
[RTN] RND	Return/round key	[RTN] : Followed by 000, returns calculator to step 000 of program memory. When encountered as step in program or subroutine, returns calculator to first step of that program or subroutine.

Key	Control or Indicator	Function
		RND : Rounds mantissa of 10-digit number in X-register to that of actual value seen in display.
[BST] DSZ	Back Step/Decrement and Skip if 0 key	[BST] : In PRGM, moves calculator back one step in program memory to previous input. In RUN, stops program and moves calculator back one program step in memory. Original X-register contents return when key is released. DSZ : Followed by [I] , subtracts 1 from contents of [I] .
[STO] →H.MS	Store/Hours, Minutes, Seconds key	[STO] : Followed by address key [0] through [9] or through [E]), stores displayed number in corresponding primary memory register: R through R_9, R_A throgh R_E or I. →H.MS : Converts decimal hours or degrees in X-register to hours, minutes, seconds or degrees, minutes and seconds.
[I] R→D	I-Register/R→D key	[I] : Recalls number in I-register into X-register. R→D : Converts radians in X-register to degrees.

Key	Control or Indicator	Function
R/S PAUSE	Run/Stop/Pause key	R/S: In RUN, begins program execution. If program is already running, pressing R/S stops program. If encountered in program as program step, program stops at that point. PAUSE: Momentarily stops running program and transfers control to keyboard for 1 sec.
SCI PRINT:PRGM	Scientific notation/ Print Program key	SCI: Selects scientific notation display. PRINT:PRGM: Prints program.
GSB F?	Go to subroutine/flag key	Causes calculator to begin executing instructions. F?: IS flag true? When followed by-designator, it tests flag. Clears flags after testing.
SST ISZ	Single step/increment	Moves calculator forward one step in program memory. ISZ: Increments value in I register.
→R FRAC	Polar magnitude/fraction	→R: Converts polar magnitude X and angle Y in X- and Y-registers to rectangular X and Y coordinates. FRAC : Leaves only fractional portion of number in X-register.

Key	Control or Indicator	Function
[y^x] ABS	Exponent/absolute value	[y^x]: Raises number in Y-register to power of number of X-register. ABS: Gives absolute power of number in X-register.
[LN] LOG	Natural logarithm	[LN]: Computes natural logarithm of number in X-register. LOG: Computes common logarithm of number in X-register.
[e^x] 10^x	Antilogarithm/common	[e^x]: Natural antilogarithm. Raises e to power of number in X-register. lox: Common antilogarithm. Raises 10 to power of number in X-register.
[→P] INT	Polar, rectangular conversion/integer	[→P] Converts X and Y rectangular coordinates placed in X- and Y-registers to polar magnitude and angle. INT: Leaves only integer part of number in X-register.
[TAN] TAN^{-1}	Tangent/arc tangent	[TAN]: Computes tangent of value in X-register. TAN-l: Computes arc tangent of number in X-register.
[1/X] N!	Reciprocal/factoral	[1/X]: Computes reciprocal of number in X-register. N!: Computes factoral of number in X-register.

Key	Control or Indicator	Function
[x²] $\bar{X}$	Square/average	[x²]: Computes square of number in X-register. $\bar{X}$: Computes mean (average) of X and Y values.
[√x] s	Square root/standard deviation	[√x]: Computes square root of number in X-register. S: Computes sample standard deviations of X and Y values.
[Σ+] Σ-	Accumulate/subtract	E l : Accumulates numbers from X- and Y-registers into secondary storage registers. Σ- : Subtracts X and Y values from storage registers.
[DSP] LAST X	Display/recall	[DSP] : Followed by number key, selects number of displayed digits. LAST X: Recalls number displayed before previous operation back into X-register.
[%] % CH	Percent/change	[%] : Computes X% of Y. % CH: Computes percent of change from number in Y-register to number in X-register.

5-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

a. Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

5-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

g. Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Item	Quantity
Brush	1 ea
Cheese cloth (Item 7, Appendix E)	ar
Calculator Head-Cleaning Card	1 ea
Isopropyl Alcohol (Item 4, Appendix E)	ar
Cotton Swabs (Item 8, Appendix E)	ar

Table 5-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

F the equipment must be kept in continuous operation, check and service only those items that can safely be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before
D - During
A - After

W-Weekly
M- Monthly
Cl - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number)- Hundreds of Hours

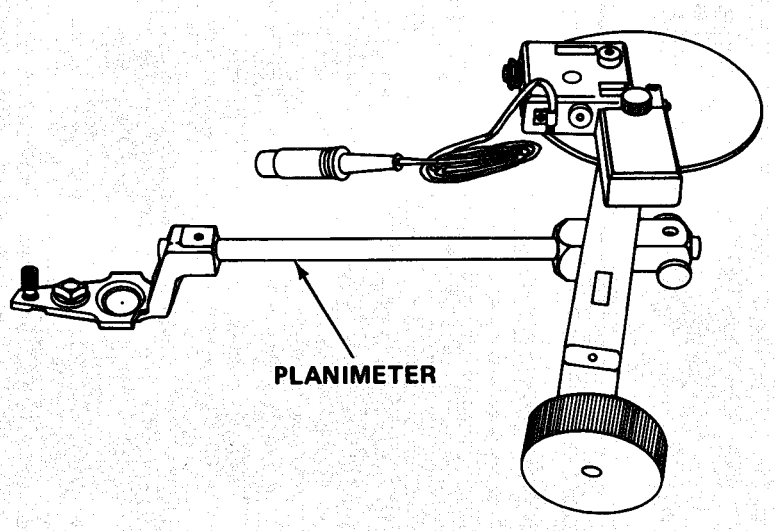
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Reedy/ Available If:
		QUANTITY PROCESSING SYSTEM (PLANIMETER) 	
1	B	Inspect Planimeter. Check wheels, lens tracing assembly, axle, and paper disk for dirt, cracks, and breaks. Clean with soft brush. Replace paper disk as needed (paragraph 5-10.4).	components are dirty or broken.
		2 Check planimeter drive gears for dirt or breaks. Check for jammed or loose drive gears.	Drive gears are damaged.
		3. Check teflon guide washer underneath tracing lens for cracks, dirt, or looseness. Clean with soft brush. Replace teflon guidede washer as needed (pararaph 5-10.2).	Teflon guide washer is dirty or cracked.

Table 5-1, OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
s - Semiannually
BI - Biennially

(Number) . Hundreds of Hours

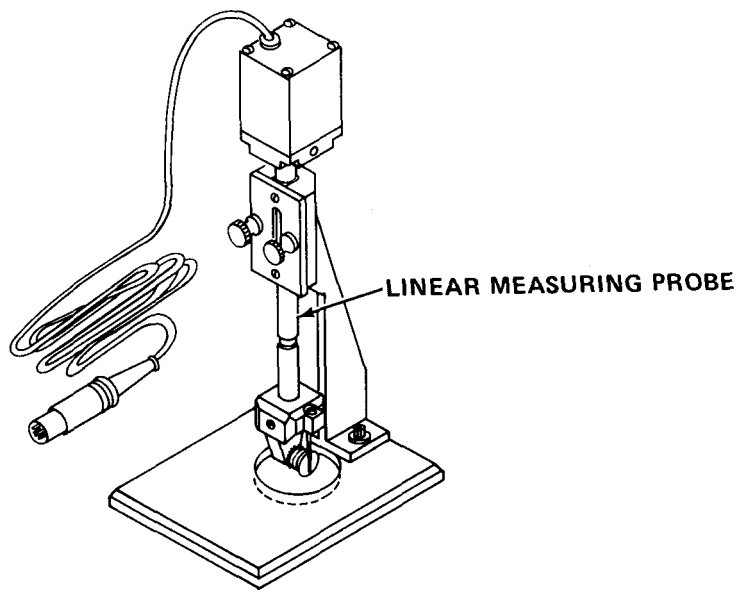
ITEM NO.	In TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		QUANTITY PROCESSING SYSTEM (PLAN I METER) - Cent	
2	B	Inspect Linear Measuring Probe.	
			
		1. Check case, stand, guidi ng wheel and gears for cracks, breaks, or dirt Clean with soft brush.	Linear measuring probe is damaged.
		2. Clean base of measuring probe with soft brush.	
		3. Remove dirt from linear measuring probe gears with soft brush.	Linear measuring probe is dirty.

Table 5-1 OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - **Before** W - Weekly AN - Annually (Number) -Hundreds of Hours
D - **During** M- Monthly S - semiannually
A - **After** Q - Quarterlv BI - Biannually

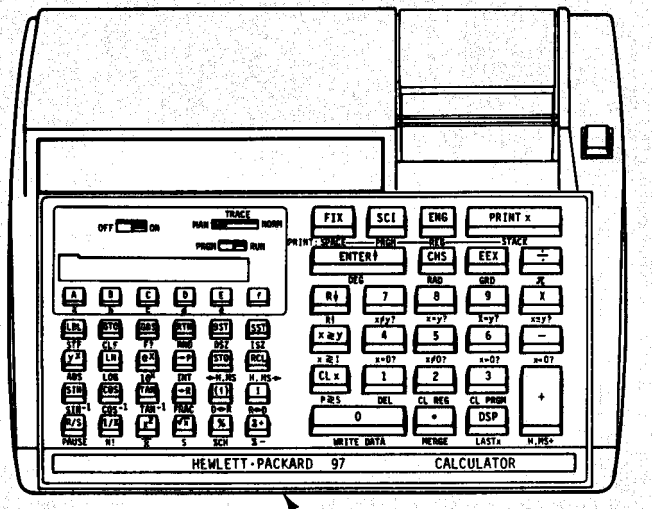
ITEM NO	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readinass Reporting, Equipment Is Not Ready/ Available If:
		OUANTITY PROCESSING SYSTEM (PLANIMETER) - Cent	
3	B	Inspect Calculator.	
		 CALCULATOR	
		1. Inspect keyboard, battery pack, display, and casing for cracks or breaks. Replace calculator as needed.	Calculator is damaged.
		CAUTION Do not allow alcohol to touch any part of the calculator. Damage to calculator could result.	
		2. Inspect calculator battery pack contacts. Clean with cotton swabs moistened with alcohol.	Blattery pack con-tacts are dirty.

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		QUANTITY PROCESSING SYSTEM (PLANIMETER) - Cont	
3	B	Inspect Calculator - Cent	
		3. Inspect ribbon cable and power jacks for cracks or breaks.	Ribbon cable or power jacks are damaged.
		4. Wipe dirt and dust from calculator with soft cloth .	
		CAUTION Use head cleaning card only after continued use of preprogrammed card. Head cleaning card is abrasive. Damage to calculator reader could result.	
		5. Clean magnetic card reader heads with head cleaning card.	
3	M	Wipe magnetic cards with soft cloth moistened with alcohol.	

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cent

B- Before W - Weekly AN - Annually (Number) - Hundreds of Hours
D- During M - Monthly S - Semiannually
A- Aftar Q - Quarterly BI - Biannually

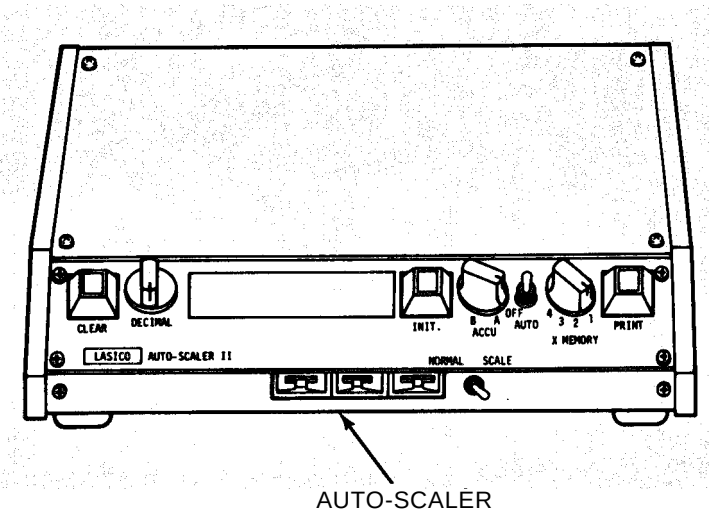
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Raady/ Available if:
		QUANTITY PROCESSING SYSTEM (PLANIMETER) - Cent	
	B	Inspect Auto-Scaler	
		 AUTO-SCALER	
		1. Inspect front panel, back panel, and casing for dirt, cracks, or breaks. Clean with soft brush.	Auto-scaler is damaged.
		2. Inspect power jacks on back of auto-scaler for breaks or loose fittings.	Power jacks are broken or loose.

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

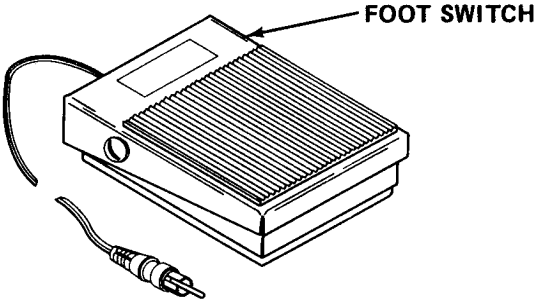
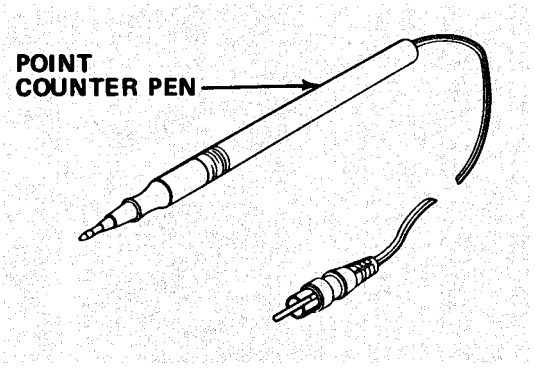
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		QUANTITY PROCESSING SYSTEM (PLANIMETER) - Cont	
5	B	Inspect Foot Switch.	
			
		1. Inspect foot switch for cracks or breaks.	Foot switch is damaged.
		2. Inspect foot switch cord for frays or breaks.	Foot switch cord is damaged.

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before	W - Weekly	AN - Annually	(Number) - Hundreds of Hours
D - During	M - Monthly	S - Semiannually	
A - After	Q - Quarterly	BI - Biennially	

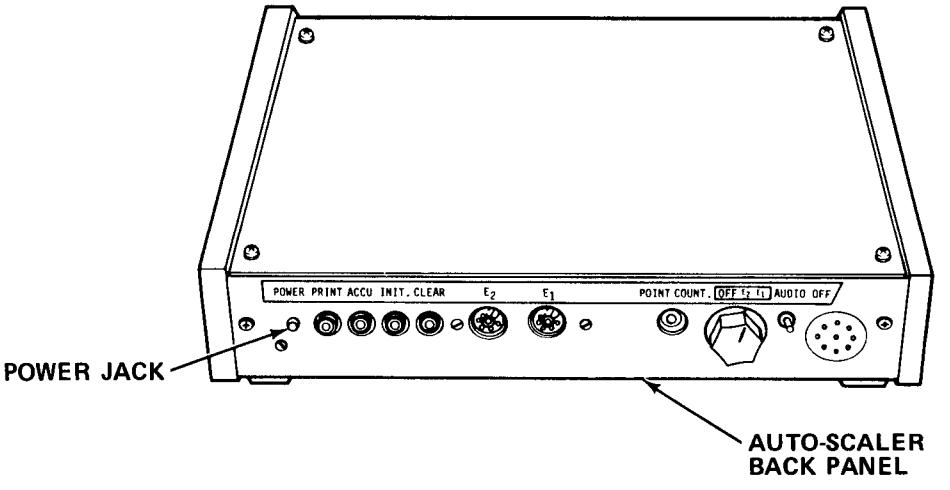
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		QUANTITY PROCESSING SYSTEM (PLANIMETER) - Cont	
6	B	Inspect Point Counter Pen.	
			
		1. Inspect pen for cracks or breaks.	Point counter pen is damaged.
		2. Inspect point counter pen cord for breaks or frays.	Point counter pen cord is damaged.

5-6. OPERATION UNDER USUAL CONDITIONS.

5-6.1 Assembly and Preparation for Use.

Remove auto-scaler from case. Set on table near drawing, map, or photograph to be measured.

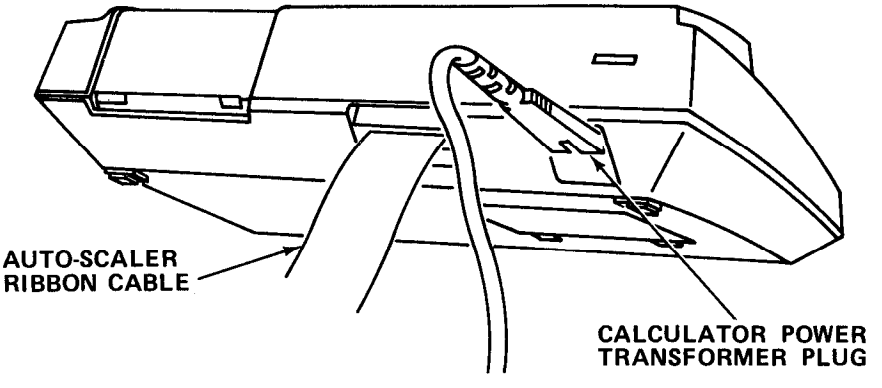
b. Remove calculator from case. Place on top of auto-scaler with keyboard facing front of auto-scaler.



CAUTION

Do not plug power transformer into power supply rated over 125 V ac. Permanent damage to auto-scaler may occur.

Plug auto-scaler power transformer plug into power supply jack on auto-scaler back panel.



CAUTION

Arrows on calculator and ribbon cable must aline. Damage to calculator may occur if cable is plugged in backward.

d. Plug auto-scaler ribbon cable into cable jack in back of calculator.

CAUTION

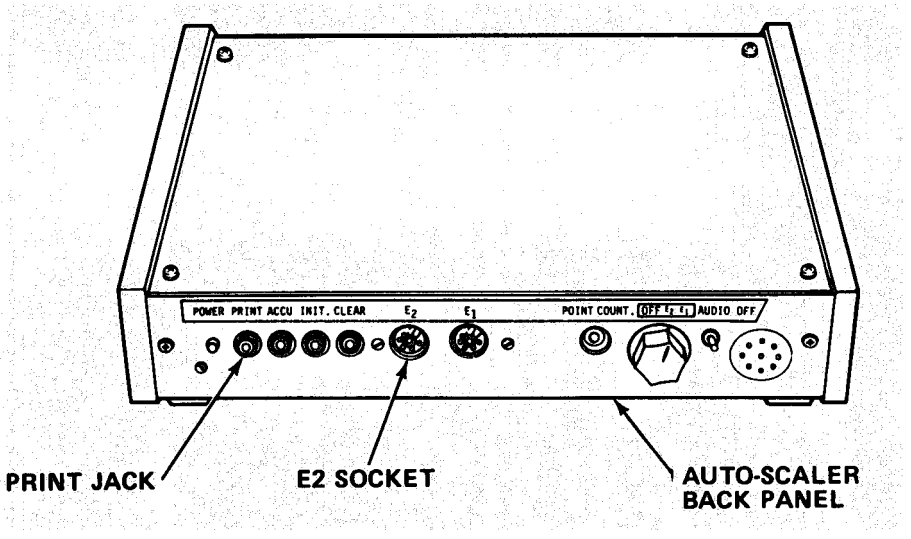
Do not plug power transformer into power supply rated over 125 V ac. Permanent damage to calculator may occur.

e. Plug calculator power transformer into power jack on calculator back panel.

CAUTION

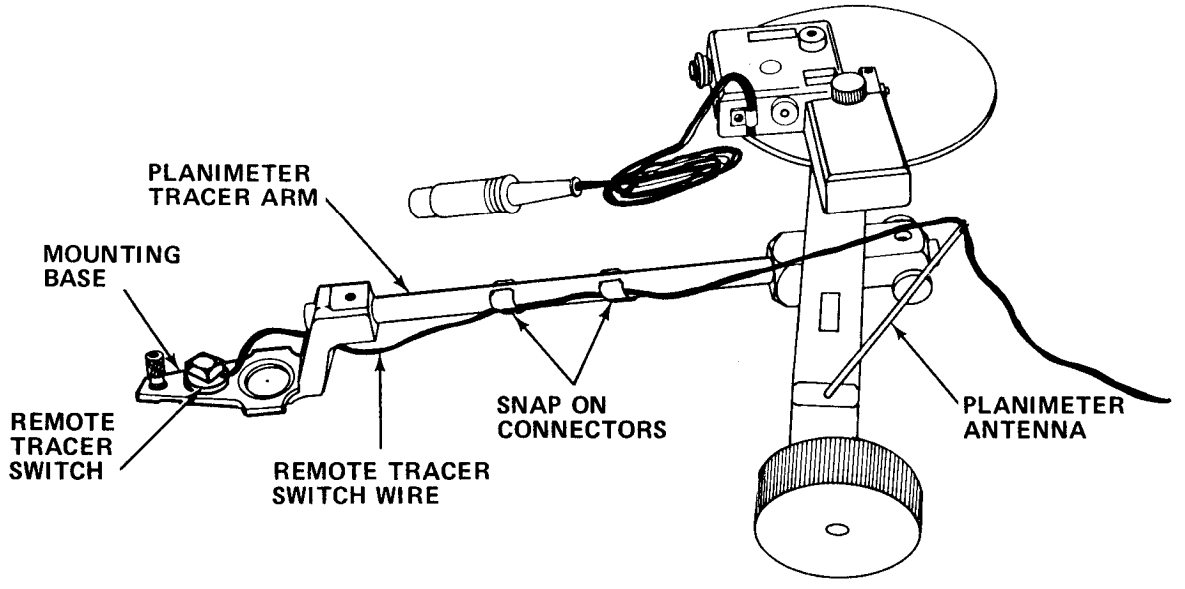
Always carry planimeter by top. Damage to planimeter or misalinement may occur.

f. Carefully remove planimeter from case. . Place planimeter on table near auto-scaler.



g. plug planimeter into E_2 encoder socket on auto-scaler back Panel.

h. Remove remote tracer switch from case. Plug into PRINT input jack on auto-scaler back panel.

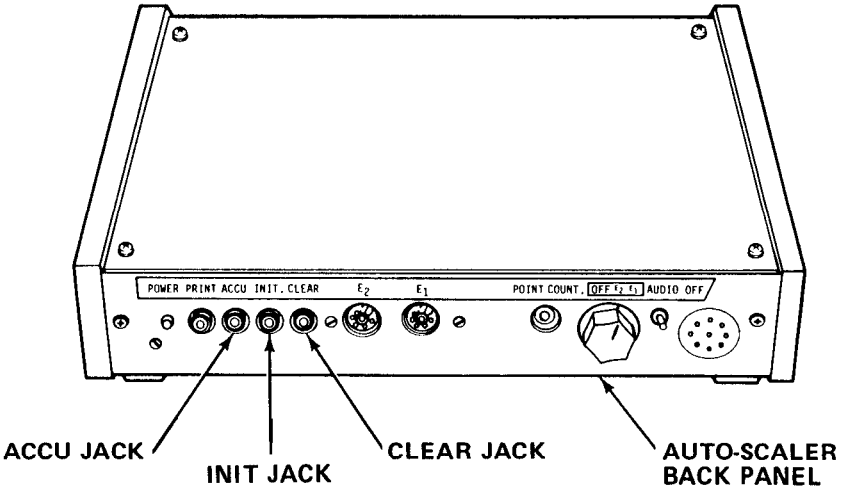


i. Mount remote tracer switch on mounting base at end of planimeter tracer arm by pressing against mounting base.

j. Remove planimeter antenna from case. Screw into hole on top of planimeter body .

k. Attach remote tracer switch wires to tracer arm with snap-on connectors.

1. Remove cap from antenna and guide remote tracer switch wires through slotted end of antenna. Replace cap.



m. Remove foot switch from carrying case. Plug into CLEAR, INIT, or ACCU input jack on auto-scaler back panel.

n. If using point counter pen, remove from case. Plug into POINT COUNT jack on autoscaler back panel.

o. If using linear measuring probe, remove from case. Plug into E_L encoder socket on auto-scaler back panel.

p. Plug both power transformers into 120 V ac outlets.

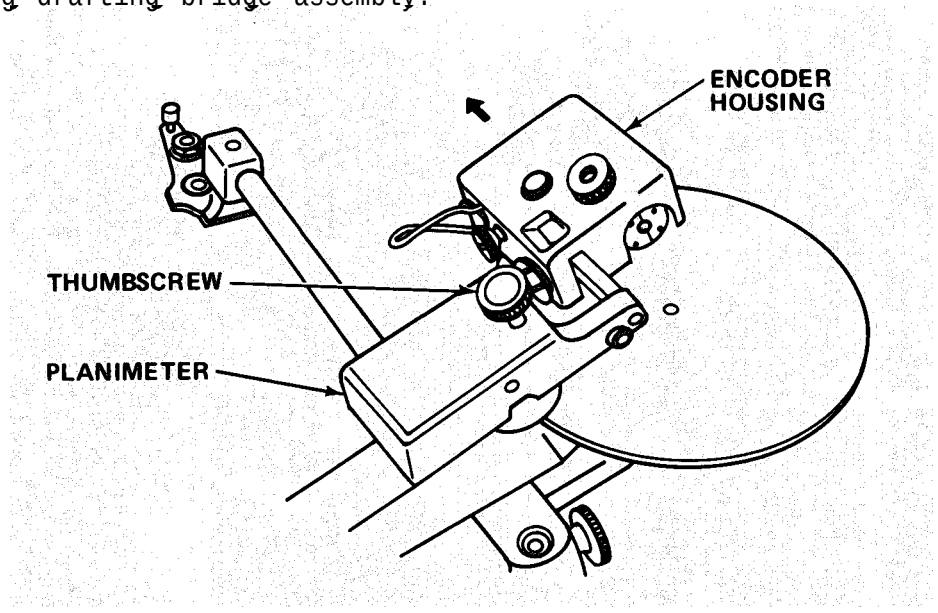
5-6.2 Operating Procedures. The QPS provides for estimation of distance, area, perimeter and volume of geographic shapes found on maps, drawings, and aerial photographs. It is precisely set and alined at the factory. Factory determined values, necessary for accurate calculations and estimations, are different for each QPS. The formulas and values on the Calibration Records Sheet, provided with the equipment, must be used in order to obtain correct results from measurements.

INDEX OF OPERATING PROCEDURES

INDEX OF OPERATING PROCEDURES - Cent

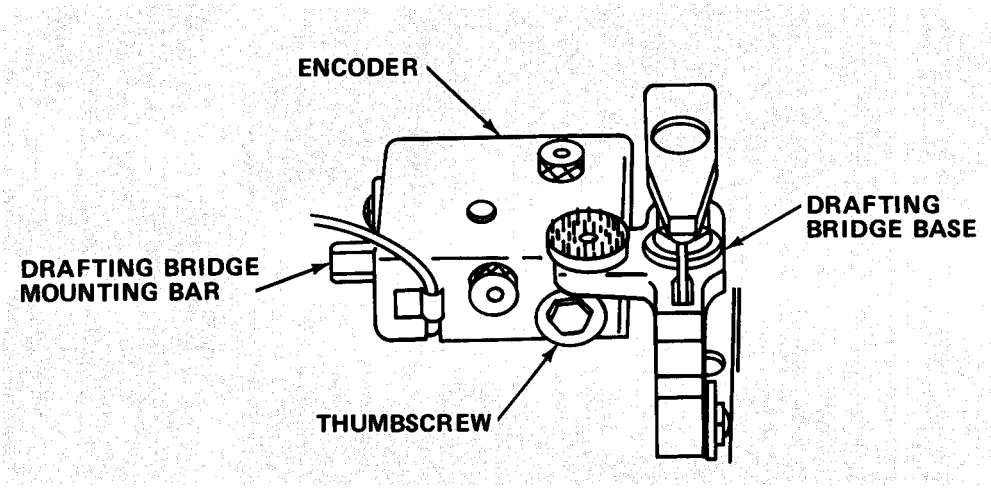
INDEX OF TABLES

a. Mounting drafting bridge assembly.



(1) loosen thubscrew holding encoder housing on planimeter

(2) Grasp encoder housing and slide off mounting bar.



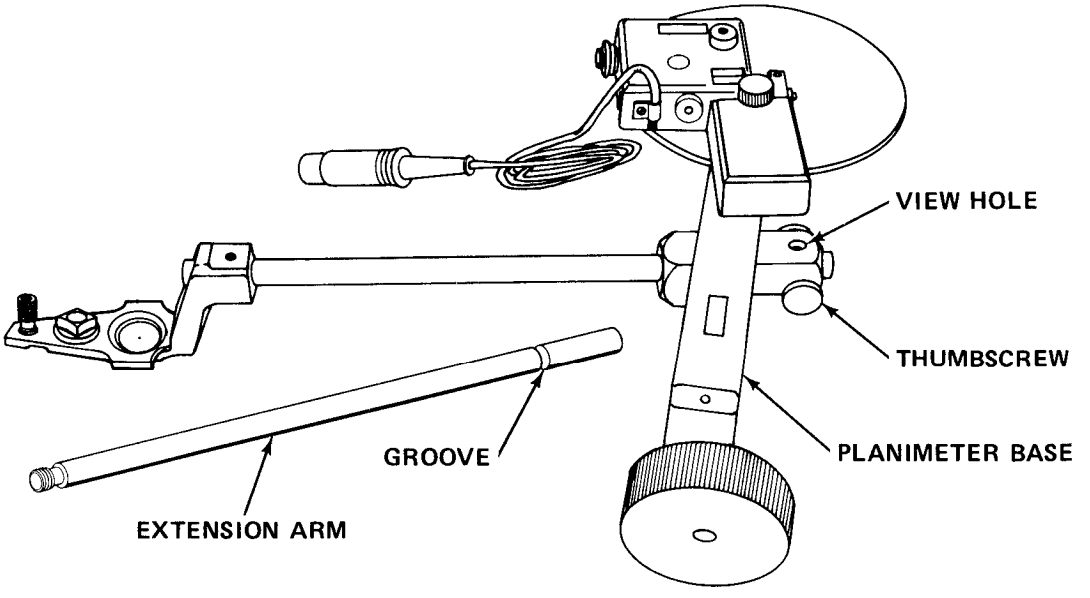
(3) Slide encoder onto drafting bridge mounting bar until it fits snugly against drafting bridge base.

(4) Tighten thumbscrew to secure.

(5) Remove remote tracer switch from end of planimeter.

(6) Mount remote tracer switch on mounting base of drafting bridge.

b. Mount tracer arm extension assembly.



(1) Remove desired lengths of tracer arm extension from case.

CAUTION

Do not release hold on planimeter when tracer arm is removed. Planimeter will turn on its side. Damage to planimeter disk may occur.

(2) Loosen two thumbscrews at back of tracer arm.

(3) Hold tracer arm with one hand. With other hand, slide tracer arm out of planimeter base.

(4) While still holdinq planimeter, slide one end of extension arm into tracer-arm slot on planimeter base. Move extension arm until groove in end lines up with view hole in tracer arm slot.

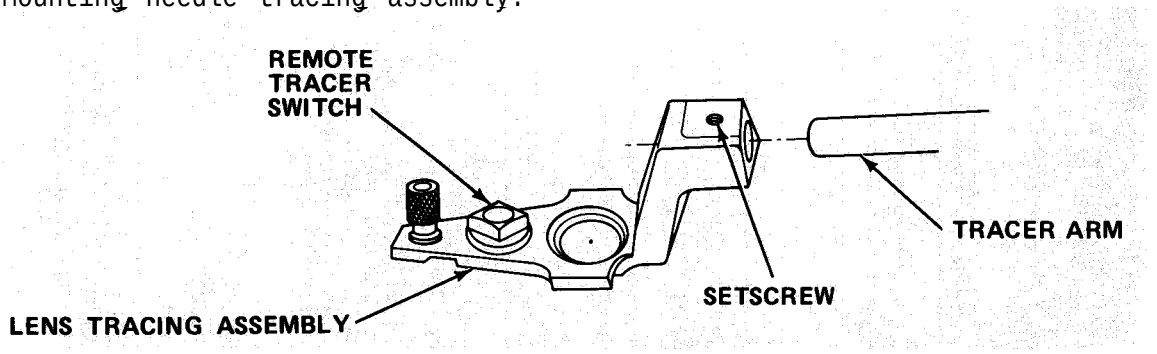
NOTE

Different tracer arm lengths with same tracer arm can be obtained by loosening two thumbscrews and sliding tracer arm in and out of its slot. Tracer arm lengths should be premarked short, medium, or long. If any other tracer arm length is desired, planimeter must be realined.

(5) Tighten two thumbscrews to secure tracer arm extension. Be sure lens tracing assembly is flat on table surface.

(6) Readjust encoder and remote tracer switch wires through antenna.

c. Mounting needle tracing assembly.

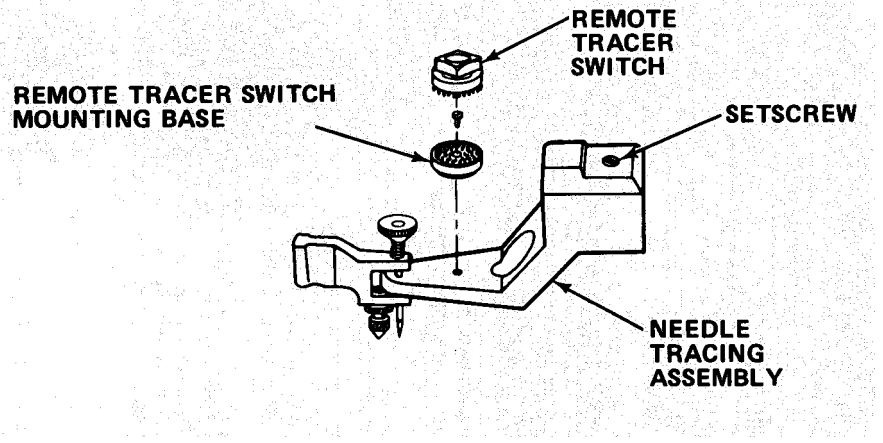


(1) Remove remote tracer switch from lens tracing assembly.

CAUTION

Hold tracer arm while removing lens tracing assembly. Planimetier will turn on its side. Damage to planimeter disk may occur.

(2) Loosen setscrew. Slide lens tracer assembly from tracer arm, remove.

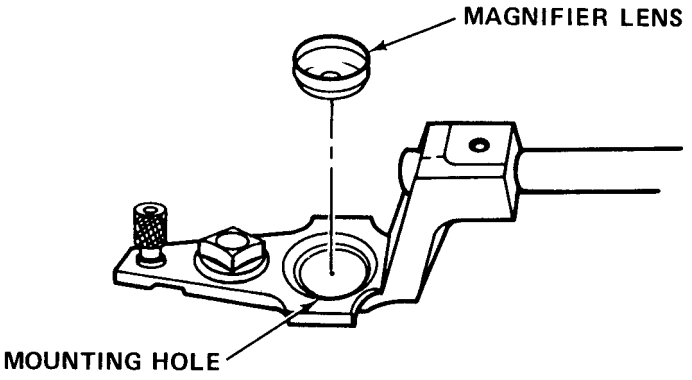


(3) Slide needle tracing assembly onto tracer arm. Tighten setscrew to secure.

(4) Screw remote tracer switch mounting base into needle tracing assembly Snap remote tracer switch into needle tracing assembly.

d. Mounting magnifier in lens tracing assembly.

(1) Remove magnifier lens from carrying case.



CAUTION

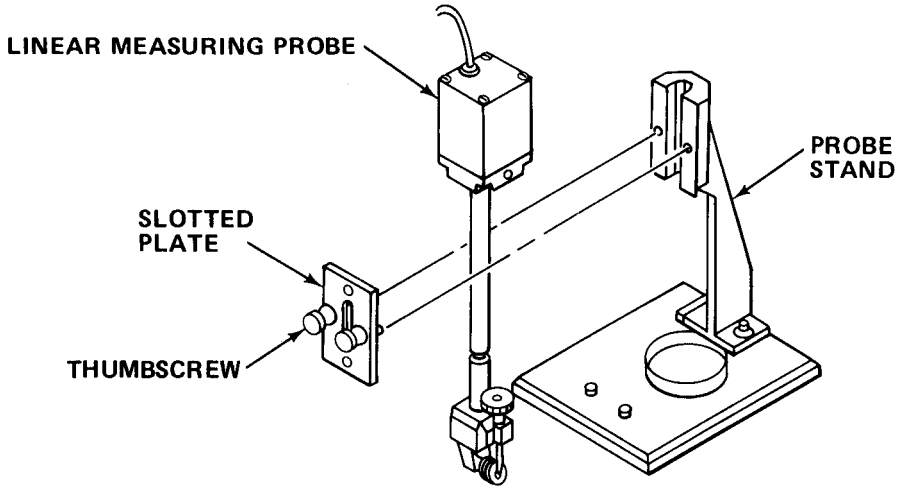
Do not touch optical surface with bare fingers. Viewing will be impaired.

(2) Holding lens by edges, drop into mounting hole.

(3) Press lens into place with finger wrapped in tissue.

e. Mounting linear measuring probe in stand.

(1) Remove linear measuring probe and probe stand from case.



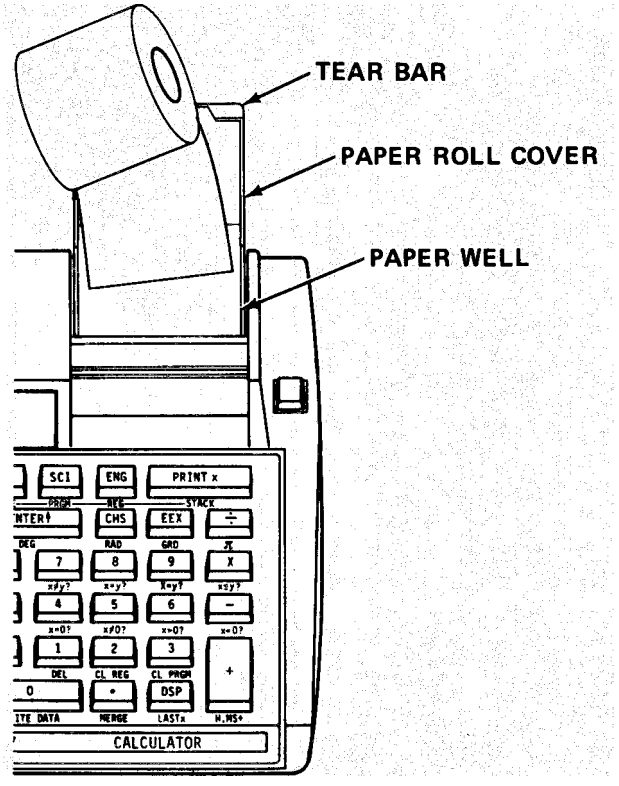
(2) Remove two thumbscrews on front of probe stand that hold slotted plate. Remove slotted plate.

(3) Place linear measuring probe into recess under slotted plate.

(4) Set linear measuring probe so that alinement stud is in center of recess and facing front.

(5) Reinstall slotted plate. Secure with two thumbscrews.

f. Installing paper in calculator.



(1) Open paper roll cover. Remove empty core from paper well.

(2) Remove first two inches of paper from new roll before installing.

(3) Fold and crease leading edge of paper.

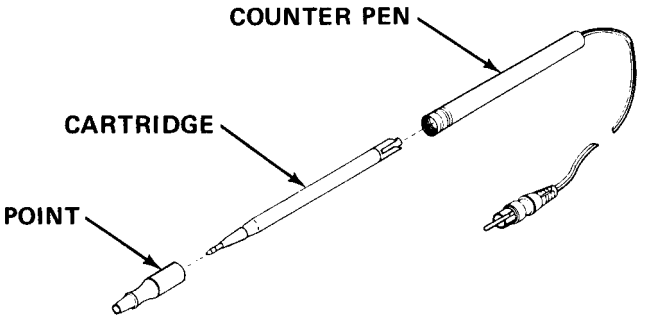
(4) Insert leading edge of paper into slot at bottom of paper well.

(5) Turn calculator OFF/ON switch to ON.

(6) Press paper advance button until leading edge of paper becomes visible beneath tear bar.

(7) Place roll of paper in paper well. Close paper roll cover.

g. Installing blank cartridge in point counter pen.



CAUTION

Cartridge is spring-loaded. Do not let spring fall out. Pen will not work without spring.

(1) Grasp point counter pen at both ends. Unscrew two halves of pen.

(2) Remove ink cartridge.

(3) Insert blank cartridge.

(4) Screw two halves of pen back together.

h. Loading magnetic cards.

(1) Turn calculator ON/OFF switch to ON.

(2) Turn MAN/TRACE/NORM switch to MAN.

(3) Turn PRGRM/RUN switch to RUN.

CAUTION

- Hold magnetic cards by the edge. Be sure hands are clean. Grease, oil, or-other materials can damage magnetic cards.
- Do not continue to hold card after it is grasped by feed mechanism. Damage to magnetic card or calculator may occur.

(4) Insert magnetic
any key to clear.

(5) Pass side one of

(6) If calculator displays Crd, reverse card and load side two.

(7) Print out program to obtain record of program from magnetic card.

(a) Press RTN and f keys.

(b) Press PRINT:PRGM key.

NOTE

. Printout should have three columns. The first column is program step number, the second column is keystrokes entered, and the third column shows key codes for the key stroke entries.

. To stop printout at any point, press R/S key.

. To start over at beginning of program, press RTN key.

i. Manual program loading. Programs are loaded as a series of keystrokes. The calculator will display two groups of numbers during the course of programming. The three digit display to the left is the program step number. The digits to the right are key code numbers identifying keys pressed by row and column. Keystrokes that make up the program are stored in the program memory of the calculator. The program memory has a storage capacity of 224 steps.

(1) Turn calculator OFF/ON switch to ON.

(2) Turn MAN/TRACE/NORM switch to MAN.

(3) Turn PRGM/RUN switch to PRGM.

(4) Press f and CL PRGM keys.

NOTE

Pressing f and CL PRGH clears calculator memory of any previous programs.

(5) Determine and write down natural sequence of keystrokes that are required to perform functions in program.

(6) Assign pro ram an identifying label by pressing LBL key followed by one of the following keys: A through E, a through e, or 0 through 9.

NOTE

Two different programs cannot be given the same label on same magnetic card at same time in calculator memory.

(7) Key in keystrokes of program determined in step c.

NOTE

Except for the following seven functions, all functions can be recorded, **f CL PRGM, BST , SST , f DEL, GTO , . , and f PRINT:PRGM** are used to load, edit and modify programs.

(8) Print out program to verify.

(a) Press RTN .

(b) Press f and PRINT:PRGM keys.

j. Printing out programs. All programs should be printed out. The printout can verify the program, and provide a copy of the program should the magnetic card get damaged or lost. The printout can be used to record a verified program onto a magnetic card.

(1) Load contents of magnetic card into calculator memory.

(a) Turn calculator ON/OFF switch to ON.

(b) Turn MAN/TRACE/NORM switch to MAN.

(c) Turn PRGM/RUN switch to RUN.

CAUTION

- Hold magnetic card by the edge. Be sure hands are clean. Grease, oil, or other materials can damage magnetic card.
- Do not continue to hold card after it is grasped by feed mechanism. Damage to magnetic card or calculator may occur.

(d) Insert magnetic card into reader. If calculator displays error, press any key to clear.

(e) If calculator displays Crd, reverse card and load side two.

(2) To obtain printout of program now loaded into calculator memory:

(a) Press RTN key.

(b) Press f and PRINT:PRGM keys.

(c) To stop printout at any time, press R/S key.

(d) To return to beginning of program, press RTN key.

(3) To obtain printout of manually loaded program follow above steps after keying last keystroke.

(4) Use printout to verify program, and load magnetic card.

k. Recording program on magnetic card.

(1) Manually enter desired program into calculator memory (paragraph 5-6.2i).

(2) Obtain printout to verify program.

(a) Press RTN key.

(b) Press f and PRINT:PRGm key.

NOTE

If printout does not verify program, repeat steps (1) and (2).

(3) Set PRGM/RUN switch to PRGM. If display does not show 000 or 001, press BST key.

(4) Select unclipped and unmarked magnetic card from packet of cards.

CAUTION

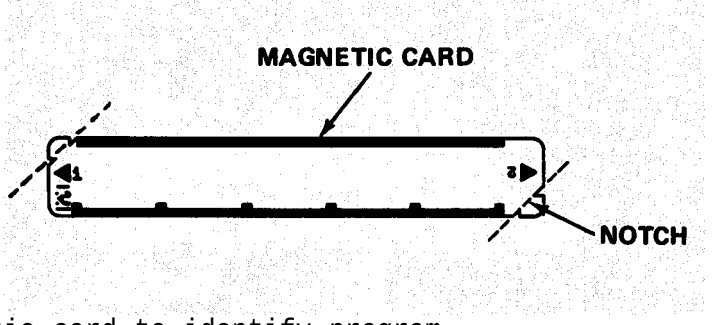
l Hold magnetic card by the edge. Be sure hands are clean. Grease, oil, and other materials can damage magnetic card.

l Do not continue to hold card after it is grasped by feed mechanism. Damage to magnetic card may occur.

(5) Load side one of magnetic card through reader. If display indicates ERROR, press any key to clear.

(6) Pass side one through reader again. If calculator displays Crd, reverse card and load side two.

(7) Print out program to verify.



(8) Mark magnetic card to identify program.

(9) To protect contents of magnetic card from being erased, cut corners of card along notches.

1. Alinement of planimeter with lens tracing assembly. Alinement of the planimeter provides information needed to make area and volume measurements. Using the testing procedure provides values needed to check alinement with factory determined values and provides a constant in determining additional measurements and calculations. Test measurement is made with the test rule. Measurement with the test rule traces a circle with a two inch radius. The area of that circle has a factory determined area AT , found on the Calibration Records Sheet provided with the equipment.

(1) Assemble QPS using the planimeter with lens tracing assembly.

(2) Activate QPS:

(a) Plug foot switch into CLEAR input jack on back panel of auto-scaler.

(b) Plug remote tracer switch into ACCU input jack on back panel of auto-scaler.

(c) Plug planimeter into E_1, encoder socket on back panel of auto-scaler.

(d) Plug power transformer cable into power supply jack on back panel of auto-scaler.

(e) Plug power transformer cable into wall outlet.

(f) Plug power cord into back of calculator.

(9) Plug power cord into wall outlet.

(h) Set encoder 0FF/E_2/E_1 switch on back panel of auto scaler to El.

(i) Set AUDIO/OFF switch on back panel of auto-scaler to AUDIO.

(j) Set auto-sealer B/ACCU/A/OFF switch to A.

(k) Set auto-sealer MAN/AUTO switch to AUTO.

(1) Set auto-scaler X-memory switch to 1.

(m) Set calculator OFF/ON switch to ON.

(n) Set calculator MAN/TRACE/NORM switch to NORM.

(o) Set calculator PRGM/RUN switch to RUN.

(P) press following keys: 1 , STO , 1 , and ENTER↑ .

(3) Remove Y-shaped test rule from carrying case.

(4) Tape piece of paper to table.

(5) Draw a horizontal line 12 inches long.

(6) Place planimeter on paper so it straddles line drawn.

(7) Hold tracer arm in place and turn wheels on planimeter so that wheel axle forms 90 degree angle with tracer arm.

(8) Press point of Y-shaped test rule into paper on horizontal line.

(9) Place lens tracing assembly so that recessed end of Y-shaped test rule rests against edge of lens.

(10) Press edge of lens so that it rides against inside edges of test rule recess.

(11) Clear auto-scaler by pressing and releasing foot switch.

NOTE

If planimeter is allowed to slip, area measured will not be actual area of test rule, and results will be inaccurate.

(12) Keep lens firmly pressed against test rule. Slowly trace 360 degree circle by moving lens around center of test rule. Stop when you return to starting point.

(13) Repeat steps (9) through (12) four times . Reposition test rule at different point on line after three measurements.

(14) Average the pulse counts shown on the LED display after test measurement to obtain R_T value.

NOTE

- If QPS is being initially alined with premarked tracer arm lengths, compare average R_T value to R_T value found on Calibration Record Sheet provided with equipment.
- Move lens tracer in 1/4 inch increment to bring "R_T value" within R_T value found on Calibration Record Sheet provided with equipment.
- If average R_T value is not within ±0.2% of factory determined R_T value, the planimeter may be defective. Repeat alinement procedure. Notify direct/general support maintenance for service or replacement.
- If using preprogrammed cards, manual calculation of C_A calibration constant) is not necessary.

(15) For manual calibration of CA:

Press [SCI] key to perform the following equation.

$$\frac{C_A \cdot ({}^{S}HORX\ {}^{S}VERT) \times {}^{A}T}{{}^{R}T}$$

S_{HOR} = Horizontal scale of shape to be measured.

S_{VERT} = Vertical scale of shape to be measured.

A_T = Area of test rule.

R_T = Average of pulse count readings.

S_{HOR} and S_{VERT} are usually provided with map.

A_T is premarked value on top of test rule.

R_T can be found on Calibration Records Sheet or from average measurements made with test rule.

(16) Note value of actual area measured by test rule, which is premarked on top of test rule.

(17) Use test rule area and the scale ratio of shape to be measured to determine CA (calibration constant). CA is needed to perform various measurements.

m. Alinement of planimeter with needle tracing assembly.

(1) Alinement of the planimeter with the needle tracing assembly follows the same procedure as alinement of the planimeter with the lens tracing assembly (paragraph 5-6.21).

(2) The test measurement checks the alinement of the planimeter with the initial use of the needle tracing assembly.

(3) The needle on the needle tracing assembly fits into the hole on the long test rule to make test measurements.

(4) The average R_T reading obtained by following the steps for the lens tracing assembly should be within ±0.2% of the R_T value given on Calibration Records Worksheet provided with equipment.

(5) The same formula is used to determine the calibration constant, CA.

n. Alinement of linear measuring probe. Provides information needed to make lilear measurements. Using the testing procedure provides values needed to check alinement with factory detemined values and provides a constant to use in determining additional measurements and calculations.

(1) Assemble QPS with the linear measuring probe.

(2) Activate QPS:

(a) Plug foot switch into CLEAR input jack on back panel of auto-scaler.

(b) Plug remote tracer switch into ACCU input jack on back panel of auto-scaler.

(c) Plug linear measuring probe into E_1, encoder socket on back panel of auto-scaler.

(d) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(e) Plug power transformer cable into wall outlet.

(f) Plug power cord into back of calculator.

(g) Plug power cord into wall outlet.

(h) Set encoder OFF/E_2/E_1 switch on back panel of auto-scaler to E_1.

(i) Set AUDIO/OFF switch on back panel of auto-scaler to AUDIO.

(j) Set auto-scaler B/ACCU/A/OFF switch to A.

(k) Set auto-scaler MAN/AUTO switch to AUTO.

(1) Set auto-scaler X MEMORY switch to 1.

(m) Set calculator OFF/ON switch to ON.

(n) Set calculator NAN/TRACE/NORM switch to NORM.

(o) Set calculator PRGM/RUN switch to RUN.

(p) Press following keys: 1 , STO , 1 and ENTER↑ .

(3) Tape piece of paper to table.

(4) Draw line exactly 10 inches long.

(5) Label ends of line A and B.

NOTE

Foot switch must remain depressed until ready to begin measurement, so that movement and handling of linear measuring probe will not increment counter.

(6) Press CLEAR button on auto-scaler.

(7) Depress foot switch to initiate ACCU and freeze count at zero.

(8) Place linear measuring probe and stand so that pricking pin is at beginning mark of line.

(9) Release foot switch.

(10) Grasp probe body and roll linear measuring probe along length of line. Stop when needle is precisely at end of line.

(11) Press foot switch.

(12) Divide digital readout on LED display by 10 to determine alined pulse count reading, R_L.

(13) Record this number.

(14) Repeat steps (6) through (13) four times.

(15) Average the five pulse count results obtained from the LED display after each test measurement to obtain R_L value.

NOTE

If average R_L value is not within ±0.2% of factory determined R_L value, the linear measuring probe may be defective. Repeat alinement procedure. Notify direct/general support maintenance for service or replacement.

(16) Compare average R_L value to R_L value found on Calibration Records Sheet provided with equipment.

NOTE

If using preprogrammed card, Program III, manual calculation of CL is not necessary.

(17) Use scale of map, plan, or blueprint being measured to determine C_L (calibration constant). C_L is needed to perform various measurements.

(18) Use the following equation to determine C_L.

$$C_L = S/R_L$$

S = Scale, in desired units for measurements.

R_L can be found on Calibration Records Sheet or from average of test measurements.

o. Measuring areas with planimeter.

(1) Assemble QPS with planimeter.

(2) Activate QPS.

(a) Plug foot switch into PRINT input jack on back panel of auto-scaler.

(b) Plug remote tracer switch into ACCU input jack on back panel of auto-scaler.

(c) Plug planimeter into E_2 encoder socket on back panel of auto-scaler.

(d) Plug power transformer cable into power supply jack on back panel of auto-scaler.

(e) Plug power transformer cable into wall outlet.

(f) Plug power cord into back of calculator.

(g) Plug power cord into wall outlet.

(h) Set encoder OFF/E_2/E_1 switch on back panel of auto-scaler to E_2.

(i) Set AUDIO/OFF switch on back panel of auto-scaler to AUDIO.

(j) Set auto-scaler B/ACCU/A/OFF switch to A.

(k) Set auto-scaler MAN/AUTO switch to MAN. ,

(1) Set auto-scaler X MEMORY to 1.

(m) Set calculator OFF/ON to ON.

(n) Set calculator MAN/TRACE/NORM switch to NORM.

(o) Set PRGM/RUN switch to RUN.

(P) Press following keys: [1] , [STO] , [1] and [ENTER↑] .

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammned magnetic card (paragraph 5-6.2h), Program I, into calculator.

(4) Tape map or drawing to be measured to table.

(5) Select correct tracer arm length.

NOTE

Tracer arm should be shortest one possible that will allow entire shape to be measured without moving planimeter

(6) Aline planimeter with tracer arm length selected (paragraph 5-6.2n).

(7) Record R_T value. This value is to be used in step (14).

NOTE

Factory determined R_T value is provided on Calibration Records Sheet provided with equipment. Alinement is performed as a check.

(8) Place planimeter near shape to be measured so that length of tracer arm lies along imaginary line through center of shape.

(9) Set wheels so that their axles form 90 degree angle with tracer arm.

(10) Make practice trace to be sure tracer arm will cover area in one operation.

(11) Select starting point for measurement on shape where imaginary line crosses boundary of shape.

(12) Mark point.

(13) Set dot in lens tracing assembly over starting point.

(14) Enter into calculator horizontal and vertical scales of shape and R_T values.

(a) Key in horizontal scale; press [ENTER↑] .

(b) Key in vertical; press [ENTER↑] .

(c) Key in R_T Value; press [B] .

(d) For results in square feet or square feet and acres, press [f] and d.

NOTE

- If R_T value is not entered, all results from calculator will be zero.
- When results are printed, the first area given will be in square feet, the second in acres.

(15) Clear auto-scaler by pressing CLEAR button.

(16) Trace boundary line of shape clockwise using dot in lens tracing assembly. Stop when you reach starting point.

(17) Press remote tracer switch to activate actuate function and freeze count.

(18) Press foot switch to activate PRINT command. Calculator will print area of shape in square feet or square feet and acres.

(19) To measure several shapes, keep foot switch and remote tracer switch depressed.

(20) Reposition planimeter to next shape and repeat steps (11), and (15) through (18).

(21) To change functions or change scale of next shape to remeasured, press [D] and repeat steps (14) through (18).

P. Measuring areas to be added and/or subtracted.

(1) Assemble QPS with planimeter.

(2) Activate QPS:

(a) Plug foot switch into PRINT input jack on back panel of auto-scaler.

(b) Plug remote tracer switch into ACCU input jack on back panel of auto-scaler.

(c) Plug planimeter into E_2 encoder socket on back panel of auto-scaler.

(d) Plug power transformer cable into power supply jack on back panel of auto-scaler.

(e) Plug power transformer cable into wall outlet.

(f) Plug power cord into back of calculator.

(g) plug power cord into wall outlet.

(h) Set encoder OFF/E_2/E_1 switch on back panel of auto-scaler to E_2.

(i) Set AUDIO/OFF switch on back panel of auto-scaler to AUDIO.

(j) Set auto-scaler B/ACCU/A/OFF switch to A.

(k) Set auto-scaler MAN/AUTO switch to MAN.

(l) Set auto-scaler X MEMORY switch to 1.

(m) Set calculator OFF/ON switch to ON.

(n) Set calculator MAN/TRACE/NORM switch to NORM.

(o) Set calculator PRGM/RUN switch to RUN.

(p) Press following keys: [1] , [STO] , [1] , and [ENT]

(3) Set up planimeter for area measurement (paragraph 5-6.2o).

(4) To add areas being measured, in square feet or square feet and acres, press [C] .

(5) Reposition planimeter near next shape to be measured. Keep remote tracer switch depressed.

(6) Clear auto-scaler by pressing CLEAR button.

(7) Trace boundary line of shape using dot on lens tracing assembly. Stop when you reach starting point.

(8) Press foot switch to activate print command.

NOTE

Calculator will print data on area just measured. It prints area of single shape in square feet first, followed by area in square feet and acres. Current total areas are printed in same order.

(9) If area is to be subtracted instead of added, press [f] and c for Actuate routine. Repeat measurement procedure.

q. Measuring surface area of slope.

(1) Assemble QPS with planimeter.

(2) Activate QPS:

(a) Plug foot switch into PRINT input jack on back panel of auto-scaler.

(b) Plug remote tracer switch into ACCU input jack on back panel of auto-scaler.

(c) Plug planimeter into E_2 encoder socket on back panel of auto-scaler,

(d) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(e) Plug power transformer cable into wall outlet.

(f) Plug power cord into back of calculator.

(g) Plug power cord into wall outlet.

(h) Set encoder OFF/E_2/E_1 switch on back panel of auto-scaler to E_2.

(i) Set AUDIO/OFF swich on back panel of auto-scaler to AUDIO.

(j) Set auto-scaler B/ACCU/A/OFF switch to A.

(k) Set auto-scaler MAN/AUTO switch to MAN.

(1) Set auto-scaler X MEMORY switch to 1.

(m) Set calculator OFF/ON switch to ON.

(n) Set calculator MAN/TRACE/NORM switch to NORM.

(o) Set calculator PRGM/RUN switch to RUN.

(P) press following keys: [1] , [STO] , [1] , and [ENTER↑] .

(3) Set up planimeter for area measurement (paragraph 5-6.2o).

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(4) Load preprogrammed card (paragraph 5-6.2h), Program I, into calculator.

(5) Tape map or drawing to be measured to table.

(6) If needed, aline planimeter with tracer arm length selected (paragraph 5-6.2o). Record R_T value.

NOTE

Factory determined R_T value is given on Calibration Records Sheet provided with equipment. Alinement is performed as a check.

(7) Position planimeter near shape to be measured so that tracer arm lies along imaginary line through center of shape.

(8) Set wheels so that their axles form 90 degree angle with tracer arm.

(9) Enter into calculator horizontal and vertical scales of shape and R_T value.

(a) Key in horizontal scale; press [ENTER↑] .

(b) Key in vertical scale; press [ENTER↑] .

(c) Key in R_T value; press [B] .

(d) Press [f] and d to obtain results in square feet or acres.

NOTE

Slope ratio should be given. Slope ratio can be determined by using the given horizontal scale and vertical scale.

$$\frac{\text{horizontal scale}}{\text{vertical scale}} \text{ invert to } \frac{\text{vertical scale}}{\text{horizontal scale}} \cdot \text{ scale ratio}$$

Example: $\frac{\text{horizontal scale}}{\text{vertical scale}} = \frac{10}{50}$ = 1/5 invert to 5/1 or 5:1 scale ratio

(e) Key in ratio slope press f and b.

(9) Press CLEAR button to clear auto-scaler.

(10) Trace boundary of shape using dot in lens tracing assembly. Stop when you reach the starting point.

(11) Press foot switch to activate PRINT command and freeze count.

NOTE

Calculator will print area of shape. Horizontal area in square feet will be printed first, folowed by the true surface area in square feet.

(12) Keeping foot switch depressed, reposition planimeter near next shape to be measured.

(13) Repeat steps (9) through (11).

Measuring slopes to be added and/or subtracted. This procedure follows measuring surface area of slope (paragraph 5-6.2q) steps (1) through (9). After completing steps (1) through (9), follow the steps provided below to add or subtract from slope measurement obtained.

(1) If slope to be measured will be added, press c.

(2) If slope to be measured will be subtracted, press f and c.

(3) Press CLEAR button to clear auto-scaler.

(4) Trace boundary of shape using dot in lens tracing assembly. Stop when you reach starting point.

(5) Depress foot switch to activate PRINT command and freeze count.

NOTE

Calculator will print horizontal and true slope surface area of shape last measured, followed by totals (added or subtracted) of horizontal and true slope surface areas.

(6) Keeping foot switch depressed, reposition planimeter near shape to be measured.

(7) Make next measurement.

(8) If change is made in planimeter function or if new seal es or slope ratios are used, press D to initiate measurement. Begin measurement procedures.

s. Measuring areas without the calculator.

(1) Assemble QPS with planimeter.

(2) Activate QPS:

(a) Plug foot switch into ACCU input jack on back panel of auto-scaler.

(b) Plug planimeter into E_2 encoder socket on back panel of auto-sealer.

(c) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(d) Plug power transformer cable into wall outlet.

(e) Plug power cord into back of calcalator.

(f) Plug power cord into wall outlet.

(9) set encoder OFF/E_2/E_1 switch on back of auto-scaler to E_2.

(h) Set AUDIO/OFF switch on back panel of auto-sealer to AUDIO.

(i) Set auto-scaler B/ACCU/A/OFF switch to A.

(j) Set auto-scaler MAN/AUTO switch to MAN.

(k) Set auto-scaler X MEMORY switch to 1.

(1) Set calculator OFF/ON switch to OFF.

(3) Tape map or drawing to be measured to table.

(4) Select correct tracer arm length.

(5) If needed, aline planimeter for tracer arm length selected (paragraph 5-6.2l). Record R_T value.

NOTE

Factory determined R_T value is given on Calibration Records Sheet provided with equipment. Alinement is performed as a check.

(6) Manually calculate alinement, C_A, using the following equation.

C_A Sc^2xu

C_A = Alinement constant

Sc^2 = Scale ratio squared (given on map being measured or determined by equation in paragraph 5-6.2q).

u = Value of one planimeter unit (factory determined value provided on Calibration Records Sheet provided with equipment.

(7) Enter three most significant digits of alinement constant, C_A, into auto-scaler-using scaler dials.

(a) Set first most significant digit on left hand dial.

(b) Set second most significant digit on middle dial.

(c) Set

read 0, and right hand dial should read 5.

(8) Set decimal selector according to value of first significant digit of alinement constant.

NOTE

- Decimal selector sets decimal place for auto-scaler LED display.
- If constant is one or greater, set decimal selector to O.
- if constant is less than one, set decimal selector according to place value of first significant digit.

(9) Place planimeter near shape to remeasured so that length of tracer arm lies along imaginary line through center of shape.

(10) Set wheels so that their axles form 90 degree angle.

(11) Make practice trace to be sure tracer arm will cover area.

(12) Select starting point for measurement, and mark.

(13) Set dot of lens tracing assembly over starting point.

(14) Press CLEAR button to clear auto-scaler.

(15) Trace boundary line of shape using dot in lens tracing assembly. Stop when you return to starting point.

(16) Multiply numbers shown in auto-sealer LED display to obtain area of shape in square feet

NOTE

- If first significant digit of C_A is in ones column **(one place to left** of decimal point), multiply auto-scaler LED display by 10.
- If first significant digit is in tens column, multiply auto-scaler LED display by 100.
- If first significant digit is three or more places to left of decimal point, increase multiplication factor by 10 for each position it lies further to left.

t. Measuring lengths with linear measuring probe to be added and/or subtracted.

(1) Assemble QPS with linear measuring probe.

(2) Activate QPS:

(a) Plug foot switch into PRINT input jack on back panel of auto-sealer.

(b) Plug remote tracer switch into ACCU input jack on back panel of auto-scaler.

(c) Plug linear measuring probe into E_1 encoder socket on back panel of auto-scaler.

(d) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(e) Plug power transformer cable into wall outlet.

(f) Plug power cord into wall outlet.

(9) Set encoder OFF/E_2/E_1 switch on back panel of auto-sealer to E_1.

(h) Set AUDIO/OFF switch on back panel of auto-sealer to AUDIO.

(i) Set auto-scaler B/ACCU/A/OFF switch to A.

(j) Set auto-scaler MAN/AUTO switch to MAN.

(k) Set auto-scaler X MEMORY switch to 1.

(1) Set calculator OFF/ON switch to ON.

(m) Set calculator MAN/TRACE/NORM switch to NORM.

(n) Set calculator PRGM/RUN switch to RUN.

(o) Press following keys: [1] , [STO] , [1] , and [ENTER↑] .

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammed magnetic card (paragraph 5-6.2h), Program I, into calculator.

(4) Tape drawing or map to be measured to table.

(5) If needed, aline linear measuring probe (paragraph 5-6.2l).

(6) Record R_L value.

NOTE

Factory determined R_L value is given on Calibration Record Sheet provided with equipment. Alinement is performed as a check.

(7) Key in scale of map or drawing to measured.

(8) Press [f] and a to call up (from memory) lengths routine for feet. Press [f] and if printout in feet and inches is desired.

NOTE

Linear measuring probe stand is used to facilitate measurement using a straightedge.

(9) If needed, mount linear measuring probe in stand.

(10) Press CLEAR button to clear auto-scaler.

(11) Press foot switch. Do not release until ready to begin measurement.

(12) Position linear measuring length to be measured. Release foot

(13) Make measurement by tracing length of line with linear measuring probe.

(14) Press foot switch to initiate PRINT command and freeze count.

(15) To make another measurement, repeat steps (11) through (14).

(16) If additional lengths are to be added, press f and c to initiate ACCU and addition subroutine.

(17) If additional lengths are to be subtracted, press f and e for ACCU and subtraction subroutine.

(18) To change scale or function with new measurement, press D to initiate calculator memory.

u. Layout work with linear measuring probe.

(1) Assemble QPS with linear measuring probe.

(2) Activate QPS.

(a) Plug foot switch into PRINT input jack on back panel of auto-scaler.

(b) Plug remote tracer switch into ACCU input jack on back panel of auto-scaler.

(c) Plug linear measuring probe into E_1 encoder socket on back panel of auto-scaler.

(d) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(e) Plug power transformer cable into wall outlet.

(f) Plug power cord into back of calculator.

(g) Plug power cord into wall outlet.

(h) Set encoder OFF/E_2/E_1 switch on back panel of auto-sealer to E_1.

(i) Set AUDIO/OFF switch on back panel of auto-sealer to AUDIO.

(j) Set auto-scaler B/ACCU/A/OFF switch to A.

(k) Set auto-scaler MAN/AUTO switch to MAN.

(1) Set auto-scaler X MEMORY switch to 1.

(m) Set calculator OFF/ON switch to ON.

(n) Set calculator MAN/TRACE/NORM switch to NORM.

(o) Set calculator PRGM/RUN switch to RUN.

(p) Press following keys: STO , 1 and ENTER↑ .

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammed magnetic card (paragraph 5-6.2h), Program I, into calculator.

(4) Tape drawing or map to be measured and paper for layout to table.

(5) If needed, aline linear measuring probe (paragraph 5-6.2 n). Record R_L value.

NOTE

Factory determined RL value is given on Calibration Record Sheets provided with equipment. Alinement is performed as a check.

(6) Key in scale of map or drawing on which measurements will be made.

NOTE

If layout is to be drawn to a different scale than original map or drawing, key in scale for layout.

(7) Press f and a.

(8) Press f and d for printout in feet and inches.

(9) Press CLEAR button to clear auto-scaler.

(10) Press foot switch. Do not release until ready to begin measurement.

(11) Position linear measuring probe so that pricking pin is at beginning of length to be measured.

(12) Release foot switch.

(13) Make measurement by tracing length of line with linear measuring probe.

(14) Depress, then release foot switch to initiate print command.

(15) Position linear measuring probe on layout sheet at beginning of line just measured.

(16) Press pricking pin.

(17) Press CLEAR button to clear auto-scaler.

(18) Using a straightedge as a guide, move linear measuring probe until auto-scaler LED display shows count total identical to previously measured line.

(19) When LED display shows the same count, stop linear measuring probe.

(20) Press pricking pin.

NOTE

Pricking pin marks identify beginning and end of lines being laid out.

(21) For each new line, repeat steps (7) through (20).

(22) To change scale or function, press D to initiate calculator memory.

v. Linear measuring probe measurements without the calculator.

(1) Assemble the QPS with the linear measuring probe.

(2) Activate the QPS:

(a) Plug foot switch into ACCU input jack on back panel of auto-scaler.

(b) Plug linear measuring probe into E_1 encoder socket on back panel of auto-scaler.

(c) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(d) Plug power transformer cable into wall outlet.

(e) Plug power cord into back of calculator.

(f) Plug power cord into wall outlet.

(g) Set encoder 0FF/E_2/E_1 switch on back panel Of auto-scaler to E_1.

(h) Set AUDIO/OFF switch on back panel of auto-scaler to AUDIO.

(i) Set auto-scaler B/ACCU/A/OFF switch to A.

(j) Set auto-scaler MAN/AUTO switch to MAN.

(k) Set auto-scaler X MEMORY switch to 1.

(1) Set calculator OFF/ON switch to OFF.

(m) Set auto-scaler NORMAL/SCALE switch to scale.

(3) Tape map or drawing to be measured to table.

(4) Calculate linear scale constant, C_L, using the following equation:

$$C_L = Sc/R_L$$

C_L = Linear scale constant

Sc = Scale of drawing or map

R_L = Alinement constant (found on Calibration Records Sheet provided with equipment)

(5) Enter three most significant digits of linear scale constant, C_L, into auto-scaler using scaler dials.

(a) Set first most significant digit on left hand dial.

(b) Set second most significant digit on middle dial.

(c) Set third most significant digit on right hand dial.

Example: If C_L is 10.571, left hand dial should read 1, middle dial should read 0, and right hand dial should read 5.

(6) Set decimal selector according to value of first significant digit of linear scale constant C_L.

NOTE

- Decimal selector switch sets decimal place for auto-scaler LED display.
- If constant is one or greater, set decimal selector to 0.
- If constant is less than one, set decimal selector according to place of first significant digit.

(7) Place linear measuring probe on line to be measured so that pricking pin is at starting point.

(8) Press CLEAR button to clear auto-scaler.

(9) Make measurement by tracing length of line with linear measuring probe.

(l0) Press foot switch to activate ACCU and freeze count.

in feet Multiply number shown in auto-scaler LED display to obtain length of line

NOTE

- If first significant digit of C_L is in ones Column (one place to left of decimal point), multiply auto-scaler LED display by 10.
- If first significant digit is in tens column, multiply auto-scaler LED display by 100.
- If first significant digit is three or more places to left of decimal point, increase multiplication factor by 10 for each position it lies further to the left.

w. Point counts with point counter pen and constants.

(1) Assemble QPS with point counter pen.

(2) Activate QPS.

(a) Plug foot switch into ACCU input jack on back panel of auto-scaler.

(b) Plug linear measuring probe into E_1 encoder socket on back panel of auto-scaler.

(c) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(d) Plug power transformer cable into wall outlet.

(e) Plug power cord into wall outlet.

(f) Set encoder OFF/E_2/E_1 switch on back panel of auto-scaler to OFF.

(9) set encoder OFF/E_2/E_1 switch on back Panel of auto-scaler to E_1.

(h) Set auto-scaler B/ACCU/A/OFF switch to A.

(i) Set auto-scaler MAN/AUTO switch to MAN.

(j) Set auto-scaler X MEMORY switch to 1.

(k) Set calculator OFF/ON switch to ON.

(1) Set calculator MAN/TRACE/NORM switch to NORM.

(m) Set calculator PRGM/RUN switch to RUN.

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammed card (paragraph 5-6.2h), Program I, into calculator.

(4) Tape drawing or map to be measured to table.

(5) When multiplying counts by one constant, key in constant, press ENTER↑ , and A .

(6) Press CLEAR button to clear auto-scaler.

(7) Using point counter pen, make point count.

(8) Press PRINT to obtain results of count.

(9) To make point count with two to four constants, follow steps (1) through (4).

(10) When multiplying counts by two to four constants, key in each constant followed by ENTER↑ .

(11) After last constant has been keyed in, press ENTER↑ , f , and e.

(12) Press CLEAR button to clear auto-scaler.

(13) Using point counter pen, make point count.

(14) Press PRINT to obtain results of count.

(15) Change X MEMORY switch to 2.

(16) Press CLEAR button to clear auto-scaler.

(17) Using point counter pen, make point count.

(18) Press PRINT to obtain results of count.

(19) Repeat steps (13) through (18) if there is another constant being used.

x. Standard volume run using contour method.

(1) Assemble QPS with planimeter.

(2) Activate QPS.

(a) Plug foot switch into ACCU input jack on back panel of auto-scaler.

(b) Plug linear measuring probe into E_1 encoder socket on back panel of auto-scaler.

(c) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(d) Plug power transformer cable into wall outlet.

(e) Plug transformer power cord into back of calculator.

(f) Plug power cord into wall outlet.

(g) Set encoder OFF/E_2/E_1 switch on back panel of auto-scaler to E_2.

(h) Set AUDIO/OFF switch on back panel of auto-scaler to AUDIO.

(i) Set auto-scaler B/ACCU/A/OFF switch to A.

(j) Set auto-scaler MAN/AUTO switch to MAN.

(k) Set auto-scaler X MEMORY switch to 1.

(1) Set calculator OFF/ON switch to ON.

(m) Set calculator MAN/TRACE/NORM switch to NORM.

(n) Set calculator PRGM/RUN switch to RUN.

(o) Press following keys: [1] , [STO] , [1] , and [ENTER↑] .

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammed magnetic card (paragraph 5-6.2h), Program II, in calculator.

(4) Tape map or drawing to be measured to table.

(5) Select correct tracer arm length.

NOTE

The tracer arm length should be shortest one possible that will allow entire shape to be measured without moving the planimeter.

(6) If needed, aline planimeter with tracer arm length selected (paragraph 5-6.2l).

(7) Record R_T value.

NOTE

Factory determined R_T value is given on Calibration Record Sheet provided with equipment. Alinement is performed as a check.

(8) Key in horizontal and vertical scales of contour map or photo and R_T value.

(a) Key in horizontal scale, press ENTER↑ .

(b) Key in vertical scale, press ENTER↑ .

(c) Key in R_T value, press ENTER↑ .

(9) Key in section interval of contours to be measured, and press ENTER↑ .

(l0) Press A to call up subroutine A.

(11) Determine if object of contour is cut (excavation) or fill (embankment).

(a) If contour is fill, press B

(b) If contour is cut, press f and b.

(12) Press INIT button to clear calculator.

(13) Key in value for elevation of first contour to be measured.

(14) Press C .

(15) Place planimeter at starting point of boundary line for measuring contour loop.

(16) Make practice trace to make sure tracer arm will cover area in one operation.

(17) Press CLEAR button to clear auto-scaler.

(18) Trace boundary line of contour loop with dot in lens tracing assembly. Stop when you reach starting point.

(19) Press and hold down remote tracer switch to activate PRINT command.

NOTE

- Calculator will print the following information after the first measurement:

  ***Elevation
  ***Section of contour loop

- Additional measurements will provide values for intermediate volume and total volume.

  0.00 Intermediate volume in cubic yards
  0.00 Total volume in cubic yards

(20) Move to next contour loop.

(21) Release remote tracer switch.

(22) Repeat steps (18) and (19) until desired volume is determined.

(23) To change contour interval when next loop to be measured is at a different interval, key in new interval. Press f and a.

(24) If last elevation is not even contour interval, key in value for last elevation. Press f and c. Repeat steps (18) through (23).

(25) To start a new run, press B or f and b to initiate memory. Repeat steps (12) through (18).

y. Merging volume runs.

(1) Assemble QPS with planimeter.

(2) Activate QPS.

(a) Plug foot switch into ACCU input jack on back panel of auto-scaler.

(b) Plug remote tracer switch into PRINT input jack on back panel of auto-scaler.

(c) plug planimeter into E_1 encoder socket on back panel of auto-scaler.

(d) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(e) Plug transformer power cable into wall outlet.

(f) Plug power cord into back of calculator.

(g) Plug power cord into wall outlet.

(h) Set encoder 0FF/E_2/E_1 switch on back panel of auto-scaler to E_1.

(i) Set AUDIO/OFF switch on back panel of auto-sealer to AUDIO.

(j) set auto-scaler B/ACCU/A/OFF switch to A.

(k) Set auto-scaler MAN/AUTO switch to AUTO.

(1) Set auto-scaler X MEMORY switch to 1.

(m) Set calculator OFF/ON switch to ON.

(n) Set calculator MAN/TRACE/NORM switch to NORM.

(o) Set calculator PRGM/RUN switch to RUN.

(p) Press following keys: [1] , [STO] , [1] , and [ENTER↑] .

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammed magnetic card (paragraph 5-6.2h), Program II, into calculator.

(4) Tape map or drawing to remeasured to table.

(5) Select correct tracer arm length.

NOTE

The tracer arm length should be shortest one possible that will allow entire shape to be measured without moving the planimeter.

(6) If needed, aline planimeter with tracer arm selected (paragraph 5-6.21).

(7) Record R_T value.

NOTE

Factory determined R_T value is given on Calibration Record Sheet provided with equipment. Alinement is performed as a check.

(8) Key in horizontal and vertical scales of contour map or photo and R_T value.

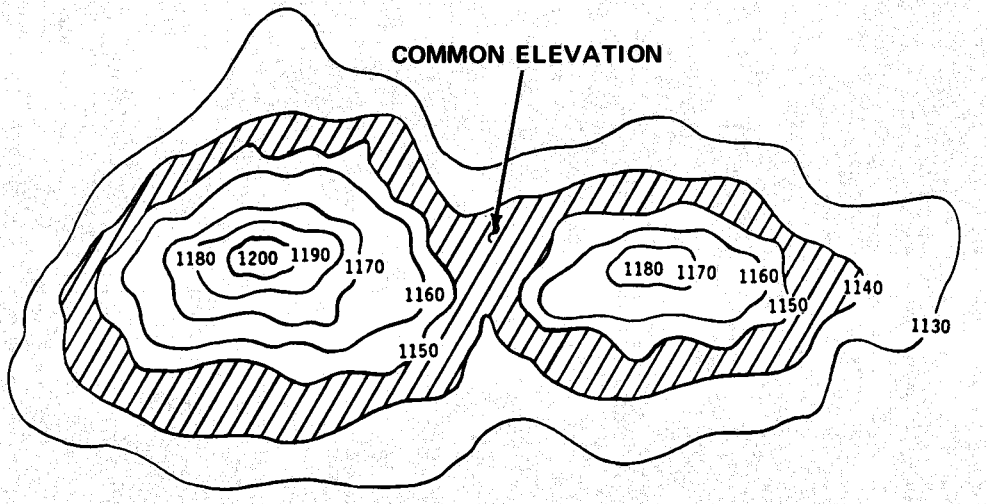
(a) Key in horizontal scale, press [ENTER↑] .

(b) Key in vertical scale, press [ENTER↑] .

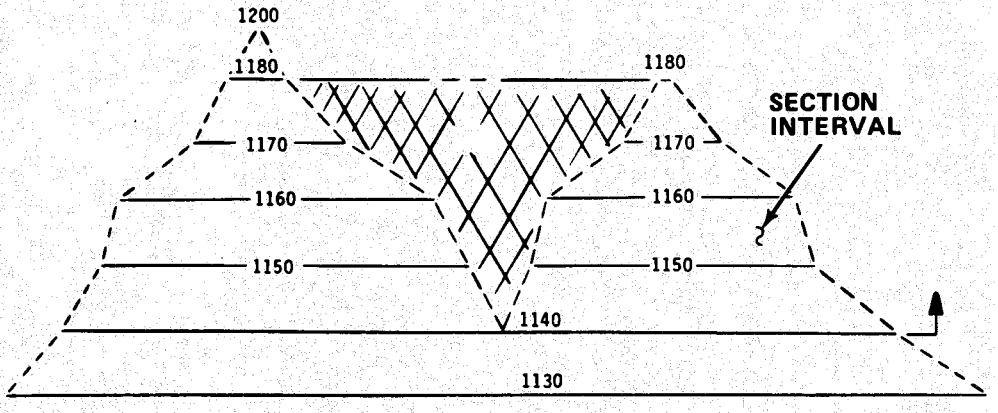
(c) Key in R_T value, press [ENTER↑] .

NOTE

In contour map example of twin peak mountain, area is elevation where volumes merge into common base. Volume of left peak above merge point will be measured first.



NORMAL VIEW



SIDE VIEW

(9) Key in section elevation interval of contours to be measured. Press

(10) If contour is a fill, press [B] . If contour is a cut, press [f] and

(11) Place planimeter at starting point of boundary line for measuring first contour.

(12) Press INIT key to clear calculator.

(13) Make practice trace to make sure tracer arm wi11 cover area in one operation.

(14) Press CLEAR button to clear auto-scaler.

(15) Key in starting elevation and press [C] .

(16) Trace boundary line of contour loop with dot in lens tracing assembly. Stop when you reach starting point.

(17) Press and hold down remote tracer switch to activate PRINT command.

NOTE

- (calculator will print the following information after the first measurement:

  *** Elevation

- Additional measurements will provide values for intermediate volume and total volume.

  0.00 Area of contour loop
  0.00 Intermediate volume in cubic yards
  0.00 Total volume in cubic yards

(18) Press and hold down foot switch.

(19) Reposition planimeter to make measurement of next contour loop.

(20) Release foot switch.

(21) Repeat steps (17) through (21) for each consecutive loop measured before merge.

(22) To change contour interval when next loop to remeasured is at a different interval, key in new interval, press [f] and a.

(23) Repeat steps (18) through (24) for each of the independent volumes, until all independent volumes have been measured.

(24) Reposition planimeter for measuring merge volume, and repeat steps (18) through (24).

(25) To measure next object, press [D] , and repeat steps (8) through (24).

z. Diverging volume runs.

(1) Use merging volume runs (paragraph 5-6.2y) to begin procedure for diverging volume runs. Follow steps (1) through (16).

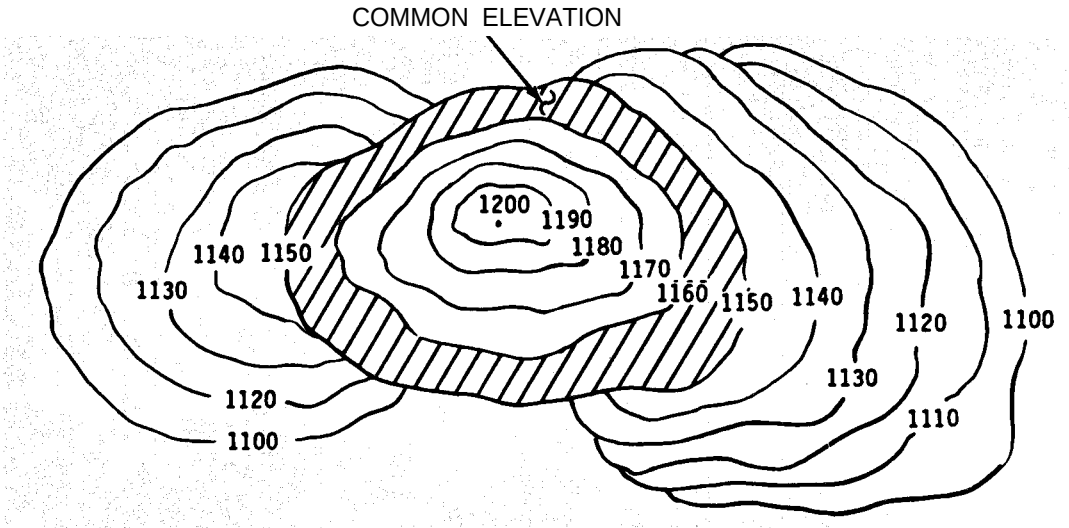
(2) Trace boundary lines of contour. Stop when you reach starting point.

(3) Move up or down contours until you reach last contour before split (diverging volume).

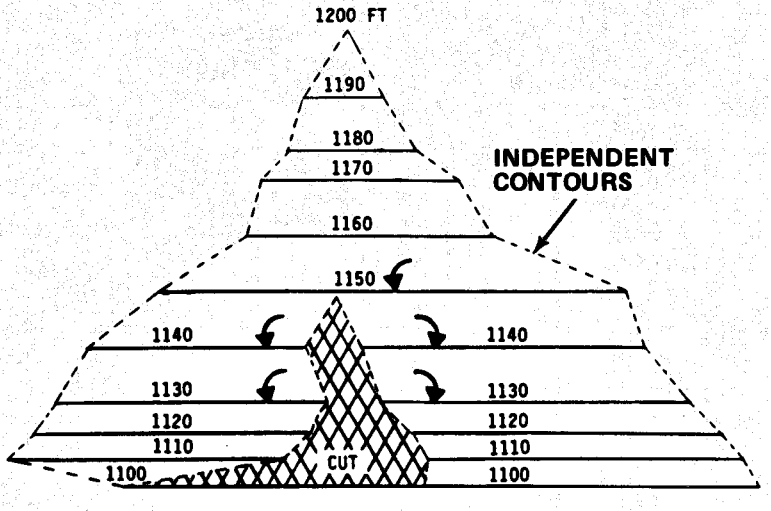
(4) Position planimeter to measure first contour adjacent to diverging cut.

(5) Trace boundary of first contour.

(6) Press and hold down foot switch to reposition planimeter over adjacent contour area.



NORMAL VIEW



SIDE VIEW

NOTE

- In contour map, example of diverging-cut ridge area is elevation where features of object diverge into two volumes.
- Contours adjacent to diverging cut represent independent portions of total volume of object. Each contour must be measured at each elevation interval. Total counts must be entered before PRINT command to prevent negative volume of cut being added to total.

(7) Release foot switch.

(8) Press remote tracer switch to activate print command.

(9) Key in elevation of first adjacent contour. Press [f] and c.

(10) Retrace first loop of short (smaller) side.

(11) Repeat steps (4) through (8) until last contour of short (smaller) side has been traced and printed.

(12) Reposition tracer arm to first adjacent contour on larger (higher) side.

(13) Press [f] and c. Enter [0] , [STO] , and [0].

(14) Trace contour.

(15) Press remote tracer switch to activate PRINT command.

(16) Repeat steps (4) through (8) until last contour of larger (higher) side has been traced and printed.

NOTE

- Calculator will print the following information after the first measurement:

  *** Elevation

- Additional measurements will provide values for area of contour, intermediate volume, and total volume.

  0.00 Area of contour
  0.00 Intermediate volume
  0.00 Total volume so far

(17) To measure new object, press [D] to initiate memory. Repeat steps (4) through (9).

aa. Vertical cross sections.

(1) Assemble QPS with planimeter.

(2) Activate QPS.

(a) Plug foot switch into ACCU input jack on back panel of auto-scaler.

(b) Plug remote tracer switch into PRINT input jack on back panel of auto-scaler.

(c) Plug planimeter into E_2 encoder socket on back panel of auto-sealer.

(d) Plug power transformer cable into POWER jack on back of auto-scaler,

(e) Plug power transformer cable into wall outlet.

(f) Plug power cord into back of calculator.

(g) Plug power cord into wall outlet.

(h) Set encoder 0FF/E_2/E_1 switch on back panel of auto-scaler to E_2.

(i) Set AUDIO/OFF switch on back panel of auto-sealer to AUDIO.

(j) Set auto-scaler B/ACCU/A/OFF switch to A.

(k) Set auto-scaler MAN/AUTO switch to MAN.

(1) Set auto-scaler X MEMORY switch to 1.

(m) Set calculator OFF/ON switch to ON.

(n) Set calculator MAN/TRACE/NORM switch to NORM.

(o) Set calculator PRGM/RUN switch to RUN.

(p) Press following keys: [1] , [STO] , [1] and [ENTER↑] .

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammed magnetic card (paragraph 5-6.2h), Program II, into calculator.

(4) Tape map or drawing to be measured to table.

(5) Select correct tracer arm length.

NOTE

Tracer arm length should be shortest one possible that will allow entire shape to be measured without moving the planimeter.

(6) If needed, aline planimeter with tracer arm length selected (paragraph 5-6.2l).

NOTE

Factory determined RT value is given on Calibration Records Sheet provided with equipment. Alinement is performed as a check.

(7) Key in horizontal scale and vertical seal e of contour map or photo and R_T value.

(a) Key in horizontal scale, press ENTER↑ .

(b) Key in vertical scale, press ENTER↑ .

(c) Key in R_T value, press ENTER↑ .

(8) Key in section interval of contours to be measured; press A.

(9) Determine if object contour described is cut (excavation) or fill (embankment).

(10) If object is fill, press B . If object is cut, press f and b.

(11) Press INIT to clear calculator.

(12) Key in value for elevation of first station point to remeasured.

NOTE

If contour is cut, first station point elevation should be largest. If contour is fill, first station point elevation should be smallest.

(13) Press C .

(14) Place planimeter at starting point on boundary line of contour loop.

(15) Press CLEAR button to clear auto-scaler.

(16) Trace boundary line of contour loop with dot in lens tracing assembly. Stop when you reach starting point.

NOTE

When running vertical sections, odd stations (elevations) may occur. Odd stations may be keyed in by the following steps:

Key in next station (elevation).

Press f and c.

Trace section.

(17) Press and hold down remote tracer switch to activate PRINT command.

(18) Move to next contour loop.

(19) Release remote tracer switch.

(20) Repeat steps (15) through (18) for each consecutive loop until desired volume is determined.

NOTE

- Calculator will print the following information after the first measurement:

  *** First station
  *** Section area

- Additional measurements will provide values for intermediate volume and total volume.

  0.00 Intermediate volume in cubic yards
  0.00 Total volume in cubic yards

(21) To start new run, press [D] , and repeat steps (12) through (20).

ab. Volume erase procedure.

(1) If error in tracing was made and caught before initiating PRINT command:

(a) Reposition planimeter at starting point.

(b) Press CLEAR button to clear auto-scaler.

(c) Retrace boundary of contour.

(2) If error is caught after initiating PRINT command:

(a) Reposition planimeter at starting point.

(b) Press CLEAR, [f] , and e.

(c) Retrace boundary of contour.

(3) If volume run is completed before error is caught, repeat entire volume run up to error. Elevation after incorrect section does not have to be rerun.

(a) Rerun volume starting from elevation section immediately above incorrect section down to error. Press [f] and d to initiate reload of volume run.

(b) Key in area of each section, read from previous printout that follows incorrect section. Press [ENTER↑] and [E] .

ac. Out-of-phase adjustments.

NOTE

Out-of-phase adjustment is used when there is constant section interval, but sections are not even elevations.

(1) Determine phase differential.

NOTE

Proqram II automatically locates next even elevation from first section entered. Determine what this number is, and subtract it from desired second elevation. Result is phase differential.

Example: Running vertical sections at 100-ft intervals

```
  525  = Desired second elevation
-600   = Next even 100-ft elevation
  -75  = Phase differential
```

Example: Running contours at 10-ft intervals

```
  1215  = Desired second elevation
- 1210  =  Next even 10-ft elevation
    +5  = Phase differential
```

(2) Key in phase differential.

(3) Press [f] and [P ≷ S.].

(4) Press [STO] and 0.

(5) Press [f] [P ≷ S.].

ad. Linear measurements on aerial photographs of unknown scale or magnification. To make linear measurements of aerial photographs, there must be a known length of an object. This known factor is used to compute constants needed for measurements.

(1) Assemble QPS with measuring probe.

(2) Activate QPS.

(a) Plug foot switch into ACCU input jack on back panel of auto-scaler.

(b) Plug linear measuring probe into auto-scaler.

(c) Plug

(d) Plug power transformer cable into wall outlet.

(e) Plug power cord into back of calculator.

(f) Plug power cord into wall outlet.

(9) Set encoder 0FF/E_2/E_1 switch on back panel of auto-scaler to E_1.

(h) Set AUDIO/OFF switch on back panel of auto-scaler to AUDIO.

(i) Set auto-scaler B/ACCU/A/OFF switch to ACCU.

(J) set auto-scaler MAN/AUTO switch to AUTO.

(k) Set auto-scaler X MEMORY switch to 1.

(1) Set calculator OFF/ON switch to ON.

(m) Set calculator MAN/TRACE/NORM switch to MAN.

(n) Set calculator PRGM/RUN switch to RUN.

(o) Press following keys: [1] , [STO] , [1] , and [ENTER↑] .

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammed magnetic card (paragraph 5-6.2.10), Program IV, into calculator.

(4) Tape photograph to be measured to table.

(5) If needed, aline li near measuring probe (paragraph 5-6.2.16). Record R_L value.

NOTE

Factory determined R_1 value is given on Calibration Records Sheet provided with equipment. Alinement is performed as a check.

(6) Press CLEAR button to clear auto-scaler.

(7) Determine length constant, C_L (multiplier), using the following formula:

$$C_L = \frac{D}{R}$$

C_L = Length of constant

D = Length of known object

R = Counts generated by measuring length of known object

Example: On aerial photograph of unknown scale or magnification where a telephone line is visible, use the known distance between two telephone poles, 105. feet, for D in formula.

(1) With linear measuring probe, measure the known distance (between two telephone poles) to obtain R.

(2) The value shown on the auto-scaler LED display (5692) can be used for R in the formula

(3) compute $C_L = \frac{D}{R}$ or $C_L = \frac{105}{5692}$

(4) Result is 0.02. Press [DSP] and to display six decimal places, 0.018477 = C_L.

(5) press [PRINT X] to activate PRINT command.

(8) Key in C_L value (computed with known length of object in photograph being measured). Press [STO] , [1] , and [ENTER↑] .

(9) Press foot switch. Do not release until ready to begin measurement.

(10) Position linear measuring probe so that pricking pin is at beginning of length to be measured. Release foot switch.

(11) Make measurement by tracing length of line with linear measuring probe.

(12) Press [PRINT X] to activate PRINT command and freeze count.

Area measurements on aerial photographs of unknown scale or magnification. To make area measurements of aerial photographs, there must be a known length of an object. This known factor must be used to compute constants needed for measurements.

(1) Assemble QPS with planimeter.

(2) Activate QPS:

(a) Plug foot switch into ACCU input jack on back panel of auto-scaler.

(b) Plug planimeter into E_2 encoder socket on back panel of auto-scaler.

(c) Plug power transformer cable into POWER supply jack on back panel of auto-scaler.

(d) Plug power transformer cable into wall outlet.

(e) Plug power cord into back of calculator.

(f) Plug power cord into wall outlet.

(g) Set encoder OFF/E_2/E_1 Switch on back Panel of auto-scaler to E_2.

(h) Set AUDIO/OFF switch on back panel of auto-scaler to AUDIO.

(i) Set auto-scaler B/ACCU/A/OFF switch to A.

(j) Set auto-scaler MAN/AUTO switch to AUTO.

(k) Set auto-scaler X MEMORY switch to 1.

(l) Set calculator OFF/ON switch to ON.

(m) Set calculator MAN/TRACE/NORM switch to MAN.

(n) Set calculator PRGM/RUN switch to RUN.

(o) Press following keys: [1] , [STO] , [1] , and [ENTER↑] .

CAUTION

Hold magnetic cards by edge. Be sure hands are clean. Grease, oil, or other materials may damage magnetic cards.

(3) Load preprogrammed magnetic card (paragraph 5-6.2h), Program IV, into calculator.

(4) Tape photograph to be measured to table.

(5) Select correct tracer arm length.

NOTE

Tracer arm length should be shortest one possible that will allow entire shape to be measured without moving the planimeter.

(6) Aline planimeter with tracer arm length selected (paragraph 5-6.2k). Record R_T value.

NOTE

Factory determined R_T value is given on Calibration Records Sheet provided with equipment. Alinement is performed as a check.

(7) Place planimeter near shape to be measured so that length of tracer arm lies along imaginary line through center of shape. Set wheels so that axles form 90 degree angle with tracer arm.

(8) Make practice trace to be sure tracer arm will cover area in one operation.

(9) Determine area constant, C (multiplier), using the following formula:

$$C = \frac{(S_c)^2 \times AT}{R_T}$$

C = Area of constant

A_T = Area of test rule (given on Calibration Records Sheet provided with equipment)

R_T = Encoder count for each revolution (given on Calibration Records Sheet provided with equipment)

S_c = Scale ratio

(a) Determine S_c by using the following formula:

$$S_c = C_L \times R_L$$

S_c = Scale ratio

C_L = Length constant (paragraph 5-6.2ad)

R_L = Counts per inch (given on Calibration Records Sheet provided with equipment)

(b) Example: Use given R_L value (724) on Calibration Records Sheet and C_L value (0.018447) obtained from linear measurements on aerial photographs (paragraph 5-6.2.ad).

$$S_c = 0.018447 \times 724 = 13.355628$$

$$(S_c)^2 = 178.372799$$

(c) Use values provided on Calibration Records Sheet for A_T and R_T. For this example, the value for R_T is 2157 and A_T is 12.54. The formula can now be computed on the calculator.

$$C = \frac{178.372799 \times 12.54}{2157} = \frac{2236.794903}{2157} = 1.036993$$

(d) Press PRINT X to activate PRINT command.

(10) Key in C value (computed with known length of object in photograph being measured). Press STO , 2 , and ENTER↑ .

(11) Set auto-scaler X MEMORY switch to 2.

(12) Trace boundary line of shape using lens tracing assembly. Stop when you reach starting point.

(13) Press PRINT X to activate PRINT command and freeze count.

NOTE

Following are tables providing information found on preprogrammed magnetic cards. The tables can be used to verify programs or to program the calculator if preprogrammed cards are damaged or lost.

Table 5-2. PRERECORDED PROGRAM SUBROUTINES (PROGRAMS I, II, III, AND IV)

Label Key	Routine	Function and Usage Notes
	Program I	
A	Point Counts	Used to total point counts and multiply total by constant. Must be reinitiated if different count is to be used.
a	Lengths	Used to measure lengths with linear measuring probe or planimeter. Must be reinitiated if scales are changed.
B	Areas	Computes area of measurement. Prints area in square feet. Must be reinitiated if tracer arm length is changed.
b	Slope Area	Computes area of slope. Must be reinitiated if new slope ratios or scales are to be used.
	ACCU +	Addition routine for adding slopes or areas.

Table 5-2. PRERECORDED PROGRAM SUBROUTINES (PROGRAMS I, II, III, AND IV) - Cont

Label Key	Routine	Function and Usage Notes
	PROGRAM I - Cont	
c	ACCU -	Subtraction routine for subtracting slopes or areas.
D	Initiate	Places zero in memory registers so they can be used for new input.
d	Inches/Acres	Converts computed area measurement into units of acres.
E	Print	Master print routine. Contains subroutines for printing results and data of other label routines in inches, square feet, or acres.
e	Memory Load	Loads constants 4, 3, 2, and 1 into memory stack.
	PROGRAM II	
A	Load Data	Used to enter horizontal and vertical scales of item to be measured and alinement data.
a	New Interval	Used to change or enter contour interval. Next even contour interval elevation for new interval is automatically determined.
B	Fill Routine	Sets system up for measurement and calculation of fill.
b	Cut Routine	Sets system up for measurement and calculation of cut.

Table 5-2. PRERECORDED PROGRAM SUBROUTINES (PROGRAMS I, II, III, AND IV) - Cont

Label Key	Routine	Function and Usage Notes
	PROGRAM II - Cont	
C	First Section	Automatically determines next even-valued section elevation from one being measured.
c	Next Section	Used anytime manual loading of next elevation is required. Used to run sections not on even elevation intervals.
D	Initiate	Stores zeros in memory registers so they can be used for new input.
d	Reload Stack	Used to rerun volume run where an incorrect section was entered; Resets memory stack for input of areas of sections that follow erroneous section on tape.
E	Print	Master print routine contains subroutines for printing results and data of other label routines.
e	Erase	Erases results and data for last (volume) contour trace made so incorrect intervals can be eliminated before volume run is completed. Calculator will reprint all data groups for previous section and ready itself for next measurement. Can only be used to erase one step at time.

Table 5-2. PRERECORDED PROGRAM SUBROUTINES (PROGRAMS I, II, III, AND IV) - Cont

Label Key	Routine	Function and Usage Notes
	PROGRAM III	
E	Print	Prints new value of X.
A B C D a, b, c, d	Load Register	Loads multiple constants or factors stored in registers 2-9 into register 1. Pressing corresponding label key loads new constant or factor into that register.
	PROGRAM IV	
A	Enter 1	Loads number 1 into memory.
B	Constant/Ratio	Computes constants C_L and S_C for aerial photographs.
C	C_L	Loads value of C_L into memory.
E	Print	Prints results of calculations.

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV)

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program I - Points, Areas, and Lengths		
001	LBL A	001 21 11	POINT COUNTS routine
002	STO A	002 35 11	Storage for constant
003	f SPACE	003 16-11	Space printer
004	1	004 01	
005	STO 1	005 35 01	Constant
006	CLX	006 -51	
007	STO I	007 35 46	Print indicator, I
008	RTN	008 24	Return to 001
009	LBL f a	009 21 16 11	LENGTHS routine
010	STO A	010 35 11	Scale (of map)
011	7	011 07	
012	2	012 02	Register
013	4	013 04	
014	f SPACE	014 16-11	Space printer
015	÷	015 -24	Register
016	STO 1	016 35 01	Constant
017	1	017 01	Input
018	STO I	018 35 46	Print indicator, I
019	RCL A	019 36 11	
020	f SPACE	020 16-11	Space printer
021	RTN	021 24	Return to 000
022	LBL B	022 21 12	AREAS routine
023	1	023 01	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code display	Meaning or Purpose
	Program I - Points, Areas, and Lengths - Cont		
024	2	024 02	
025	.	025 -62	A_T, Area of test rule
026	5	026 05	
027	5	027 05	
028	X≷Y	028 -41	
029	R↓	029 -31	Roll down stack 1
030	X	030 -35	Multiply S_2 X A_T
031	X	031 -35	
032	X≷Y	032 -41	
033	÷	033 -24	Divide by R_T
034	STO 1	034 35 01	Store constant
035	1	035 01	Input
036	CHS	036 -22	Change sign
037	STO 1	037 35 46	Print indicator, 1
038	CL X	038 -51	Clear X
039	f SPACE	039 16-11	Space printer
040	RTN	040 24	Return to 000
041	LBL f b	041 21 16 12	SLOPE AREA routine
042	STO 8	042 35 08	Slope factor
043	RCL I	043 36 46	
044	f X<0?	044 16-45	Conditional area test
045	GTO 7	045 22 07	Go to slope calculation
046	RTN	046 24	Return to 000 (Test Failed)

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, II, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program I - Points, Areas, and Lengths - Cont		
047	LBL 7	21 07	Slope area calculation
048	R↓	-31	Adjust memory stack
049	1	01	Input
050	PRINT X	-14	Print display
051	f SPACE	16 11	Space printer
052	X≷Y	-41	
053	+	-24	
054	f TAN^{-1}	16 43	Arc tangent
055	COS	42	Slope cosine (run)
056	STO 7	35 07	Slope storage
057	RTN	24	Return to 000
058	LBL C	21 13	Actuate + Routine
059	1	01	Input
060	STO 6	35 06	Storage indicator
061	f SPACE	16-11	Space printer
062	RTN	24	Return to 000
063	LBL f c	21 16 13	Actuate - Routine
064	1	01	Input
065	CHS	-22	Change sign
066	STO 6	35 06	Store indicator
067	f SPACE	16-11	Space printer
068	RTN	24	Return to 000
069	LBL D	21 14	Initiate routine

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program I - Points, Areas, and Lengths - Cont		
070	0	00	Input 0
071	STO 0	35 00	Zero register 0
072	STO 2	35 02	Zero register 2
073	STO 3	35 03	Zero register 3
074	STO 4	35 04	Zero register 4
075	STO 5	35 05	Zero register 5
076	STO 6	35 06	Zero register 6
077	STO 7	35 07	Zero register 7
078	STO 8	35 08	Zero register 8
079	STO 9	35 09	Zero register 9
080	f SPACE	16-11	Space printer
081	RTN	24	Return to 000
082	LBL f d	21 16 14	INCHES/ACRES routine
083	1	01	Input
084	STO 9	35 09	Zero register nine
085	RCL I	36 46	
086	f X>0?	16-44	Test for length or area
087	GTO 5	22 05	To calculate inches
088	RCL 1	36 01	
089	4	04	
090	3	03	
091	5	05	Constant
092	6	06	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code	Display	Meaning or Purpose
	Program I - Points, Areas, and Lengths - Cent			
093	0	093	00	
094	÷	094	-24	Divide
095	f SPACE	095	16-11	Space printer
096	STO 2	096	35 02	
097	RTN	097	24	Return to 000
098	LBL E	098	21 15	PRINT routine
099	STO 0	099	3500	
100	RCL I	100	36 46	
101	f X=0?	101	16-43	Test for points
102	STO 0	102	22 00	If Yes
103	RCL 8	103	3608	If No
104	f X≠0?	104	16-42	Test for slope
105	GTO 4	105	2204	If Yes, routine 4
106	RCL 9	106	36 09	If No
107	f X>0?	107	16-44	Test for inches/acres
108	GTO 2	108	22 02	If Yes, routine 2
109	GTO 1	109	22 01	If No, routine 1
110	RTN	110	24	Return to 000
111	LBL 1	111	21 01	Print areas or length routine
112	RCL 0	112	3600	
113	PRINT X	113	-14	Print display
114	RCL 6	114	3606	
115	f X≠0?	115	16-42	Test for actuate

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
	Program I - Points, Areas, and Lengths - Cont			
116	GTO 8	116	22 08	If Yes, routine 8
117	f SPACE	117	16-11	If No
118	R↓	118	-31	Adjust memory stack
119	RTN	119	24	Return to 000
120	LBL 8	120	21 08	PRINT actuate routine
121	X	121	-35	Input X
122	RCL 3	122	36 03	
123	+	123	-55	Add
124	STO 3	124	35 03	
125	PRINT X	125	-14	Print total
126	f SPACE	126	16-11	Space printer
127	RTN	127	24	Return to 000
128	LBL 2	128	21 02	Print inches/acres routine
129	RCL 0	129	36 00	
130	PRINT X	130	-14	Print display
131	RCL 1	131	36 01	
132	÷	132	-24	
133	RCL 2	133	36 02	
134	X	134	-35	
135	PRINT X	135	-14	Print inches/acres
136	STO 5	136	35 05	
137	RCL 6	137	36 06	
138	f X≠0?	138	16-42	Test for actuate

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
	Program I - Points, Areas, and Lengths - Cont			
139	GTO 9	139	22 09	If yes, routine 9
140	f SPACE	140	16-11	If no
141	R↓	141	-31	Adjust memory to X
142	RTN	142	24	Return to 000
143	LBL 9	143	21 09	Print inches/acres Actuate routine
144	RCL 0	144	36 00	
145	RCL 6	145	36 06	
146	X	146	-35	
147	RCL 3	147	36 03	
148	+	148	-55	Add
149	STO 3	149	35 03	
150	PRINT X	150	-14	Print display
151	RCL 5	151	36 05	
152	RCL 6	152	36 06	
153	X	153	-35	Input
154	RCL 4	154	36 04	
155	+	155	-55	Add
156	STO 4	156	35 04	
157	PRINT X	157	-14	Print
158	f SPACE	158	16-11	Space printer
159	f SPACE	159	16-11	Space printer
160	RTN	160	24	Return to 000
161	LBL 0	161	21 00	Print points routine

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
	Program I - Points, Areas, and Lengths - Cent			
162	RCL 0	162	36 00	
163	RCL A	163	36 11	
164	PRINT X	164	-14	
165	X	165	-35	Input
166	PRINT X	166	-14	
167	f SPACE	167	16-11	
168	RTN	168	24	Return to 000
169	LBL 4	169	21 04	Print slope routine
170	RCL 0	170	36 00	
171	PRINT X	171	-14	Print
172	RCL 7	172	36 07	
173	÷	173	-24	Divide
174	PRINT X	174	-14	Print
175	STO 5	175	35 05	
176	f SPACE	176	16-11	Space printer
177	RCL 6	177	36 06	
178	f	178	16-42	Test for ACCU
179	GTO 9	179	22 09	If Yes, routine 9
180	R↓	180	-31	If No, move stack
181	RTN	181	24	Return to 000
182	LBL 5	182	21 05	Inches routine
183	RCL 1	183	36 01	
184	RCL A	184	36 11	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program I - Points, Areas, and Lengths - Cont		
185		185 -24	Divide
186		186 35 02	
187		187 16-11	Space printer
188		188 24	Return to 000
189		189 21 16 15	Memory load routine
190		190 35 04	
191		191 -31	Move memory stack
192		192 35 03	
193		193 -31	Move memory stack
194		194 35 02	
195		195 -31	Advance memory stack
196		196 35 01	
197		197 01	
198		198 35 46	
199		199 16-11	Space printer
200		200 51	Run/Stop, end of program
	Program II - Volumes by Contour		
001		001 21 11	Load data routine
002		002 35 15	
003		003 16-31	Roll up stack
004		004 35 11	Horizontal scale entry
005		005 16-31	Roll up stack
006		006 35 12	Vertical scale entry

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program II - Volumes by Contour - Cont		
007	R↓	-31	Roll down stack
008	1	01	
009	2	02	
010	.	-62	Actual area of test rule
011	5	05	
012	5	05	
013	STO C	35 13	Test area
014	f R↑	16-31	Roll up stack
015	STO D	35 14	
016	f R↑	16-31	Roll up stack
017	CL X	-51	Clear display
018	f SPACE	16-11	
019	RTN	24	Return to 000
020	LBL B	21 12	Fill routine
021	I	01	
022	LBL 4	21 04	Cut/Fill indication
023	STO I	35 46	Entry
024	f SPACE	16-11	
025	RTN	24	Return to 000
026	LBL C	21 13	First section routine
027	STO 9	35 09	
028	f SPACE	16-11	
029	RCL 5	36 05	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
		Program II - Volumes by Contour - Cont		
030	RCL 6	030	36 06	
031	f P≷S	031	16-51	
032	STO 6	032	35 06	
033	R↓	033	-31	Roll down stack
034	STO 5	034	36 05	
035	f P≷S	035	16-51	
036	0	036	00	
037	STO 0	037	35 00	
038	RTN	038	24	Return to 000
039	LBL D	039	21 14	Initiate routine
040	RCL A	040	36 11	Indicator
041	RCL B	041	36 12	
042	X	042	-35	Multiply
043	RCL C	043	36 13	
044	X	**044**	**-35**	**Multiply**
045	RCL D	**045**	**36 14**	
046	+	**046**	**-24**	**Divide**
047	STO 1	**047**	**35 01**	**0 Stored**
048	0	**048**	**00**	
049	STO 5	049	35 05	Store 0's
050	STO 6	050	35 06	Store 0's
051	STO 7	**051**	**35 07**	**Store 0's**
052	STO 8	**052**	**35 08**	**Store 0's**

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
		Program II - Volumes by Contour - Cont		
053	STO 9	053	35 09	Store O's
054	f P≷S	054	16-51	
055	STO 0	055	35 00	Store O's
056	STO 1	056	35 01	Store O's
057	STO 2	057	35 02	
058	STO 3	058	35 03	
059	STO 4	059	35 04	
060	STO 5	060	35 05	
061	STO 6	061	35 06	
062	f P≷S	062	16-51	
063	f SPACE	063	16-11	
064	f CLF 0	064	16 22 00	Clear flag 0
065	RTN	065	24	Return to 000
066	LBL E	066	21 15	Print routine
067	RCL 6	067	36 06	
068	f P≷S	068	16-51	Current area next to last area
069	STO 2	069	35 02	
070	f P≷S	070	16-51	
071	X≷Y	071	-41	
072	STO 6	072	35 06	Store new area in current area
073	RCL 7	073	36 07	
074	f P≷S	074	16-51	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
		Program II - Volumes by Contour - Cont		
075	STO 3	075	35 03	Store current intermediate volume in last interme-diate volume
076	f P≷S	076	16-51	
077	RCL 9	077	36 09	
078	PRINT X	078	-14	Print next elevation
079	RCL 6	079	36 06	
080	PRINT X	080	-14	Print new area
081	f P≷S	081	16-51	
082	RCL 2	082	36 02	
083	+	083	-55	Add
084	f P≷S	084	16-51	
085	RCL 0	085	36 00	Section/Volume calculation
086	X	086	-35	Multiply
087	5	087	05	
088	4	088	04	Constant
089	÷	089	-24	Divide
090	RCL 9	090	36 09	
091	RCL 5	091	36 05	
092	−	092	-45	Subtract
093	X	093	-35	Multiply
094	STO 7	094	35 07	
095	PRINT X	095	-14	Print intermediate volume
096	RCL 8	096	36 08	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program II - Volumes by Contour - Cont		
097	f P≷S	097 16-51	
098	STO 4	098 35 04	
099	f P≷S	099 16-51	
100	+	100 -55	Add
101	STO 8	101 35-08	Store total volume
102	PRINT X	102 -14	Print total volume
103	RCL 9	103 36 09	
104	f P≷S	104 16-51	
105	RCL 5	105 36 05	
106	f P≷S	106 16-51	
107	−	107 -45	Subtract
108	f X≠0?	108 16-42	Twin peak test
109	GTO 0	109 22 00	If yes
110	RCL 6	110 36 06	If no
111	f P≷S	111 16-51	
112	RCL 6	112 36 06	
113	f P≷S	113 16-51	
114	+	114 -55	Add
115	STO 6	115 35 06	
116	LBL 0	116 21 00	Twin peak routine
117	RCL 9	117 36 09	
118	f F? 0	118 16 23 00	Test flag 0
119	GTO 2	119 22 02	If yes

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
	Program II - Volumes by Contour - Cont			
120	RCL E	120	36 15	If no
121	÷	121	-24	Divide
122	f FRAC	122	16 44	
123	f X=0?	123	16-43	Test for 000
124	GTO 1	124	22 01	If yes
125	RCL I	125	36 46	If odd elevations
126	1	126	01	
127	−	127	-45	Subtract
128	2	128	02	
129	÷	129	-24	Divide
130	CHS	130	-22	Change sign
131	RCL 9	131	36 09	
132	RCL E	132	36 15	
133	÷	133	-24	Divide
134	+	134	-55	Add
135	f INT	135	16 34	Truncate to integer
136	RCL E	136	36 15	
137	X	137	-35	
138	GTO 2	137	22 02	To twin peak routine
139	LBL 1	139	21 01	Even elevation routine
140	RCL 9	140	36 09	
141	LBL 2	141	21 02	Twin peak routine
142	RCL 1	142	36 46	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program II - Volumes by Contour - Cont		
143	RCL E	143 36 15	
144	X	144 -35	Multiply
145	+	145 -55	Add
146	f F? 0	146 16 23 00	Test flag 0
147	GTO 8	147 22 08	If yes
148	f P≷S	148 16-51	If no
149	RCL 0	149 36 00	
150	f P≷S	150 16-51	
151	+	151 -55	Add
152	LBL 8	152 21 08	In twin peak routine
153	RCL 9	153 36 90	
154	RCL 5	154 36 05	
155	f P≷S	155 16-51	
156	STO 1	156 35 01	
157	f P≷S	157 16-51	
158	R↓	158 -31	Roll down stack
159	STO 5	159 35 05	
160	R↓	160 -31	
161	STO 9	161 35 09	
162	1	152 01	
163	STO 0	163 35 00	
164	RCL 8	164 36 08	
165	f P≷S	165 16-51	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
		Program II - Volumes by Contour - Cont		
166	RCL 0	166	36 00	
167	f X=0?	167	16-42	Test for twin peak
168	f STF 0	168	16 21 00	Set flag to 0
169	f P≧S	169	16-51	
170	RCL 8	170	36 08	
171	f SPACE	171	16-11	Space printer
172	RTN	172	24	Return to 000
173	LBL f a	173	21 16 11	New interval routine
174	STO E	174	35 15	
175	f SPACE	175	16-11	Space printer
176	RCL 5	176	36 05	
177	STO 9	177	35 09	Store last elevation
178	f P≧S	178	16-51	In current elevation
179	RCL 1	179	36 01	
180	f P≧S	180	16-51	
181	STO 5	181	3505	
182	GTO 0	182	22 00	To first section routine
183	LBL f b	183	21 16 12	Cut routine
184	1	184	01	
185	CHS	185	-22	Change sign
186	GTO 4	186	22 04	
187	LBL f c	187	21 16 13	Next section routine
188	STO 9	188	35 09	

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display		Meaning or Purpose
		Program II - Volumes by Contour - Cont		
189	f SPACE	189	16-11	Space printer
190	RTN	190	24	Return to 000
191	LBL f d	191	21 16 14	Reload stack routine
192	GSB 5	192	23 05	To subroutine 5, data load
193	f R↑	193	16-31	
194	RCL E	194	36 15	
195	RCL I	195	36 46	Set up for next elevation
196	X	196	-35	Multiply
197	+	197	-55	Add
198	STO 9	198	35 09	
199	RCL 8	199	36 08	
200	f SPACE	200	16-11	
201	RTN	201	24	Return to 000
202	LBL f e	202	21 16 15	Erase routine
203	RCL 5	203	36 05	
204	STO 9	204	35 09	
205	f P≷S	205	16-51	Backs up data
206	RCL 1	206	36 01	Group 1 section
207	RCL 2	207	36 02	
208	RCL 3	208	36 03	
209	RCL 4	209	36 04	
210	f P≷S	210	16-51	
211	f STACK	211	16-14	Print stack

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program II - Volumes by Contour - Cont		
212	LBL 5	212 21 05	Loader routine
213	STO 8	213 3508	
214	R↓	214 -31	Roll down stack
215	STO 7	215 35 07	Loads stack into memory
216	R↓	216 -31	Roll down stack
217	STO 6	217 35 06	
218	R↓	218 -31	Roll down stack
219	STO 5	219 35 05	
220	R↓	220 -31	Roll down stack
221	RTN	221 24	Return to 000
222	R/S	222 51	Run/Stop, end of program
	Program III - Multiple Scale or Alinement Factors		
001	LBL E	001 21 15	Print X routine
002	PRINT X	002 -14	
003	RTN	003 24	Return to 000
004	LBL A	004 21 11	Loads register 2
005	RCL 2	005 36 02	
006	STO 1	006 35 01	Loads register 2 into 1
007	RTN	007 24	Return to 000
008	LBL B	008 21 12	Loads register 3
009	RCL 3	009 36 03	
010	STO 1	010 35 01	Loads register 3 into 1
011	RTN	011 24	Return to 000

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program III - Multiple Scale or Alinement Factors - Cont		
012	LBL C	012 21 13	Loads register 4
013	RCL 4	013 36 04	
014	STO 1	014 35 01	Loads register 4 into 1
015	RTN	015 24	Return to 000
016	LBL D	016 21 14	Loads register 5
017	RCL 5	017 36 05	
018	STO 1	018 35 01	Loads register 5 into 1
019	RTN	019 24	Return to 000
020	LBL f a	020 21 16 11	Loads register 6
021	RCL 6	021 36 06	
022	STO 1	022 35 01	Loads register 6 into 1
023	RTN	023 24	Return to 000
024	LBL f b	024 21 16 12	Loads register 7
025	RCL 7	025 36 07	
026	STO 1	026 35 01	Loads register 7 into 1
027	RTN	027 24	Return to 000
028	LBL f c	028 21 16 13	Loads register 8
029	RCL 8	029 36 08	
030	STO 1	030 35 01	Loads register 8 into 1
031	RTN	031 24	Return to 000
032	LBL f d	032 21 16 14	Loads register 9
033	RCL 9	033 36 09	
034	STO 1	034 35 01	Loads register 9 into 1

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program III - Multiple Scale or Alinement Factors - Cont		
035	RTN	035 24	Return to 000
036	R/S	036 51	Run/Stop, end of program
	Program IV - Linear Measuring Probe Program for Aerial Photos		
001	LBL A	001 21 11	Enter 1 routine
002	1	002 01	
003	STO 1	003 35 01	Enter 1 into memory
004	RTN	004 24	Return to 000
005	LBL B	005 21 12	Constant/Ratio routine
006	ENTER↑	006 -21	
007	RCL 1	007 36 01	
008	X	008 -35	Multiply
009	1/X	009 52	Reciprocal of X
010	RCL B	010 36 08	
011	X	011 -35	Multiply
012	PRINT X	012 -14	Print X
013	STO 3	013 35 03	
014	7	014 07	
015	2	015 02	Constant
016	4	016 04	
017	X	017 -35	
018	PRINT X	018 -14	
019	f SPACE	019 16-11	Space printer
020	RTN	020 24	Return to 000

Table 5-3. PREPROGRAMMED KEYSTROKE ENTRIES (PROGRAMS I, II, III, AND IV) - Cont

Step	Keystroke Entry	Key Code Display	Meaning or Purpose
	Program III - Multiple Scale or Alinement Factors - Cont		
021	LBL C	021 21 13	C_L routine
022	RCL 3	022 36 03	
023	STO 1	023 35 01	Enter C_L in memory
024	RTN	024 24	Return to 000
025	LBL E	025 21 15	Print routine
026	PRINT X	026 -14	
027	RTN	027 24	Return to 000
028	R/S	028 51	Run/Stop, end of program

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES

Step	Keyboard Entry	Purpose
001		Clear registers subroutine.
002		
003		
004		
005		
006		Function test subroutine.
007		
008		
009		
010		
011		

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

Step	Keyboard Entry	Purpose
012	DSZI	DSZI and RCLI subroutine.
013	*LBL5	
014	RCL(i)	
015	RTN	RCL and STOP if called.
016	*LBLc	
017	RCLI	
018	RCLI	Verify registers and sum in
019	X≠Y?	R_0 subroutine.
020	R/S	
021	STO 0	
022	DSZI	
023	GTOC	
024	3	
025	EEX	
026	2	
027	RCL0	
028	X≠Y?	Test R_0.
029	R/S	
030	RTN	
031	*LBLe	Decrement x subroutine.
032	1	
033	-	
034	RTN	

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

Step	Keyboard Entry	Purpose
	NOTE	
	These first 34 instruction steps are standard for any program run. They are used to set registers and flags for the following program.	
035	*LBLA	Start and pause after first subroutine execution.
036	5	
037	7	
038	GSBO	
039	P SE	
040	GSBe	Decrement x.
041	**ENT↑**	
042	**R↑**	Stack (X, Y, Z, T) test.
043	**X≧Y**	
044	**R↑**	
045	**R↑**	
046	**X≧Y**	
047	**R↑**	
048	**X≠0?**	
049	**X≠Y?**	
050	RTN	
051	GSBe	Decrement x.
052	X>Y?	
053	RTN	
054	GSBe	X-to-Y comparisons.

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

Step	Keyboard Entry	Purpose
055	X-Y?	
056	RTN	
057	GSBe	
058	X≤Y?	
059	GTO1	
060	RTN	
061	*LBL1	Decrement x.
062	GSBe	
063	STOI	I-register test.
064	RCLI	
065	X≧Y	
066	X≠Y?	X-to-O comparisons.
067	RTN	
068	GSB2	
069	X≠0?	
070	GTO3	
071	RTN	
072	*LBL3	
073	GSB2	
074	X=0?	
075	RTN	
076	GSB2	
077	X<0?	
078	RTN	

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

Step	Keyboard Entry	Purpose
079	GSB2	
080	X>0?	
081	GT04	
082	RTN	
083	*LBL4	Check set status on flags.
084	DSZI	
085	F?2	
086	GT05	
087	DSZI	
088	F?l	
089	GT05	
090	DSZI	
091	F?3	
092	GT06	
093	GT05	
094	*LBL6	
095	DSZI	
096	F?O	
097	GT07	
098	GT05	
099	*LBL7	Check complement of set status on flags.
100	STF2	
101	STF1	

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

Step	Keyboard Entry	Purpose
102	CFO	
103	DSZI	
104	F?3	
105	6T05	
106	DSZI	
107	F?O	
108	GT05	
109	DSZI	
110	F?2	
111	GT08	
112	GT05	
113	*LBL8	
114	DSZI	
115	F?l	
116	GT09	
117	GT05	
118	*LBL9	Check F2 for test clearing.
119	DSZI	
120	F?2	
121	GT05	
122	GSB2	Test DEG, SIN, SIN^{-1}.
123	DSP7	
124	DEG	
125	SIN	

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

Step	Keyboard Entry	Purpose
126	SIN^{-1}	
127	GSBa	
128	Cos	Test COS, COS^{-1}.
129	COS^{-1}	
130	GSBa	
131	TAN	Test TAN, TAN^{-1}.
132	TAN^{-1}	
133	GSBa	
134	**→P**	Test **→ P, → R.**
135	**→R**	
136	GSBa	
137	SIN^{-1}	
138	**→H.MS**	Test **→H.MS, H.MS →**
139	**H.MS →**	
140	SIN-l	
141	GSBa	
142	LOG	Test LOG, 10^x.
143	$l0^x$	
144	GSBa	
145	LN	Test LN, e^x.
146	e^x	
147	GSBa	
148	$\sqrt{X}$	Test $\sqrt{X}$, X^2.
149	X^2	

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTIRES - Cont

Step	Keyboard Entry	Purpose
150	GSBa	
151	ENT↑	Test y^x, LASTx, 1/x.
152	Y^X	
153	LAST X	
154	1/X	
155	Y^X	
156	GSBa	
157	ENT↑	Test +, -
158	+	
159	LAST X	
160	-	
161	GSBa	
162	ENT↑	Test x, ÷
163	X	
164	LAST X	
165	÷	
166	GSBa	
167	$\sqrt{X}$	Test FRAC, INT.
168	FRAC	
169	LAST X	
170	INT	
171	+	
172	X^2	
173	GSBa	Test D R, R D.

Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

Step	Keyboard Entry	Purpose
174	D→R	
175	R→D	
176	GSBa	
177	EEX	Test EEX, %.
178	2	
179	X≷Y	
180	%	
181	GSBa	
182	DSP1	Test registers 24 and 0.
183	*LBLb	
184	RCLI	
185	STO(I)	(Sensitivity of lower-order registers to higher-order register changes.)
186	DSZI	
187	GTOb	
188	2	
189	4	
190	X≷I	
191	GSCc	
192	GSBO	
193	*LBLd	
194	DSZI	
195	RCLI	
196	ABS	

Table 5-4 PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

Step	Keyboard Entry	Purpose
197	STO(i)	
198	2	
199	**4**	
200	**X≠Y?**	
201	**GTOd**	
202	**STOI**	
203	**GSBc**	
204	**9**	**Generate "PASS" display.**
205	**EEX**	
206	**8**	**-8-888888888-88**
207	**7**	
208	**1/X**	
209	**8**	
210	**CHS**	
211	**X**	
212	**STF 0**	
213	CLF 1	**Reset status for possible second pass.**
214	**STF 3**	
215	**RAD**	
216	DSP3	Test display **formatting and printing.**
217	ENG	
210	PRINT X	
219	**SCI**	

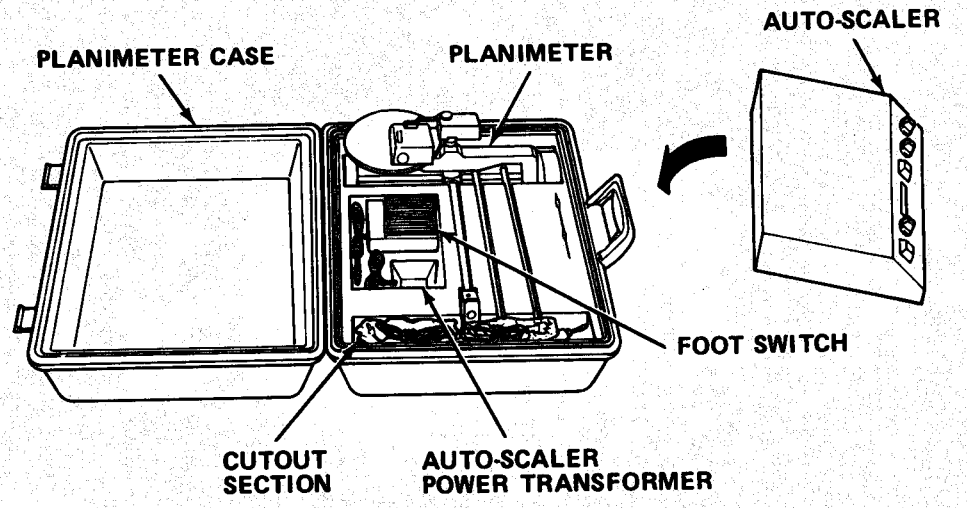
Table 5-4. PREPROGRAMMED DIAGNOSTIC ENTRIES - Cont

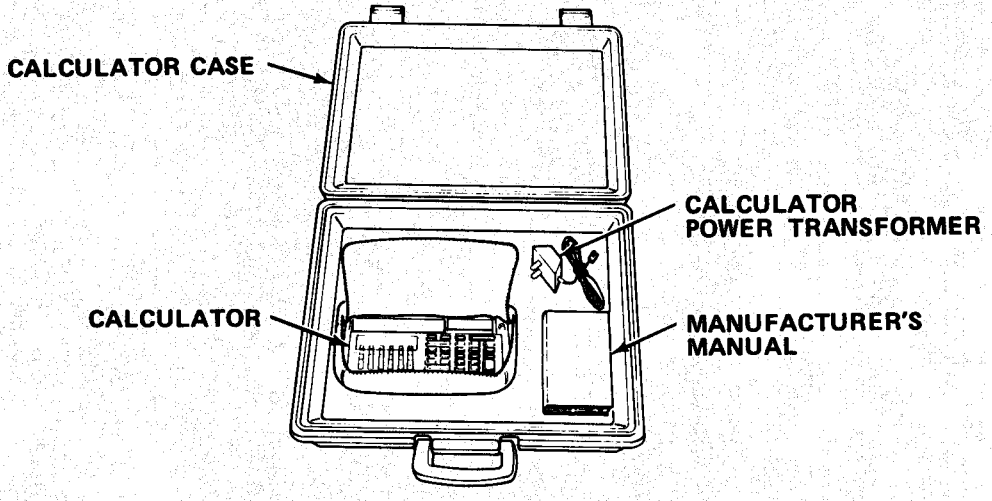
Step	Keyboard Entry	Purpose
220	PRINT X	
221	DSP1	
222	FIX	
223	PRINT X	
224	R/S	End of test.

5-6.3 Preparation for Movement.

a. Disconnect all cables and switches from equipment.

b. Cover components with their respective plastic covers.





c. Place foot switch and auto-scaler power transformer into planimeter case.

d. Place planimeter tracer arm extensions into cutout section of planimeter case.

e. Place planimeter with needle tracing assembly sideways into case.

f. Place remote tracer switch, point counter pen, linear measuring probe, and drafting bridge into cutout section of planimeter case.

g. Place auto-scaler in planimeter case.

h. Place calculator in small case.

i. Place calculator case, calculator power transformer, magnetic card pack, and manufacturer's manual in large calculator case.

j. Close and secure both cases.

5-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III Operator Maintenance

5-8. LUBRICATION INSTRUCTIONS.

NOTE

These lubrication instructions are mandatory.

Apply one drop of watch oil (Item 15, Appendix E) to drive gears of linear measuring probe quarterly.

5-9. TROUBLESHOOTING PROCEDURES.

5-9.1 The table lists the common malfunctions which you may find during the operation or maintenance of the QPS. You should perform the test/inspections and corrective actions in the order listed.

5-9.2 This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 5-5. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. AUTO-SCALER DOES NOT OPERATE.	
Step 1. Check to see if power transformer is plugged into wall outlet and auto-scaler back panel.	
	(a) If power transformer is plugged in, proceed to step 2.
	(b) Plug in power transformer.
Step 2. Check position of circuit breaker in power panel.	
	(a) If circuit breaker is on, refer to organizational maintenance.
	(b) Turn on circuit breaker.
2. CALCULATOR DOES NOT OPERATE.	
Step 1. Check to see if power transformer is plugged into wall outlet and back of calculator.	
	(a) If power transformer is plugged in, proceed to step 2.
	(b) Plug in power transformer.
Step 2. Check position of circuit breaker at power panel.	
	(a) If circuit breaker is turned on, refer to organizational maintenance and proceed to step 3.
	(b) Turn on circuit breaker.
Step 3. Check to see If calculator will energize with good battery pack.	
	(a) If calculator energizes, replace power transformer.
	(b) If calculator does not energize, replace calcilator.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. AUTO-SCALER AND CALCULATOR DISPLAY ALL ZEROS .	Step 1. With scale dials set to 000, check setting of NORMAL/SCALE switch.	(a) If NORMAL/SCALE switch is on NORMAL, proceed to step 2. (b) Set NORMAL/SCALE switch to NORMAL.
	Step 2. Check to see if switches on auto-scaler front panel are set correctly for specific measuring procedure.	(a) If switches are set correctly, proceed to step 3. (b) Set auto-scaler switches for measuring procedure being performed.
	Step 3. Check to see if remote tracer switch is stuck.	(a) If remote tracer switch functions properly, proceed to step 4. (b) Free remote tracer switch.
	Step 4. Check to see if auto-scaler 0FF/E_2/E_1 switch is set correctly for specific measuring procedure.	(a) If 0FF/E_2/E_1 switch is set correctly, proceed to step 5. (b) Set 0FF/E_2/E_1 switch correctly.
	Step 5. Check alinement procedure with linear measuring probe (paragraph 5-6.2n).	Perform alinement procedure with linear measuring probe (paragraph 5-6.2n).
4. AUTO-SCALER DISPLAYS ALL ZEROS. CALCULATOR DISPLAYS CORRECT COUNT.	Check to see if auto-scaler switches are set correctly for specific measuring procedures.	Set switches correctly.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. AUTO-SCALER DISPLAYS CORRECT COUNT. CALCULATOR DISPLAYS ALL ZEROS.		
	Step 1. Check to see if ribbon cable in back of calculator is correctly connected.	(a) If ribbon cable is connected properly, proceed to step 2. (b) Insert ribbon cables correctly.
	Step 2. Check to see if [1] , [STO] , [1] , and [ENTER↑] have been keyed into calculator memory.	(a) If correct entries have been keyed in, proceed to step 3. (b) Key into calculator [1] , [STO] , [1] , and [ENTER↑] .
	Step 3. Check to see if auto-scaler MAN/AUTO switch, X MEMORY switch, and INIT button are set correctly for specific measuring procedure.	(a) If switches are set correctly, proceed to step 4. (b) Set switches correctly.
	Step 4. Run calculator diagnostic program on preprogrammed magnetic card.	Replace calculator.
6. AUTO-SCALER IS ERRATIC. CALCULATOR DISPLAYS CORRECT COUNT.		
	Perform checks in malfunction 5.	
7. CALCULATOR DISPLAYS CORRECT COUNT BUT DOES NOT RESPOND TO AUTO-SCALER SWITCHES.		
	Step 1. Check to see if ribbon cable in back of calculator is correctly connected.	(a) If ribbon cable connection is correct, proceed to step 2. (b) Insert ribbon cable correctly.
	Step 2. Run calculator diagnostic program on preprogrammed magnetic card.	Replace calculator.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
8. CALCULATOR AND AUTO-SCALER DISPLAYS ARE ERRATIC.	
Step 1. Check to see if encoder cable is correctly inserted into auto-scaler back panel.	(a) If encoder cable is correctly inserted, proceed to step 2. (b) Insert encoder cable correctly.
Step 2. Check to see if encoder mounting screws are loose or missing.	(a) If no screws are loose or missing, proceed to step 3. (b) Notify direct/general support maintenance for tightening or replacing screws.
Step 3. Check to see if planimeter drive gears are slipping or jamming.	(a) If gears are operating correctly, proceed to step 4. (b) Tighten or loosen setscrew on wheel axle to adjust drive gears.
Step 4. Check to see if compression spring is operating.	(a) If compression spring is operating properly, proceed to step (b) Replace compression spring (paragraph 5-10.3).
Step 5. Check to see if encoder measuring wheel is in contact with planimeter disk.	Proceed to step 6.
Step 6. Check for any obstruction under the planimeter disk.	(a) If there is no obstruction present, proceed to step 7. (b) Remove obstruction, press encoder housing in place.
Step 7. Check to see if there are enough paper disks in planimeter.	If necessary, add another disk to planimeter (paragraph 5-10.4).

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

9. AUTO-SCALER DISPLAYS CORRECT COUNT. CALCULATOR DISPLAY IS ERRATIC.

Perform checks in malfunction 8.

10. POINT COUNTER PEN DOES NOT INCREMENT COUNT CORRECTLY.

Step 1. Check to see if point of point counter pen is jammed.

(a) If point is free, proceed to step 2.

(b) Free point.

(c) Replace cartridge.

(d) Replace point counter pen.

Step 2. Check to see if point counter pen will operate with new cartridge.

(a) Replace cartridge.

(b) Replace point counter pen.

Step 3. Check to see if auto-scaler LED display shows erratic counting while moving point counter pen.

Replace point counter pen.

11. BOTH DISPLAYS APPEAR NORMAL. ALINEMENT RESULTS ARE INCORRECT OR INCONSISTENT.

Step 1. Check to see if planimeter tracer arm has slipped or moved.

(a) If planimeter tracer arm is in the proper position, proceed to step 2.

(b) Set tracer arm to proper length.

Step 2. Check to see if planimeter wheels are clean.

(a) If planimeter wheels are clean, proceed to step 3.

(b) Clean wheels using a soft brush.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
11. BOTH DISPLAYS APPEAR NORMAL. ALINEMENT RESULTS ARE INCORRECT OR INCONSISTENT - Cont
Step 3. Check to see if teflon guide washer beneath the lens tracing assembly is clean and in contact with surface.
(a) If teflon guide washer is clean and positioned correctly, proceed to step 4.
(b) Clean teflon guide washer with soft clean cloth.
(c) Replace teflon guide washer (paragraph 5-10.2).
Step 4. Check to see if paper disk on planimeter is clean.
(a) If paper disk is clean, proceed to step 5.
(b) Replace paper disk (paragraph 5-10.4).
Step 5. Check to see if auto-scaler NORMAL/SCALE switch is set to NORMAL.
(a) If switch is correctly set, proceed to step 6.
(b) Set NORMAL/SCALE switch to NORMAL.
Step 6. With 90° triangle, check to see if axis of tracing assembly is at 90° angle to surface being measured.
(a) If axis is at proper angle, proceed to step 7.
(b) Adjust axis of tracing assembly until it is at 90° angle with surface being measured.
Step 7. With 90° triangle, check to see if axis of tracer arm and axis of wheel axle are at 90° angle.
(a) If axis is correct, proceed to step 8.
(b) Adjust tracer arm assembly until it is at 90° angle with axis of wheel axle.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
11. BOTH DISPLAYS APPEAR NORMAL . ALINEMENT RESULTS ARE INCORRECT OR INCONSISTENT - Cent	
Step 8. Check to see if encoder measuring wheel is clean.	(a) If encoder measuring wheel is clean, proceed to step 9. (b) Clean encoder measuring wheel with soft brush.
Step 9. Check to see if encoder is alined.	Notify direct/general support maintenance for encoder alinement and replacement.
12. AUTO-SCALER AND CALCULATOR DISPLAYS DO NOT AGREE BY TWO OR MORE COUNTS.	
Check to see if ribbon cable in back of calculator is correctly connected.	Insert ribbon cable correctly.
13. CALCULATOR WILL NOT ACCEPT MAGNETIC CARD.	
Step 1. Check to see if magnetic card is being fed into reader backward or upside down.	(a) If card is being inserted correctly, proceed to step 2. (b) Feed magnetic card correctly.
Step 2. Check to make sure calculator is correctly keyed to accept card.	(a) If calculator has been correctly keyed, proceed to step 3. (b) Set keys correctly.
Step 3. Check to see if head-cleaning card will be accepted into magnetic card reader.	(a) If head-cleaning card will be accepted, proceed to step 4. (b) Run head-cleaning card through magnetic card reader.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
13. CALCULATOR WILL NOT ACCEPT MAGNETIC CARD - Cont	
Step 4. Check to see if magnetic card is dirty.	(a) If magnetic card is clean, proceed to step 5. (b) Clean magnetic card with cloth moistened with alcohol (Table 5-1).
Step 5. Check to see if battery pack contacts are clean and straight.	(a) If contacts are clean and straight, proceed to step 6. (b) Clean battery pack contacts with cotton swab moistened with alcohol (Table 5-1). (c) Straighten battery pack contacts by pressing down with finger. (d) Replace battery pack (paragraph 5-10.1).
Step 6. Run calculator diagnostic program on preprogrammed magnetic card.	Replace calculator.
14. CALCULATOR PRINTER WILL NOT ADVANCE.	
Step 1. Check to see if paper roll is jammed.	(a) If paper roll is free, proceed to step 2. (b) Free paper roll.
Step 2. Check to see if battery pack is defective.	(a) If battery pack is good, proceed to step 3. (b) Replace battery pack (paragraph 5-10.1).
Step 3. Check to see if calculator display is active.	(a) If display is active, proceed to step 4. (b) Replace calculator.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
14. CALCULATOR PRINTER WILL NOT ADVANCE - Cont	Step 4. Check to see if calculator PRGM/RUN switch is set to RUN.	(a) If PRGM/RUN is set properly, proceed to step 5. (b) Set switch to RUN.
	Step 5. Run calculator diagnostic program on preprogrammed magnetic card.	Replace calculator.
15. CALCULATOR PRINTER ADVANCES, BUT NOTHING PRINTS WHEN PRINT X IS ACTIVATED.	Step 1. Check to see if paper roll is jammed.	(a) If paper roll is free, proceed to step 2. (b) Free paper roll.
	Step 2. Perform checks in malfunction 14.	
16. AUTO-SCALER LED DISPLAY DOES NOT OPERATE OR SHOWS INCORRECT COUNT.	Step 1. Check to see if power source has 10 v dc to 15 V dc output.	(a) If output is correct, proceed to step 2. (b) Change power source.
	Step 2. Check to see if voltage on regulator on main logic PC board is 8 V dc.	(a) If voltage is correct, proceed to step 3. (b) Notify direct/general support maintenance for replacement of main logic PC board.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
16. AUTO-SCALER LED DISPLAY DOES NOT OPERATE OR SHOWS INCORRECT COUNT - Cont	
Step 3. Check to see if there is power at power source but not on main logic PC board.	(a) If power is present, proceed to step 4. (b) Notify direct/general support maintenance for replacement of main logic PC board and front display PC board.
Step 4. Check to see if auto-scaler LED display shows numbers but does not count.	(a) If display operates properly, proceed to step 5. (b) Notify direct/general support maintenance for replacement of main logic PC board and front display PC board.
Step 5. Check to see if auto-scaler LED display shows count only increasing or only decreasing.	(a) If count is correct, proceed to step 6. (b) Notify direct/general support maintenance for replacement of main logic PC board and front display PC board.
Step 6. Check to see if auto-scaler LED display shows erratic counts or skips counts.	(a) If count is correct, proceed to step 7. (b) Notify direct/general support maintenance for replacement of main logic PC board and front display PC board.
Step 7. Check to see if auto-scaler LED display does not show even or odd digits.	(a) If display is correct, proceed to step 8. (b) Notify direct/general support maintenance for replacement of main logic PC board.

Table 5-5. TROUBLESHOOTING - Cont

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

16. AUTO-SCALER LED DISPLAY DOES NOT OPERATE OR SHOWS INCORRECT COUNT - Cont

Step 8. Check to see if auto-scaler LED display shows inaccurate counts.

(a) If display is correct, proceed to step 9.

(b) Notify direct/general support maintenance for replacement of main logic PC board.

Step 9. Check to see if calculator LED shows incorrect readings.

(a) If calculator LED display is correct, proceed to step 10.

(b) Notify direct/general support maintenance for replacement of main logic PC board.

Step 10. Check to see if calculator LED display will clear.

(a) If display clears, proceed to step 11.

(b) Notify direct/general support maintenance for replacement of main logic PC board.

Step 11. Check to see if auto-scaler NORMAL/SCALE switch and scale dials are operating correctly.

(a) Notify direct/general support maintenance for replacement of scaler PC board.

(b) Replace auto-scaler.

NOTE

If above procedures do not correct malfunction, notify direct/general support maintenance for replacement of all auto-scaler. PC boards in the following order:

(1) Replace main logic PC board.

(2) Replace front display PC board.

(3) Replace scaler PC board.

(4) Replace rear input PC board.

5-10. MAINTENANCE PROCEDURES.

a. This section contains instructions covering operator maintenance functions for the quantity processing system. Personnel required are listed only if the task requires more than one.

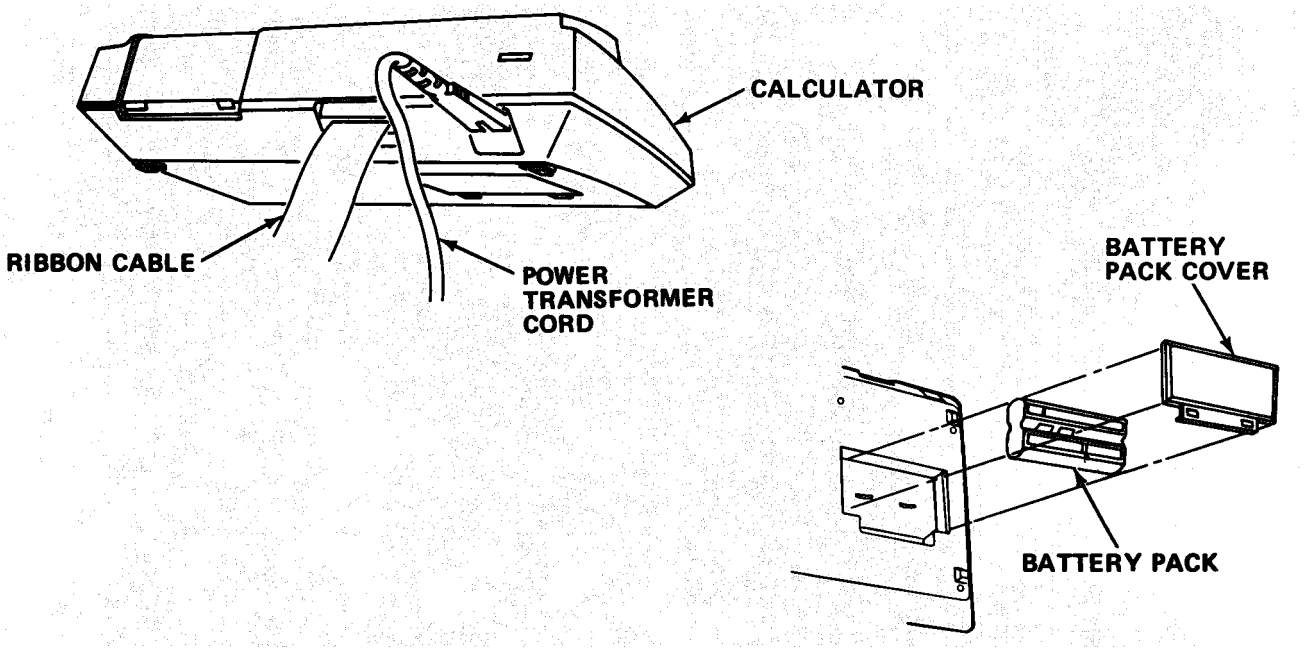
b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

5-10.1 Replace Battery Pack.

MOS: 81Q, Terrain Analyst

SUPPLIES: Battery Pack



a. Turn calculator OFF/ON switch to OFF. Disconnect power transformer from wall outlet.

b. Remove ribbon cable.

c. Turn calculator over. Slide battery cover latches open.

d. Remove defective battery pack.

e. Install new battery pack so contacts face calculator and line up with connectors.

f. Replace cover. Slide cover latches over to secure.

CAUTION

Arrows on ribbon cable and calculator must aline. Damage to calculator can result if cable is plugged in backward.

g. Turn calculator over. Replace ribbon cable.

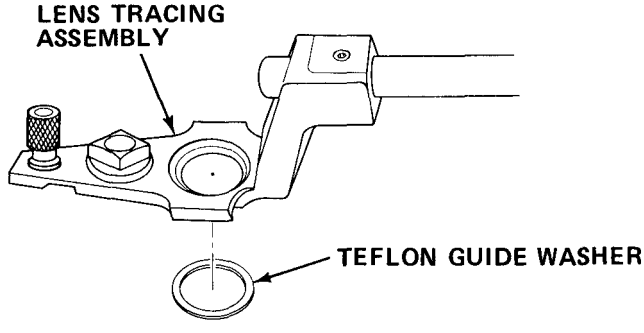
h. Reconnect power transformer to wall outlet. Turn calculator on.

5-10.2 Replace Teflon Guide Washer.

MOS: 81Q, Terrain Analyst

TOOLS: 3/16 in. Flat Tip Screwdriver
Steel Knife
3/32 in. Hex Head Key Wrench

SUPPLIES: Teflon Guide Washer
Rubber Adhesive (Item 2, Appendix E)
Alcohol (Item 4, Appendix E)
Cheesecloth (Item 7, Appendix E)



CAUTION

Hold tracer arm with one hand before removing lens tracing assembly. Tracer arm will fall and damage planimeter

a. Remove lens tracing assembly from planimeter tracer arm by loosening setscrew on top. Slide lens tracing assembly off tracer arm.

b. Turn lens tracing assembly over. Pry up teflon guide washer.

c. Scrape off glue and pieces of washer from base of lens tracing assembly.

d. Apply small amount of rubber adhesive to bottom of new teflon guide washer.

e. Press new teflon guide washer into place. Remove excess adhesive with alcohol and soft cloth.

f. Check to be sure teflon washer guide is level and is flat on surface.

g. Slide lens tracing assembly on tracer arm. Secure by tightening setscrew on top.

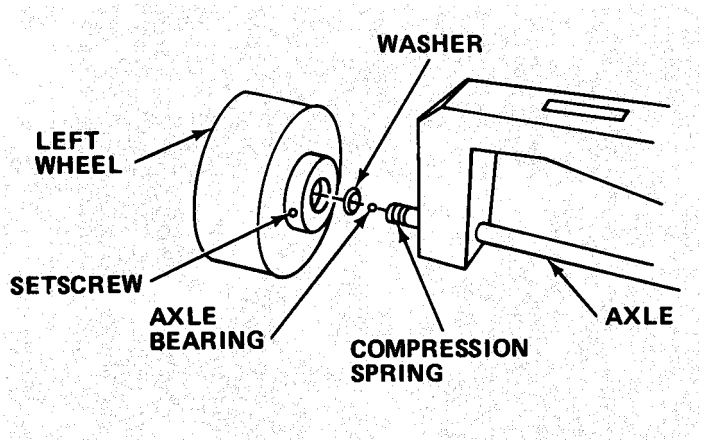
5-10.3 Replace Compression Spring.

MOS: 81Q, Terrain Analyst

TOOLS: 5/64 in. Hex Head Key Wrench

SUPPLIES: Compression Spring

a. Remove wires from antenna and tracer arm assembly.



b. Facing the back of the planimeter, loosen three setscrews holding left wheel on axle.

c. Slide left wheel and washer off end of axle.

d. Slide axle bearing off.

e. Pull defective compression spring from end of axle.

f. Install new compression spring on end of axle.

g. Reinstall axle bearing.

h. Reinstall washer and left wheel on end of axle.

i. Evenly tighten setscrews.

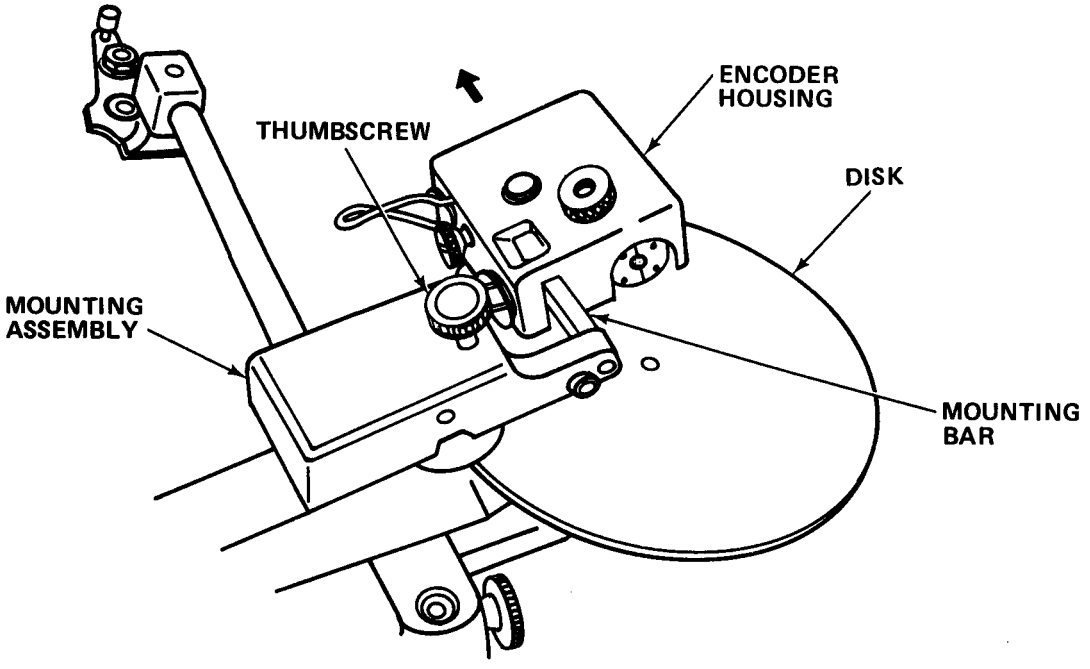
j. Reinstall wires on tracer arm assembly and antenna.

5-10.4 Replace Paper Disk.

MOS: 81Q, Terrain Analyst

TOOLS: Knife

SUPPLIES: Paper Disk
Rubber Adhesive (Item 2, Appendix E)
Alcohol (Item 4, Appendix E)
Brush



a. Loosen thumbscrew on side of encoder housing. Slide encoder housing off mounting bar.

b. Turn thumbscrew to move mounting assembly away from paper disk.

c. Pry up old paper disks with knife and remove.

d. Remove any remaining adhesive with alcohol and a brush.

e. Spread three or four drops of rubber adhesive along edge of paper disk.

f. Reinstall new disk on planimeter surface. Press down firmly.

g. Trim excess paper from edges with knife. Remove any excess adhesive from edges.

h. Slide encoder housing onto mounting bar. Tighten thumbscrew.

Section IV ORGANIZATIONAL MAINTENANCE

5-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication at the organizational level.

5-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT. These items are not required at this level of maintenance.

5-13. SERVICE UPON RECEIPT.

5-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

5-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

5-15. ORGANIZATIONAL TROUBLESHOOTING. There are no organizational trouble-shooting procedures assigned for this equipment.

5-16. MAINTENANCE PROCEDURES. There are no organizational maintenance procedures assigned for this equipment.

5-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

5-18. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE) ; AND SUPPORT EQUIPMENT.

5-18.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

5-18.2 Special Tools; Test. Measurement, and Diagnostic Equipment; and Support Equipment. Special tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

5-18.3 Repair Parts.Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-324-24P covering direct/general support maintenance for this equipment.

5-19. DIRECT/GENERAL SUPPORT TROUBLESHOOTING.

There are no direct/general support troubleshooting procedures assigned for this equipment.

5-20. DIRECT/GENERAL SUPPORT MAINTENANCE PROCEDURES.

a. This section contains instructions covering direct/general support maintenance functions for the quantity processing system. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

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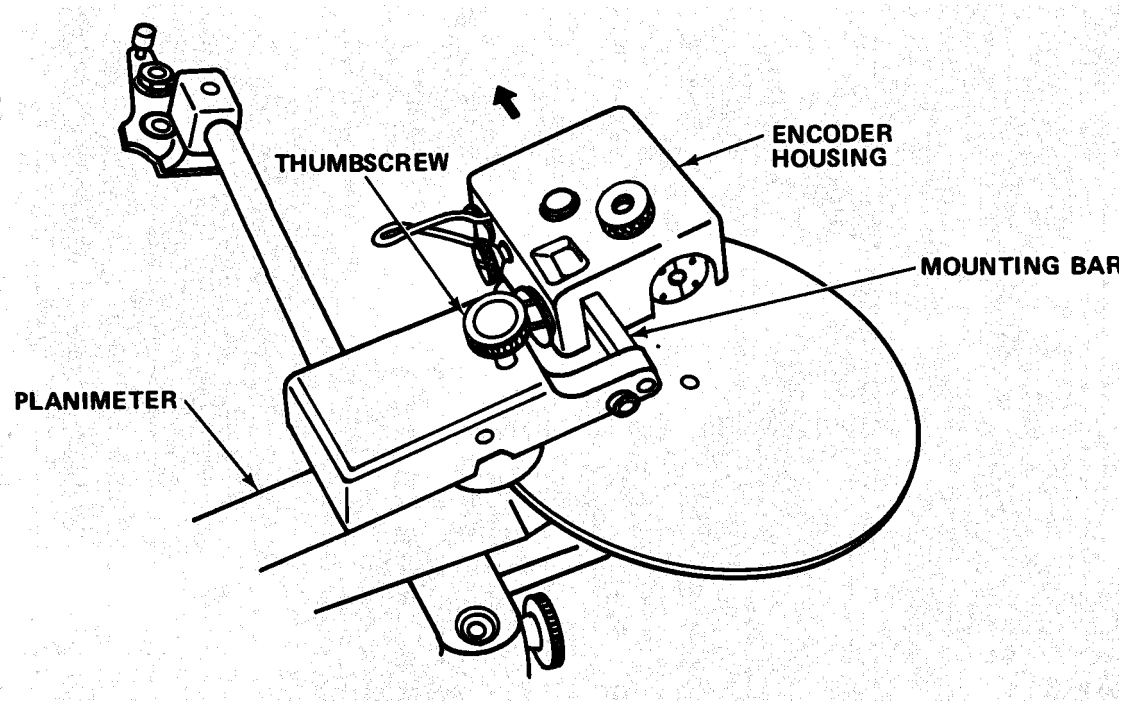
5-20.1 Replace Planimeter Encoder

MOS: 35E, Special Electronic Devices Repairer

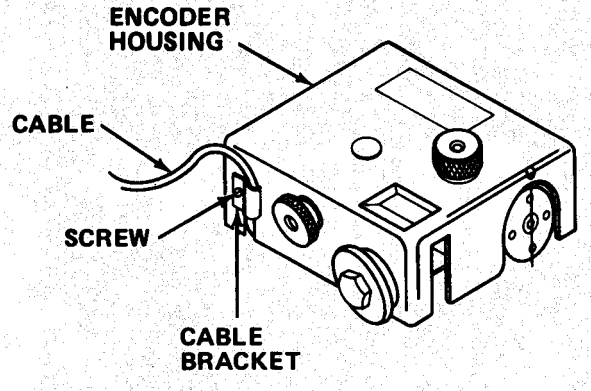
TOOLS: 5/64 in. Hex Head Key Wrench
No. 2 Jeweler's Screwdriver
3/16 in. Flat Tip Screwdriver
No. 2 Cross Tip Screwdriver
Scribe

SUPPLIES: Encoder

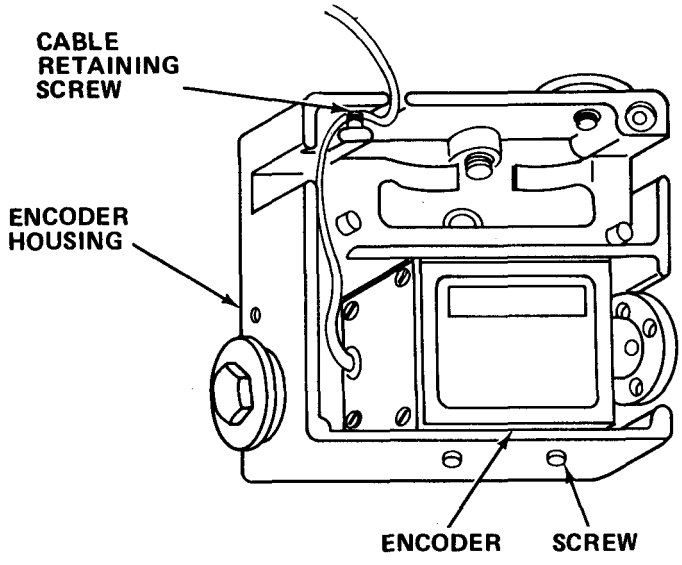


a. Loosen thumbscrew holding encoder housing on planimeter.

b. Grasp encoder housing and slide off mounting bar.



c. Remove screw holding cable bracket to encoder housing. Remove cable bracket and cable.



d. Remove cable retaining screw.

e. Mark exact position of encoder on inside walls of encoder housing with scribe.

f. Remove two hex head screws on side of housing.

g. Remove defective encoder from housing.

h. Install new encoder in housing.

i. Make sure the new encoder is parallel with the bottom of the housing and placed exactly between the marks made on the housing.

j. Reinstall two hex head screws on side of encoder housing.

k. Insert cable in housing. Reinstall cable retaining screw.

1. Reinstall cable bracket. Secure with screw.

m. Slide encoder housing onto mounting bar of planimeter.

n. Tighten thumbscrew holding encoder housing on planimeter.

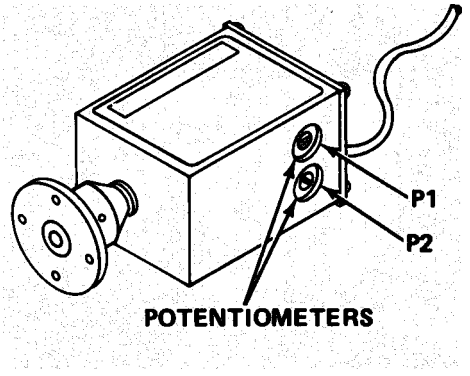
5-20.2 Aline Planimeter Encoder

MOS: 35E, Special Electronic Devices Repairer

TOOLS: 3/16 in. Flat Tip Screwdriver
1/8 in. Flat Tip Screwdriver
No. 2 Cross Tip Screwdriver
No. 2 Jeweler's Screwdriver
5/64 in. Hex Head Key Wrench
Encoder Calibrator

SUPPLIES: Spar Varnish (Item 26, Appendix E)
Technical Acetone (Item 1, Appendix E)
Dip-Clip (14 pin)

a. Remove planimeter encoder from housing (paragraph 5-20.1).



b. With technical acetone, remove resin covering from adjustment potentiometers, P1 and P2.

c. Remove four screws and washers from top of auto-scaler. Lift off top.

d. Plug encoder into E1 encoder socket on back of auto-scaler.

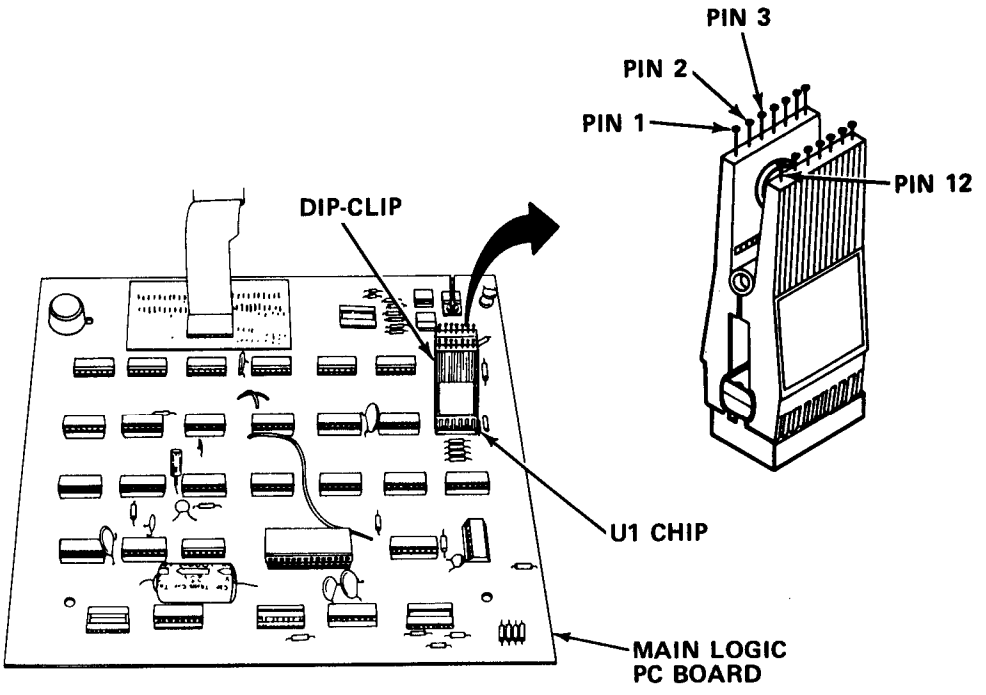
e. Set encoder switch to E1.

CAUTION

Plug transformer power cable into auto-scaler before connecting it to wall outlet. Failure to do so could result in damage to auto-scaler.

f. Plug transformer power cable into POWER supply jack on back panel of auto-scaler.

g. Plug transformer power cable into wall outlet.



CAUTION

Make sure power is off before attaching dip-clip to U1 chip. Failure to do so could result in damage to auto-scaler.

h. Attach dip-clip to U1 chip on main logic PC board.

i. Attach positive lead from encoder calibrator to pin 3 on U1 chip. Attach negative lead to pin 12.

j. Turn B/ACCU/A/OFF switch to A.

k. Take voltage reading on encoder calibrator. Divide voltage reading by two to obtain encoder alinement voltage.

NOTE

- At pin 3 and pin 12, voltage should be 12 V dc.
- The encoder wheel must be turning to aline.

l. Turn B/ACCU/A/OFF switch to OFF.

m. Disconnect positive lead from pin 3 and attach to pin 1. Leave negative lead on pin 12.

n. Turn B/ACCU/A/OFF switch to A.

o. While encoder wheel is turning, adjust P1 by turning screw slowly to obtain encoder alinement voltage (6 ±0.3 V dc).

p. Turn B/ACCU/A/OFF switch to OFF.

q. Disconnect positive lead from pin 1 and attach to pin 2. Leave negative lead on pin 12.

r. Turn B/ACCU/A/OFF switch to A.

s. While encoder wheel is turning, adjust P2 by turning screw slowly to obtain encoder alinement voltage (6 ±0.3 V dc).

t. Turn B/ACCU/A/OFF switch to OFF.

u. After encoder alinement is obtained, coat adjustment pots, P1 and P2 with spar varnish.

v. Disconnect and remove probes from dip-clip.

w. Reinstall encoder in housing (paragraph 5-20.1).

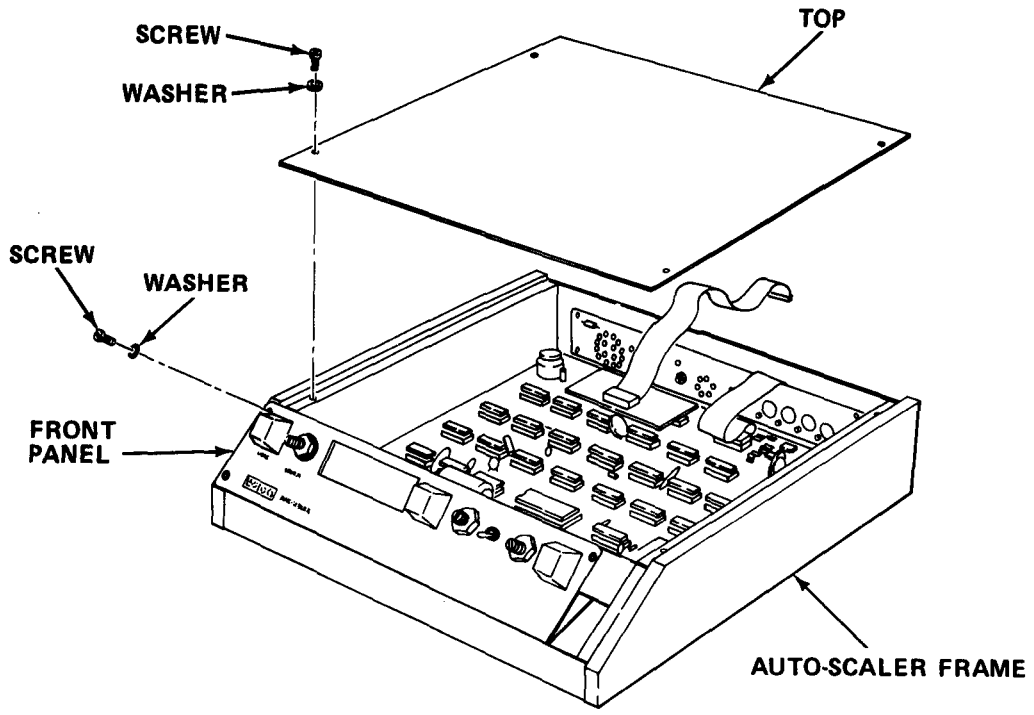
x. Reinstall top on auto-scaler. Secure with four washers and screws.

5-20.3 Replace Main Logic PC Board.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: 3/16 in. Flat Tip Screwdriver
No. 2 Cross Tip Screwdriver
Needle Nose Pliers

SUPPLIES: Main Logic PC Board

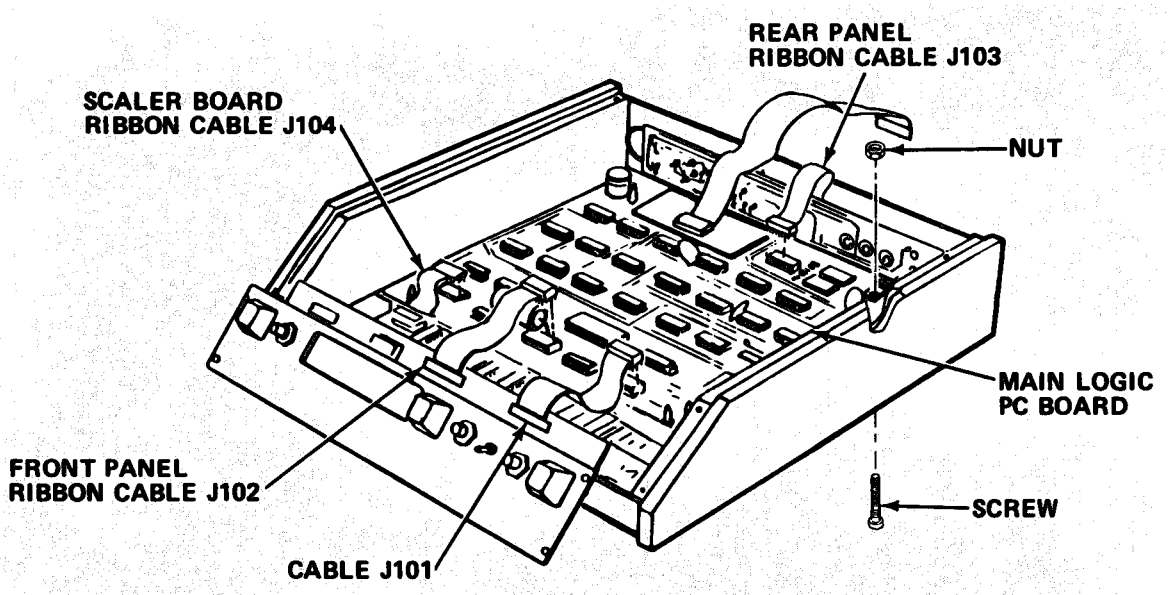


a. Remove four screws and washers from top of auto-scaler. Lift off top.

CAUTION

Front panel is connected to frame of auto-scaler by two ribbon cables. Do not pull front panel more than a few inches from frame. Damage to circuit boards can result.

b. Remove four screws on front panel of auto-scaler. Pull front panel free from auto-scaler frame.



c. Disconnect front panel ribbon cables J101 and J102 from main logic PC board.

d. Disconnect scaler board ribbon cable J104 and rear panel ribbon cable J103 from main logic PC board.

e. Remove screw and nut from upper right corner of main logic PC board.

f. Pinch plastic retainers to free main logic PC board from auto-scaler base.

g. Remove defective main logic PC board. Remove plastic retainers from board.

h. Install plastic retainers in auto-scaler base.

i. Press new main logic PC board onto plastic retainers in auto-scaler base.

j. Reinstall screw and nut on upper right corner of main logic PC board.

k. Reconnect rear panel ribbon cable J103 and scaler board ribbon cable J104 to main logic PC board.

l. Reconnect front panel ribbon cables J101 and J102 to main logic PC board.

m. Reinstall front panel on auto-scaler frame. Secure with four screws.

n. Reinstall top on auto-scaler. Secure with four washers and screws.

5-20.4 Replace Front Display PC Board.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: 3/16 in. Flat Tip Screwdriver
1/2 in. Box End Wrench
No. 2 Cross Tip Screwdriver

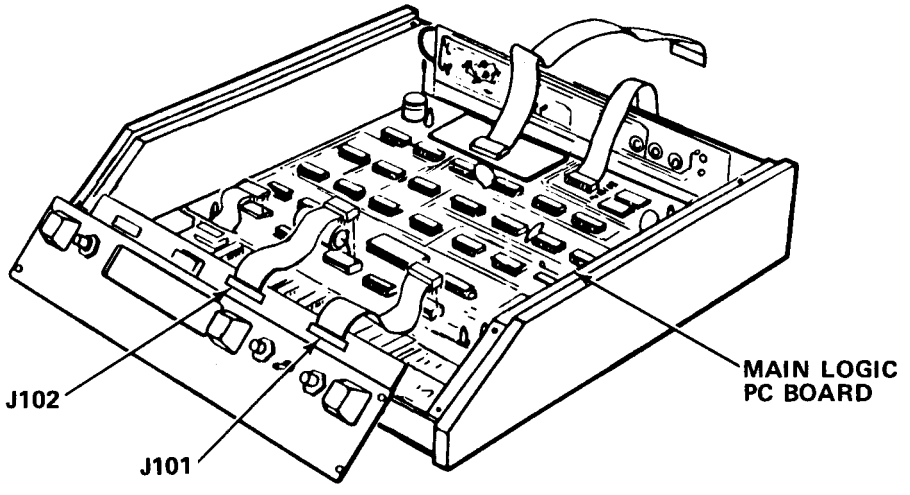
SUPPLIES: Front Display PC Board

a. Remove four screws and washers from top of auto-scaler. Lift off top.

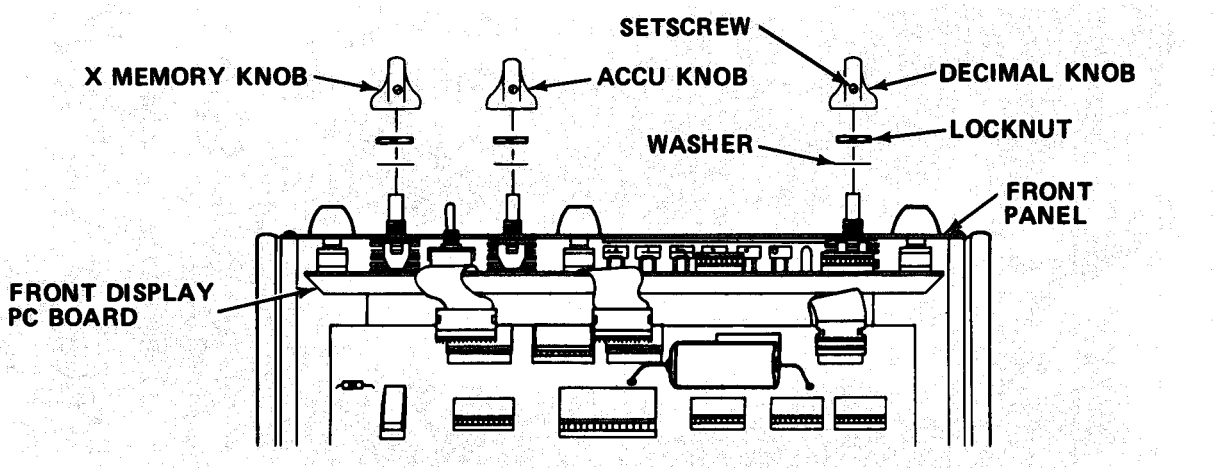
CAUTION

Front panel is connected to frame of auto-scaler by two ribbon cables. Do not pull front panel more than a few inches from frame. Damage to circuit boards can result.

b. Remove four screws on front panel of auto-scaler. Pull front panel free from auto-scaler frame.



c. Disconnect front panel ribbon cables J101 and J102 from main logic PC board.



d. Loosen setscrews holding DECIMAL, ACCU, and X MEMORY switch knobs to front panel. Remove knobs.

e. Remove three locknuts and washers from front panel. Lift off front panel. Remove defective front display PC board.

f. Place front panel on new front display PC board. Reinstall three washers and locknuts to front panel.

g. Reinstall DECIMAL, ACCU, and X MEMORY knobs on front panel. Tighten setscrews to secure.

h. Reconnect front panel ribbon cables J101 and J102 to main logic PC board.

i. Reinstall front panel on auto-scaler frame. Secure with four screws

j. Reinstall top on auto-scaler. Secure with four washers and screws.

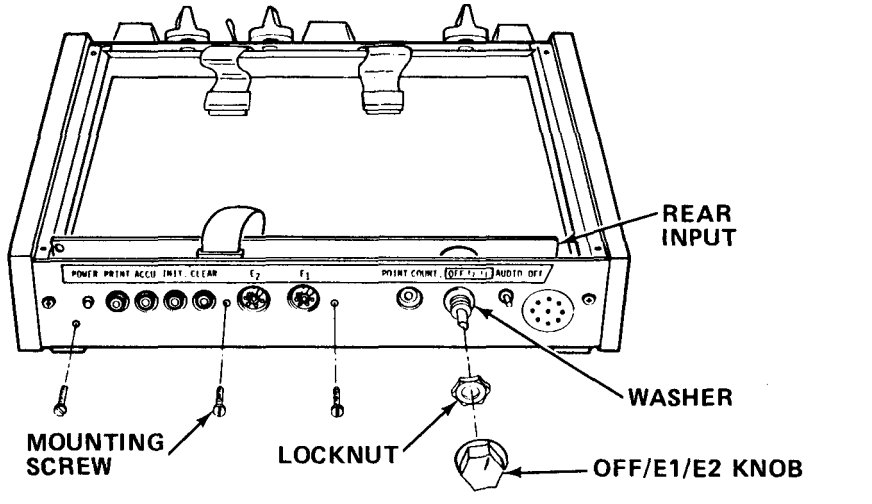
5-20.5 Replace Rear Input PC Board.

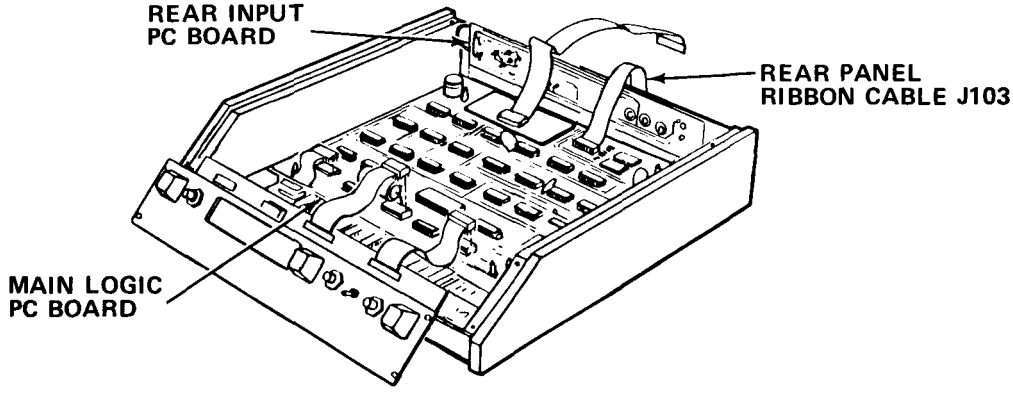
MOS: 35E, Special Electronic Devices Repairer

TOOLS: 3/16 in. Flat Tip Screwdriver
No. 2 Cross Tip Screwdriver

SUPPLIES: Rear Input PC Board

a. Remove four screws and washers from top of auto-scaler. Lift off top.





b. Disconnect rear panel ribbon cable J103 from main logic PC board.

c. Loosen OFF/E2/El knob locknut. Remove 0FF/E_2/E_1 knob, locknut, and washer from back panel.

d. Remove three rear input PC board mounting screws and nuts from back panel. Remove defective rear input PC board.

e. Secure new rear input PC board on back panel with three nuts and screws.

f. Reinstall OFF/E_2/E_1 washer, locknut, and knob on back panel. Tighten locknut.

g. Reconnect rear panel ribbon cable J103 to main logic PC board.

h. Reinstall top on auto-scaler. Secure with four washers and screws.

5-20.6 Replace Scaler PC Board.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: 3/16 in. Flat Tip Screwdriver
No. 2. Cross Tip Screwdriver
Needle Nose Pliers

SUPPLIES: Scaler PC Board

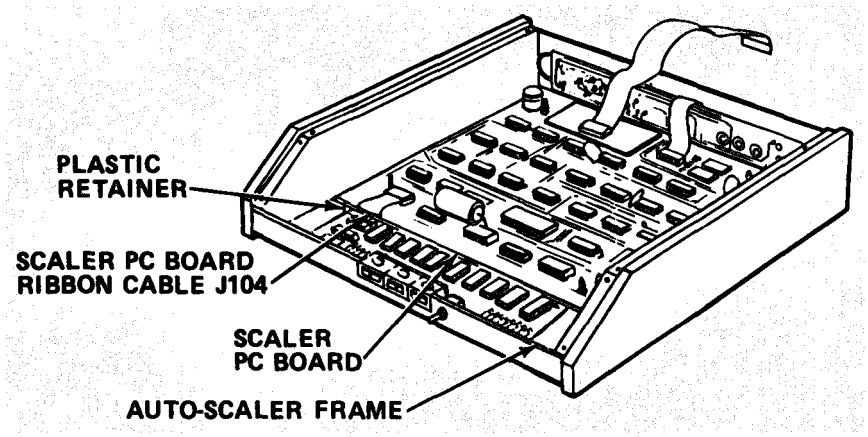
a. Remove four screws and washers from top of auto-scaler. Lift off top.

CAUTION

Front panel is connected to frame of auto-scaler by two ribbon cables. Do not pull front panel more than a few inches from frame. Damage to circuit boards can result.

b. Remove four screws on front panel of auto-scaler. Pull front panel free from auto-scaler frame.

c. Disconnect front panel ribbon cables J101 and J102 from main logic PC Board. Set front panel to one side.



d. Disconnect scaler board ribbon cable J104 from scaler PC board.

e. Pinch plastic retainers, and gently pry scaler PC board free from auto-scaler frame. Lift out scaler PC board.

f. Install new scaler PC board by snapping onto plastic retainers.

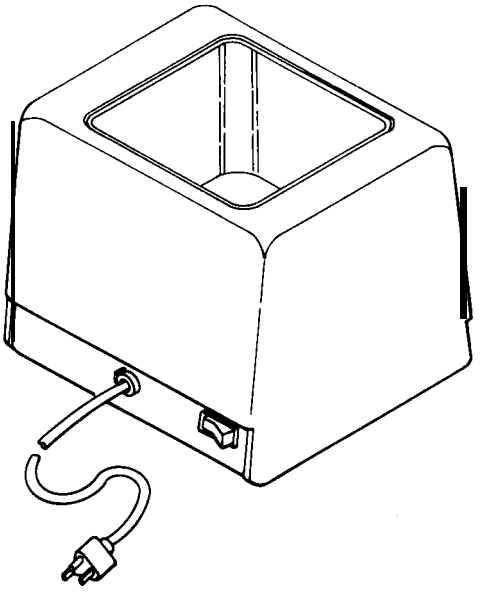
g. Reconnect scaler board ribbon cable J104 to scaler PC board.

h. Place front panel on auto-scaler frame.

i. Reconnect front panel ribbon cables J101 and J102 to main logic PC board.

j. Secure front panel to auto-scaler frame with four screws.

k. Reinstall top on auto-scaler. Secure with four washers and screws.



CHAPTER 6

ULTRASONIC CLEANER

Section I INTRODUCTION

6-1. GENERAL INFORMATION.

6-1.1 Scope.

a. Model Number and Equipment Name. Model 3069USC3 Ultrasonic Cleaner.

b. Purpose of Equipment. To clean drafting/drawing pens.

6-2. EQUIPMENT DESCRIPTION.

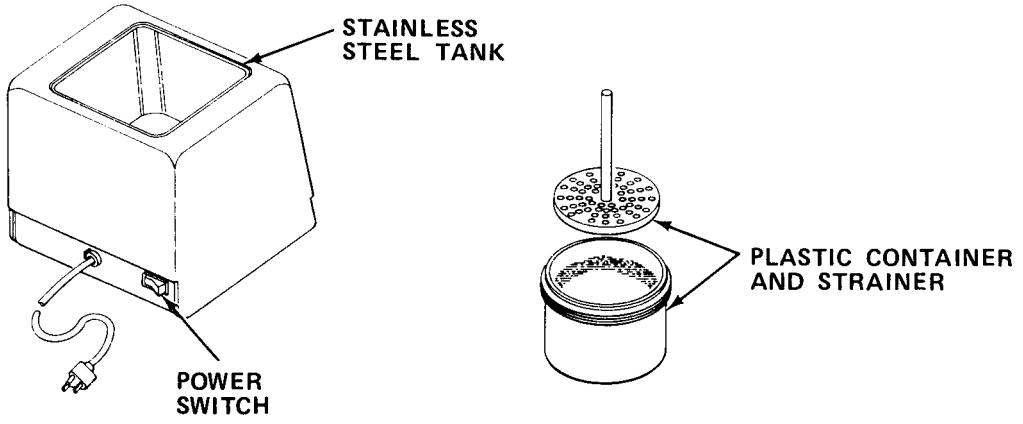
6-2.1 Equipment Characteristics, Capabilities, and Features.

a. Cleans without disassembly.

b. Removes dried ink.

c. Portable.

6-2.2 Location and Description of Major Components.



STAINLESS STEEL TANK. Holds water.

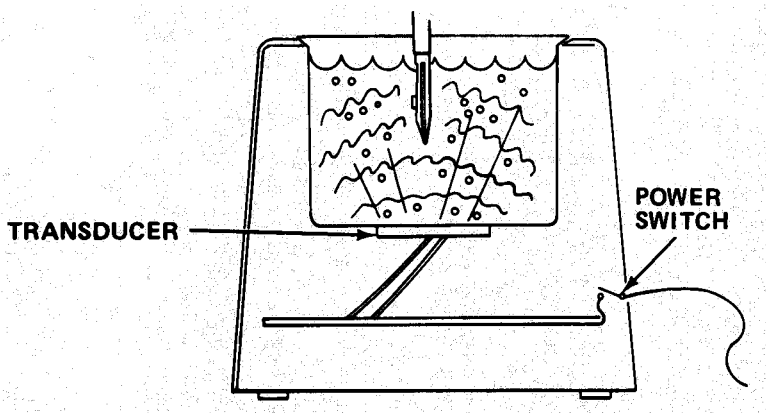
PLASTIC CONTAINER AND STRAINER. Holds small parts in solution for cleaning.

POWER SWITCH. Turns machine ON or OFF.

6-2.3 Equipment Data.

Weight	5.51 lbs (2.5 kg)
Power Requirements	115 V, 60 Hz, 60 W

6-3. TECHNICAL PRINCIPLES OF OPERATION.

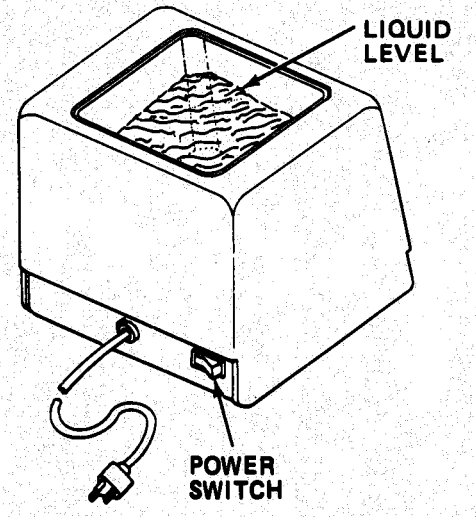


POWER SWITCH. When turned ON, provides power to the transducer.

TRANSDUCER. Generates ultrahigh frequency sound waves.

Section II OPERATING INSTRUCTIONS

6-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.



Control or Indicator	Function
Liquid Level	Level of liquid in stainless steel tank must be 1/3 full.
Power Switch	Turns power on or off.

6-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

a. Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

6-5.1 PMCS Procedures.

a. PMCS are designed to keep the equipment in good working condition by performing periodic-service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

g. Interval columns. This column determines the time period designated to perfor your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Item	Quantity
Cheesecloth (Item 7, Appendix E)	ar

Table 6-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can safely be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - - before
D - - During
A - - After

w . weekly
M - Monthly
Q. Quertarly

AN - Annually
S - Semiannually
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	in-TER! VAI	ITEM TO BE INSPECTED PROCEDURE	For Reediness Reporting, Equipment Is Not Ready/ Available If:
		ULTRASONIC CLEANER	
1	B	Inspect Cleaner.	

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

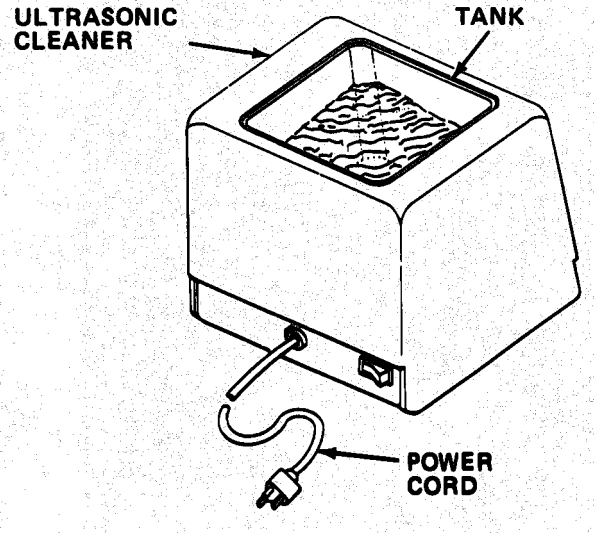


Table 6-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D . During
A - After

W . Weekly
M - Monthly
Cl - Quarterly

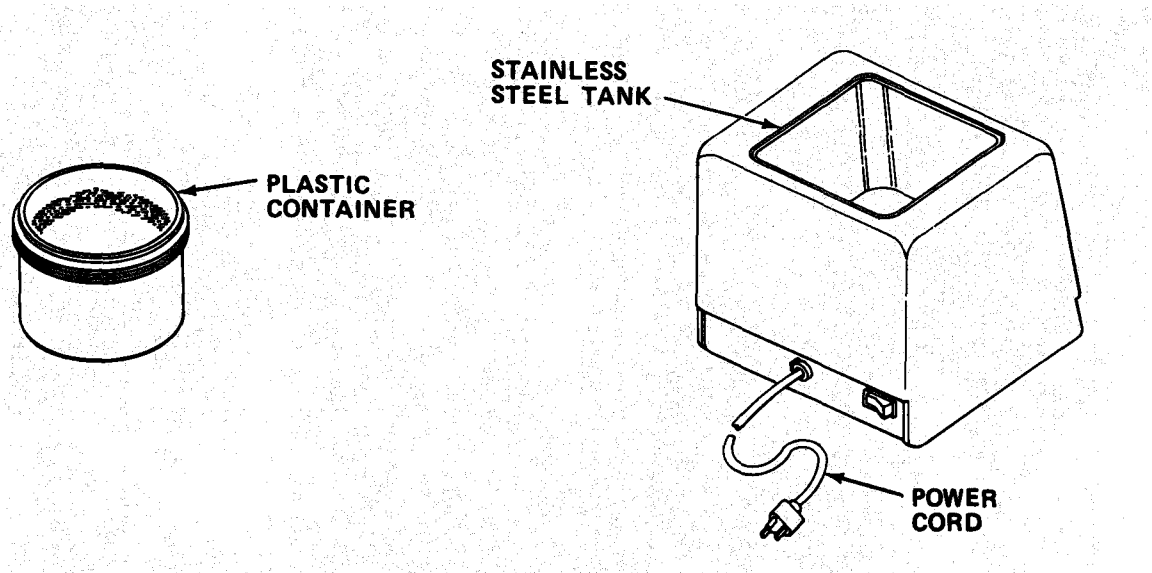
AN - Annuallv
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ULTRASONIC CLEANER - Cont	
1	B	Inspect Cleaner - Cont	
		1. Check power cord for kinks, frays, or burns. If power cord is defective, notify organizational maintenance.	Power cord is damaged.
		2. Check tank for dirt or chemical residue. Clean tank by wiping with cheesecloth moistened with water.	
		3. Check for agitation of water surface.	Water surface is not agitating.

6-6. OPERATION UNDER USUAL CONDITIONS.

6-6.1 Operating Procedure.



a. Fill stainless steel tank 1/3 full with fresh, clean water. Fill plastic container with water to-within l/2 in. (12.7 mm) of top.

b. Add .135 oz (4 ml) of cleaning solution to plastic container.

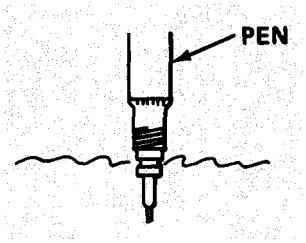
c. Plug in power cord to 120 V, 60 Hz grounded outlet.

d. Turn power on. Be sure water surface in stainless steel tank is agitating.

WARNING

Do not place fingers in stainless steel tank when ultrasonic cleaner is operating. Cleaning solution may be driven through skin or ultrasonic waves may cause injury to body tissue.

Prepare cleaning solution by operating ultrasonic cleaner for one minute before cleaning pen tips.



CAUTION

Do not immerse pen beyond cap threads. Damage to pen may result.

f. Dip pen about 3/4 in. (19 mm) in cleaning solution.

g. Lift pen from cleaning solution. Keeping point downward, shake solution from pen onto cheesecloth (Item 7, Appendix E).

h. Wipe pen.

i. Draw pen over scrap paper until ink flows freely and shows uniform color.

j. Turn power off. Unplug power cord.

k. Dispose of cleaning solution when dirty.

CAUTION

Avoid getting water into body of ultrasonic cleaner. Damage to circuit board can result.

1. Carefully rinse stainless steel tank.

m. Wipe stainless steel tank dry with cheesecloth (Item 7, Appendix E).

6-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

6-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

6-9. TROUBLESHOOTING PROCEDURES. There are no operator troubleshooting procedures assigned for this equipment.

6-10. MAINTENANCE PROCEDURES. Operator maintenance is limited to performance of regular preventive maintenance checks and services and replenishment of cleaning solution.

Section IV ORGANIZATIONAL MAINTENANCE

6-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

6-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE) ; AND SUPPORT EQUIPMENT.

6-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

6-12.2 Special Tools: Test, Measurement, and Diagnostic Equipment: and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

6-12.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 6-6675-324-24P covering organizational maintenance for this equipment.

6-13. SERVICE UPON RECEIPT.

6-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.,

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

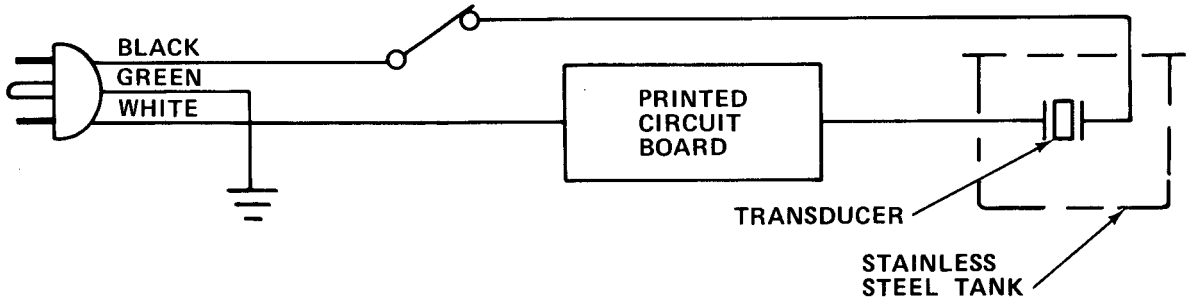
6-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

6-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES.

Organizational troubleshooting procedures cover the most common malfunctions that may be repaired at the organizational level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Trouble-shooting procedures used by the operator should be conducted in addition to the organizational troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/ inspection and corrective action. If a malfunction is not listed or corrected listed corrective action, notify your supervisor.

located at the end of this manual for further fault analysis.



d. If the ultrasonic cleaner does not power up when turned on, verify that 120 V ac is present at the receptacle. If voltage is not present, plug equipment into receptacle with power available and proceed with equipment troubleshooting. Perform no-power procedure for dead receptacle (Table 1-4).

Table 6-2. ORGANIZATIONAL TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. NO CLEANING ACTION, WATER AGITATES. Check cleaning action using fresh cleaning solution. (a) If test was satisfactory, instruct operator to change cleaning solution when dirty. (b) If test was not satisfactory, replace circuit board (paragraph 6-16.3).
2. NO WATER AGITATION. Step 1. Using multimeter, check for continuity of power cord. (a) If continuity exists, proceed to step 2. (b) If continuity does not exist, replace power cord (paragraph 6-16.1).

Table 6-2. ORGANIZATIONAL TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
2. NO WATER AGITATION - Cont	
Step 2. Check continuity of power switch.	
(a) If continuity does not exist, replace power switch (paragraph 6-16.2).	
(b) If continuity does exist, replace circuit board (paragraph 6-16.3).	

6-16. MAINTENANCE PROCEDURES.

This section contains instructions covering organizational maintenance funcions for the ultrasonic cleaner. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

6-16.1 Replace Power Cord.

MOS : 41B, Topographic Instrument Repair Specialist

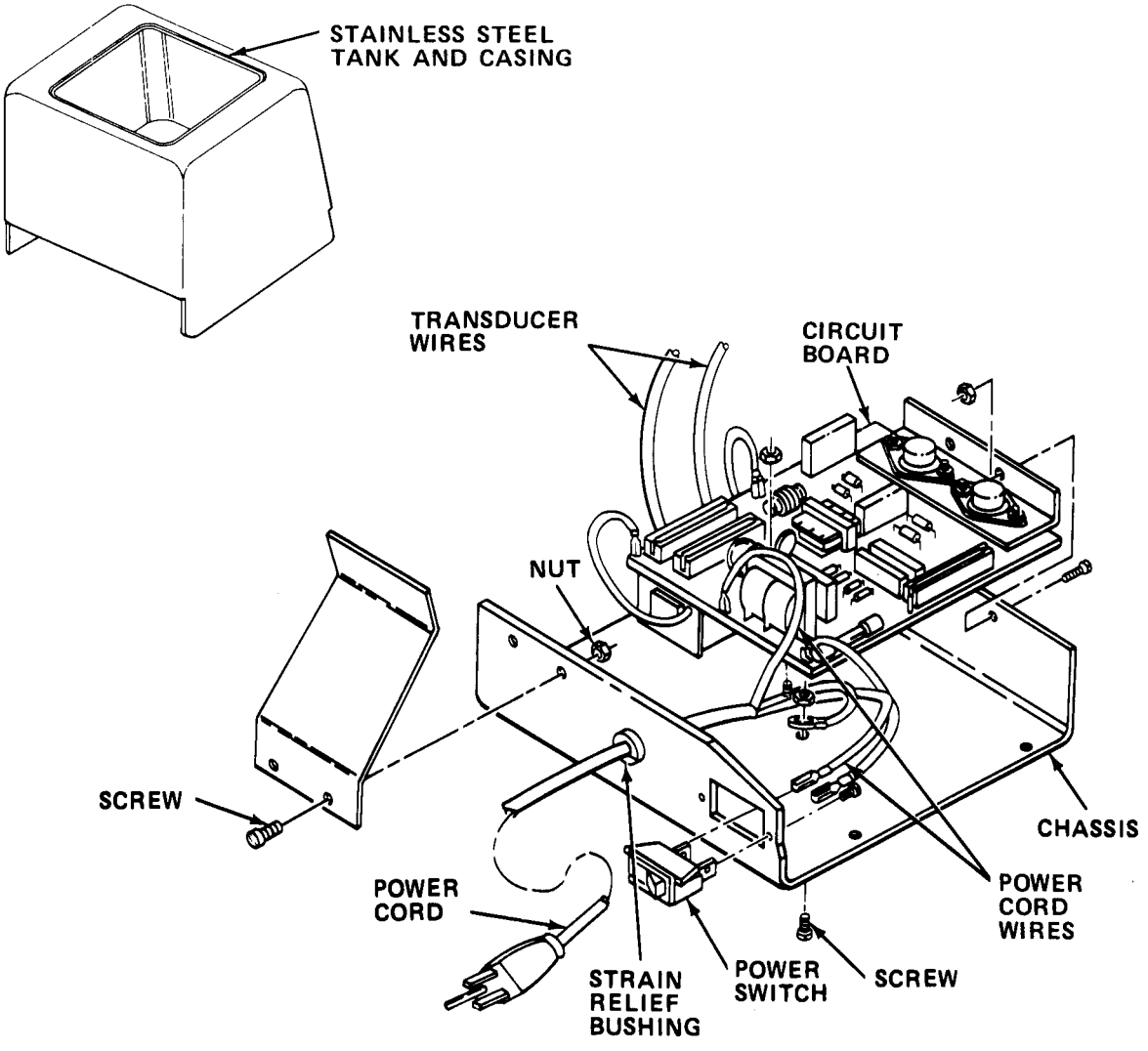
TOOLS: Flat Tip Screwdriver

SUPPLIES: Power Cord
Wire Clips

WARNING

Death or serious injury may occur if power cord is not unplugged before servicing.

a. Turn power off. Unplug power cord.



b. Remove screws and washers holding stainless steel tank and casing to chassis.

c. Lift stainless steel tank and casing free. Set aside.

NOTE

Do not disconnect wires to transducer.

d. Remove three screws, one nut, and one washer holding circuit board to chassis.

e. Disconnect power cord wire from power switch, chassis ground, and circuit board.

f. Loosen strain relief bushing from chassis and remove defective power cord.

g. Install strain relief bushing on new power cord. Insert terminal ends of cord into chassis.

h. Fit strain relief bushing into chassis.

i. Reconnect power cord wire to circuit board, chassis, and power switch.

j. Reinstall circuit board into chassis and secure with one washer, one nut, and three screws.

k. Reinstall stainless steel tank and casing. Secure with screws and washers.

1. Fill stainless steel tank 1/3 full with water.

m. Plug in power cord and turn power on. Check that water surface agitates.

6-16.2 Replace Power Switch.

MOS : 41B, Topographic Instrument Repair Specialist

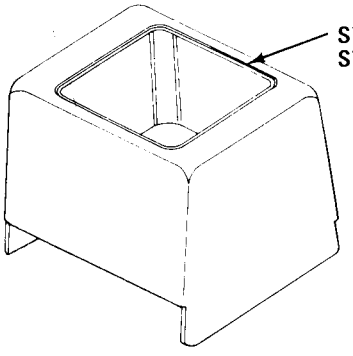
TOOLS : Flat Tip Screwdriver

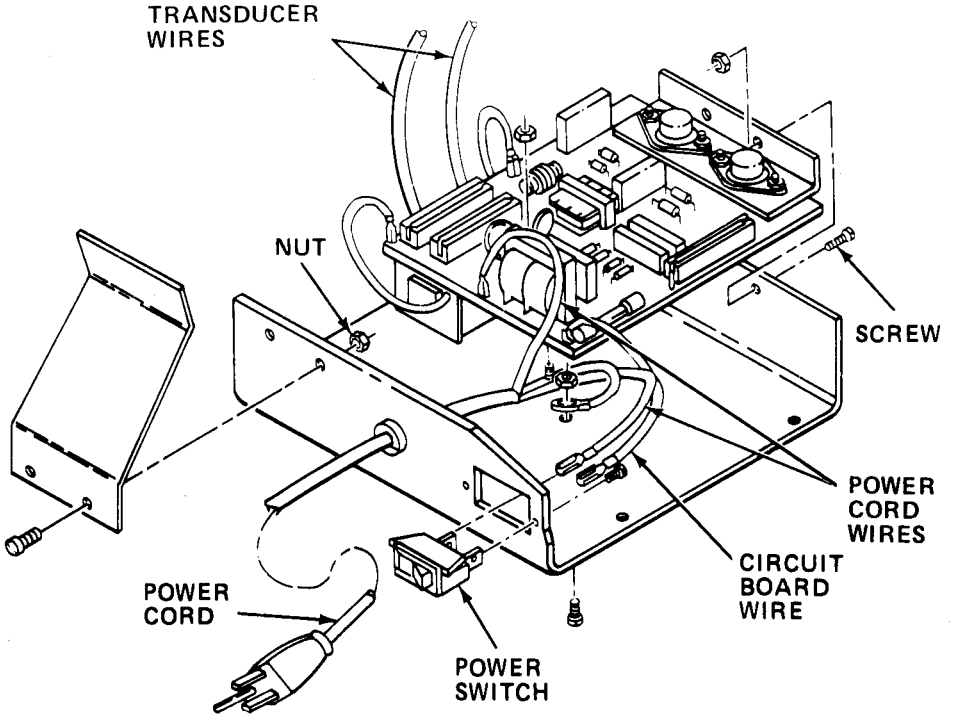
SUPPLIES: Switch

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power off and unplug power cord.





b. Remove screws and washers holding stainless steel tank and casing to chassis.

c. Lift stainless steel tank and casing free. Set aside.

NOTE

Do not disconnect wires to transducer.

d. Tag and disconnect power cord wire and circuit board wire from power switch.

e. Press sides of defective power switch and remove from chassis.

f. Install new power switch in chassis. Push power switch until tabs lock into hole.

g. Reconnect wires to power switch.

h. Reinstall stainless steel tank and casing. Secure with screws and
.

i. Fill stainless steel tank 1/3 full with water.

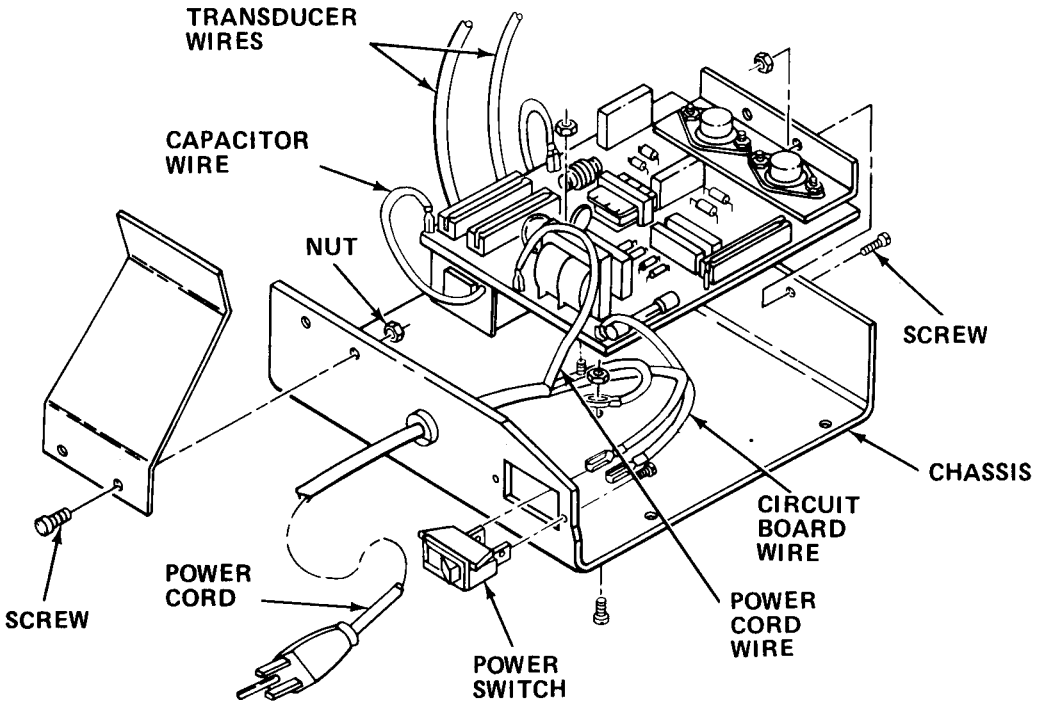
j. Plug in power cord and turn power on. Check that water surface agitates.

6-16.3 Replace Circuit Board.

MOS : 41B, Topographic Instrument Repair Specialist

TOOLS: Flat Tip Screwdriver

SUPPLIES: Circuit Board



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power off and unplug power cord.

b. Remove screws and washers holding stainless steel tank and casing to chassis.

c. Lift stainless steel tank and casing free. Set aside.

NOTE

Do not disconnect wires to transducer.

d. Remove three screws, one nut, and one washer holding circuit board to chassis.

e. Tag and disconnect power cord wire and circuit board wires from circuit board.

f. Disconnect capacitor wires from circuit board.

g. Tag and disconnect two transducer wires from circuit board.

h. Remove defective circuit board.

i. Install new circuit board.

j. Reconnect two transducer wires to circuit board.

k. Reconnect capacitor wires to circuit board.

l. Reconnect circuit board wire and power cord wire to circuit board.

m. Reinstall one washer, one nut, and three screws holding circuit board to chassis.

n. Reinstall stainless steel tank and casing. Secure with screws and washers.

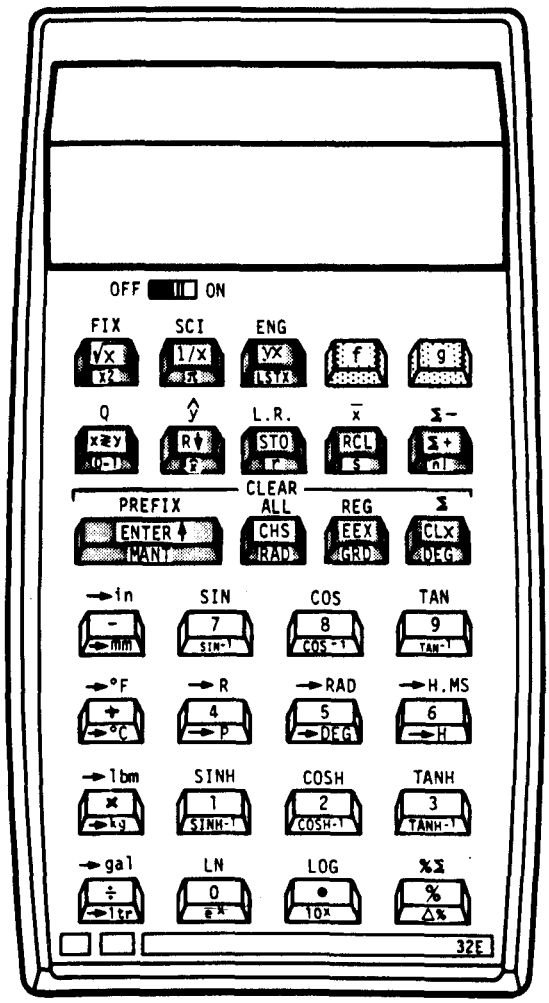
o. Fill stainless steel tank 1/3 full with water.

p. Plug in power cord and turn power on. Check that water surface agitates.

6-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

There are no direct/general support maintenance procedures assigned for this equipment.


OFF ON
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32E

Chapter 7

POCKET CALCULATOR

Section I INTRODUCTION

7-1. GENERAL INFORMATION.

7-1.1 Scope.

a. Model Number and Equipment Name. Model HP-32E Pocket Calculator.

b. Purpose of Equipment. To perform mathematical calculations.

7-2. EQUIPMENT DESCRIPTION.

7-2.1 Equipment Characteristics, Capabilities, and Features. Performs mathematical calculations with the following capabilities and features.

a. Rechargeable battery pack.

b. AC operation.

c. Trigonometric functions.

d. Ten-digit display.

e. Automatic memory stack.

f. Fifteen storage registers.

g. Scientific notation.

h. Logarithmic functions.

i. Square root.

j. Fixed-point display.

k. Engineering display.

l. Automatic overflow and underflow.

m. Error display.

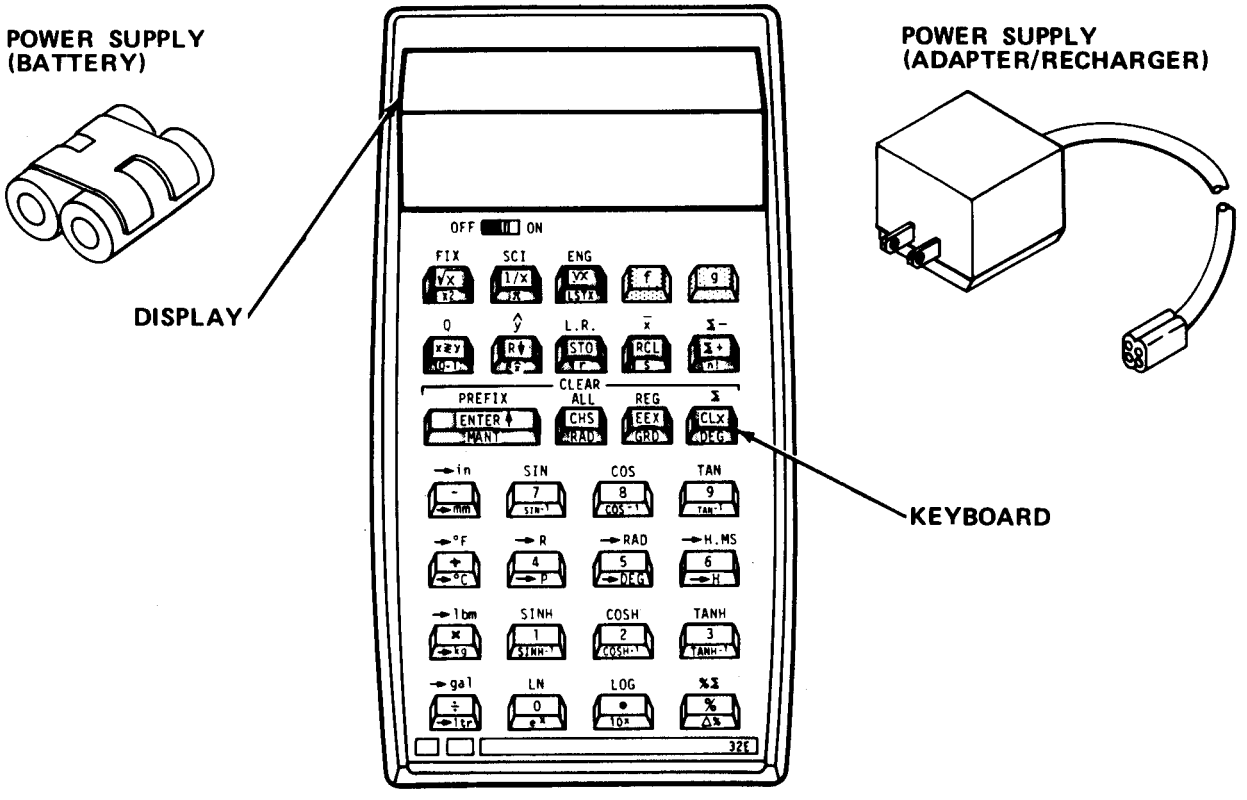
n. Key-selected metric conversions.

o. Self-Check.

7-2.2 Equipment Data.

Power Requirements	120 V, 60 Hz
Battery Pack:	
Recharge Time	9 hrs, maximum (calculator off)
	17 hrs, minimum (calculator on)
Operating Time	3 hrs, maximum

7-3. TECHNICAL PRINCIPLES OF OPERATION. The purpose of the HP-32E Calculator is to assist its user in the performance of complex or simple mathematics equations and consists of the following functional parts:



POWER SUPPLY. Power is provided to the calculator from either the battery pack or ac adapter/recharger. The battery pack consists of two rechargeable nickel cadmium batteries which give the calculator full portability. The adapter/recharger also provides power to the calculator when plugged into a power outlet. When battery pack is in need of recharging, raised decimal is turned on at the far left of the display. When raised decimal is displayed, there are 1 to 25 minutes of operating time left.

KEYBOARD. The keyboard is used to select functions and input numbers into the calculator. All keys, except [f] and [g] keys, perform three functions.

One function is indicated by the symbol on the flat surface of the key, a second by the symbol on the slanted key face, and a third by the symbol written above the key on the calculator case. Function printed on the flat face of the key is selected by pressing the key. Function printed above the key is selected by first pressing prefix key [f] and then the function key. The function printed on the slanted face of the key is selected by first pressing prefix key [g] and then the function key.

DISPLAY. The display is the X-register of the automatic memory stack and provides a visual readout of latest numeric entry, operation result, or error messages.

MEMORY. Memory is divided into two parts; storage registers and automatic memory stack.

a. Storage registers. Storage registers are used to set aside numbers for recall in later calculations. Numbers are stored by first pressing [STO] followed by a number [0] thru [8] or a decimal point and a number [0] thru [5]. The number in displayed X-register is then copied into the selected register. Recalling a number is accomplished by first pressing [RCL] followed by a number [0] thru [8] or a decimal point and a number [0] thru [5]. The number that is in the selected register will be copied into the displayed X-register without any change to contents of that register. Storage registers R_0 through R_5 are used for accumulation of statistical data. Turning calculator off will clear (place zeros in) all storage registers.

b. Automatic memory stack. The automatic memory stack is used to store intermediate results during calculations. The stack consists of four registers designated X, Y, Z and T. The contents of X-register are constantly shown on the calculator display. Numbers are manually entered into the memory stack by pressing [ENTER↑]. During chain calculations (long equations), intermediate answers are automatically entered in the memory stack. Each new entry into the stack is first entered in the X-register and, with each additional entry, the stack rolls up one and the contents that were in the T-register before roll-up, are lost. The contents of the stack can be viewed by pressing [RCL] key four times. The contents of T-register are not lost because the stack forms a continuous loop, i.e., the contents of T-register are shifted to the Z-register; Z-register to Y-register; Y-register to X-register; and X-register to T-register. With intermediate answers stored in the stack, operations can be performed with these numbers by pressing the key of the desired operation.

Example: To calculate (3 x 5) + 2, press:

[3] (3 enters X-register.)

[ENTER↑] (3 is copied to Y-register.)

[5] (5 is entered in X-register; 3 stays in Y-register.)

[x] (5 is multiplied by 3; result, 15, is placed in X-register; Y-register becomes 0.)

[2] (15 moves to Y-register; 2 enters X-register.)

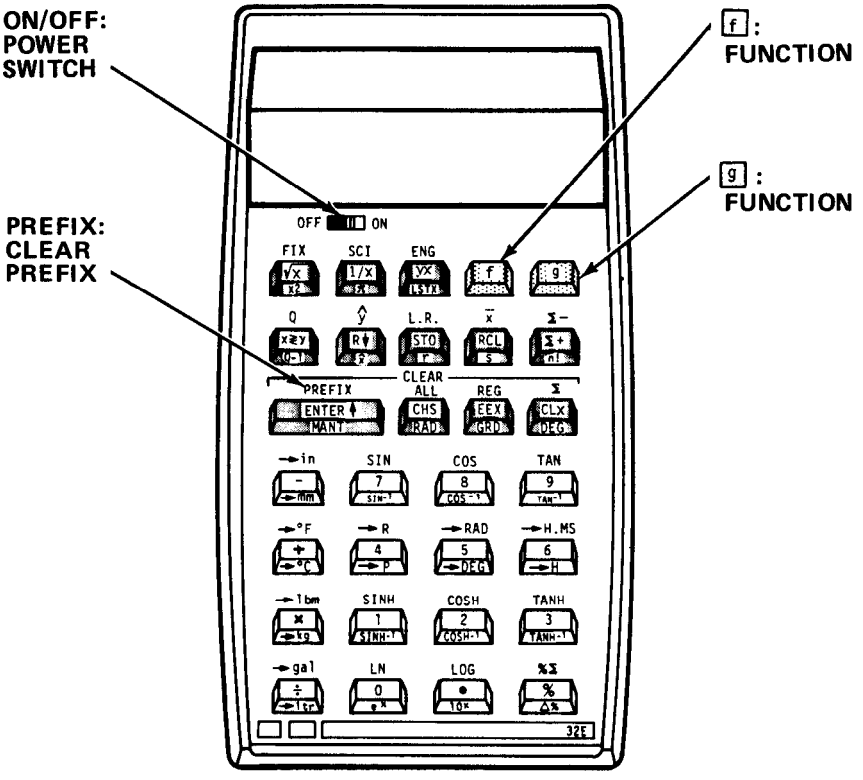
[+] (2 is added to 15; result, 17, is placed in X-register; Y-register becomes 0.)

Section II OPERATING INSTRUCTIONS

7-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.

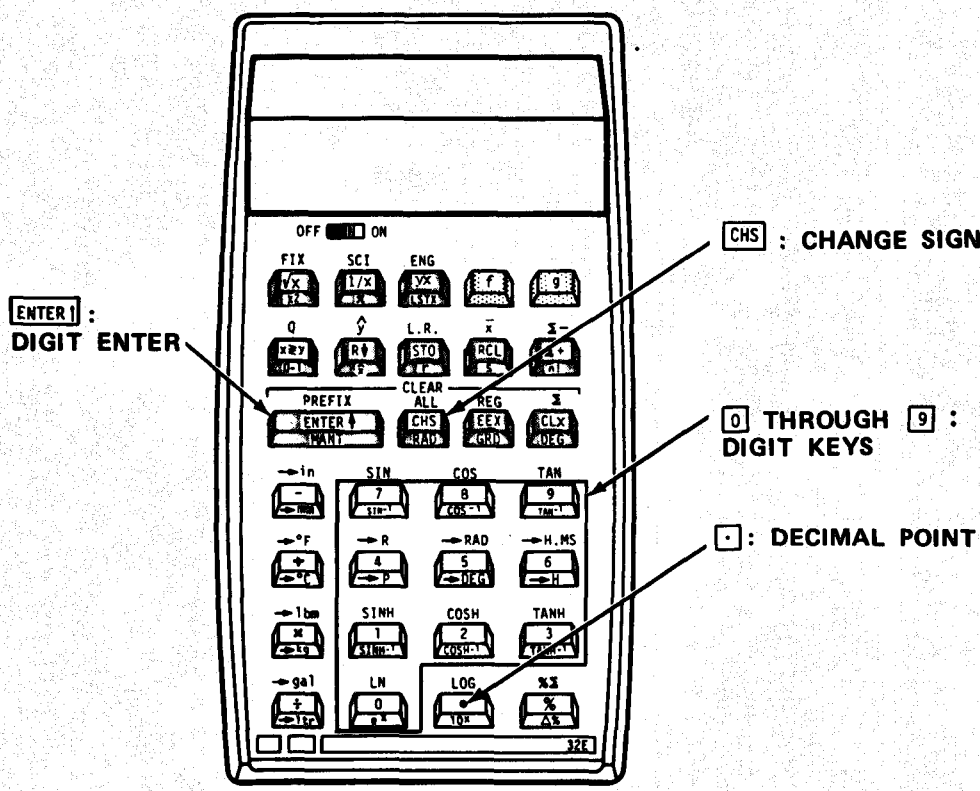
NOTE

Symbols on flat surface and slanted surface of keys are boxed. Symbols over keys are not boxed.



Key	Control or Indicator	Function
OFF ON	Power Switch	Turns power on or off.
f	Function	Pressed before another key, it selects function printed above key.
g	Function	Pressed before another key, it selects function printed on slanted face of key.

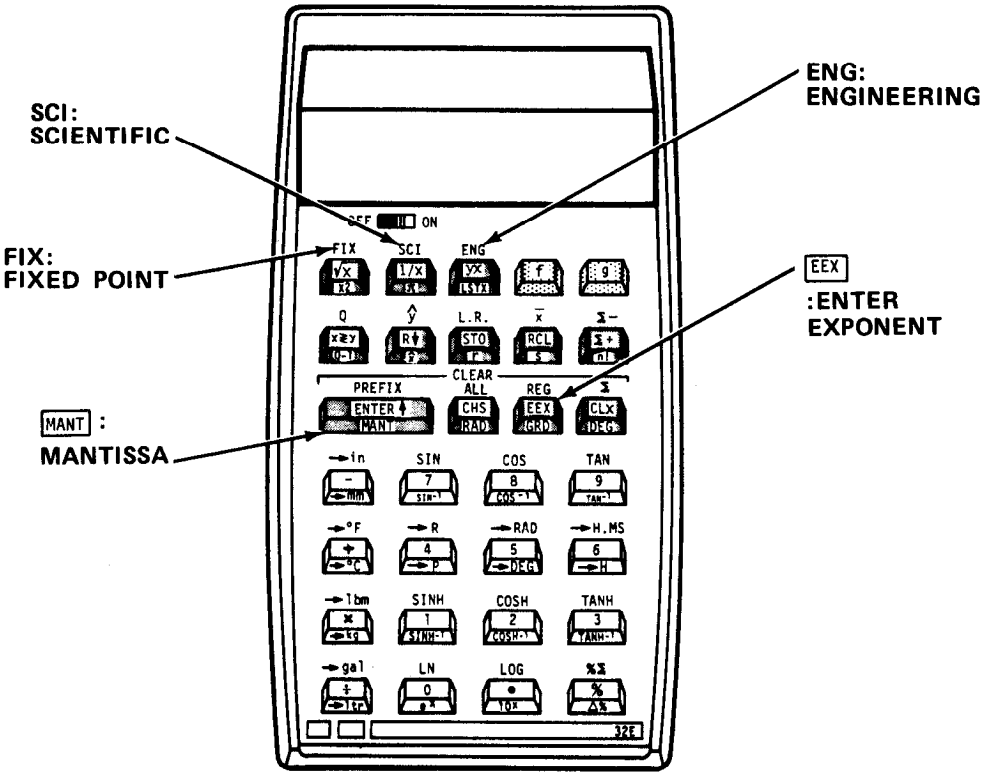
Key	Control or Indicator	Function
PREFIX	Clear Prefix	Cancels the following key strokes or sequence of key strokes when pressed after each one: f, g, STO, RCL, STO ., RCL ., STO +, STO -, STO x, STO ÷, STO + ., STO - ., STO Ax ., STO ÷ ., FIX, SCI, ENG.



Digit Entry

0 thru 9	Digit Keys	Enters digits.
.	Decimal Point	Enters decimal point.

Key	Control or Indicator	Function
ENTER↑	Digit ENTER	Enters copy of number displayed in X-register into Y-register of automatic memory stack. Pressing key also causes contents of Y-register to be shifted to Z-register and Z-register to the T-register. Contents of T-register are lost.
CHS	Change Sign	Changes sign of mantissa or exponent in display (X-register).

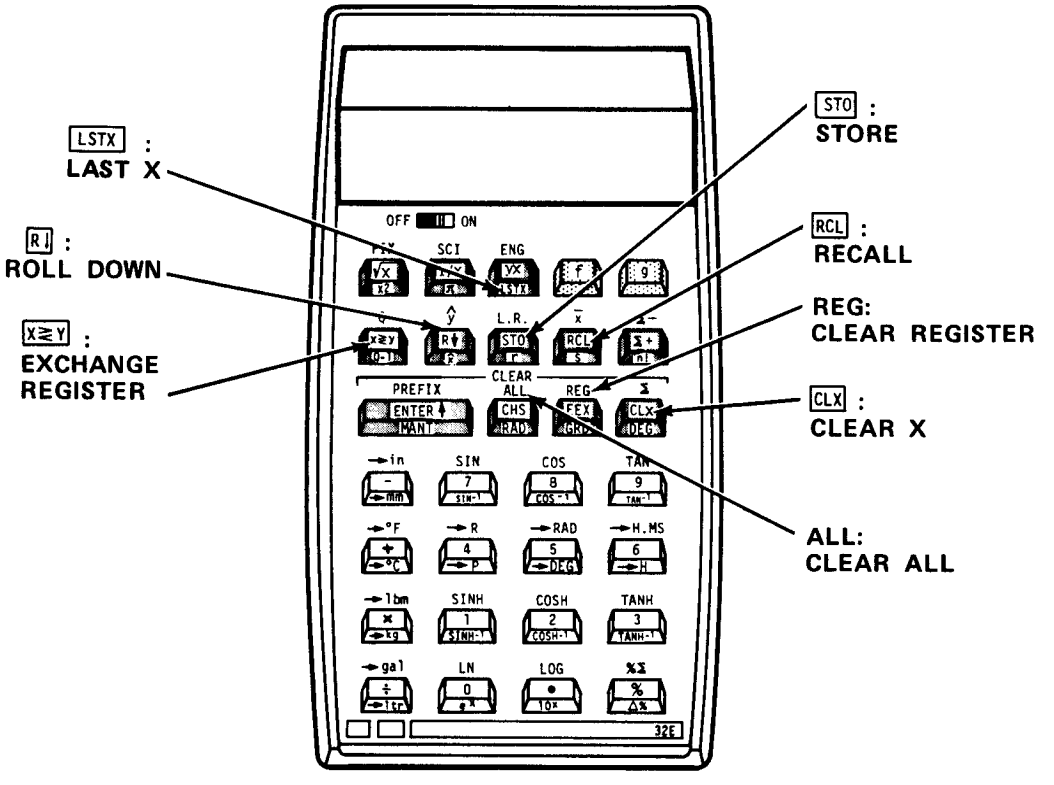


Display Control

EEX	Enter Exponent	After pressing, next numbers keyed in are exponents of 10.

Key	Control or Indicator	Function
FIX	Fixed Point	Followed by digit key, selects fixed point notation display. Digit entry designates number of digits to be displayed to the right of decimal point.
SCI	Scientific	Followed by the number key that specifies the number of decimal places the display will be rounded to.
ENG	Engineering	Followed by digit key, selects engineering notation display. Digit key specifies number of digits to be displayed to right of decimal point.
MANT	Mantissa	Temporarily displays all 10 digits of mantissa of number in X-register.

Key	Control or Indicator	Function

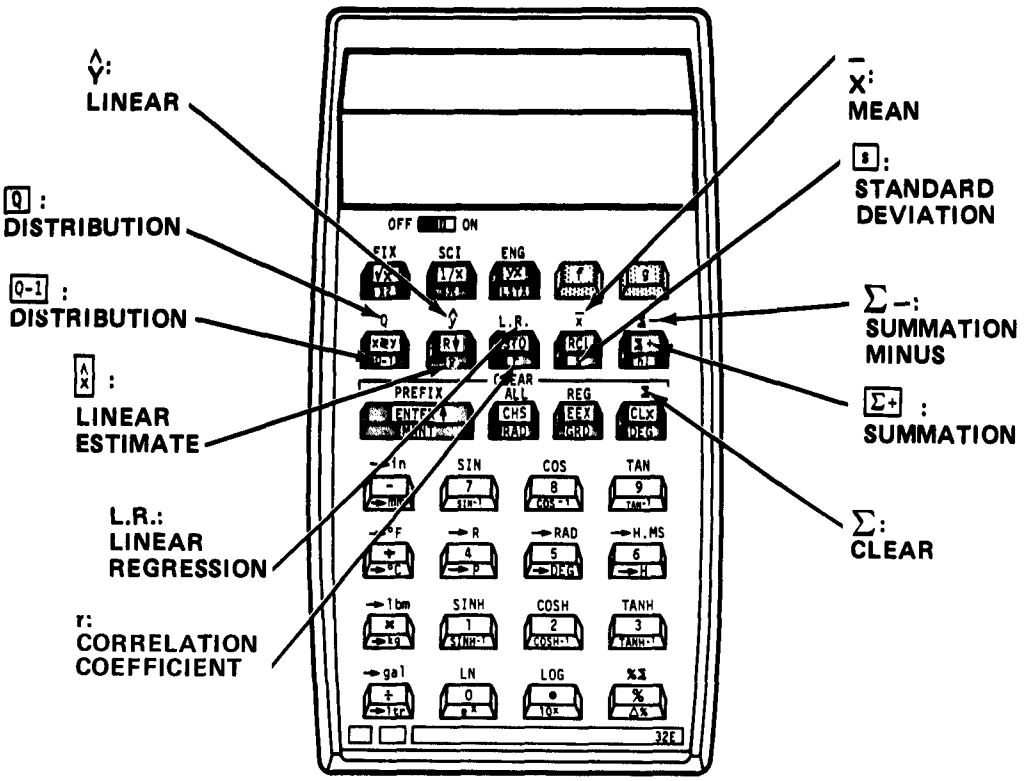


Number Manipulation

X≷Y	Exchange Register	Interchanges contents of X and Y-registers.
R↓	Roll Down	Rolls down contents of automatic memory stack for viewing in X-register without loss of data. When pressed, contents of X-register is shifted to T-register, T-register shifts to Z-register, Z-register shifts to Y-register, and Y-register advances to X-register for viewing.
CLX	CLEAR X	Clears contents of displayed X-register.

Key	Control or Indicator	Function
ALL	CLEAR ALL	Clears contents of memory stack and all storage registers.
STO	Store	Followed by digit key 0 through 8 or by a decimal point and a key 0 through 5, stores displayed number in that specified location. Also used to perform storage register arithmetic.
RCL	Recall	Followed by digit key 0 thru 8 or by a decimal point and a digit key 0 thru 5,, recalls value from specified storage register into the dis-displayed X-register.
REG	CLEAR Register	Clears contents of storage registers R_0 through R_8. Contents of registers $R_{.0}$ thru $R_{.5}$ are unaffected.
LSTX	LAST X	Recalls number displayed before previous operation back into displayed X-register.

Key	Control or Indicator	Function

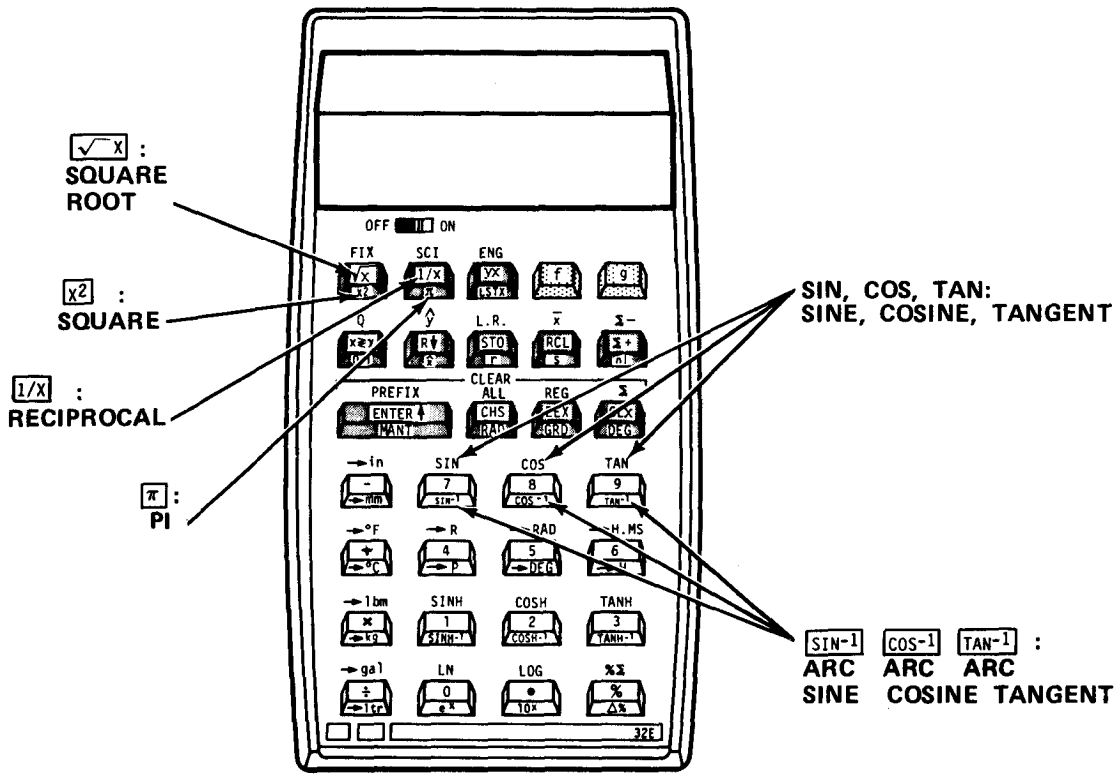


Statistical

Q	Distribution	Computes area under standard normal distribution curve to left of X.
Q-1	Distribution	Computes X, given area under standard normal distribution curve to left of X.
Ŷ	Linear Estimate	Computes estimated value of Y for a given value of X.
X̂	Linear Estimate	Computes estimated value of X for a given value of Y.

Key	Control or Indicator	Function
L.R.	Linear Regression	Computes Y-intercept and slope for linear function approximated by X and Y values accumulated using Σ+. Value of slope is placed in Y-register.
r	Correlation Coefficient.	Computes goodness of fit between X and Y values accumulated using Σ+ and linear function which they approximate.
x̄	MEAN	Computes mean (average) of X and Y values accumulated using Σ+.
s	Standard Deviation	Computes standard deviations of X and Y values accumulated using Σ+.
Σ+	Summation	Accumulates statistical data in storage registers R_0 thru R_5 using numbers in X- and Y-registers.
Σ-	Summation Minus	Subtracts from statistical data in storage registers R_0 thru R_5 using numbers in X- and Y-registers.
Σ	CLEAR	Clears statistical storage registers R_0

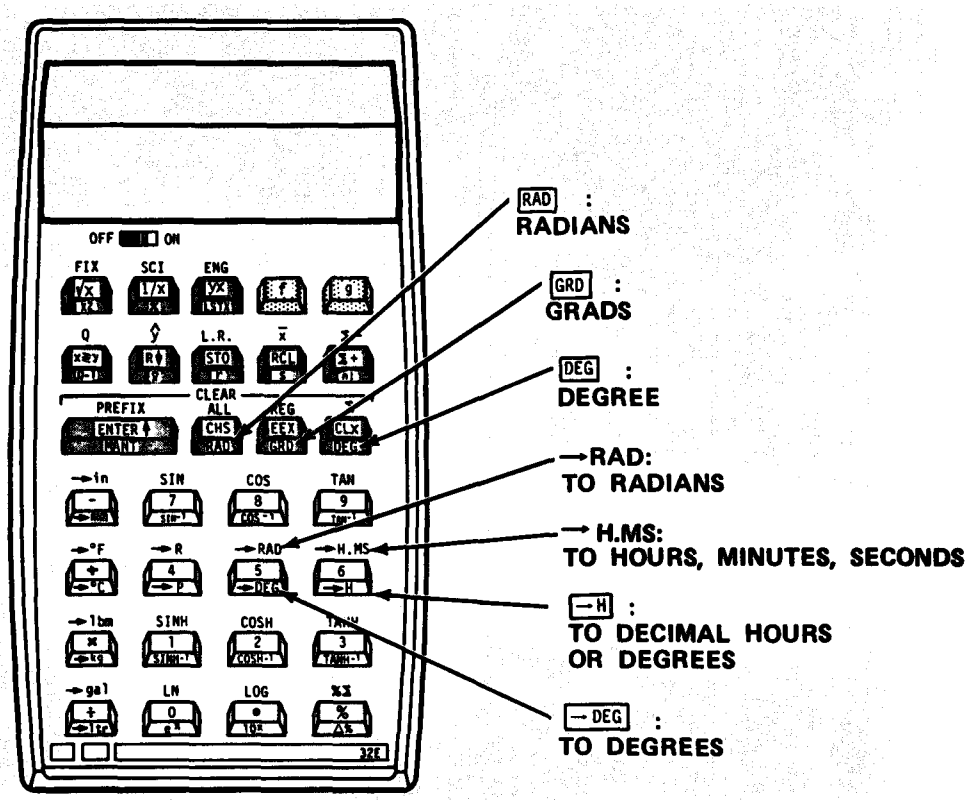
Key	Control or Indicator	Function



Mathematical

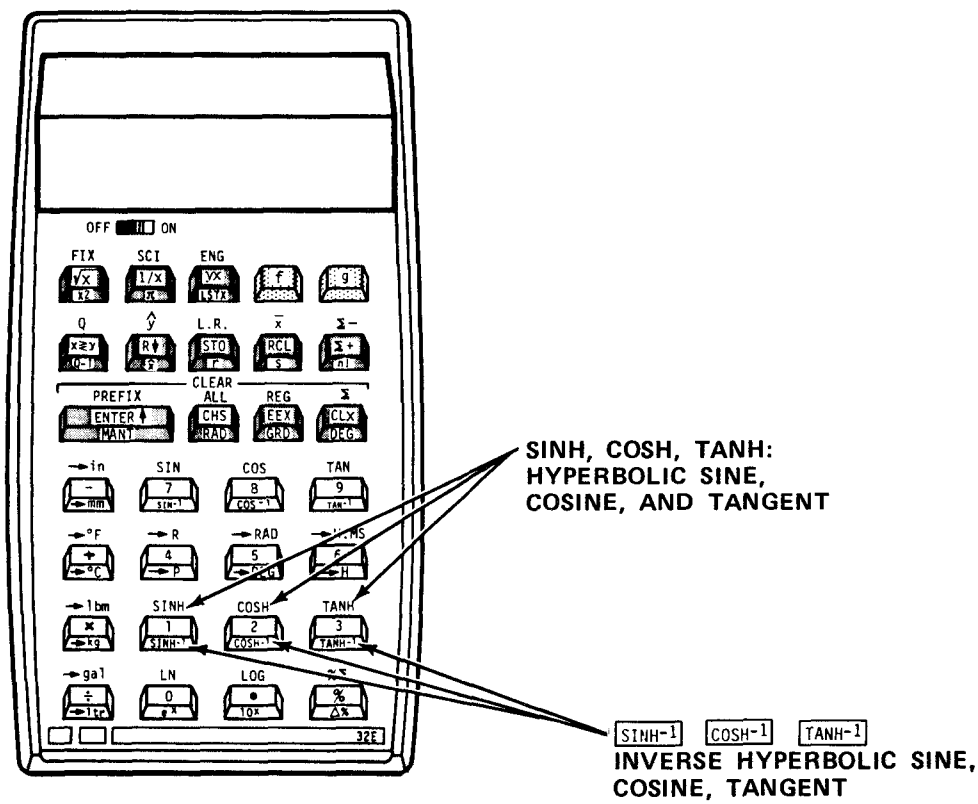
√x	Square Root	Computes square root of number in displayed X-register.
x²	Square	Computes square of number in displayed X-register.
1/X	Reciprocal	Computes reciprocal of number in displayed X-register.
π	pi	Places value of pi (3.141592654) into X-register.
SIN, COS, TAN	Sine, Cosine, Tangent	Computes sine, cosine, or tangent of number in displayed X-register.

Key	Control or Indicator	Function
[SIN-1] , [COS-1] , [TAN-1]	Arc Sine, Arc Cosine, Arc Tangent	Computes arc sine, arc cosine, or arc tangent of number in displayed X-register.



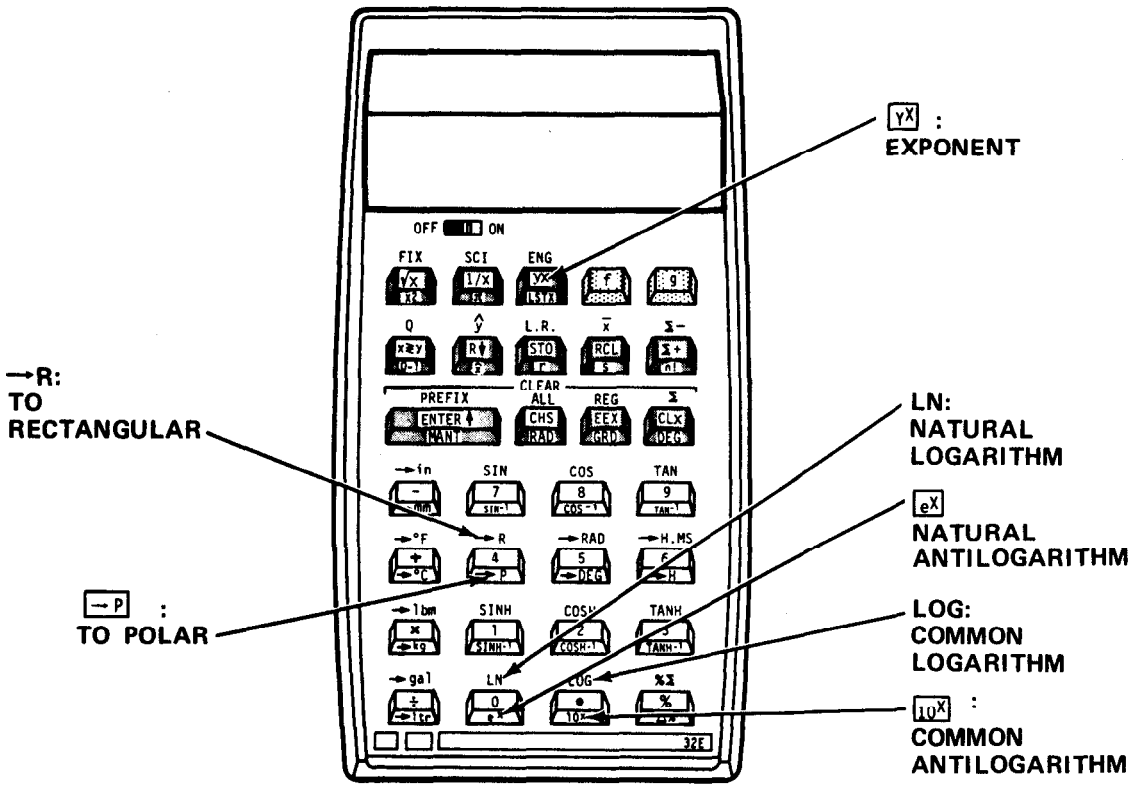
[RAD]	Radians	Sets radians mode for all trigonometric functions.
[GRD]	Grads	Sets grads mode for all trigonometric functions.
[DEG]	Degree	Sets decimal degrees mode for all trigonometric functions.
→RAD	To Radians	Converts decimal degrees to radians.
[→DEG]	To Degrees	Converts radians to decimal degrees.

Key	Control or Indicator	Function
→H.MS	To Hours. Minutes Seconds	Converts decimal hours or degrees to hours, minutes, seconds or degrees, minutes, seconds.
[→H]	To Decimal Hours or Degrees	Converts hours, minutes, seconds, or degrees, minutes, seconds to decimal hours or degrees.



Key	Control or Indicator	Function
	Hyperbolic	
SINH, COSH, TANH	Hyperbolic Sine, Cosine, and Tangent	Computes hyperbolic sine, hyperbolic cosine, or hyperbolic tangent of number in displayed X-register.
SINH-1 , COSH-1 , TANH-1	Inverse Hyperbolic Sine, Cosine, Tangent	Computes inverse hyperbolic sine, inverse hyperbolic cosine, or inverse hyperbolic tangent of number in displayed X-register.

Key	Control or Indicator	Function

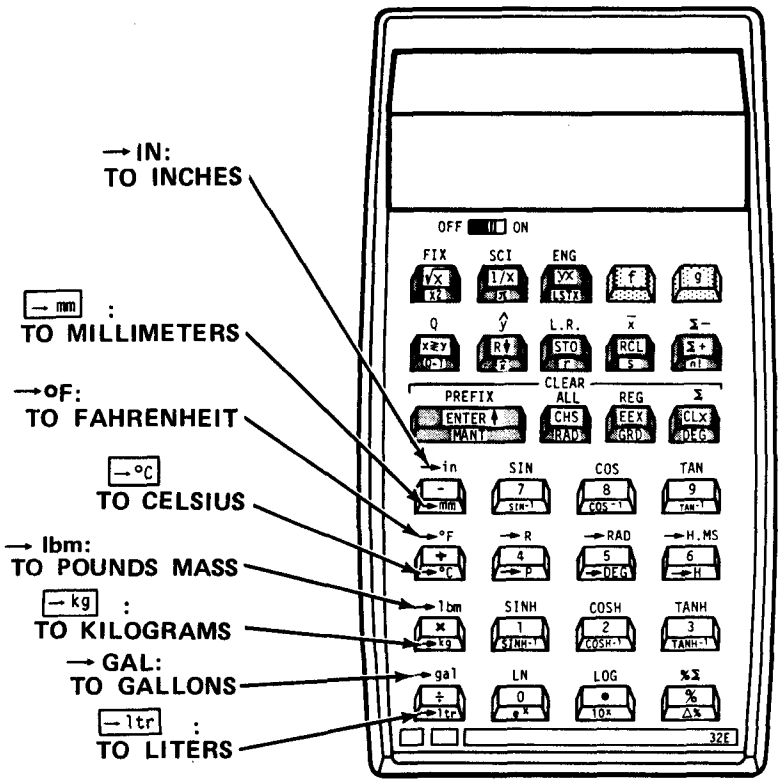


Logarithmic and Exponential

YX	Exponent	Raises number in Y-register to power of number in displayed X-register.
LN	Natural Logarithm	Computes natural logarithm (base e) of number in displayed X-register.
eX	Natural Antilogarithm	Raises e to power of number in displayed X-register.
LOG	Common Logarithm	Computes common logarithm (base 10) of number in displayed X-register.

Key	Control or Indicator	Function
10^X	Common Antilogarithm	Raises 10 to power of number in displayed X-register.
→P	To Polar	Converts rectangular (X,Y) coordinates in X- and Y- registers into polar (R, θ) coordinates. Angle stored in Y-register.
→R	To Rectangular	Converts polar (R, θ) coordinates in X- and Y-registers into rectangular (X,Y) coordinates.

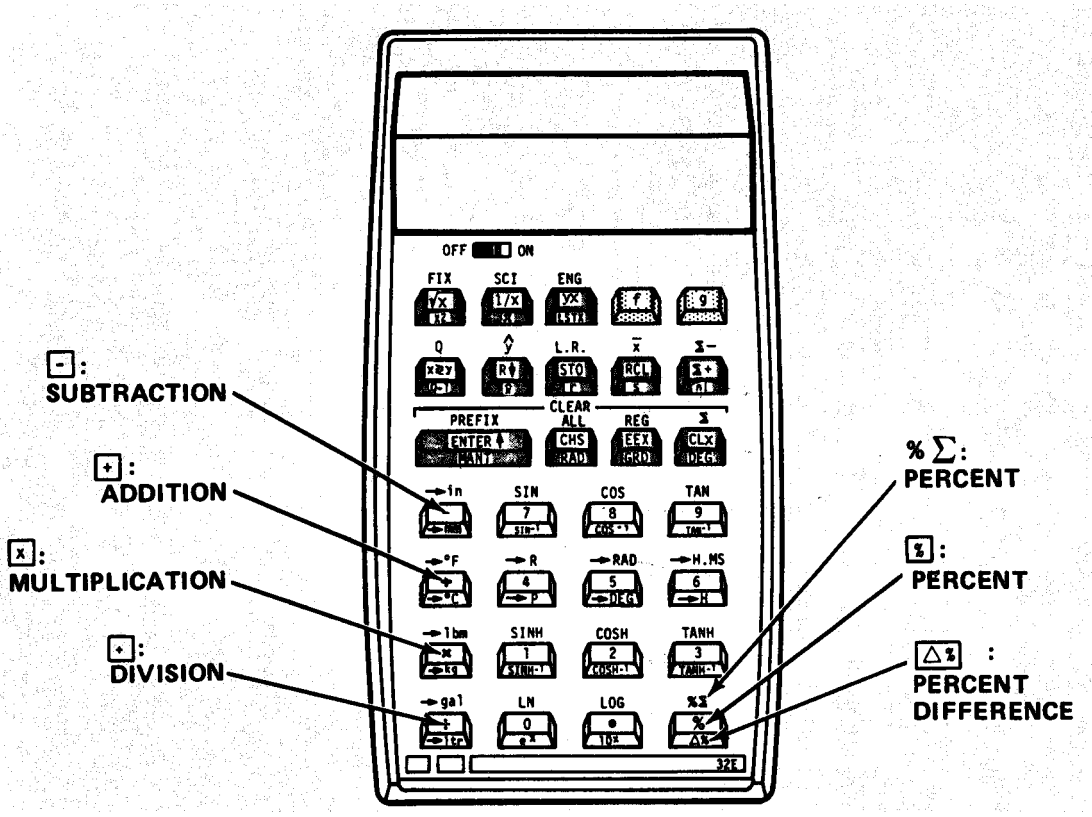
Key	Control or Indicator	Function



Metric Conversions

→in	To Inches	Converts millimeters to inches.
→mm	To Millimeters	Converts inches to millimeters.
→°F	To Fahrenheit	Converts degrees Celsius to degrees Fahrenheit.
→°C	To Celsius	Converts degrees Fahrenheit to degrees Celsius.
→lbm	To Pounds Mass	Converts kilograms to pounds mass.
→kg	To Kilograms	Converts pounds mass to kilograms.

Key	Control or Indicator	Function
→gal	To Gallons	Converts liters to gallons (U.S.).
[→ltr]	To Liters	Converts gallons (U.S.) to liters.



Percentage

[%]	Percent	Computes X-percent of Y.
[Δ%]	Percent Difference	Computes percent difference between number in Y-register and number in X-register.
%Σ	Percent	Computes percent that X is of the number (ΣX) in storage register $R_{.1}$.

Arithmetic Functions

[+]	Addition	Arithmetic functions
[-]	Subtraction	
[x]	Multiplication	
[÷]	Division	

7-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

a. Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

7-5.1 PMCS Procedures.

a. PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows.

Item	Quantity
Cheesecloth (Item 7, Appendix E)	ar

Table 7-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		POCKET CALCULATOR	
1	B	Inspect.	
		1. Check keyboard, display, and casing for cracks or breaks. Replace calculator if casing or display is cracked or broken.	Calculator keyboard, display, or casing is damaged.

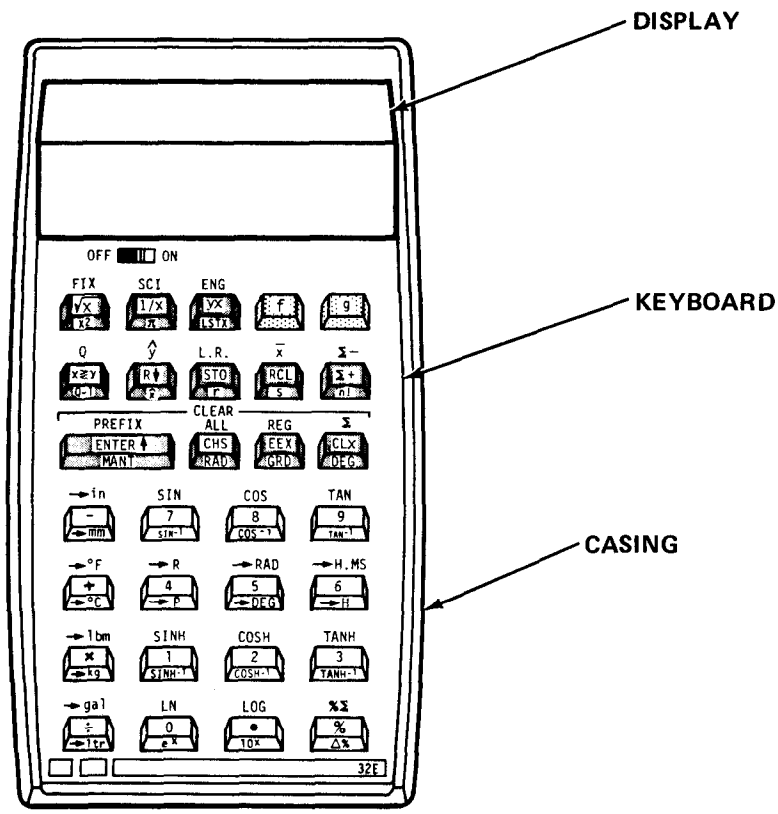


Table 7-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B Before W - Weekly AN - Annually (Number) - Hundreds of Hours
D During M - Monthly S - Semiannually
A After Q - Quarterly Bl - Biennially

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		POCKET CALCULATOR - Cont	
1	B	Inspect - Cont	
		2. Connect ac adapter/recharger to calculater and plug in. Turn calculator on. Press [STO] and [ENTER↑] . [Display should indicate -8, 8, 8, 8, 8, 8, 8, 8, 8, 8.	Display does not show - 8, 8, 8, 8, 8, 8, 8, 8, 8, 8.
		3. With battery pack in calculator, check operation to be sure calculator turns on. Remove battery pack and check for clean contacts. Wipe clean. Reinstall battery pack.	Battery pack is defective.
		4. Check power cord for kinks, frays or burns.	Power cord is **damaged.**

7-6. **OPERATION UNDER USUAL CONDITIONS.**

7-6.1 Operating Procedure.

a. Selecting a function.

NOTE

Most keys on the keyboard perform three functions. One function is indicated by symbol on top of key, second is above key, and third is on slanted face of key.

(1) To select a function printed on the key, press the key.

(2) To select a function printed above the key, press key [f] , then function key.

Example: To use LOG in calculation, enter number, [f] then LOG.

(3) To select a function printed on slanted face of key, press [g] then function key.

Example: To use [x²] in calculations, enter number, [g] then [x²] .

b. Keying in numbers.

(1) Press keys corresponding to digits and decimal point in the order that they appear, reading from left to right.

(2) If needed, press [CHS] to make number negative.

c. One-number functions.

(1) Key in number on which operation is to be performed.

(2) Select desired function. Press key.

Example: To calculate square root of 5, press [5] and [√x]

Answer is 2.2361.

d. Two-number functions.

(1) Key in first number.

(2) Press [ENTER↑] to separate first number from second number.

(3) Key in second number.

(4) Select desired function. Press key.

Example: To calculate 5 percent of 35, press [5], [ENTER↑], [5], and [%].

Answer is 1.75.

e. Exponent key [y^x].

NOTE

Exponent key is two-number function.

(1) Key in number for Y. Press [CHS] if it is negative.

(2) Press [ENTER↑] to send number to Y register in automatic memory stack.

(3) Key in number for X (exponent for Y).

(4) Press [y^x] key.

Example: To calculate 5^3, press [5], [ENTER↑], [3], and [y^x].

Answer is 125.

f. Chain calculations.

NOTE

Calculator uses reverse polar notation (RPN) logic for chain calculations.

(1) If equation has parenthetical expressions, key in numbers and perform function in first parenthesis. Key in first number, press [ENTER↑], key in second number, and press function key for that operation.

(2) Key in numbers and perform function in second parenthesiss. Key in first number, press [ENTER↑], key in second number, then press function key for that operation.

(3) Press function key for operation indicated between parentheses.

Example: To calculate (3 x 4) x (5 + 6), press

[3], [ENTER↑], [4], and [x]
[5], [ENTER↑], [6], and [+]
[x]; answer is 132.

g. Operations with powers of 10.

(1) Key in number being multiplied by power of 10. Press [CHS] if number is negative.

(2) Press [EEX].

(3) Key in exponent (power) of 10. Press [CHS] if exponent is negative.

(4) Press [ENTER↑] and key in exponent.

(5) Press [x].

Example: To multiply 15.6×10^{12} by 25 press

[1], [5], [.], [6], [EEX], and [12]
[ENTER], [25], and [x]; answer is 3.9000×10^{14}.

h. Storage (memory) register arithmetic.

NOTE

This procedure performs two-number arithmetic functions on number stored in storage register. The displayed X-register is the second number.

(1) Press [STO].

(2) Press appropriate function key [+], [-], [x], or [÷].

(3) Press [0] through [8] or, [.] through [.] [5] indicating on which register function will be performed.

Example: Pressing [STO] , [x] , and multiplies value of (displayed) X-register by contents of storage (memory) register 1. The answer is placed into storage (memory) register 1.

NOTE

Value of X-register will not be changed.

i. Clearing storage (memory) register.

(1) To clear single storage (memory) register, press [0] , [STO] ,, and location of register to be cleared.

Example: To clear register 2, press [STO] , and [2] .

(2) To clear registers 0 through 8, press [f] and REG. To clear registers 0 through 5, press [f] and [.] [.] to clear all registers (including the automatic memory stack) press [f] and ALL.

j. Trigonometric functions.

(1) Enter or calculate value of X, number on which trigonometric function is to be performed.

(2) Press [g] key.

(3) Press [DEG] , [RAD], or [GRD] to select measurement for answer (degrees, radians, or grads).

(4) Press [f] key.

(5) Press needed function (SIN, COS, TAN) key.

Example: To calculate sine 35 , press
[3] , [5] , [g] , [DEG] , [f] , and SIN . Answer is 0.5736.

k. Polar/rectangular coordinate conversion.

(1) Convert from rectangular (X,Y) to polar coordinates.

NOTE

Value for Y is always keyed in first.

(a) Key in value of Y.

(b) Press [ENTER↑] .

(c) Key in value of X.

(d) Press [g] then key in [DEG] , [RAD] , or [GRD] to select measurement for answer (degrees, radians, or grads).

(e) Press [g] and [→P] to get R (magnitude). Press [x≷y] to get angle in radians.

Example: To convert rectangular coordinates (4, 3) to polar with angle in radians, press

[3] , [ENTER↑] , and [4]
[g] and [RAD]
[g] and [→P] ; answer is 5.
[x≷y] ; answer is .64.

(2) Convert from polar to rectangular coordinates.

(a) Key in angle in radians.

(b) Press [ENTER↑] .

(c) Key in value of R (magnitude).

(d) Press [g] then key in [DEG] , [RAD] , or [GRD] to select measurement of angle (degrees, radians, or grads).

(e) Press [g] , R to get X. Press [x≷y] to get Y.

Example: To convert polar coordinates 5 and .64 to rectangular, press

[·] , [6] , [4] , [ENTER↑] , and [5]
[g] and [RAD]
[g] and [→R] : answer is 4.01.
[x≷y] : answer is 2.986.

1. Statistical functions.

(1) Accumulations.

(a) Pressing [Σ+] key computes sums and products of the values in the X- and Y-registers. Results are automatically accumulated in storage registers R_0 through R_5. Before starting to calculate accumulations with a new set of x and y values, clear registers by pressing [f] REG . REG.

Key y value into X-register.

Press [ENTER↑] to raise y value into Y-register.

Key x value into X-register.

Press [Σ+] .

b. If statistical problem involves only one variable (x), clear storage registers $R._0$ through $R._5$ and Y-register. Press [f], [Σ], and [ENTER↑].

Key number into X-register.

Press [Σ+].

NOTE

Unlike storage register arithmetic, the accumulation operation allows overflows (i.e., number whose magnitudes are greater than $9.99999999 \times 10^{99}$) in storage registers $R._0$ through $R._5$ without indicating Error 1 in the display.

c. To use any of the accumulations, recall contents of desired storage register into displayed X-register by pressing [RCL] [.] followed by the number of the register. If this is done immediately after pressing or [Σ-], the accumulation recalled is written over the number of data pair entries (n) in the display. To use both Σx and Σy press [RCL] [Σ+]. This simultaneously copies Σx from $R._1$ into displayed X-register and co from $R._3$ into Y-register. If this is done immediately after pressing [Σ+], [Σ-], [CLX], or [ENTER↑], the number in the Y-register is first lifted into the Z-register. Otherwise, the numbers in the X- and Y-registers are first lifted into Z- and T- registers, respectively.

Example: To find Σx, Σx^2, Σy, Σy^2, and Σxy for the paired values of x and y listed below, press:

y	7	5	9
x	5	3	8

Keystrokes	Display	
[f] CLEAR Σ	0.0000	Clear statistical storage registers. (Display shown assumes no results remain from previous calculations.)
[7] [ENTER↑]	7.0000	
[5] [Σ+]	1.0000	First pair is accumulated: n=1
[5] [ENTER↑]	5.0000	
[3] [Σ+]	2.0000	Second pair is accumulated: n = 2
[9] [ENTER↑]	9.0000	
[8] [Σ+]	3.0000	Third pair is accumulated: n=3

Keystrokes	Display	
RCL . 1	16.0000	Sum of x values from register $R._1$
RCL . 2	98.0000	Sum of squares of x values from register $R._2$
RCL . 3	21.0000	Sum of y values from register
RCL . 4	155.0000	Sum of squares of y values from register $R._4$
RCL . 5	122.0000	Sum of products of x and y values from register $R._5$
RCL . 0	3.0000	Number of entries (n=3) from register $R._0$

(2) Deleting and correcting data.

(a) If an incorrect value is keyed in and Σ+ has not yet been pressed, press CLX and key in correct value.

(b) To change one of the values, or if after pressing Σ+ one of the values was erroneous, correct the accumulations by using Σ- (summation minus) key as follows:

Key incorrect data pair into X- and Y-registers. LSTX can be used to return a single incorrect data value to displayed X-register.

Press f Σ- to delete incorrect data.

Key in correct values for x and y. If one value of an (x, y) data pair is incorrect, both values must be deleted and reentered.
Press Σ+ .

Example: If last data pair (8, 9) in previous example should have been (8, 6), correct the accumulation as follows, press:

Keystrokes	Display	
9 ENTER↑	9.0000	Incorrect y value is entered again.
8	8.	Correct x value is entered again.
f Σ-	2.0000	Number of entries (n) is now two.

Keystrokes	Display	
6 ENTER↑	6.0000	Correct y value is entered.
8	8.	x value is entered again.
Σ+	3.0000	Number of entries is again three.

(3) Mean. Pressing $\hat{x}$ computes the arithmetic mean (average) of x and y values accumulated in registers $R._1$ and $R._3$ respectively.

Pressing f $\hat{x}$ causes the following operations to be performed.

The contents of the stack registers are lifted just as they are when pressing RCL .

The mean of the x values ($\hat{x}$) is calculated using data accumulated in registers R_1 (Σ x) and $R._0$ (n). The resulting value for x appears in displayed X-register.

The mean of y values ($\hat{y}$) is calculated using data accumulated in registers $R._3$ (Σ y) and $R._0$ (n).

The resulting value for y is available in Y-register of stack.

Example: Below is a chart of daily high and low temperatures for a winter week. To find average high and low temperatures for week selected, press:

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
High	6	11	14	12	5	-2	-9
Low	-22	-17	-15	-9	-24	-29	-35

Keystrokes	Display	
f CLEAR Σ+	0.0000	Statistical registers cleared. (Display shown assumes no results remain from previous calculations.)
6 ENTER↑ 22	22.	
CHS Σ+	1.0000	Number of data pairs (n) is now 1.
11 ENTER↑ 17	17.	
CHS Σ+	2.0000	Number of data pairs (n) is now 2.
14 ENTER↑ 15	15.	

Keystrokes	Display	
CHS Σ+	3.0000	
12 ENTER↑ 9	9.	
CHS Σ+	4.0000	
5 ENTER↑ 24		
CHS Σ+	5.0000	
2 CHS ENTER↑	-2.0000	
29 CHS Σ+	6.0000	
9 CHS ENTER↑	-9.0000	
35 CHS Σ+	7.0000	Number of data pairs (n) is now 7.
f $\bar{x}$	-21.5714	Average low temperature.
x≷y	5.2857	Average high temperature.

(4) Standard deviation.

(a) Pressing s computes the standard deviation (a measure of dispersion around the mean) of accumulated data.

(b) When 9 s is pressed:

The contents of stack registers are lifted just as they are when pressing RCL Σ+ .

The standard deviation of x values (s_x) is calculated using data accumulated in registers $R._2$(2), $R._1$(Σ), and $R._0$(n). The result appears in displayed X-register.

The standard deviation of y values (s_y) is calculated using data accumulated in registers $R._4$(y2), $R._3$(y), and $R._0$(n). The result appears in Y-register.

Example: To determine the standard deviation of the following test scores: 79, 94, 68, 86, 82, 78, 83, and 89, press

Keystrokes	Display	
f CLEAR ALL	0.0000	Clear statistical registers and Y-register for new, one-variable problem.

Keystrokes	Display	
79 Σ+	1.0000	First score is entered. Since this problem involves only one variable, y-value does not have to be entered into Y-register using the m key.
94 Σ+	2.0000	Display shows number of scores entered so far.
68 Σ+	3.0000	
86 Σ+	4.0000	
82 Σ+	5.0000	
78 Σ+	6.0000	
83 Σ+	7.0000	
89 Σ+	8.0000	Last score in sample.
g s	7.8365	Standard deviation of test scores.

(5) Linear regression. Linear regression is a statistical method for finding a straight line that best fits a set of data points, thus providing a relationship between two variables.

(a) To use the linear regression function, first key in a series of data points using the Σ+ key. Then press f L.R.

(b) When f L.R. if pressed:

The contents of the stack registers are lifted just as they are when you press RCL Σ+ .

The slope (A) of the least squares line of the data is available in the Y-register of the stack.

The y-intercept (B) of the least squares line of the data appears in the displayed X-register of the stack.

(c) To use value for A or to bring it into displayed X-register, simply shift stack contents with the x≤y key.

Example: An oil company wishes to know the slope and y-intercept of a least squares line for the consumption of motor fuel in the United States against time since 1945. It knows the data given in the table.

Motor Fuel Demand (Millions of Barrels)	696	994	1330	1512	1750	2162	2243	2382	2484
Year	1945	1950	1955	1960	1965	1970	1971	1972	1973

Solution: Key the data into the calculator using the Σ+ key, key, then press f L.R.

Keystrokes	Display	
f CLEAR Σ+	0.0000	Clear statistical storage registers. (Display shown assumes no results remain from previous calculations).
696 ENTER↑	696.0000	
1945 Σ+	1.0000	
994 ENTER↑	994.0000	
1950 Σ+	2.0000	
1330 ENTER↑	1,330.0000	
1955 Σ+	3.0000	
1512 ENTER↑	1,512.0000	
1960 Σ+	4.0000	
1750 ENTER↑	1,750.0000	
1965 Σ+	5.0000	
2162 ENTER↑	2,162.0000	
1970 Σ+	6.0000	
2243 ENTER↑	2,243.0000	
1971 Σ+	7.0000	
2382 ENTER↑	2,382.0000	
1972 Σ+	8.0000	
2484 ENTER↑	2,484.0000	
1973 Σ+	9.0000	**All data pairs have been keyed in.**

Keystrokes	Display	
[f] L.R.	-118,290.6295	The y-intercept of the line.
[x≷y]	61.1612	Slope of the line.

(6) Linear esti mation. With data accumulated in registers $R._0$ through $R._5$ a predicted value for y (denoted y) can be calculated by keying in a new value for x and pressing [f] $\hat{y}$. A predicted value for x (denoted x) can be calculated by keying in a new value for y and pressing [g] $\hat{x}$.

Example: With data intact from previous example in registers $R._0$ through $R._5$ to predict demand for motor fuel for the years 1980 and 2000, key in new x values and press [f] $\hat{y}$. To determine the year that the demand for motor fuel is expected to pass 3,500 million barrels, key in 3,500 (new value for y) and press [g] $\hat{x}$.

Keystroke	Display	
1980 [f] $\hat{y}$	2,808.6264	Predicted demand in millions of barrels for the year 1980.
2000 [f] $\hat{y}$	4,031.8512	Predicted demand in millions of barrels for the year 2000.
35 [g] $\hat{x}$	1,991.3041	The demand is expected to pass 3,500 million barrels during 1992.

(7) Correlation coefficient. Both linear regression and linear estimation presume that the relationship between x and y data values can be approximated, to some degree, by a linear function (a straight line). [r] (correlation coefficient) can be used to determine how closely the data "fits" a straight line. The correlation coefficient can range from r = + 1 to r = - 1. At r = + 1, data falls exactly onto a straight line with positive slope. While at r = -1, data falls exactly onto a straight line with negative slope. At r = 0, data cannot be approximated by a straight line.

Example: To calculate the correlation coefficient for previous example press:

Keystrokes	Display	
[g] [r]	0.9931	The data very closely approximates a straight line.

7-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

7-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

7-9. TROUBLESHOOTING PROCEDURES.

a. The table lists the common malfunctions which you may find during the operation or maintenance of the pocket calculator or its components. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 7-2. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. CALCULATOR DISPLAY IS BLANK.
Step 1. Plug in ac adapter/recharger. Turn calculator on.
(a) If display of zeros comes on, proceed to step 2.
(b) If display is blank, replace adapter/recharger.
(c) If problem remains, replace calculator.
Step 2. Check for raised decimal point at far left corner of display. Indicates low power condition.
(a) If indicator is on, proceed to step 3.
(b) If indicator is off, recharge battery pack.
Step 3. Check to see if contacts are dirty.
(a) Clean contacts on inside of calculator and battery pack with cotton swab (Item 8, Appendix E) moistened with alcohol (Item 4, Appendix E).
(b) Replace battery pack. Open battery pack door. Remove defective battery pack. Install new battery pack. Reinstall battery pack door.

Table 7-2. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
2. CALCULATIONS OR DISPLAY ERRATIC.	
Step 1. Check for raised decimal point at far left corner of display. Indicates low power condition.	
	(a) Recharge battery pack.
	(b) Replace battery pack.
	(c) Replace calculator.
Step 2. Press [STO] and [ENTER↑] to see if display shows -8,8,8,8,8,8,8,8, not ERROR 9.	
If ERROR 9 is displayed, replace calculator.	
NOTE For error conditions refer to operator's instructions for the HP-32E provided with equipment.	

7-10. MAINTENANCE PROCEDURES. There are no operator maintenance procedures assigned for this equipment.

Section IV ORGANIZATIONAL MAINTENANCE

7-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

7-12. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT. These items are not required at the organizational level of maintenance.

7-13. SERVICE UPON RECEIPT.

7-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

7-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

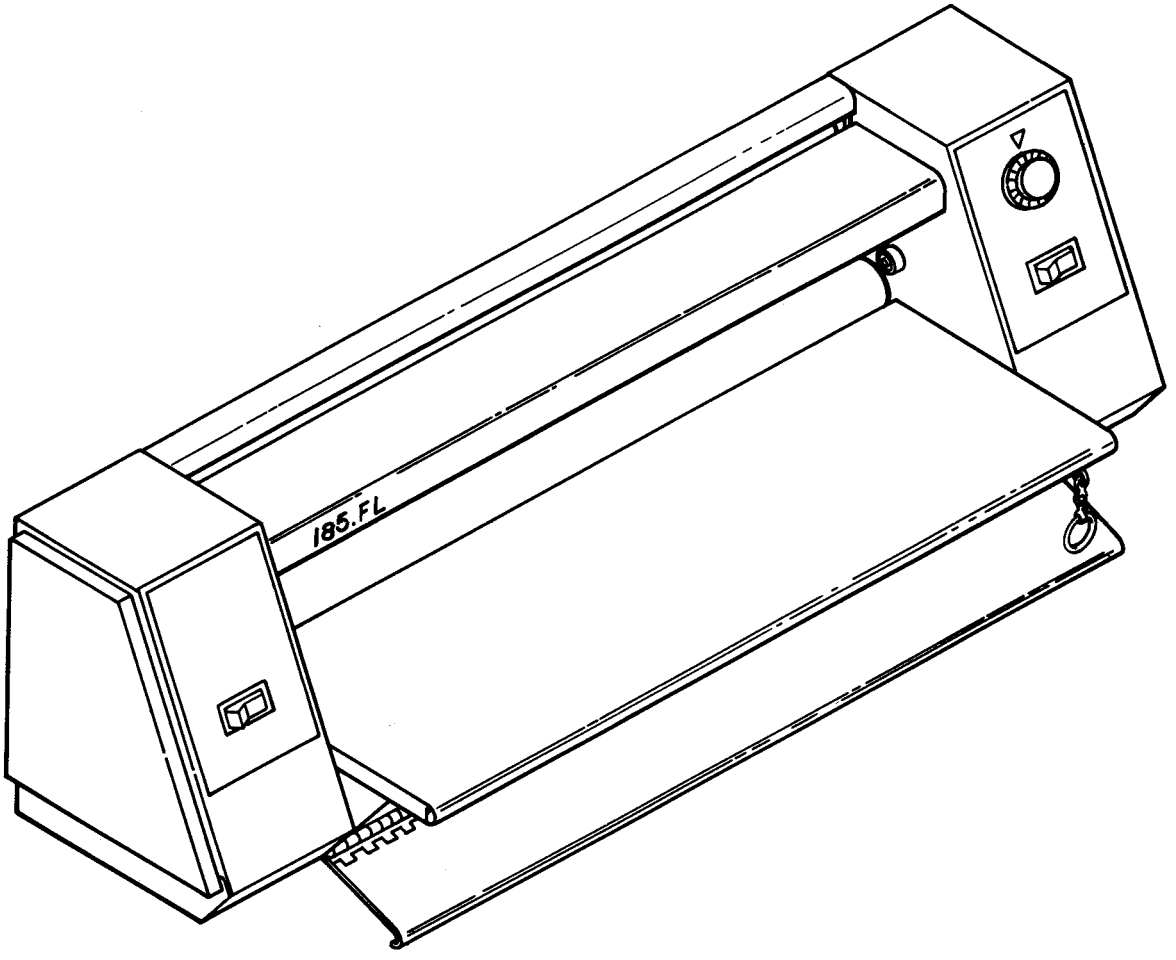
7-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES. There are no organizational troubleshooting procedures assigned for this equipment.

7-16. MAINTENANCE PROCEDURES. There are no organizational maintenance procedures assigned for this equipment.

7-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

There are no direct/general support maintenance procedures assigned for this equipment.


185.FL

CHAPTER 8

DIAZO PRINTER

Section I INTRODUCTION

8-1. GENERAL INFORMATION.

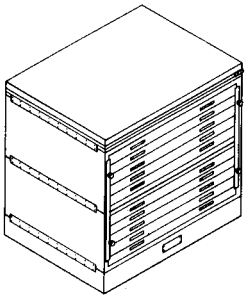
8-1.1 Scope.

a. Model Number and Equipment Name. Model GAF 185.FL Diazo Printer.

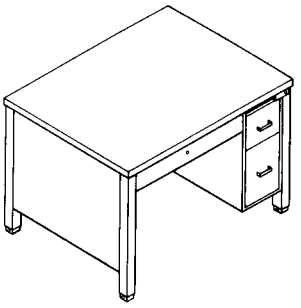
b. Purpose of Equipment. To produce dry Diazo prints from translucent paper, film, or cloth originals.

8-1.2 Reference Information.

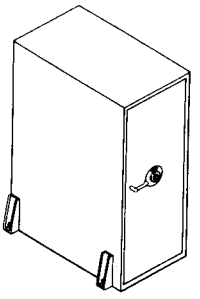
TN 5-3610-256-14 and -24P, Operator, Organizational, Direct Support, and General Support Maintenance Manual, including Repair Parts and Special Tools List, Reproduction Set, Diazo Process 185.FL-M (3610-01-123-7782), (NSN361O-O1-O61-O621 FL), contains the information applicable to this equipment.



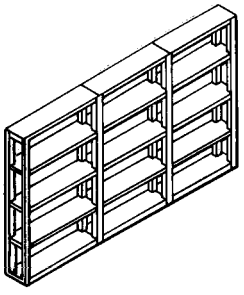
MAP AND PLAN SECURITY CABINET



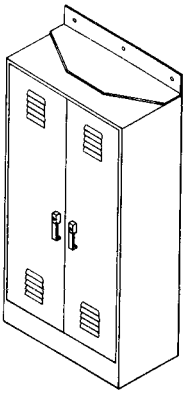
FLAT TOP DESK



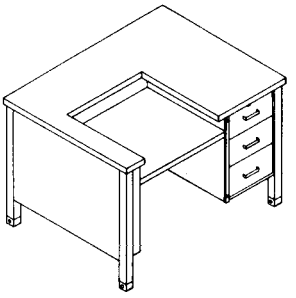
MAP AND PLAN FILING CABINET



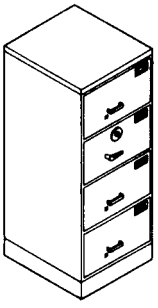
DISPLAY AND STORAGE SHELVING



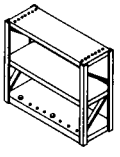
CHEMICAL STORAGE CABINET



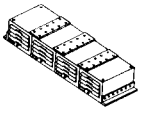
TYPEWRITER DESK



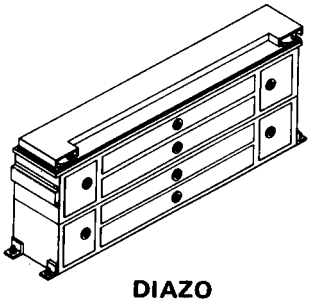
SECURITY FILING CABINET



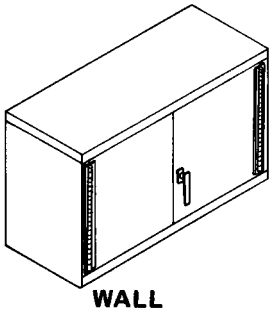
ACCESSORY STORAGE SHELF



VISIBLE INDEX FILE

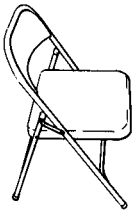


DIAZO SUPPORT CABINET



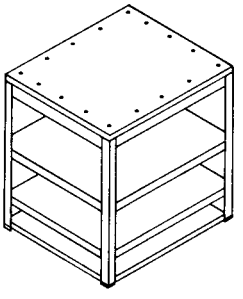
WALL STORAGE CABINET

ROTARY DESK CHAIR



FOLDING CHAIR

ROTARY DRAFTING CHAIR



COPIER STAND/SHELVING

CHAPTER 9

FURNITURE AND CABINETS

Section I INTRODUCTION

9-1. GENERAL INFORMATION.

9-1.1 Scope. This chapter contains the description of all furniture and cabinets contained in this section.

9-2. EQUIPMENT DESCRIPTION.

Flat top desk. Provides work space for clerical personnel. It has three drawers and a pull-out writing table. The three drawers can be locked. Dimensions:

Width	45 in. (114.3 cm)
Depth	34 in. (86.4 cm)
Height	30.5 in. (77.5 cm)

b. Typewriter desk. Provides a typing area and general work space for clerical personnel. The typewriter mounts to a section of the desktop which can be flipped over to convert to a flat work area. There are three drawers and a pull-out writing table. The three drawers can be secured by a locking bar. Dimensions:

Width	45 in. (114.3 cm)
Depth	34 in. (86.4 cm)
Height	30.5 in. (77.5 cm)

Chemical storage cabinet. Used for storage of miscellaneous chemicals. There are six shelves within the cabinet. It has two doors secured by a handle-type latch with a built-in lock. Dimensions:

Width	36 in. (91.4 cm)
Depth	18 in. (45.7 cm)
Height	64.5 in. (163.8 cm)

d. Security filing cabinet. Used for security storage of classified documents. It has four drawers locked by a latch and combination lock located on the second drawer. Dimensions:

Width	20.75 in. (52.7 cm)
Depth	28 in. (71.1 cm)
Height	52 in. (132.1 cm)

Map and plan security cabinet. Used for the security storage of maps, plans and charts of various sizes. These items are hung from racks in the cabinet. The door is secured by a bolt-work latch with an integral combination lock. Dimensions:

Width	22 in. (55.9 cm)
Depth	39 in. (99.1 cm)
Height	51.38 in. (130.5 cm)

f. Map and plan filing cabinet. Used for flat, horizontal storage of maps, blueprints, charts and plans of various sizes. The eight drawers are held shut by two locking bars located on either side of the front of the cabinet. Dimensions:

Width	40.75 in. (103.5 cm)
Depth	28.62 in. (72.7 cm)
Height	41.68 in. (105.9 cm)

g. Wall storage cabinet. Used for miscellaneous storage. There are two shelves. The two doors are held shut by a handle-type latch. Dimensions:

Width	30 in. (76.2 cm)
Depth	12 in. (30.5 cm)
Height	18 in. (45.7 cm)

h. Display and storage shelving. Prov ides storage for books and technical manuals. Dimensions:

Width	122 in. (309.9 cm)
Depth	12 in. (30.5 cm)
Height	72 in. (182.9 cm)

i. Rotary drafting chair. Provides seating for drafting personnel. It has adjustable seat height and back position. Dimensions:

Width	17.12 in. (43.5 cm)
Depth	17.12 in. (43.5 cm)
Height	42 in. (106.7 cm), Max 36 in. (91.4 cm), Min

j. Rotary desk chair. Provides seating for personnel working at desk. It has a 3-3/4 in. (9.5 cm) seat height adjustment, ball bearing casters, tilt movement tension adjustment and adjustable back height. Dimensions:

Width	20 in. (50.8 cm)
Depth	21 in. (53.3 cm)
Height	32 in. (81.3 cm)

k. Folding chair. Provided for general seating. Folds flat for storage. Dimensions:

Width	18 in. (45.7 cm)
Depth	20 in. (50.8 cm)
Height	32 in. (81.3 cm)

1. Diazo support cabinet. Provides storage for support items associated with the Diazo copy machine. This cabinet has four separate sections, each with its own door and latch. Dimensions:

Width	68.12 in. (173.0 cm)
Depth	28.7 in. (72.9 cm)
Height	15.68 in. (39.8 cm)

m. Visible index file. Provides for rapid file access. Dimensions:

Width	10.75 in. (27.3 cm)
Depth	24.5 in. (62.2 cm)
Height	8.0 in. (20.3 cm)

n. Accessory storage shelf. Provides for general storage. Dimensions:

Width	25 in. (63.5 cm)
Depth	12 in. (30.5 cm)
Height	29 in. (73.7 cm)

o. Copier stand/shelving. Provides mounting for the plain paper copier and storage for copy paper. Dimensions:

Width	36 in. (90.0 cm)
Depth	24 in. (60.96 cm)
Height	29 in. (73.66 cm)

9-3. TECHNICAL PRINCIPLES OF OPERATION. There are no specific principles of operation for this equipment.

Section II OPERATING INSTRUCTIONS

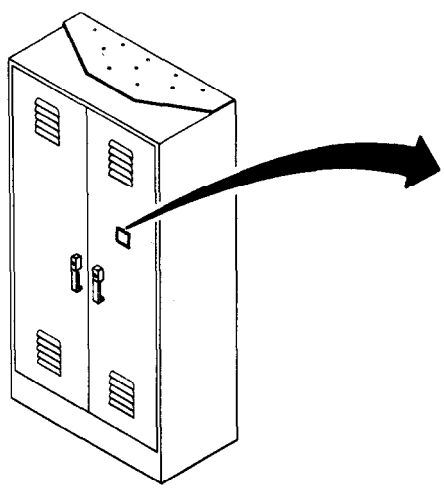
9-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS. This equipment has no operator's controls or indicators.

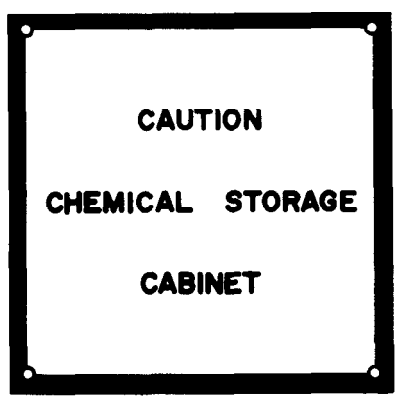
9-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no operator PMCS procedures assigned for this equipment.

9-6. OPERATION UNDER USUAL CONDITIONS.

9-6.1 Preparation for Movement. Ensure that portable equipment is properly secured with tiedowns provided.

9-6.2 Operating Instructions on Decals and Instruction Plates.





9-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

9-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

9-9. TROUBLESHOOTING PROCEDURES. There are no operator troubleshooting procedures assigned for this equipment.

9-10. MAINTENANCE PROCEDURES.

This section contains instructions covering operator maintenance functions for the furniture and cabinets. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

9-10.1 Inspect Furniture and Cabinets. Inspect furniture and cabinets for structural damage, rust, and proper operation of all latches, hinges, and adjustment mechanisms.

Section IV ORGANIZATIONAL MAINTENANCE

9-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

9-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

9-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

9-12.2 Special Tools; Test, Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

9-12.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-324-24P covering organizational maintenance for this equipment.

9-13. SERVICE UPON RECEIPT.

9-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

9-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

9-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES. There are no organizational troubleshooting procedures assigned for this equipment.

9-16. MAINTENANCE PROCEDURES.

a. This section contains instructions covering organizational maintenance functions for the furniture and cabinets. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

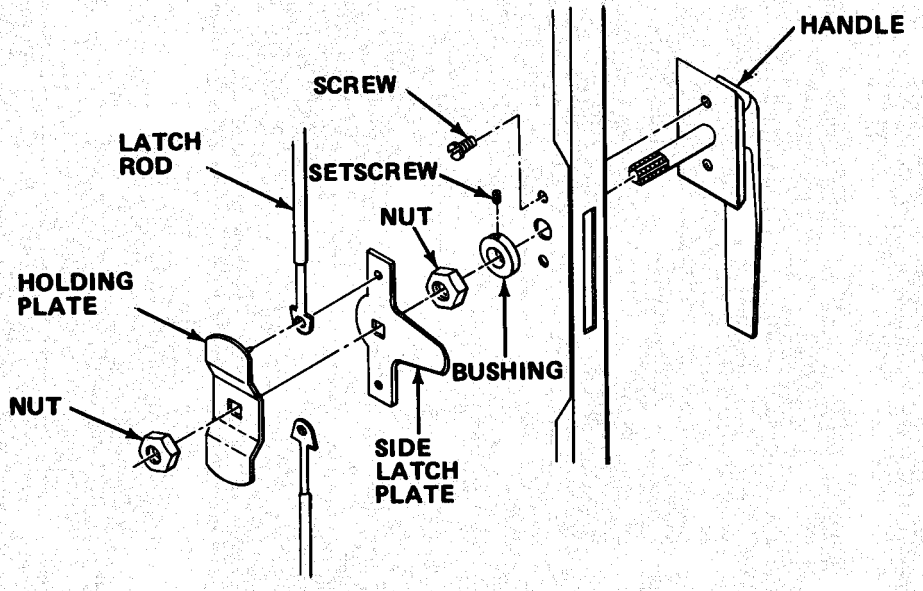
INDEX - Cont

9-16.1 Replace Door Latch (Wall Storage Cabinet).

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 9/16 in. Combination Wrench
Flat Tip Screwdriver

SUPPLIES: Handle Type Latch



a. Remove holding plate retaining nut.

b. Remove holding plate and latch rods.

c. Remove side latch plate.

d. Remove handle retaining nut.

e. Loosen setscrew and remove bushing from handle shaft.

f. Remove handle retaining screws and remove handle.

g. Install new handle and secure with screws.

h. Reinstall bushing on handle shaft and tighten setscrew.

i. Reinstall handle retaining nut.

j. Install side latch plate.

k. Reinstall latch rod holding plates and latch rods.

l. Reinstall holding plate retaining nut.

9-16.2 Replace Door Hinge (Piano Hinge).

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS : 1/4 in. Electric Drill
5/32 in. Drill Bit
Pop Rivet Gun

SUPPLIES: Storage Cabinet Hinge
5/32 in. Pop Rivets
8-32 x 1/2 in. Screws (4 required)
8-32 Nuts (4 required)

a. Drill out rivets holding hinge to cabinet and remove hinge.

b. Install new hinge and temporarily secure with four screws and nuts.

c. Close and latch cabinet door and install pop rivets.

d. Remove temporarily installed screws and nuts, and install pop rivets.

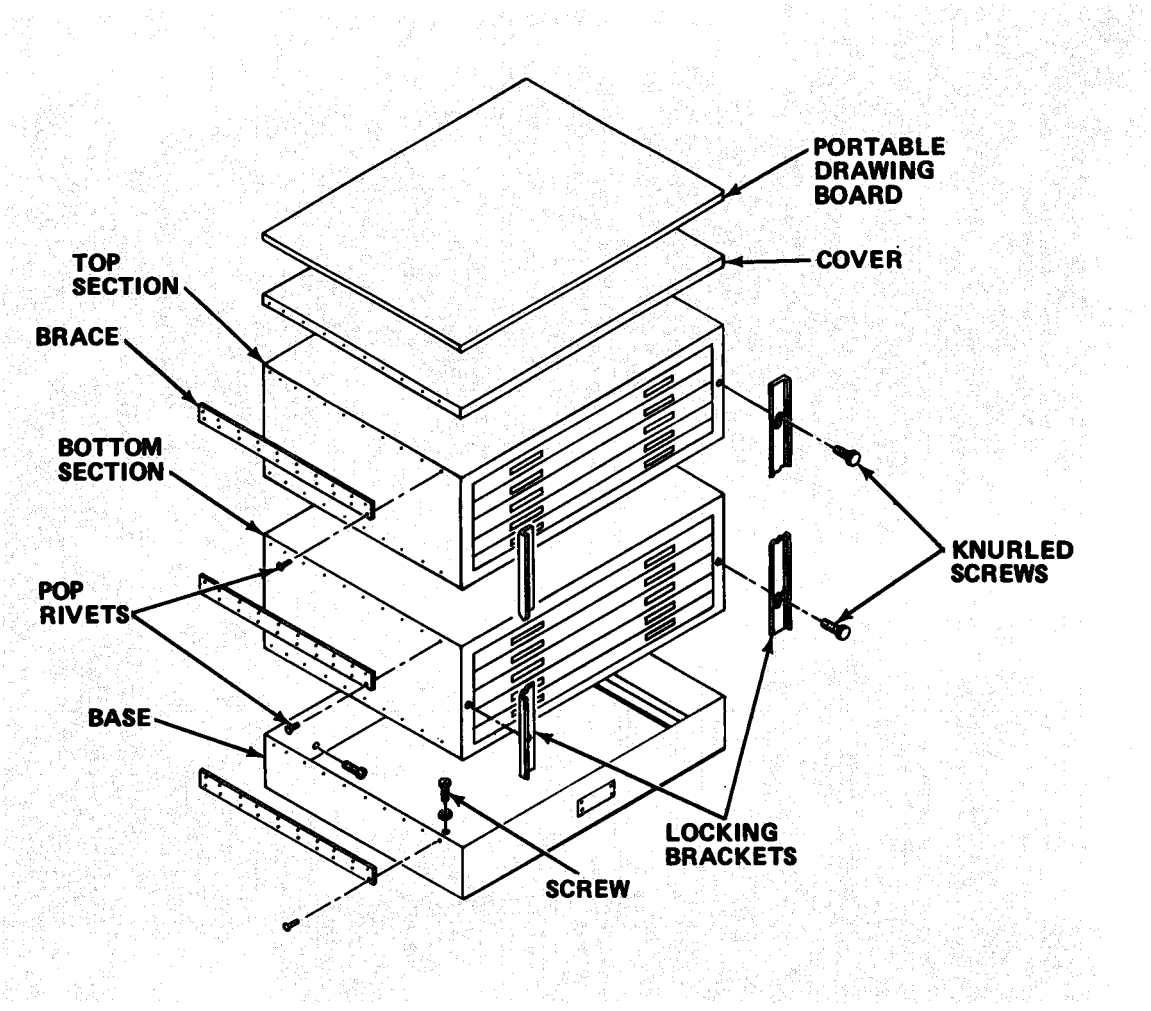
9-16.3 Remove/Install Map and Plan Filing Cabinet/Portable Drawing Board Assembly.

MOS: 83FJ6, Reproduction Equipment Repairer

PERSONNEL: Two persons are required to perform this procedure.

TOOLS: Flat Tip Screwdriver
Pop Rivet Gun
Drill and Bits

SUPPLIES: Map and Plan Filing Cabinet
Pop Rivets
Portable Drawing Board



a. If applicaple, remove visible index file (paragraph 9-16.10).

b. Drill rivets from braces and remove braces.

c. Remove map and plan filing cabinet cover, turn cover over, remove screws and portable drawing board from cover. Retain screws for reuse.

d. Remove knurled screws from locking bracket on each side of front. Then remove locking bracket.

WARNING

Serious personal injury can result if an inadequate number of personnel are used to move the map and plan filing cabinet.

e. Lift top and bottom sections free from base.

f. Remove screws and base from floor. Retain screws for reuse.

g. Install new base, top or bottom map and plan filing cabinet, or drawing board as required.

h. Reinstall base to floor and secure with screws.

i. Reinstall bottom section to base and rivet braces to base and bottom sections.

j. Reinstall top section on bottom section and rivet braces to both top and bottom sections.

k. Reinstall portable drawing board on cover and secure with screws.

1. Reinstall cover on top section and rivet braces to both the cover and top section.

m. Reinstall locking brackets, and secure with knurled screws.

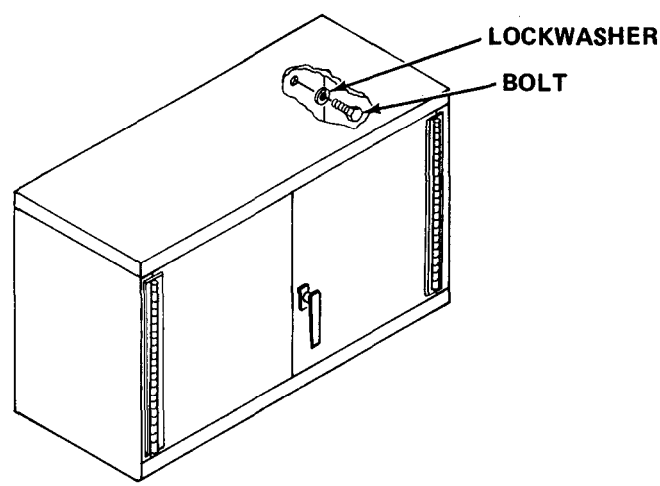
n. Reinstall visible index file inapplicable (paragraph 9-16.10).

9-16.4 Remove/Install Wall Storage Cabinet.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 1/2 in. Drive Ratchet
2 in. Socket Extension, 1/2 in. Drive
1/2 in. Socket, 1/2 in. Drive

SUPPLIES: Wall Storage Cabinet



a. Remove bolts and lockwashers which secure defective cabinet to wall.

b. Remove defective cabinet.

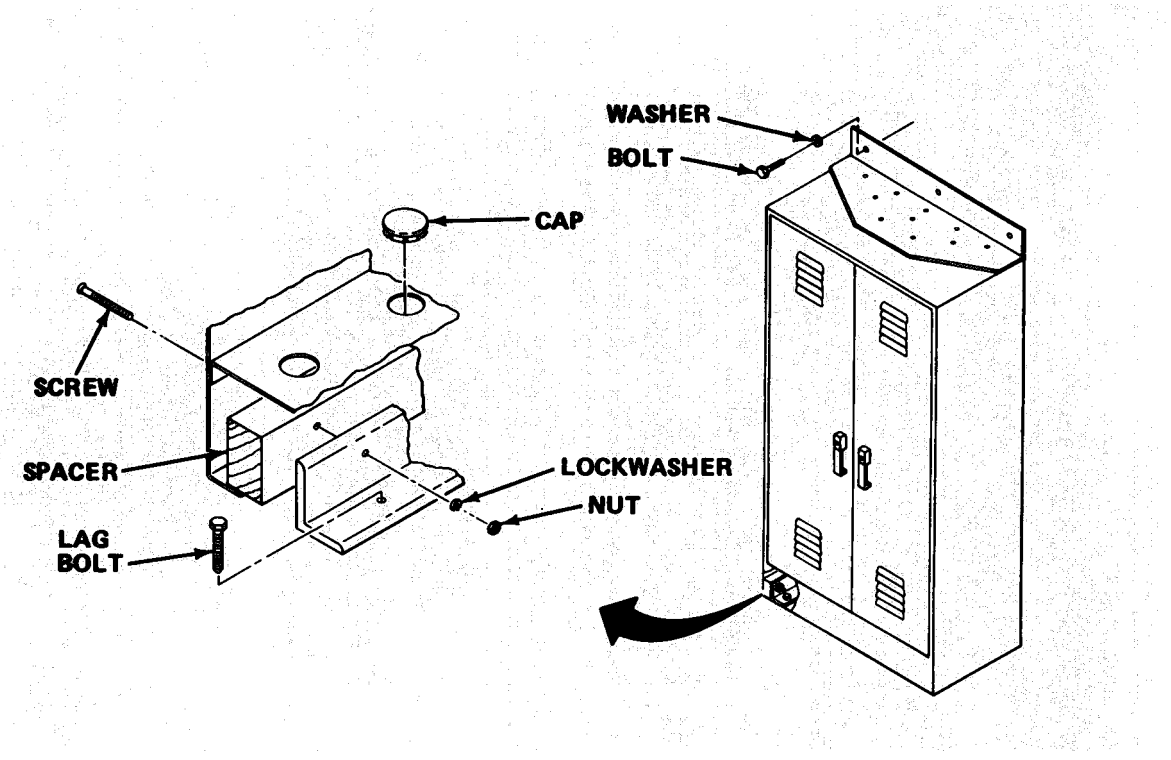
c. Install new cabinet and secure to wall with lockwashers and bolts.

9-16.5 Remove/Install Chemical Storage Cabinet.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 1/4 in. Drive Socket Set
6 in. Extension, 1/4 in. Drive
11/32 in. Combination Wrench
Flat Tip Screwdriver
Cross Tip Screwdriver

SUPPLIES: Supply Cabinet



a. Remove bolts and washers holding cabinet to wall.

b. Remove caps and lag bolts holding mounting bracket to floor and remove cabinet.

c. Remove screws, lockwashers, and nuts and remove mounting brackets and spacers from cabinet. Retain mounting brackets and spacers for use on new cabinet.

d. Position spacers and mounting brackets on new cabinet, and install but do not tighten nuts, lockwashers, and screws.

e. Place new cabinet in position, and install but do not tighten lag bolts.

f. Secure cabinet to wall with washers and bolts.

g. Tighten the bracket retaining bolts and nuts.

h. Tighten the bolts holding the mounting brackets to the floor, and install the caps.

9-16.6 Remove/Install Map and Plan Security Cabinet.

MOS: 83FJ6, Reproduction Equipment Repairer

PERSONNEL: Two persons are required to perform this procedure.

TOOLS: 1/2 in. Drive Ratchet
1 1/8 in. Socket, 1/2 in. Drive
3 in. Extension, 1/2 in. Drive

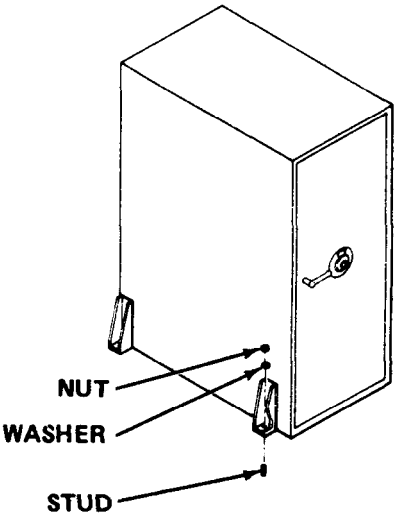
SUPPLIES: Map and Plan Security Cabinet

a. Open cabinet.

b. Remove contents and temporarily store in secure area.

c. Tape lock combination to outside of cabinet.

d. Remove nuts and washers.



WARNING

Serious injury may result if security filing cabinet is removed or replaced in the section without using adequate lifting equipment.

e. Move cabinet to door.

f. Remove cabinet from section.

g. Position new cabinet over studs and reinstall washers and nuts.

h. Have lock combination changed on cabinet before replacing material in cabinet.

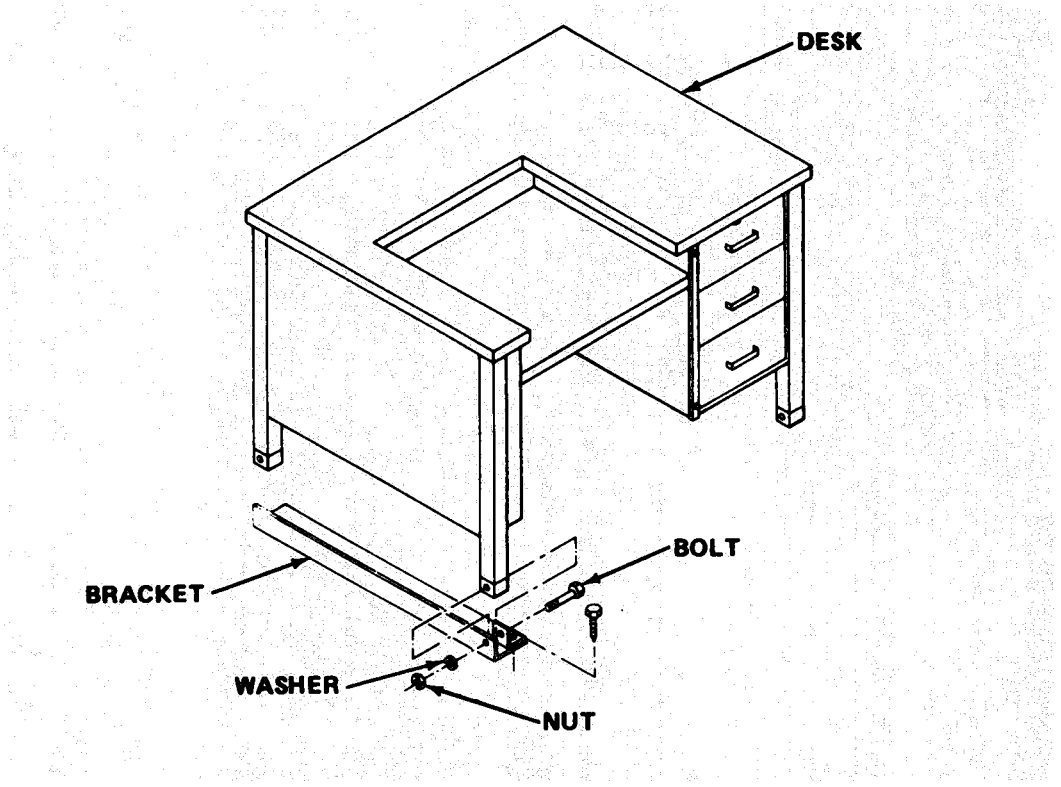
9-16.7 Remove/Install Typewriter Desk.

MOS: 83FJ6, Reproduction Equipment Repairer

PERSONNEL: Two persons are required to perform this procedure.

TOOLS: 1/4 in. Drive Ratchet
1/2 in. Socket, 1/4 in. Drive
3 in. Extension, 1/4 in. Drive

SUPPLIES: Typewriter Desk



a. Remove typewriter (paragraph 10-16.1).

b. Remove mounting bolts, washers, and nuts.

c. Remove desk.

d. Position new desk and line up holes with mounting bracket.

e. Secure with bolts, washers, and nuts.

f. Replace typewriter (paragraph 10-16.1).

9-16.8 Remove/Install Security Filing Cabinet.

MOS: 83FJ6, Reproduction Equipment Repairer

PERSONNEL: Two persons are required to perform this procedure.

TOOLS: 1/2 in. Drive Ratchet
1 1/8 in. Socket, 1/2 in. Drive
3 in. Extension, 1/2 in. Drive

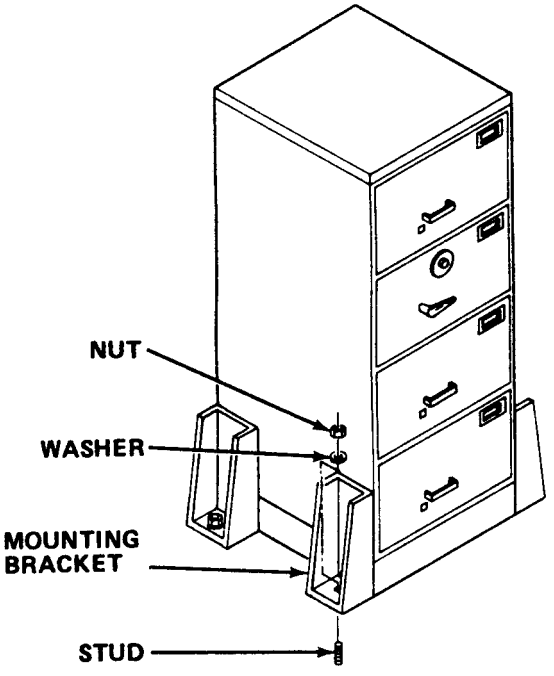
SUPPLIES: Security Filing Cabinet

a. Open cabinet.

b. Remove contents and temporarily store in secure area.

c. Tape lock combination to outside of cabinet.

d. Remove nuts and washers.



WARNING

Serious injury may result if security filing cabinet is removed or replaced in the section without using adequate lifting equipment.

e. Move cabinet to door.

f. Remove cabinet from section.

g. Position new cabinet over studs and reinstall washers and nuts.

h. Have combination lock changed to new combination before storing material in security filing cabinet.

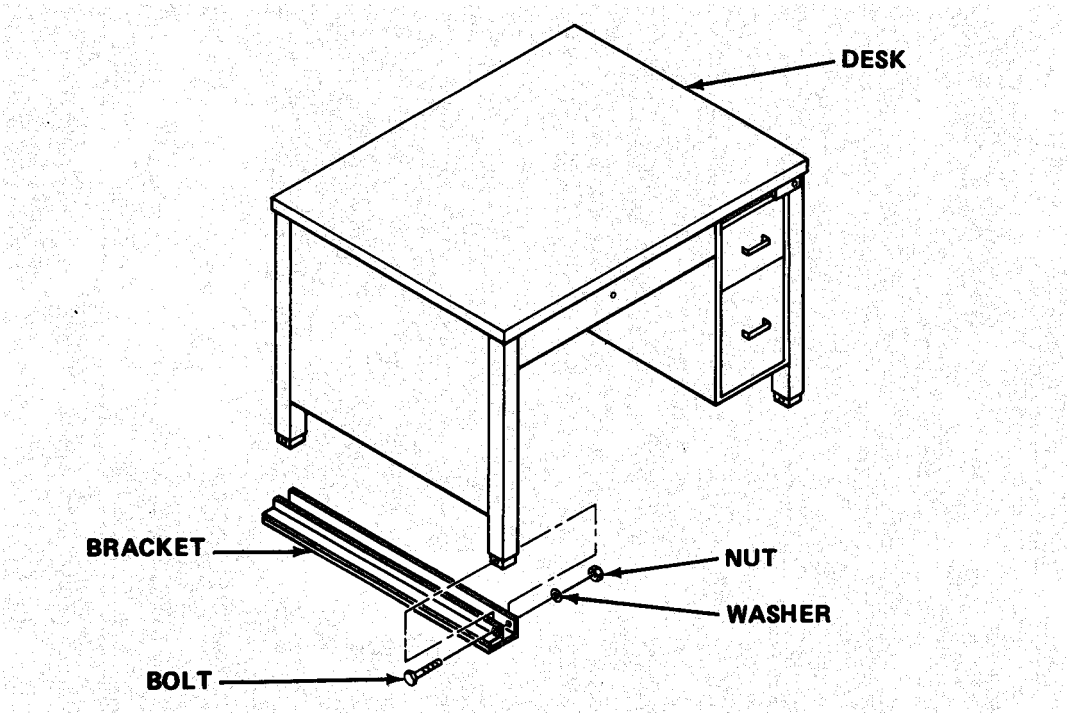
9-16.9 Remove/Install Flat Top Desk.

MOS: 83FJ6, Reproduction Equipment Repairer

PERSONNEL: Two persons are required to perform this procedure.

TOOLS: 1/4 in. Drive Ratchet
1/2 in. Socket, 1/4 in. Drive
3 in. Extension, 1/4 in. Drive

SUPPLIES: Flat Top Desk



a. Remove material from drawers. Lock drawers and tape key to desk.

b. Remove mounting bolts, washers, and nuts.

c. Remove desk.

d. Position new desk and line up holes with mounting bracket.

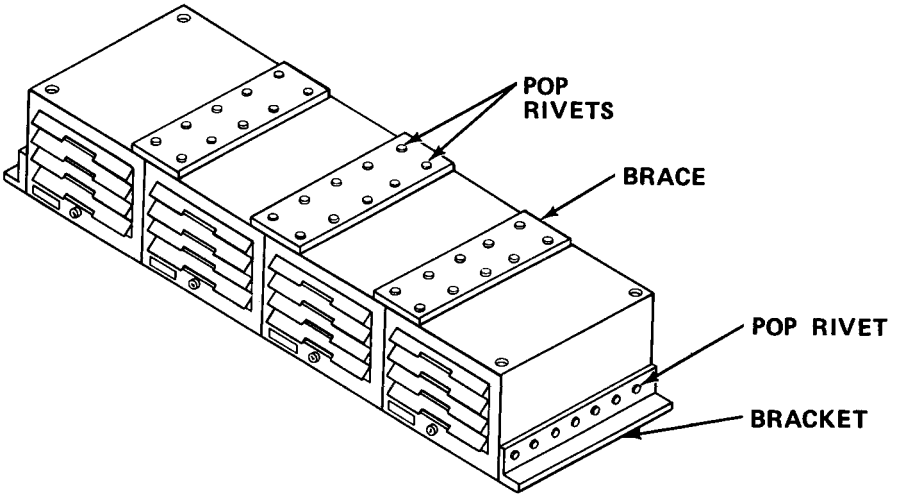
e. Secure with bolts, washers, and nuts.

9-16.10 Remove/Install Visible Index File(s).

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS : 1/4 in. Electric Drill
Pop Rivet Gun
Drill Index
1/2 in. Combination Wrench

SUPPLIES: Visible Index File(s)
Pop Rivets



a. Drill out pop rivets from brace(s) and bracket(s) of defective visible index file(s).

b. Remove defective file(s).

c. Install new file(s).

d. Reinstall brace(s) and bracket(s) with pop rivets.

9-16.11 Remove/Install Diazo Support Cabinet.

MOS: 83FJ6, Reproduction Equipment Repairer

PERSONNEL: Two persons are required to perform this procedure.

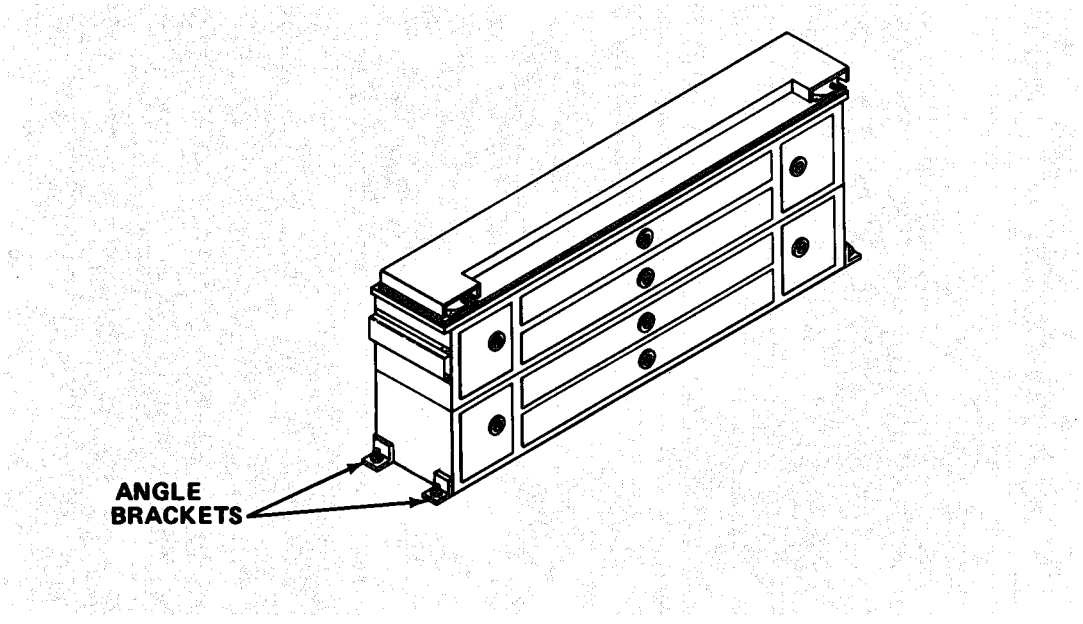
TOOLS: Drill and Bits
9/16 in. Combination Wrench
7/16 in. Combination Wrench
1-1/8 in. Socket, 1/2 in. Drive
1/2 in. Drive Ratchet
3 in. Extension, 1/2 in. Drive

SUPPLIES: Tape
Diazo Support Cabinet

a. Remove Diazo supplies from cabinet. Check that all ammonia and absorber containers are securely capped.

b. Unplug Diazo copier. Coil and tape cord.

c. Pull away tubing from cabinet into Diazo and tape to Diazo copier.



d. Remove mounting bolts and washers, then remove Diazo copier.

e. Remove Diazo copier mounting plate from top of cabinet by removing bolts, washers, and nuts.

f. Remove portable tracing/scribing boards from mounting bracket.

g. Remove portable tracing/scribing board mounting bracket from Diazo cabinet by drilling out pop rivets.

h. Remove bolts and washers from angle brackets. Then remove cabinet.

i. Install new cabinet. Aline with angle brackets and secure with bolts and washers.

j. Reinstall Diazo mounting plate on top of cabinet and secure with bolts, washers, and nuts.

k. Mount Diazo copier to Diazo mounting plate and secure with bolts and washers.

l. Reinstall mounting bracket for portable tracing/scribing boards.

m. Reinstall portable tracing/scribing boards in mounting bracket.

n. Reinstall tubing from Diazo copier to cabinet. Check that there are no kinks or bends in the tubing.

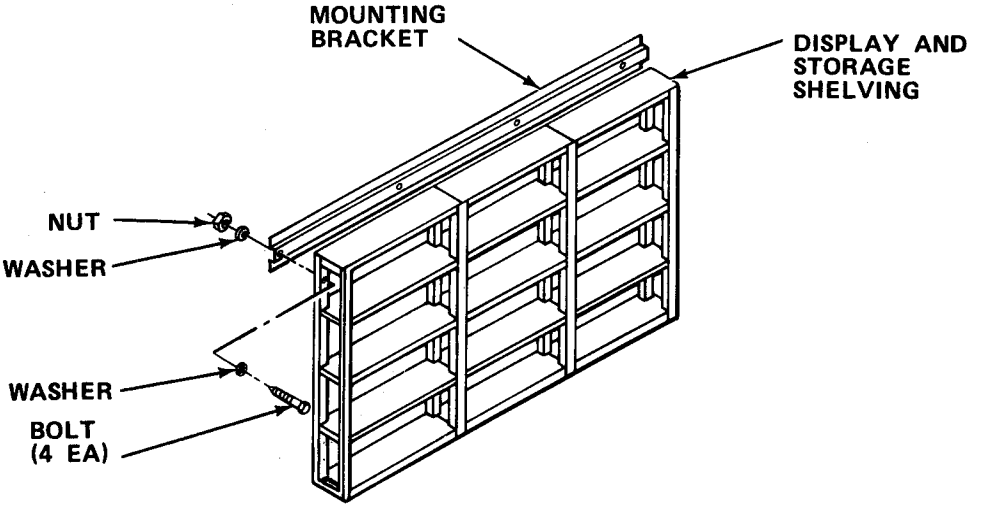
9-16.12 Remove/Install Display and Storage Shelving.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS : 1/2 in. Drive Ratchet
1/2 in. Socket, 1/2 in. Drive
3 in. Extension, 1/2 in. Drive

SUPPLIES: Display and Storage Shelving

a. Remove equipment and supplies from shelving.



b. Remove nuts, bolts, and washers from mounting bracket.

c. Remove lag bolts holding shelving to the floor.

d. Replace display and storage shelving.

e. Aline shelving holes with holes in mounting brackets and holes in floor.

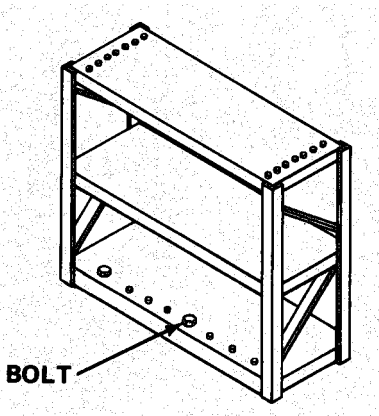
f. Reinstall nuts, bolts, and washers.

9-16.13 Remove/Install Accessory Storage Shelf.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 1/2 in. Combination Wrench

SUPPLIES: Accessory Storage Shelf



a. Remove bolts and washers holding shelf to floor.

b. Remove bolts and washers holding shelf to wall.

c. Remove defective shelf.

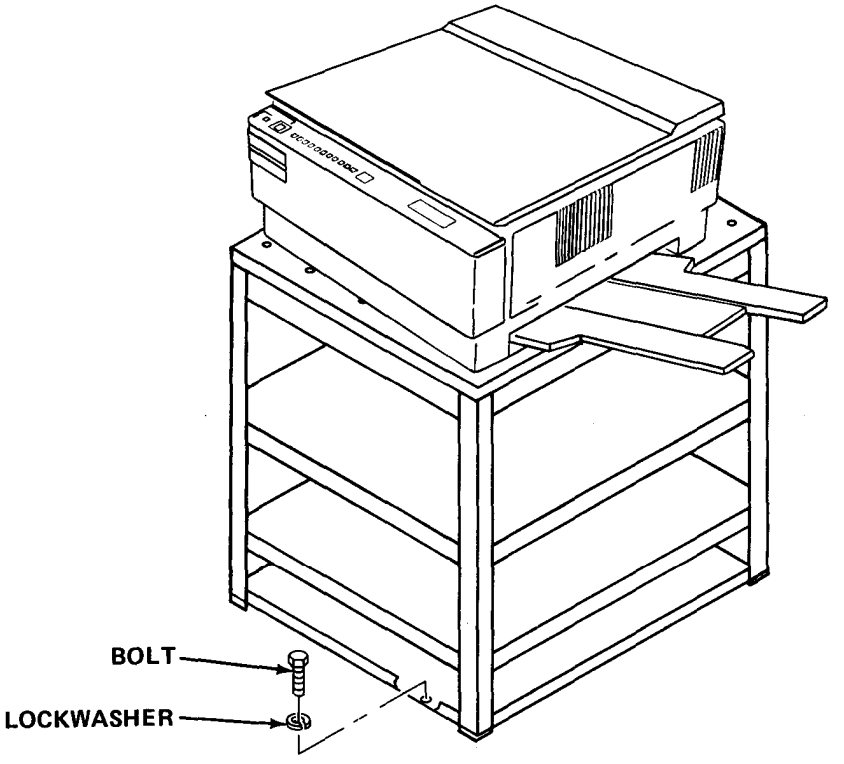
d. Install new shelf and secure with bolts and washers.

9-16.14 Remove/Install Copier Stand/Shelving.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS : 1/2 in. Combination Wrench

SUPPLIES: Copier Stand/Shelving



a. Remove bolts and lockwashers holding defective stand/shelving to floor.

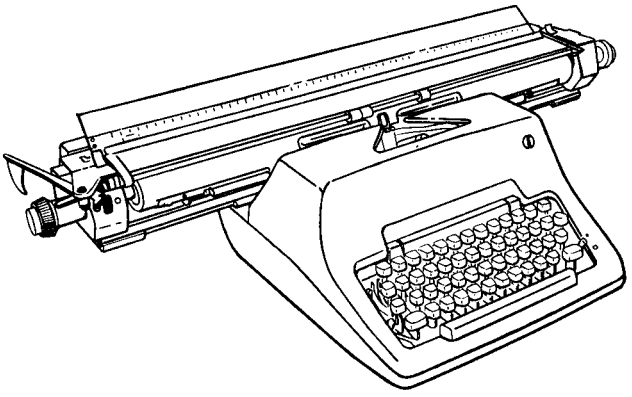
b. Remove defective stand/shelving.

c. Install new stand/shelving and secure with bolts and lockwashers.

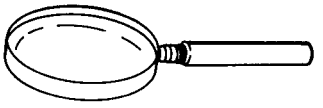
9-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

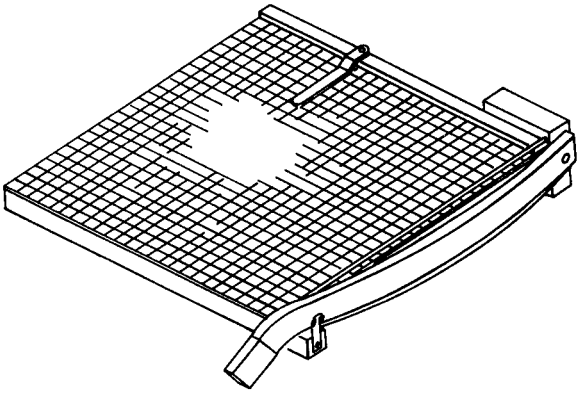
There are no direct/general support maintenance procedures assigned for this equipment.



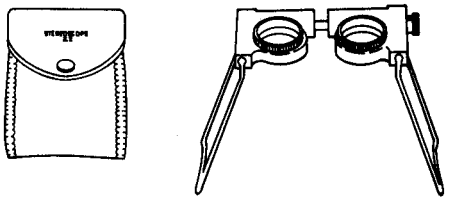
MANUAL TYPEWRITER



MONOCULAR
MAGNIFIER



PAPER TRIMMER



POCKET STEREOSCOPE

CHAPTER 10

SUPPORT ITEMS

Section I INTRODUCTION

10-1. GENERAL INFORMATION.

10-1.1 Scope. This chapter covers the support items contained in this section. The support items consist of the following equipment:

a. Model P/N 12070C Monocular Magnifier

b. Model FED-99-T-678 Paper Trimmer

c. Type 1 Pocket 2X Stereoscope

d. Model SG3B Manual Typewriter

10-2. EQUIPMENT DESCRIPTION.

10-2.1 Equipment Characteristics, Capabilities, and Features.

a. Monocular magnifier. Hand held magnifier.

b. Paper trimmer. Cuts paper up to 24 in. wide.

c. Pocket stereoscope. Optically matches and gives operator an apparent single image of two maps or photographs.

d. Manual typewriter. Refer to operator's manual supplied with the typewriter for characteristics, capabilities, and features.

10-2.2 Equipment Data.

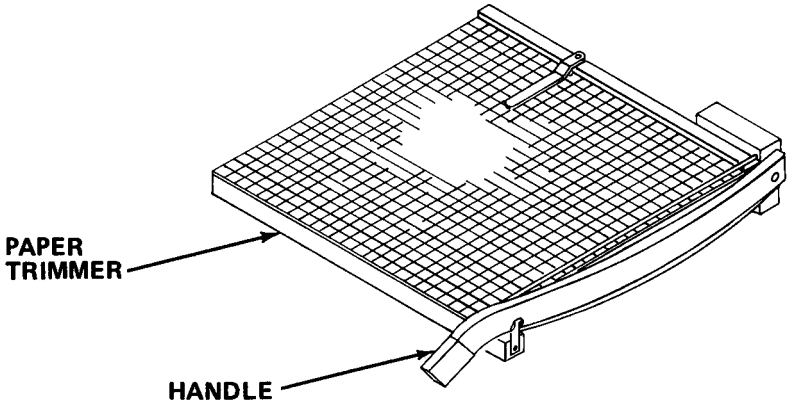
Manual typewriter. Refer to operator's manual supplied with the typewriter for equipment data.

10-3. TECHNICAL PRINCIPLES OF OPERATION. Principles of operation are combined with operator controls and indicators.

Section II OPERATING INSTRUCTIONS

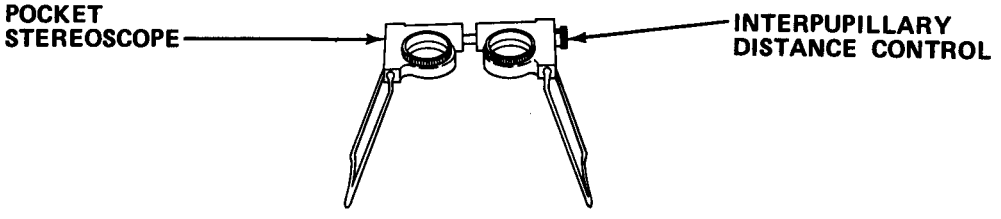
10-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.

10-4.1 Paper Trimmer.



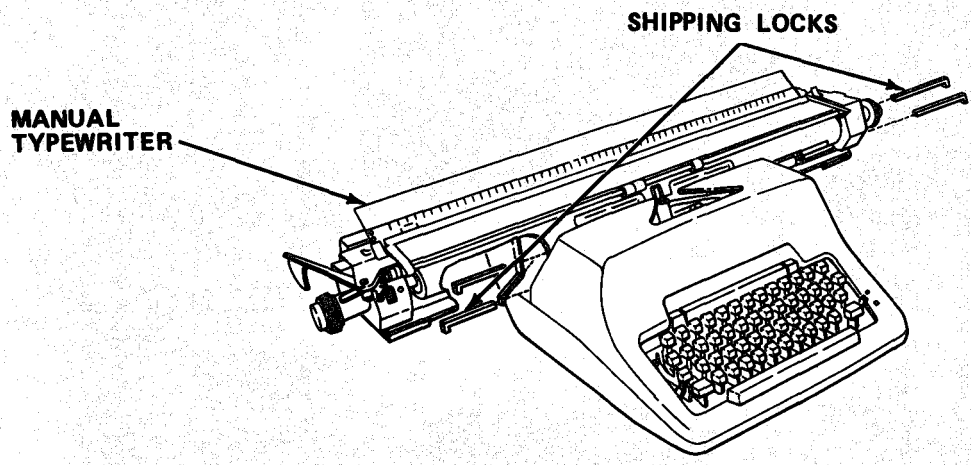
Control or Indicator	Function
Handle	Operates cutter.

10-4.2 Pocket Stereoscope.



Control or Indicator	Function
Interpupillary Distance Control	Adjusts interpupillary distance of lenses to match that of viewer.

10-4.3 Manual Typewriter. Refer to the owner's manual supplied with the typewriter for the controls and indicators not shown.



Control or Indicator	Function
Shipping Locks	Lock carriage when typewriter is being transported.

10-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails To Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

10-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

g. Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Equipment	Items	Quantity
Monocular Magnifier	Lens Tissue (Item 30, Appendix E)	ar
Pocket Stereoscope	Lens Tissue (Item 30, Appendix E)	ar
Manual Typewriter	Typewriter Ribbon	1 ea

Table 10-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can safely be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B- Before
D- During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biannually

(Number) - Hundreds of Hours

ITEM NO	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available if:
		SUPPORT ITEMS	
1	B	1. Inspect lens for cracks or breaks. 2. Clean lenses with lens tissue.	Lens is cracked or broken.
2	B	Service Monocular Magnifier. Wipe surface of lens with lens tissue to remove dust and dirt.	
3	B	Paper Trimmer. Inspect paper trimmer for structural damage and proper operation of blade.	Blade will not operate.
4	B	Pocket Stereoscope. 1. Inspect lenses for dust, dirt, cracks, or breaks. 2. Clean lenses with lens tissue. 3. Inspect housing and legs for cracks or breaks.	Cracks or breaks in lens, housing, or legs.

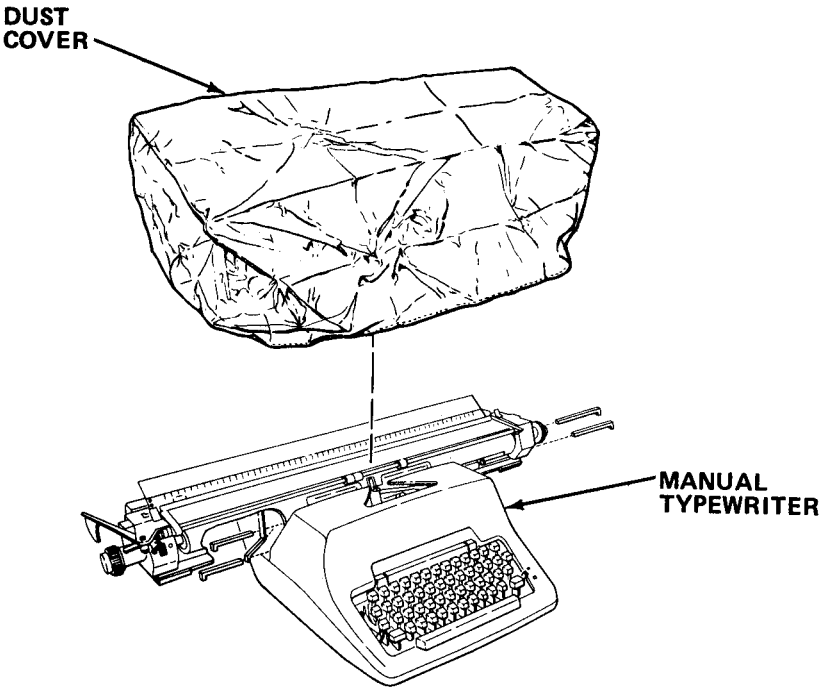
Table 10-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

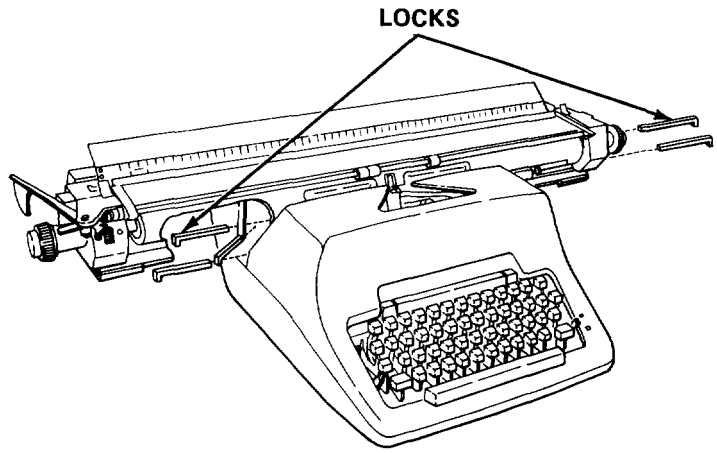
(Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS - Cont	
5	W	Manual Typewriter.	
			
		1. Remove dust cover.	
		2. Check that typewriter is mounted securely.	
		3. Check that typewriter ribbon is installed.	Ribbon not installed.
		4. Replace dust cover.	
6	S	Replace Typewriter Ribbon on Manual Typewriter. Refer to your operator's manual for replacement of ribbon.	

10-6. OPERATION UNDER USUAL CONDITIONS.

10-6.1 Assembly and Preparation for Use

10-6.1.1 Manual Typewriter.



a. Remove dust cover.

b. Remove locks.

10-6.2 Operating Procedures.

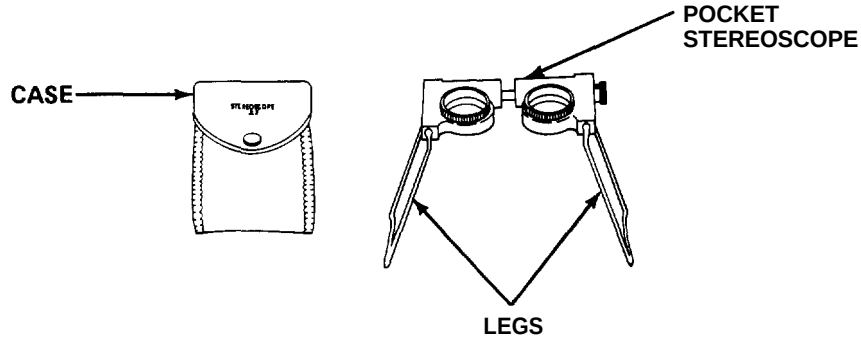
a. Monocular magnifier.

(1) Hold lens a few inches from viewing eye.

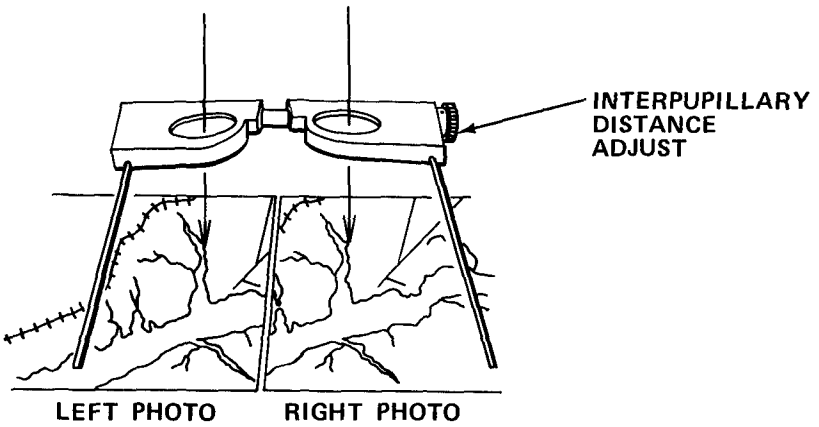
(2) Move magnifier toward and away from object until it comes into focus.

b. Pocket stereoscope.

(1) Position photographs in preparation for viewing in stereo.



(2) Remove pocket stereoscope from case and unfold legs.



(3) Set pocket stereoscope on photograph so that left lens is over left photograph and right lens is over right photograph.

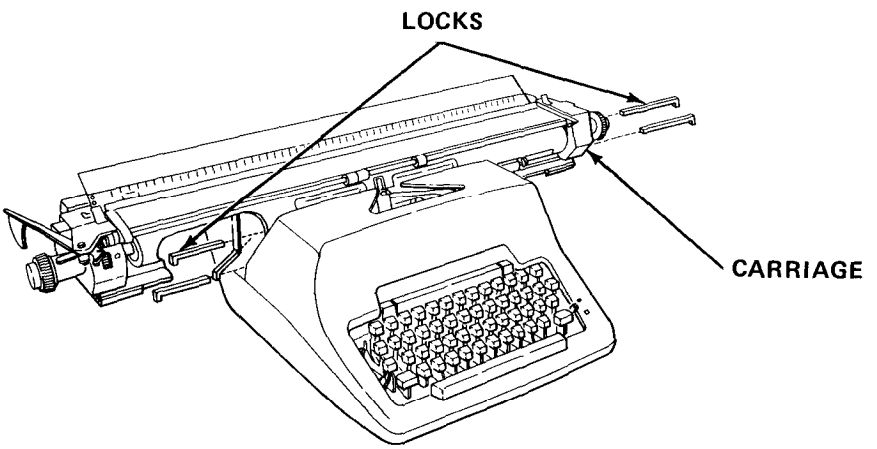
(4) Adjust interpupillary distance between lenses until it matches that of viewer.

(5) Locate detail to be viewed on left photograph and center left lens over it.

(6) Move right photograph until the same detail is centered under right lens. When viewed simultaneously, two details should merge into one. Adjust photographs until this effect is achieved.

10-6.3 Preparation For Movement.

10-6.3.1 Manual Typewriter.



a. Install locks on carriage.

b. Replace dust cover.

10-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

10-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

10-9. TROUBLESHOOTING PROCEDURES. There are no operator troubleshooting procedures assigned for this equipment.

10-10. MAINTENANCE PROCEDURES. There are no operator maintenance procedures assigned for this equipment.

Section IV ORGANIZATIONAL MAINTENANCE

10-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

10-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

10-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

10-12.2 Special Tools; Test, Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

10-12.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-324-24P covering organizational maintenance for this equipment.

10-13. SERVICE UPON RECEIPT.

10-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

10-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

10-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES. There are no organizational troubleshooting procedures assigned for this equipment.

10-16. MAINTENANCE PROCEDURES.

a. This section contains instructions covering organizational maintenance functions for the support items. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

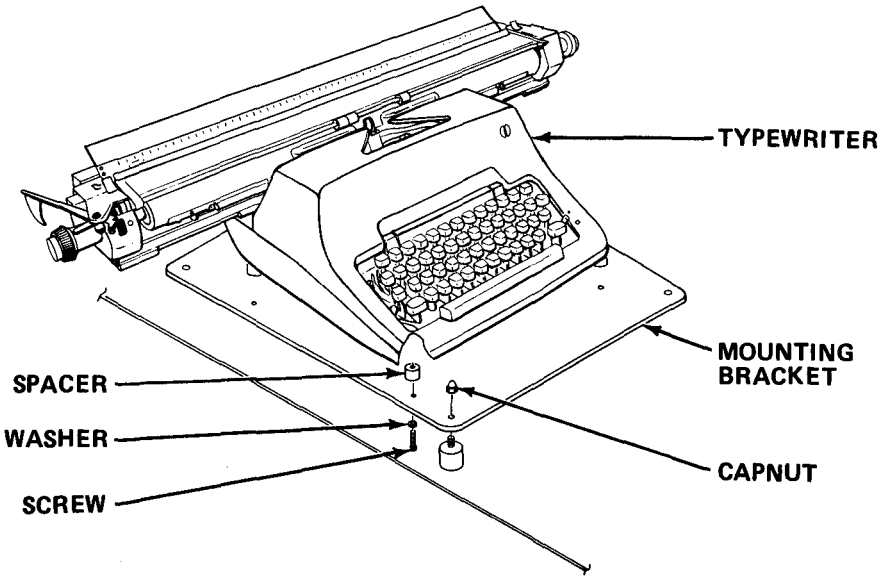
INDEX

10-16.1 Remove/Install Manual Typewriter.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: Flat Tip Screwdriver
8 in. Adjustable Wrench

SUPPLIES: Typewriter



a. Remove capnuts from mounting bracket.

b. Remove typewriter and mounting bracket.

c. Remove screws, washers, and spacers securing typewriter to mounting bracket.

d. Remove defective typewriter.

e. Secure new typewriter to mounting bracket with spacers, washers, and screws.

f. Install new typewriter and bracket.

g. Secure mounting bracket with capnuts.

10-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

There are no direct/general support maintenance procedures assigned for this equipment.

APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual.

A-2. FORMS.

Recommended Changes to Publications and Blank Forms. . . . . DA Form 2028

Recommended Changes to Equipment Technical Publications . . . . . DA Form 2028-2

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404

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

Quality Deficiency Report . . . . . .SF 368

A-3. FIELD MANUALS.

Camouflage. . . . . .FM 5-20

Nuclear, Biological and Chemical (NBC)
Defense (Reprinted w/Basic Incl Cl) . . . . . .FM 21-40

Basic Cold Weather Manual . . . . FM 31-70

Northern Operations . . . . . .FM 31-71

Metal Body Repair and Related Operations . . . . . FM 43-2

First Aid for Soldiers . . . . . FM 21-11

A-4. TECHNICAL MANUALS.

Administrative Storage of Equipment . . . . . TM 740-90-1

Chemical, Biological and Radiological (CBR)
Decontamination . . . . . TM 3-220

Operator, Organizational, Direct Support and General
Support Maintenance Manual: Air Conditioner, Horizontal,
Compact, 208-Volt, 3-Phase, 18,000 Btu Cooling, 12,000
Btu Heating . . . . . TM 5-4120-367-14

Operator, Organizational, Direct Support and
General Support Maintenance Manual for Chassis,
Semi-Trailer, Container Transporter (ADCOR) . . . . . TM 5-2330-305-14

Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Air Conditioner/Heater . . . . . TM 5-4120-367-24P

Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Chassis, Semi-Trailer, Container Transporter (ADCOR) . . . . . TM 5-2330-305-24P

Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List (RPSTL) (Including Depot Maintenance Repair Parts and Special Tools) for Information Section . . . . . TM 5-6675-324-24P

Painting Instructions for Field Use . . . . . TM 43-0139

Procedure for the Destruction of Equipment to Prevent Enemy Use. . . . . TM 750-244-3

Use and Care of Hand Tools and Measuring Tools . . . . . TM 9-243

Operator, Organizational, Direct Support and General Support Maintenance Manual for Copying Machine, Diazo Process, Model GAF 185.FL . . . . . TM 5-3610-256-14

Organizational, Direct Support and General Support Maintenance Manual Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Copying Machine, Diazo Process, Model GAF 185 FL . . . . . .TM 5-3610-256-24P

Operator, Organizational, and Direct Support Maintenance Manual for Canon Plain Paper Copier, Model NP200. . . . . TM 5-6740-315-13

Organizational and Direct Support Maintenance Manual Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Canon Plain Paper Copier, Model NP200 . . . . . .TM 5-6740-315-23P

A-5. MISCELLANEOUS PUBLICATIONS.

Lubrication Order: Topographic Support System Information Section, Model ADC-TSS-13. . . . . LO 5-6675-324-12

Lubrication Order: Topographic Support System Chassis, Semi-Trailer, Container Transporter (ADCOR) . . . . . LO 5-2330-305-12

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 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. Aline. 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 equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known 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 3d position code of the SMR code.

i. Repair. The application of maintenance services1, including fault location/-troubleshooting2, removal/installation, and disassembly/assembly3 procedures, and 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 material 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 detailed explanation of these functions, see paragraph B-2.)

---

[1]Services - Inspect, test, service, adjust, aline, 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.

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 varies 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 operation 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:

C . . . . Operator or Crew

O . . . . Organizational Maintenance

F . . . . Direct Support Maintenance

H . . . . General Support Maintenance

L . . . . Specialized Repair Activity[5]

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 alphabetical order, which shall be keyed to the remarks contained in Section IV.

[5]This maintenance category is not included in Section II, column (4) of the Maintenance Allocation Chart. To identify functions to this category of maintenance, enter a work time figure in the "H" column of Section II, column (4), and use an associated reference code in the Remarks column (6). Key the code to Section IV, Remarks, and explain the SRA complete repair application there. The explanatory remark(s) shall reference the specific Repair Parts and Special Tools List (RPSTL) TM which contains additional SRA criteria and the authorized spare/repair parts.

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 Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
00	INFORMATION SECTION	Overhaul					**		
01	VAN BODY (ISO CONTAINER)	Inspect	0.8						
		Service	0.9	0.5				8,11,12,14	E
		Repair		1.0	1.5	2.0		1,3,6,17	
	FLUORESCENT LIGHT ASSY	Repair	0.1	0.7				1	
	BLACKOUT/DOME LIGHT ASSY	Repair	0.2						
	EXHAUST FAN ASSEMBLY	Repair		0.5				1	
	AIR CONDITIONER/ HEATER ASSY	Replace				2.0		1	C
	ELECTRICAL ASSY	Inspect		0.5				3	C
		Repair		0.9	1.0			1,3	
	TELEPHONE BINDING POST ASSY	Repair		0.7				1	
	EMERGENCY LIGHT ASSY	Replace		0.3				1	
	TIEDOWN SOCKET ASSY	Replace		0.3				6	
	LEVEL INDICATOR ASSY	Repair		0.6				2,3	
	BLACKOUT CURTAIN ASSY	Repair		1.0				6	
	PERSONNEL LADDER ASSY	Repair		0.8				6,17	E
	PERSONNEL/CARGO DOOR ASSY	Replace			1.5			6	
		Repair			2.0			6	

**Depot will determine work time.

Section II. MAINTENANCE ALLOCATION CHART - Cont.

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
02	PORTABLE TRACING/ SCRIBING BOARD	Inspect	0.2						
		Service	0.2						
		Repair	0.3	0.5				1,10	
03	PLAIN PAPER COPIER	Inspect	0.2						
		Service	1.0	1.0	0.3			1,3,6,20,21	
		Adjust			1.5			5,6,16	
		Replace			0.3				
		Repair			4.5			4,5	
	LOWER MAIN BODY	Repair			2.0				
	DC CONTROLLER PC BOARD	Replace			0.5			5	B
	AC DRIVER PC BOARD	Replace			0.5			5	B
	CONNECTOR PC BOARD	Replace			0.5			5	B
	LAMP REGULATOR PC BOARD	Replace			0.5			5	B
	UPPER MAIN BODY	Adjust			0.3			3,5	
		Repair			1.0			1,4,5,6	
		Replace			0.3				
	FRONT COVER ASSEMBLY	Repair			0.2			1	
	DEVELOPING ASSEMBLY	Service			0.3			5	
		Adjust			0.5			3,18	
		Repair			0.5			1	
	COPY BOARD RAIL ASSEMBLY	Aline			0.3			3,21	
		Repair			0.5			3,16	
	FIXING ASSEMBLY	Adjust			0.3			3	
		Replace			0.5			1,3,5,21	

Section II. MAINTENANCE ALLOCATION CHART—Cont.

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
03	PLAIN PAPER COPIER - Cont								
	SECONDARY CORONA ASSEMBLY	Adjust Replace			0.3 0.5			5	
	PRIMARY CORONA ASSEMBLY	Adjust Replace			0.3 0.5			3	
	PRESCAN CORONA ASSEMBLY	Adjust Replace			0.3 0.5			3	
	TRANSFER CORONA ASSEMBLY	Adjust Replace			0.3 0.5			3	
	DRUM ASSEMBLY AND DRUM SHAFT	Replace Repair			0.5 0.5			3 3,16	 E
	CASSETTE HOLDER ASSEMBLY	Repair			0.5			3,20	E
	CLEANING ASSEMBLY	Repair			0.5			1,3,5,19	
04	THERMOGRAPHIC COPY MACHINE	Inspect Test Service Adjust	0.2 0.3 	 0.3 0.3 0.5				 10,11,15,16 3	 E
	ELECTRICAL ASSEMBLY	Inspect Repair		0.2 1.8				 3,4,16	 E
	PRINTED CIRCUIT BOARD	Replace		0.3					B
	BLOWER MOTOR ASSEMBLY	Replace		0.5				3	
	DRIVE MOTOR ASSEMBLY	Replace		0.5				3	

Section II. MAINTENANCE ALLOCATION CHART - Cont.

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
05	QUANTITY PROCESSING SYSTEM (PLANIMETER)	Inspect Service Repair	0.2 0.3 0.5					7	
	PLANIMETER ASSEMBLY	Inspect Aline Repair	0.2 0.5 0.7		0.5 0.8			5,16 5,9,11,13	E E
	LINEAR MEASURING PROBE ASSEMBLY	Inspect Service Aline	0.1 0.1 0.3						
	AUTO-SCALER ASSEMBLY	Inspect	0.2						
	MAIN LOGIC PC BOARD	Replace			0.3			5	B
	FRONT DISPLAY PC BOARD	Replace			0.5			4,5	B
	REAR INPUT PC BOARD	Replace			0.5			5	B
	SCALER PC BOARD	Replace			0.5			5	B
06	ULTRASONIC CLEANER	Inspect Repair	0.2	0.7				1	
	CIRCUIT BOARD	Replace		0.6				1	
07	POCKET CALCULATOR	Inspect Repair	0.3 0.2						
08	DIAZO PRINTER								D
09	FURNITURE AND CABINETS	Inspect Remove/ Install Repair	0.5	0.9 0.7				1,3,6,17 1,17	E E

Section II. MAINTENANCE ALLOCATION CHART - Cont.

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
10	SUPPORT ITEMS	Inspect Service Remove/ Install	0.8 0.5	0.3				6	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) Reference Code	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
1	O	Shop Equipment, Automotive Maintenance and Repair, Common #1 Plus Metric Option	4910-00-754-0654	
2	O	Tool Kit, Carpenters Eng. Squad	5180-00-293-2875	
3	O	Tool Kit, General Mechanic's Automotive Plus Metric Option	5180-00-177-7033	
4	O,F,H	Tool Kit, Electronic Equipment	5180-00-605-0079	
5	F,H	Tool Kit, Electronic Equipment	5180-00-610-8177	
6	O,F,H	Tool Kit, Light Machine Repair	5180-00-596-1540	
7	C	Brush, Lens	7920-00-205-0565	
8	C	Brush, Wire	7920-00-291-5815	
9	C	Knife, TL-29	5110-00-240-5943	
10	C	Screwdriver, Cross-tip No. 2	5120-00-234-8913	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS - Cont

(1) Reference Code	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO Stock Number	(5) Tool Number
11	C	Screwdriver, Flat Tip	5120-00-234-8910	
12	C	Wrench, Adjustable	5120-00-264-3795	
13	C	Wrench Set, Hex Head Key	5120-00-935-4641	
14	O	Spring Scale	6670-00-238-9777	
15	O	Test Resistor (86.6K OHM)		(76381) 78-9020-1385-9
16	O,F,H	Multimeter		(28480) 3435A
17	O,F,H	Rivet Gun	5120-00-017-2849	
18	F,H	Feeler Gage		(93389) OOMM25
19	F,H	Heat Gun	3540-01-112-3225	
20	F,H	Spring Gage (0-1500 grams)		(60939) CK-0054
21	F,H	Spring Hook	5120-00-901-7270	

Section IV. REMARKS

Reference Code	Remarks
A	Printed circuit boards will be repaired at the General Support maintenance level to the maximum extent possible as required by AR 750-1.
B	Replacement of printed circuit boards authorized by the MAC are those identified as damaged, or otherwise defective which - a. Can be readily removed/installed with easy to use tools. b. Do not require critical adjustment, calibration, or alinement before or after installation.
C	See TM 5-4120-367-14 for maintenance procedures.
D	See TM 5-3610-256-14 and TM 5-3610-256-24P for maintenance procedures.
E	Maintenance personnel and TSS section 7, maintenance van (which carries the required tools) are authorized by HHC TOE 05336 H600.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I INTRODUCTION

-1. SCOPE.

This appendix lists components of end item and basic issue items for the Information Section 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 Information Section in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the Information Section 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.

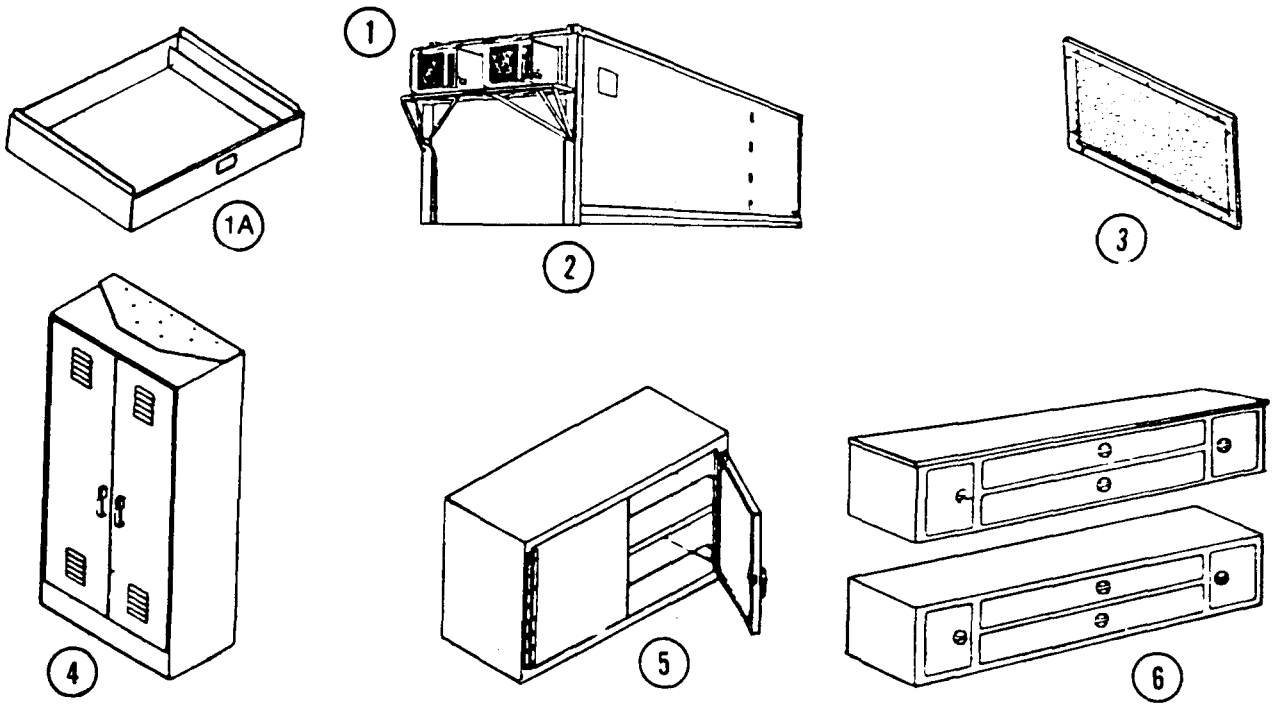
b. Column (2) - National Stock Number. Indicates the national stock number assigned to the item and will be used for requisitioning purposes.

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 FSCM (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 Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
1	4120-00-974-7206	AIR CONDITIONER (81349) MIL-A-52767	ea	2
1A		BASE, FILING CABINET: (88915) S4634	ea	1
2	6675-01-220-2584	VAN ASSEMBLY: MODIFIED (97403) 13225E3038	ea	1
3	7195-00-105-7941	BULLETIN BOARD, CORK: (79819) T5-2303	ea	1
4	7125-00-764-5744	CABINET, STORAGE, CHEMICAL: (78252) AA-C-1770	ea	1
5	7125-00-286-5259	CABINET, STORAGE, WALL: (81349) MIL-C-40060/1Type 1	ea	9
6		CABINET, STORAGE, DIAZO: (97403) 13225E3397	ea	1
		CABINET, STORAGE, DIAZO: (97403) 13225E3857	ea	1

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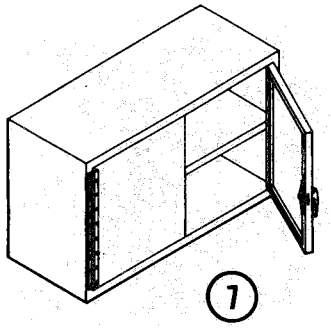
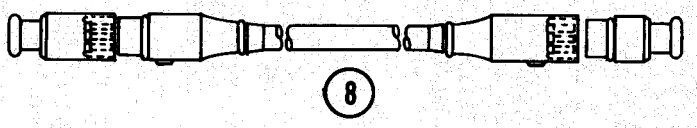
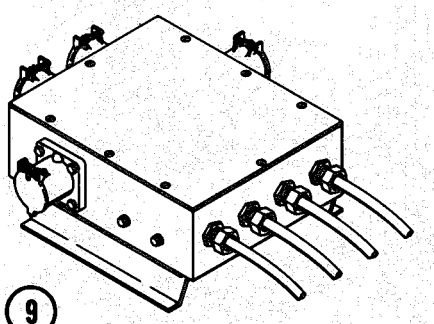
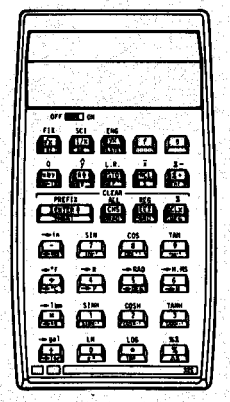
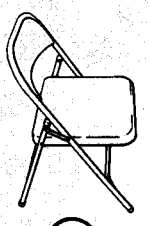
Section II COMPONENTS OF END ITEM - Cont





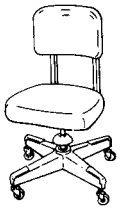






(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
7		CABINET, STORAGE, TECH MANUAL: (97403) 13225 E4648	ea	1
8	6150-00-134-0847	CABLE ASSEMBLY, POWER ELECTRICAL: (75477) 11601643, except 50.5 ft lg	ea	2
9	6150-01-081-9264	CABLE TERMINAL BOX ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: (51745) TL/TA 13222 E6250	ea	1
10	7420-01-139-7441	CALCULATING MACH INE: (51174) HP-32E	ea	1
11	7105-00-269-8463	CHAIR, FOLDING: (80063) SCD539471	ea	1

Section II COMPONENTS OF END ITEM - Cont



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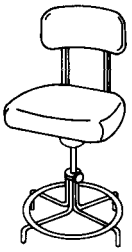

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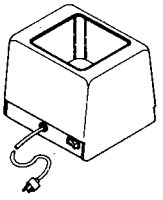

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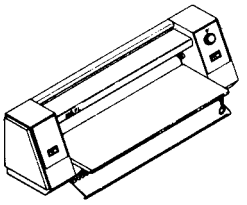

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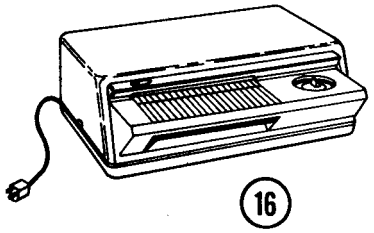

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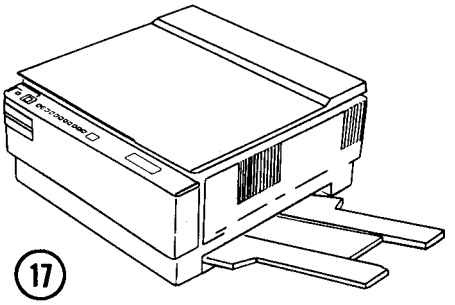

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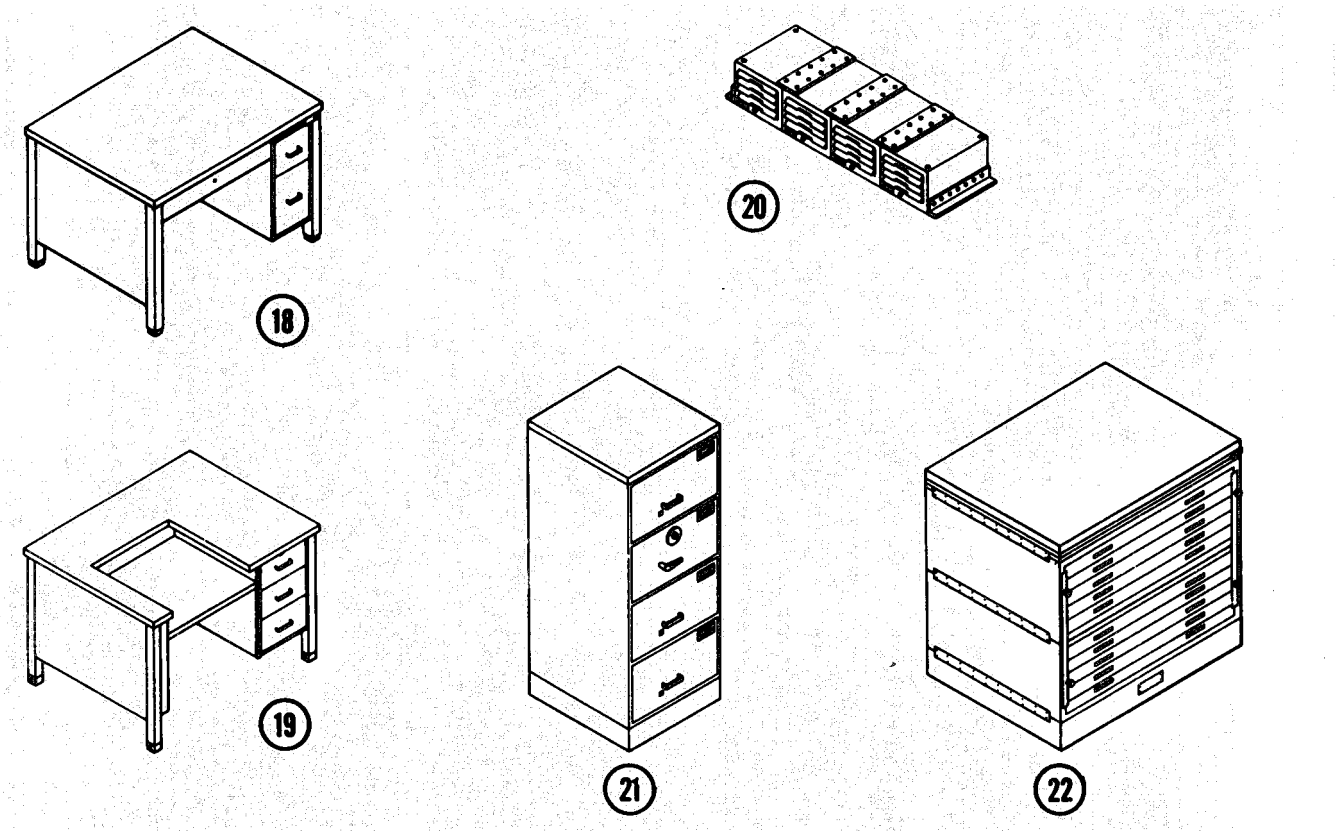
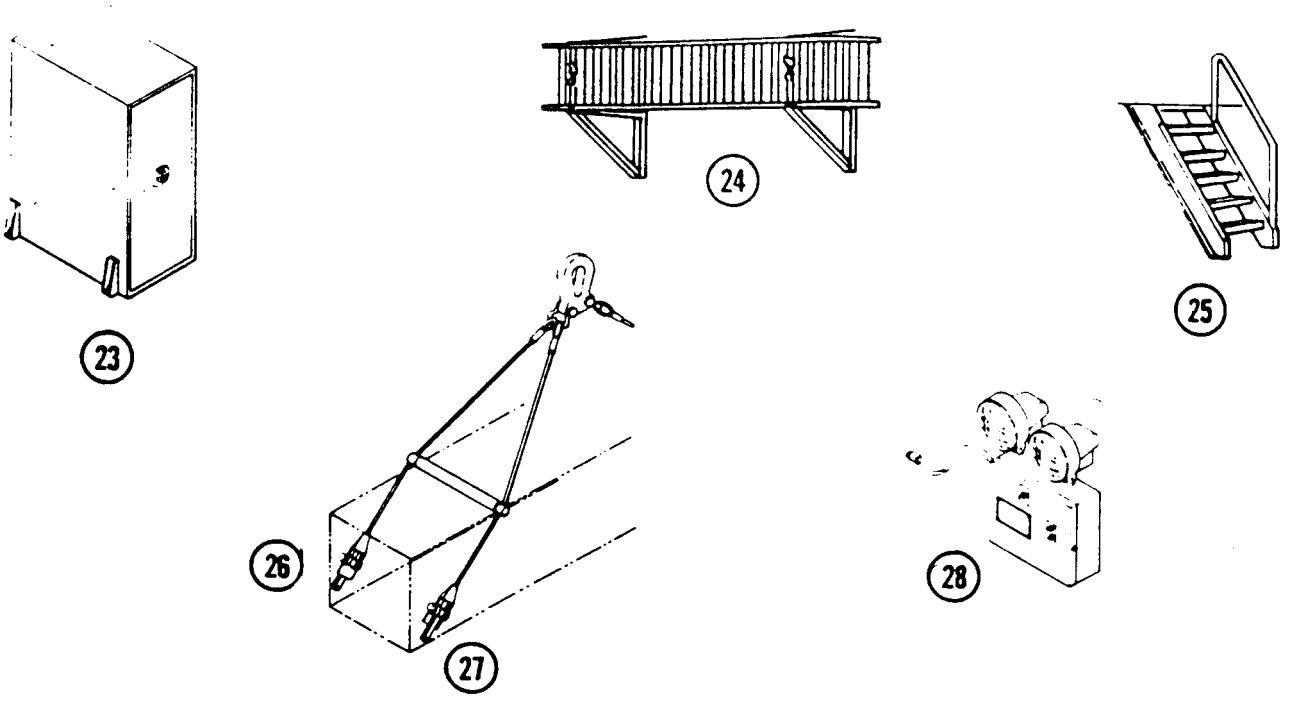
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
12	7110-00-273-8791	CHAIR, ROTARY: (8D190) UC-S-17	ea	
13	7110-00-281-4472	CHAIR, ROTARY: (8D190) UC-D42-L	ea	
14	4940-01-118-1890	CLEANER, ULTRASONIC: (79819) 3069 USC3	ea	
15	3610-01-123-7882	COPYING MACHINE, DIAZO PROCESS: (03641) 185. FL	ea	
16	3610-00-001-3585	COPYING MACHINE, THERMOGRAPHIC PROCESS: (76381) 45	ea	
17	3610-01-171-7848	COPIER, PLAIN PAPER: (60939) NP-200	ea	

Section II COMPONENTS OF END ITEM - Cont



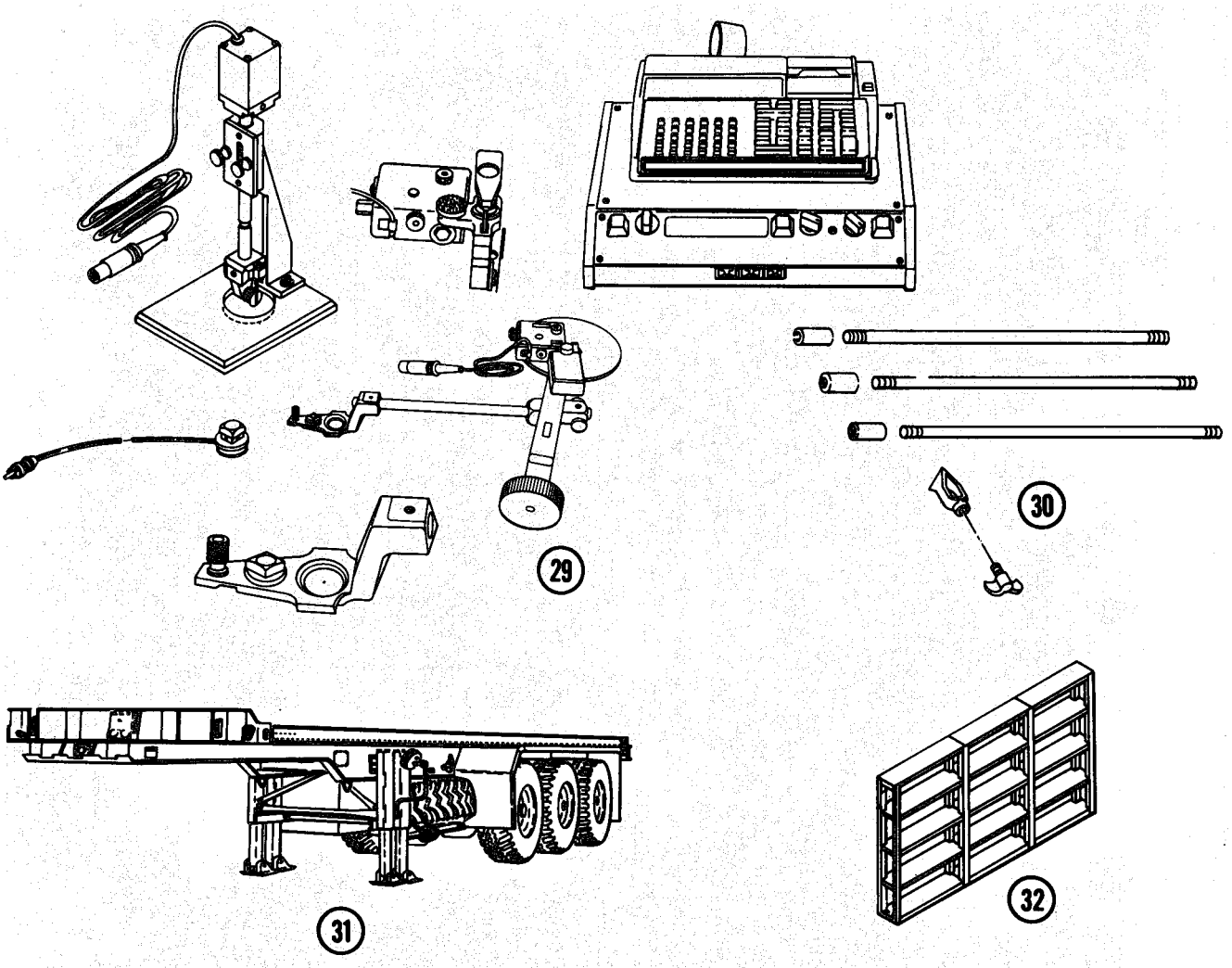
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
18	710-00-143-0830	DESK, FLAT TOP: (79819) HN-7303	ea	1
19	7110-00-143-0844	DESK, TYPEWRITER: (37296) AA-D-191, type II, class 2	ea	1
20	7460-00-913-1531	FILE, VISIBLE INDEX CABINET: (39428) 4871T11	ea	4
21	7110-00-920-9320	FILING CABINET, SECURITY: (544127) AA-F-358, class 6, size 3, 28 in. d, 52 in. h, 20.813 in. w	ea	2
22		FILING ASSEMBLY: Map/plan (97403) 13225 E3138	ea	2

Section II. COMPONENTS OF END ITEM - Cont



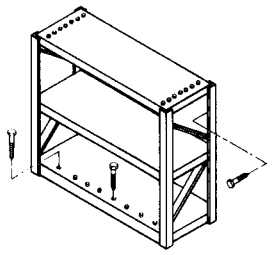
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
23	7110-00-068-7736	FILING CABINET, SECURITY: Map/plan (41729) 7110-00-068-7736HC, w/CTH-405905 and PHR 405904	ea	2
24	5440-01-152-7757	LADDER, EXTENSION-FOLDING: (39428) 8028T16	ea	1
25	2540-01-133-9726	LADDER, VEHICLE BOARDING: (97403) 13225E3074	ea	2
26		LIFTING AND TIEDOWN DEVICE, TRANSPORTABLE SHELTER: Left hand (52555) 1390-4	ea	2
27		LIFTING AND TIEDOWN DEVICE, TRANSPORTABLE SHELTER: Right hand (52555) 1390-3	ea	2
28		LIGHT, EMERGENCY (97403) 13225E3396	ea	1

Section II COMPONENTS OF END ITEM - Cont



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
29	6675-01-155-6592	PLANIMETER, QUANTITY PROCESSING SYSTEM: (36970) 12501, w/HP-97	ea	1
30	5975-00-878-3971	ROD, GROUND: (82370) A104	ea	1
31	2330-01-076-4797	SEMITRAILER, FLATBED: (97403) TL/MIL-B-13207, par. 3.11, fig. 12, tables III and IV	ea	1
32		SHELVES, STORAGE AND DISPLAY: (97403) 13225E3870	ea	1

Section II COMPONENTS OF END ITEM - Cont



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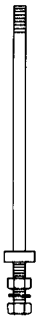

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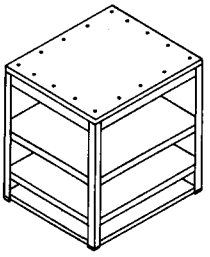

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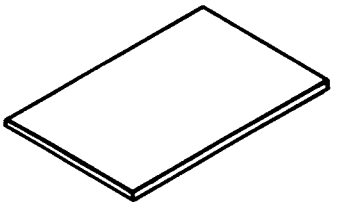

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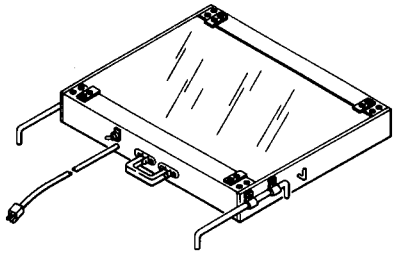

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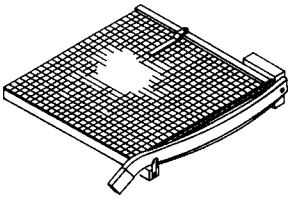

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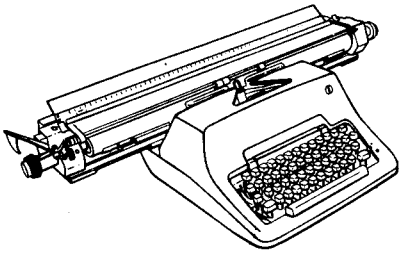
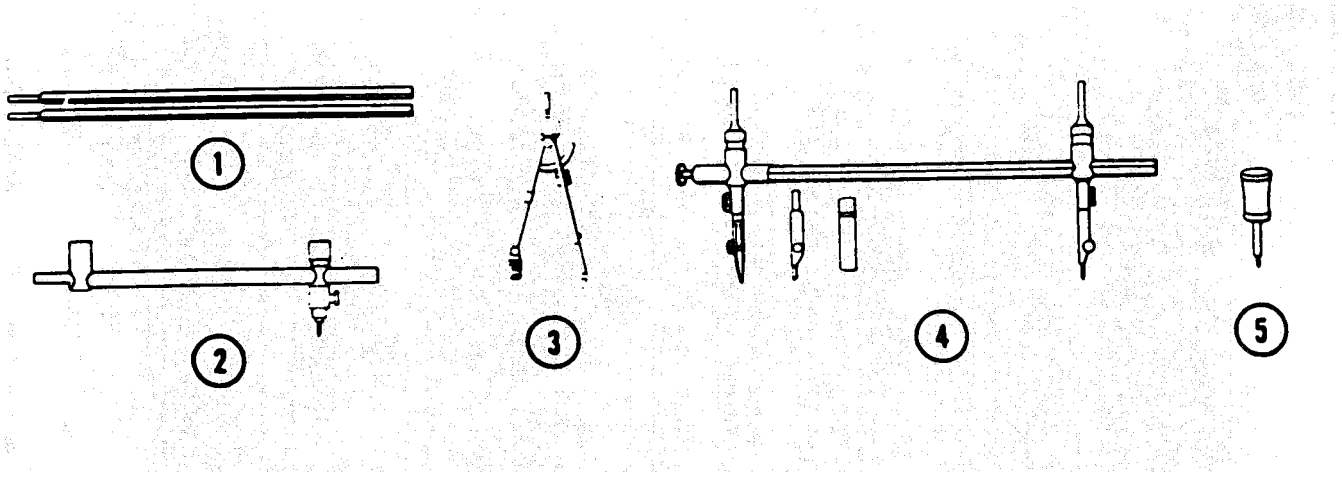


39

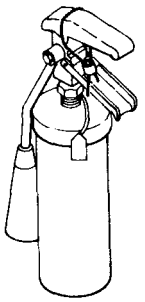
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
33		SHELVES, ACCESSORY STORAGE: (97403) 13225 E3866	ea	1
34	5120-01-013-1676	SLIDE HAMMER, GROUND ROD EMPLACEMENT: (45225) P74-144	ea	1
35		SHELVES, STAND, COPIER: (97403) 13225 E3896	ea	1
36		TOP, FILING CABINET: (88915) T3445	ea	2
37	6675-00-221-7121	TRACING BOARD, PORTABLE: (26954) 51J3	ea	2
38	7520-00-224-7621	TRIMMER, PAPER, DROP KNIFE: (81348) GG-T-678-Type-1 Class 5	ea	1
39	7430-00-663-9102	TYPEWRITER: (61634) Model S27	ea	1

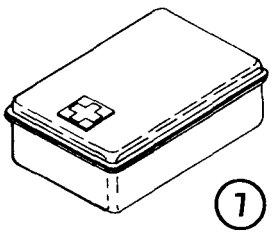
Section III. BASIC ISSUE ITEMS



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
1	6675-01-114-7226	BAR, EXTENSION, BEAM, COMPASS: (33363) 55-1318	ea	3
2	6675-01-071-8913	BEAM, ATTACHMENT, DRAFTING COMPASS: (75364) 3175BN	ea	2
	6675-01-186-6920	BOARD, CALIBRATION: (36970) 20188	ea	1
	7920-00-291-5812	BRUSH, DUSTING, DRAFTSMAN: (79819) Q6-38NB-010	ea	2
	7920-00-205-0565	BRUSH, DUSTING, LENS AND PHOTOGRAPHIC NEGATIVE: (17866) R698	ea	2
	7920-00-291-5815	BRUSH, WIRE, SCRATCH: (39428) 7187T2	ea	1
3	6675-00-459-8935	COMPASS, DRAFTING BEAM: (79819) 3175-N	ea	3
4	6675-00-904-1947	COMPASS, FREE BEAM: (33363) 55-1806	ea	3
5	6675-01-071-8912	COMPASS, DRAFTING LEAD ATTACHMENT: (79819) 3175LA	ea	3

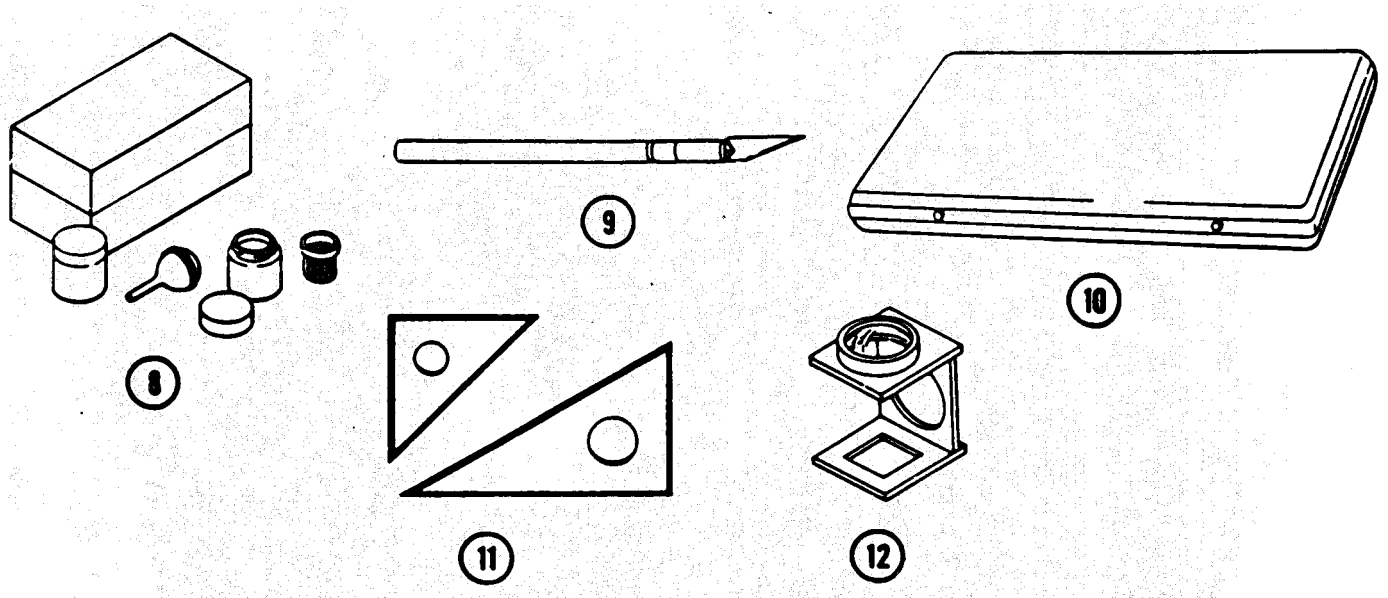
Section III. BASIC ISSUE ITEMS - Cont





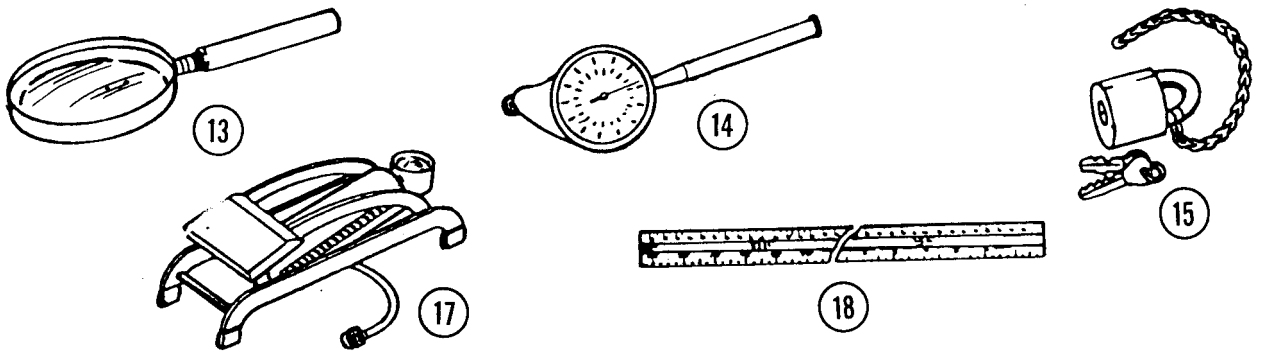
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
	6675-00-250-2508	CURVE, DRAFTING, IRREGULAR: French type (79819) 8255-A	ea	4
	6675-00-250-2509	CURVE, DRAFTING, IRREGULAR: ship type (17866) 2217-107	ea	4
	6675-00-641-3512	DIVIDERS, DRAFTING, PLAIN: (33363) 55-2910	ea	4
	6675-00-240-2049	DIVIDERS, DRAFTING, PROPORTIONAL: (09177) 64-584	ea	2
	6675-00-599-8880	DIVIDERS, EQUAL SPACING: 6.0 (39428) 1995D11, 6 in.	ea	1
	6675-00-599-8879	DIVIDERS, EQUAL SPACING: 12.0 (39428) 1995D12, 12 in.	ea	1
6	4210-00-555-8837	EXTINGUISHER, FIRE, MONOBROMOTRIFLUOROMETHANE: (33525) T2	ea	2
7	6545-00-922-1200	FIRST AID KIT, GENERAL PURPOSE: (89875) SC C-6545-IL vol 2	ea	1

Section III. BASIC ISSUE ITEMS - Cont



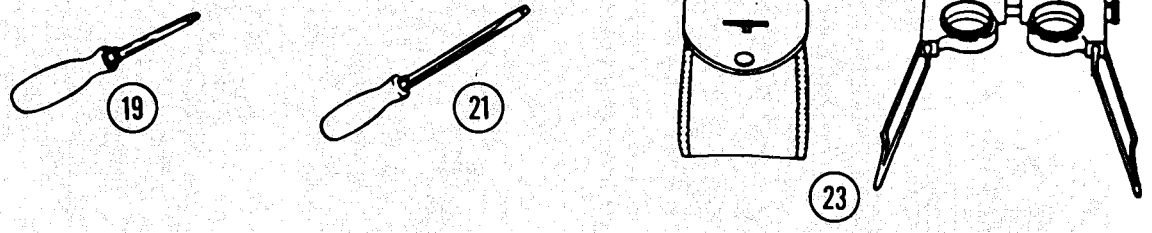
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
	4240-00-959-3586	GOGGLES, INDUSTRIAL: (18037) GGD	ea	1
	5120-00-935-4641	KEY SET, SOCKET HEAD SCREW: (81348) GGG-K-275 CL1 TY1	se	1
8	7510-00-927-8685	KIT, PEN CLEANING: (33363) 61-3115	kt	3
	5110-00-240-5943	KNIFE: (81348) TL-29	ea	1
9	5110-00-595-8400	KNIFE, CRAFTSMEN: stencil (99941) 3001	ea	4
	7520-01-008-7640	LEAD REPOINTER, PENCIL: (79819) 992WB	ea	4
10	6675-00-551-0785	LETTERING SET: (33363) 61-2901	ea	1
11	6675-00-190-5854	LINE GUIDE, LETTERING, NONADJUSTABLE: (17866) 2030B6	ea	6
12	6650-0-255-8268	MAGNIFIER: linen tester (79819) Q8-9518	ea	4

Section III. BASIC ISSUE ITEMS - Cont



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
13	6650-00-403-0812	MAGNIFIER: round (39428) 149104	ea	2
		MANUALS, TECHNICAL		
	TM 5-6675-324-14	OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT, TSS INFORMATION SECTION	ea	1
	LO 5-6675-324-12	LUBRICATION ORDER,TSS INFORMATION SECTION	ea	1
	TM 55-6675-324-24P	REPAIR PARTS AND SPECIAL TOOLS LIST, TSS INFORMATION SECTION	ea	1
14	6675-00-222-2542	MEASURER, MAP: (33363) 62-0300	ea	2
15	5340-00-682-1505	PADLOCK SET: (77765) 21313-52	se	1
16	DELETED			
	7510-01-030-7427	PEN POINT ASSORTMENT AND PENHOLDER: (79819) 3165-JDCS-9	se	4
	6675-00-222-2535	PROTRACTOR, SEMICIRCULAR: (23366) P478	ea	4
17		PUMP, INFLATING, MANUAL: (53800) 6 A 49454	ea	1

Section III. BASIC ISSUE ITEMS - Cont

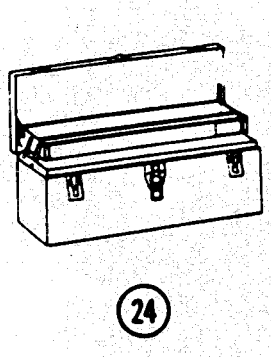


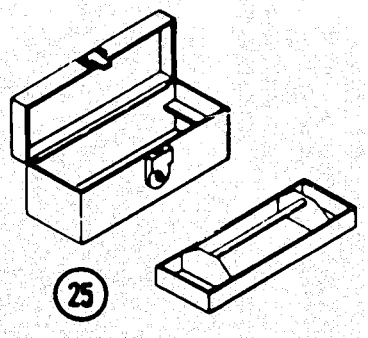
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
18	5210-00-204-1283	RULE, STEEL, MACHINIST: (57163) CME 600	ea	1
	6675-00-641-5727	SCALE, DRAFTING: (33363) 56-3280	ea	4
	6675-00-283-0035	SCALE, PLOTTING: (17866) GG-S-161/8c, type VIII shape 2, composition A, grade 1, size B, scale graduation 1, numbering A, style A	ea	1
	6675-00-283-0037	SCALE, PLOTTING: (23366) 28/MR, 12 in.	ea	1
	6675-00-283-0027	SCALE, PLOTTING: (23363) 28 YD, 10 in.	ea	1
19	5120-00-234-8913	SCREWDRIVER, CROSS TIP: size 2 (81348) GGG-S-121	ea	1
20	DELETED			
21	5120-00-234-8910	SCREWDRIVER, FLAT TIP: (78525) 1006	ea	1
22	DELETED			
	7510-00-224-7242	SHIELD, ERASING: (79819) 03-605	dz	1
23	6675-00-641-3561	STEREOSCOPE, LENS, AERIAL PHOTOGRAPH INTERPRETATION: (7D560A) 51034, Abrams Model SV-1	ea	4

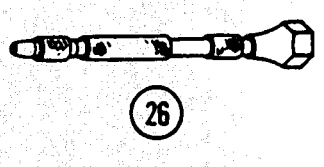
Section III. BASIC ISSUE ITEMS - Cont

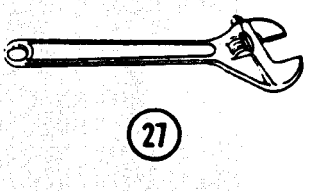
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
		STRAIGHTEDGE: (33363) 56-4150	ea	1
		STRAP ASSEMBLY, BUCKLE-END: 6.0 in. (82820) 1844-104	ea	4
		STRAP ASSEMBLY, BUCKLE-END: 9.0 in. (82820) 1844-103	ea	66
		STRAP ASSEMBLY, TIP-END: 8.0 in. (82820) 1845-107	ea	2
		STRAP ASSEMBLY, TIP-END: 36.0 in. (82820) 1845-106	ea	3
		STRAP ASSEMBLY, TIP-END: 40.0 in. (82820) 1845-101	ea	24
		STRAP ASSEMBLY, TIP-END: 65.0 in. (82820) ADC-2058-102	ea	2
		STRAP ASSEMBLY, TIP-END: 72.0 in. (82820) 1845-104	ea	2
		STRAP ASSEMBLY, WEBBING: 30.00 in. (98313) 13225E3695-8	ea	1
		STRAP ASSEMBLY, WEBBING: 35.00 in. (82820) 13225 E3695-2	ea	5
		STRAP ASSEMBLY, WEBBING: 38.00 in. (98313) 13225E3695-7	ea	2
		STRAP ASSEMBLY, WEBBING: 45.00 in. (98313) 13225E3695-3	ea	3
		STRAP ASSEMBLY, WEBBING: 55.00 in. (98313) 13225E3695-6	ea	5
		STRAP ASSEMBLY, WEBBING: 72.00 in. (98313) 13225E3695-1	ea	2

Section III. BASIC ISSUE ITEMS - Cont









(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
		STRAP ASSEMBLY, WEBBING: 29.00 in. (98313) 13225E3695-13	ea	2
	6675-00-253-5501	TEMPLATE, DRAFTING: (79819) 831040	ea	4
24	5140-00-331-5496	TOOL BOX, PORTABLE: 1 fixed hinge tray (75206) CS 19	ea	5
25	5140-00-315-2747	TOOL BOX, PORTABLE: 1 removable tray (75206) CS 16	ea	1
		TRACER, NEEDLE: (36970) 1260 NK	ea	1
	6675-00-190-5867	TRIANGLE, DRAFTING: 1 30 deg; 1 60 deg (33363) 57-0220, size 10	ea	4
	6675-00-190-5863	TRIANGLE, DRAFTING: 2 45 degs (33363) 57-0292, size 10	ea	4
	6675-00-183-6487	T-SQUARE: (81562) 8068E, 42 in.	ea	2
26	5120-00-224-7271	VISE, PIN (18037) PVDE	ea	4
27	5120-00-264-3795	WRENCH, ADJUSTABLE: (80244) GGG-W-631 TY1 CL1	ea	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I INTRODUCTION

D-1. SCOPE.

This appendix lists additional items you are authorized for the support of the Information Section.

D-2. GENERAL.

This list identifies items that do not have to accompany the Information Section and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA or JTA.

D-3. EXPLANATION OF LISTING.

National stock numbers, descriptions and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

Section II. ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description FSCM and Part Number	(3) U/M	(4) Qty Auth
	TOE AUTHORIZED ITEMS		
6675-00-641-3615	Drafting Equipment Set, TOPO, H and S CO	ea	1
5805-00-543-0012	Telephone Set: TA-312/PT	ea	1

APPENDIX E

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I INTRODUCTION

E-1. SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain the Information Section. This listing is for information 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), or CTA 6-100, Army Medical Department Expendable/Durable 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 E.").

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

C - Operator/Crew

O - Organizational 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 part number followed by Federal Supply Code for Manufacturer (FSCM) 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 two-character alphabetical abbreviations (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 FSCM and Part Number	(5) U/M
	C	3610-01-193-4752	Absorber and Ammonia Hydroxide, Supply Kit	kt
1	C	6810-00-223-2739	Acetone, Technical	pt
2	O	8040-00-174-2610	Adhesive, Rubber (87719) 103, 4 oz. can	cn
3	F	8040-00-152-0063	Adhesive, Waterproof	cn
4	C	6810-00-205-6786	Alcohol, Denatured	qt
5	O		Anderol Lubricant 495	tu
	C	7520-00-935-7136	Ball Point Pen (00625) 84, black	dz
6	C	6810-00-930-6311	Belt, Cleaner (TRICH)	cn
	C	7510-00-616-7471	Binder and Filler, Loose Leaf: (65957) UU-B-356, grade C 5 x 3 in. sh.	ea
	C	5110-00-359-6478	Blade, Craftsman Knife: Beveled (99941) 11	pk
	C	5110-00-542-2043	Blade, Craftsman Knife: Curved (99941) 10	pk
	C	5110-00-542-2044	Blade, Craftsman Knife: Square (99941) 17	pk
	C	5110-00-765-4144	Blade, Craftsman Knife: Stencil (99941) 16	pk
	C	8125-01-088-3553	Bottle, Adhesive Dispenser (87719) 500 plastic	ea
	C	7510-00-223-6702	Chalk, Marking: blue (70362) SS-C-266, Grade A, Composition 3, blue	gr
	C	7510-00-223-6705	Chalk, Marking: red (85419) SS-C-266, grade A, Composition 3, red	gr
	C	7510-00-223-6706	Chalk, Marking: white (85419) 1402, white	gr
	C	7510-00-223-6707	Chalk, Marking: yellow (79819) T2-1401	gr
	C	8330-00-965-1722	Chamois Leather, Sheepskin (39428) 7358T11	ea

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST- Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
	C	6850-01-007-8073	Cleaning Concentrate (79819) 3068	bt
	C	7510-00-161-4291	Clip, Paper (79819) P-2-72620	bx
7	C	8305-00-222-2423	Cloth, Cheesecloth	yd
	C	8220-00-299-8625	Cotton, Nonsterile: (90878) JJJ-C-561, grade B, 1 lb. roll	ro
8	C	6515-00-303-8250	Cotton Swabs	bg
9	C	7930-00-530-8067	Detergent, General Purpose	gl
	C		Developer, Diazo Process (89953) 892-055	bx
	C		Developer, Plain Paper Copier (S4546) NP-210	ea
	C	7350-00-285-1772	Dispenser, Pressure Sensitive Adhesive Tape (79819) C-22	ea
10	O		Drum Cleaning Powder (60939) CK0429	cn
	C	7530-00-268-3994	Envelope, Wallet (872632) 1355E	bx
	C	7510-01-099-3953	Eraser (79819) 292-F	bt
	C	7510-01-034-1278	Eraser, Film (75364) 9600 (PT 20)	bx
	C	7510-01-035-1317	Eraser Kit (75364) 290-K	kt
	C	7510-00-634-5034	Eraser, Rubber (D8230) 7099B	dz

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
	C	7530-00-501-5957	Film, Copying, Thermographic Process (76381) 389	bx
	C	7530-01-018-4231	Film, Copying, Thermographic Process (76381) 588	bx
	C		Film, Diazo Type, Sensitized: Black image (24299) 104A5, 42 in. x 50 yd.	ro
	C		Film, Diazo Type, Sensitized: Blue image (24299) 202BL, 42 in. x 50 yd.	ro
	C		Film, Diazo Type, Sensitized: Brown image (24299) 402BR, 42 in. x 50 yd	ro
	C		Film, Diazo Type, Sensitized: Green image (24299) 602GN, 42 in. x 50 yd.	ro
	C		Film, Diazo Type, Sensitized: Red image (24299) 302RD, 42 in. x 50 yd.	ro
	C		Film, Diazo Type, Sensitized: Violet image (24299) 702VT, 42 in. x 50 yd.	ro
11	F	5610-00-618-0258	Floor Patch	gl
	C	7530-01-023-4050	Frames, Transparency (94862) 215-1006-4	hd
12	O	9150-00-616-9212	Grease, Silicone	bt
13	O		Grease, Heat Resistant (60939) CK0427	cn

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
	C	7510-01-028-2877	Ink, Drawing (79819) 3080-F1	bt
	C	7510-01-070-8947	Ink, Drawing (79819) 3084-F	bt
	C	7510-01-035-8133	Ink, Drawing: Blue (79819) 3080-F1, Blue	bt
	C	7510-01-035-8131	Ink, Drawing: Brown (79819) 3080-F1, Brown	bt
	C	7510-01-039-5075	Ink, Drawing: Carmine (79819) 3080-F1, Carmine	bt
	C	7510-01-035-8132	Ink, Drawing: Green (79819) 3080-F1, Green	bt
	C	7510-01-036-3726	Ink, Drawing: Orange (79819) 3080-F1, Orange	bt
	C	7510-01-080-1481	Ink, Drawing: Red (79819) 3080-F1, Red	bt
	C	7510-01-036-3725	Ink, Drawing: Violet (79819) 3080-F1, Violet	bt
	C	7510-01-035-8130	Ink, Drawing: Yellow (79819) 3080-F1, Yellow	bt
	C		Lamp, Fluorescent (90917) 33026	ea
	C	7510-00-285-5865	Lead, Pencil, Graphite: F (79819) 2200-F	bx
	C	7510-00-285-5866	Lead, Pencil, Graphite: H (79819) 2200-H	bx
	C	7510-00-281-2143	Lead, Pencil, Graphite: HB (79819) 2200-HB	bx
	C	7510-00-285-5862	Lead, Pencil, Graphite: HB (8D190) U2-F370-HB	pk
	C	7510-00-285-5863	Lead, Pencil, Graphite: 2H (79819) 2200-2H	bx
	C	7510-00-285-5847	Lead, Pencil, Graphite: 2H (8D190) U2-F350-2H	pk

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
	C	7510-00-272-9820	Lead, Pencil, Graphite: 3H (79819) 2200-3H	bx
	C	7510-00-285-5864	Lead, Pencil, Graphite: 4H (79819) 2200-4H	bx
	C	9150-00-273-2389	Lubricating Oil, General Purpose (98308) BRAYCO 300	cn
	C		NA Test Sheet (60939) FY9-9024-000	ea
14	O	9150-00-273-2389	Oil, Lubricating, General Purpose	cn
15	C	9150-00-252-6382	Oil, Lubricating, Watch	bt
	C		Oil Pan Assembly (60939) FGI-1368-000	ea
16	O		Oil, Silicone S-200 (60939) KF9-0500-00	cn
	C	7530-00-285-3083	Pad, Writing Paper (8D190) M9-21-112	pk
17	O	8010-01-131-6254	Paint, Black	kt
17A	O	8010-01-160-6745	Paint, Brown	kt
17B	O	8010-01-162-5578	Paint, Green	kt
18	O	8010-00-298-3859	Paint, Light Green, INT.	gl
19	C	5350-00-619-9166	Paper, Abrasive	pk

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
	C	6750-00-201-0892	Paper Copying, Diazo Process: Black image (03641) 100S	ro
	C	6750-00-663-0771	Paper Copying, Diazo Process: Blue image (03641) 200 SE	ro
	C	7530-00-576-4994	Paper, Copying, Thermographic Process (76381) 15	bx
	C	7530-00-871-8310	Paper, Drawing (33363) 15-2155, 24 x 30 in.	pk
	C		Paper, Graph (33363) 48-5094, 50 yd. x 22 in. w	ro
	C		Paper, Graph (33363) 48-6002, 50 yd. x 12 in. w	ro
19A	C	6640-00-559-1384	Paper, Lens (22527) 11-995	pk
20	O	7920-00-982-1203	Paper Towels	bx
	C	7530-01-006-4496	Paper, Tracing (33363) 10-9155, 24 x 30 in.	pk
	O	7510-00-286-6985	Paperweight (33363) 58-0810	ea

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
	C	6675-01-107-9678	Pen Points: rapidometric 0.13 mm, pink (79819) 92J, 0.13 mm	ea
	C	6675-01-098-1219	Pen Points: rapidometric 0.18 mm, lavender (79819) 92J, 0.18 mm	ea
	C	6675-01-098-1220	Pen Points: rapidometric 0.25 mm, beige (79819) 92J, 0.25 mm	ea
	C	6675-01-107-9679	Pen Points: rapidometric 0.35 mm, gray (79819) 92J, 0.35 mm	ea
	C	6675-01-098-1221	Pen Points: rapidometric 0.50 mm, red (79819) 92J, 0.50 mm	ea
	C	6675-01-099-3440	Pen Points: rapidometric 0.70 mm, light blue (79819) 92J, 0.70 mm	ea
	C	6675-01-098-0308	Pen Points: rapidometric 1.00 mm, orange (79819) 92J, 1.00 mm	ea
	C	6675-01-098-1222	Pen Points: rapidometric 1.40 mm, cordovan brown (79819) 92J, 1.40 mm	ea
	C	6675-01-097-4516	Pen Points: rapidometric 2.00 mm, cerise red (79819) 92J, 2.00 mm	ea
	C	75 0-00-240-1526	Pencil: black (79819) 1555, black	dz
	C	75 0-00-223-2027	Pencil: blue (79819) 1344, blue	dz
	C	75 0-00-436-5210	Pencil: blue (79819) 1555, blue	dz
	C	75 0-00-275-7212	Pencil: green (79819) 1555, green	dz

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
	C	7510-00-264-4610	Pencil: green (79819) 1800-16, green	dz
	C	7510-00-174-3205	Pencil: red (79819) 1555, red	dz
	C	7510-00-233-2021	Pencil: red (79819) 1800-39, red	dz
	C	7510-00-264-4608	Pencil: yellow (79819) 1800-5, yellow	dz
	O	7520-00-161-5664	Pencil, Mechanical: automatic (8D190) VSC-P400	ea
	O	7520-01-083-6734	Pencil, Mechanical: non-automatic (79819) 5611	ea
	C	7510-00-174-7343	Pin, Straight (8D190) P3-780C	bx
	C		Plastic Sheet (33363) 44-1037, 24 in. w, 30 in. lg.	pk
	C		Plastic Sheet (33363) 44-1057, 24 in. w, 30 in. lg.	pk
	C		Plastic Sheet, Tracing (33363) 19-1253, 30.0 in. x 24.0 in.	pk
	O	8010-01-193-0520	Primer	ea
	C	7510-00-543-6792	Refill, Ball Point Pen (79819) VER-4	dz
21	F	8010-01-030-7254	Resin, Epoxy	kt
	C	7510-00-926-9146	Ribbon, Typewriter (6P460) 451-8183	ea
	C	7510-00-243-3435	Rubber Band (79819) N18366-64	bx

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
22	O		Screen, Nylor (39428) 1017A31	ro
23	O	8040-00-851-0211	Sealant, Silicone	tu
		5110-00-161-6912	Shears, Straight Trimmers (90137) 509-59	ea
24	F	3439-00-273-3722	Solder, Rosin Core	si
25	O	6850-00-274-5421	Solvemt. P-D-680	cn
26	O	8010-00-160-5851	Spar Varnish	qt
27	C	6850-00-880-1013	Spray, Silicone	cn
28	O		Sprayfoam Sealant (39428) 7627T1	cn
	C	7520-00-281-5895	Stapler, Paper Fastening, Office (8D190) X8-27, gray	ea
	C	7510-00-272-9662	Staples, Paper Fastening, Office Type (8D190) 8-SF4-5M	bx
	C	5345-00-184-1374	Stone, Sharpening (58692) 42862	ea
29	O	5640-00-103-2254	Tape, Cloth, Duct Sealing, 2 in.	ro
	C		Tape, Paper, Computing Machine (28480) 82045A	bx
	C	7510-00-550-7126	Tape, Pressure Sensitive Adhesive (99742) P45	ro
	C	7510-00-198-5831	Tape, Pressure Sensitive Adhesive (76381) 230	ro
	C	7510-00-234-7960	Tape, Pressure Sensitive Adhesive (76381) 600	ro
	C	7510-00-551-9824	Tape, Pressure Sensitive Adhesive (76381) 810	ro
30	C	6640-00-597-6745	Tissue, Lens Cleaning	bk
	C	7510-00-272-6887	Thumbtack (79819) V6-53	hd

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description FSCM and Part Number	(5) U/M
	C	4020-00-242-4072	Twine, Fibrous (79819) S9-9	lb
			Waste Developer Receptacle (60939) FY7-0043-000	ea

U.S. GOVERNMENT PRINTING OFFICE: 1984 - 462-032/40

GLOSSARY

ABBREVIATION/TERM	DEFINITION
BSSDA	Blank Exposure Shutter Solenoid.
CBFW	Copyboard Forward.
CBHP	Copyboard Home Position.
CBRV	Copyboard Reverse.
CBSP	Copyboard Start Position.
CCNTI	Control Counter Installed.
CLA1	Cassette Lamp 1.
CLKP	Clock Pulse.
CNTOP	Counter Open.
Compensation	To make up for what is excessive or deficient.
Constant	Factor used to convert electronic measurement counts of rolling disk planimeter or linear probe to desired physical unit, such as feet, inches, yards, etc.
Contour	Closed loop on contour map, plan, drawing, Also called isorhythm.
Contour Interval	Difference in elevation of two consecutive contour lines.
Contour Method	Estimates volume of fill or cut via its contours.
Corona	Faint glow adjacent to surface of electrical conductor at high voltage.
COVF	Cleaner Overflow.
CPU	Central Processing Unit.
CPUSD	Cassette Pickup Solenoid Drive.
Cut	Excavation- or depression-like formation.

GLOSSARY - Cont

ABBREVIATION/TERM	DEFINITION
Daylighted (Contour)	Point or edge where cut becomes fill or vice-versa.
DD1	Digital Display 1.
DD2	Digital Display 2.
DRMD	Drum Drive.
DSPA	Display A.
DSPB	Display B.
DSPC	Display C.
DSPD	Display D.
ETFS	Extension Timer for Shut-off.
EXP1	Exposure Control Lever at 1.
EXP9	Exposure Control Lever at 9.
EXPAJ	Exposure Control.
Fill	Embankment or hilly formation.
HPRGP	Copyboard Home Position or Registration Pulse.
IEXP	Scanning Lamp Drive.
INTR	Initial Rotation.
I/O Port	Input/Output Port.
JAM	Jam Command.
JAMI	Jam Indication.
JAMRD	Jam Relay Drive.
JRST1	Jam Reset 1.
JRST2.	Jam Reset 2.
K1	Key 1.
K2	Key 2.

GLOSSARY - Cont

ABBREVIATION/TERM	DEFINITION
K3	Key 3.
K4	Key 4.
KS1	Key Scan 1.
KS2	Key Scan 2.
KS3	Key Scan 3.
KS4	Key Scan 4.
KYBZ	Keypad Buzzer Drive.
LCNTD	Large Copy Counter Drive.
LINT	Light Intensity Control.
LINT	Light Intensity Control Timer.
LSTR	Last Rotation.
Micro *(μ)*	Resolution factor (or planimeter unit) for linear measuring probe or for rolling disk planimeter at specified tracer arm length. Represents smallest area or length measuring instrument can measure. Measuring instrument emits single pulse count for each unit.
Microcomputer	Complete, small computing system consisting of hardware and software.
Micron	Unit of length equal to one-millionth of a meter.
MPUSD.	Manual Pickup Solenoid Drive.
MS4	Microswitch 4.
MS5	Microswitch 5.
OSC	Oscillator Output.
Ozone	Form of oxygen that is a bluish, irritating gas of pungent odor and is formed naturally in upper atmosphere or is generated by an electrical discharge of high potential in air.
Pad.	One contour.

GLOSSARY - Cont

ABBREVIATION/TERM	DEFINITION
PEEL	Paper/Cassette Out Lamp.
PDP1	Paper Detection Pulse 1.
PDP2	Paper Detection Pulse 2.
PDP3	Paper Detection Pulse 3.
PEP	Paper Empty.
PFP	Paper Feed.
Photosensitive	Responds readily to action of radiant energy.
Planimeter	Instrument that provides data used to estimate area of geometric shape by tracing its boundary line.
POWER	Wait and Power.
Precondition	To put in proper or desired state.
Program Flag	(Calculator) Memory device, set either true or false, to install decision capabilities into a program.
PT	Pulse Transformer.
PUT	Programmable Unijunction Transistor.
QPS	Quantity Processing System.
RAM	Random Access Memory.
Registration	Accurately positioning copy paper.
Resistivity.	Axial electrical resistance of a uniform rod of unit length and unit cross-sectional area: Reciprocal of conductivity.
RGP	Registration Pulse.
RGSD	Registration Solenoid Drive.
R_L(or R_2).	Calibration reading of linear measuring probe representing total number of pulse counts emitted by probe per unit of length (inches or centimeters).

GLOSSARY - Cont

ABBREVIATION/TERM	DEFINITION
RMH1	**Remote HV 1.**
RMH2	**Remote HV 2.**
RMH2H	**Remote HV 2 Strong.**
RMH2L	**Remote HV 2 Weak.**
ROM	**Read Only Memory.**
R_L (or R_1)	Calibration reading of rolling disk planimeter representing total number of pulse counts derived by measuring area described by a test rule.
Scale Ratio	Ratio between given distance on map or drawing to corresponding distance on ground.
SCNTD	Small Copy Counter Drive.
Sensitivity	Capacity of a device to respond to stimulation.
SIEXP	Strong Image Exposure.
Skew	Change from straight line.
Slope	Natural or artificial incline or slant of ground.
SOFF	Auto Shutoff.
Subroutine	Distinct routine program, part of larger routine/program, that will perform, its own distinct manipulations of data when called up.
TCNTD	Total Copy Counter Drive.
TEP	Developer Hopper Empty Pulse.
TEOFL	Developer Hopper Empty or Overflow Lamp Drive.
TEOFP	Developer Empty or Overflow Pulse.
Toe	Lowest point, in terms of elevation, of embankment.

GLOSSARY - Cont

ABBREVIATION/TERM	DEFINITION
WAIT	Wait Signal.
WTCTO	Wait or Counter Open.

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General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

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PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-6675-324-14-2	3 Sep 85	Topographic Support System Information Section

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
6	2-1 a		
B1		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 2 910-00-762-3001. 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
JOHN DOE

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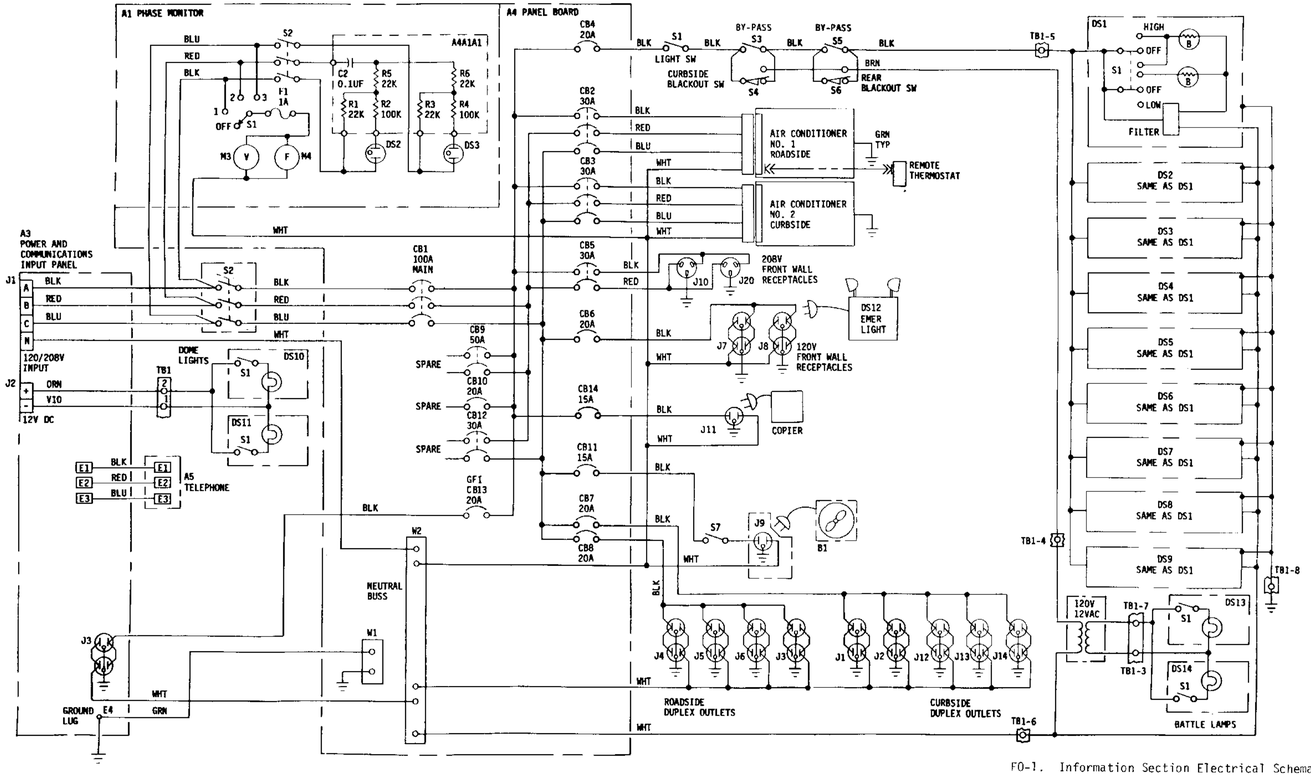
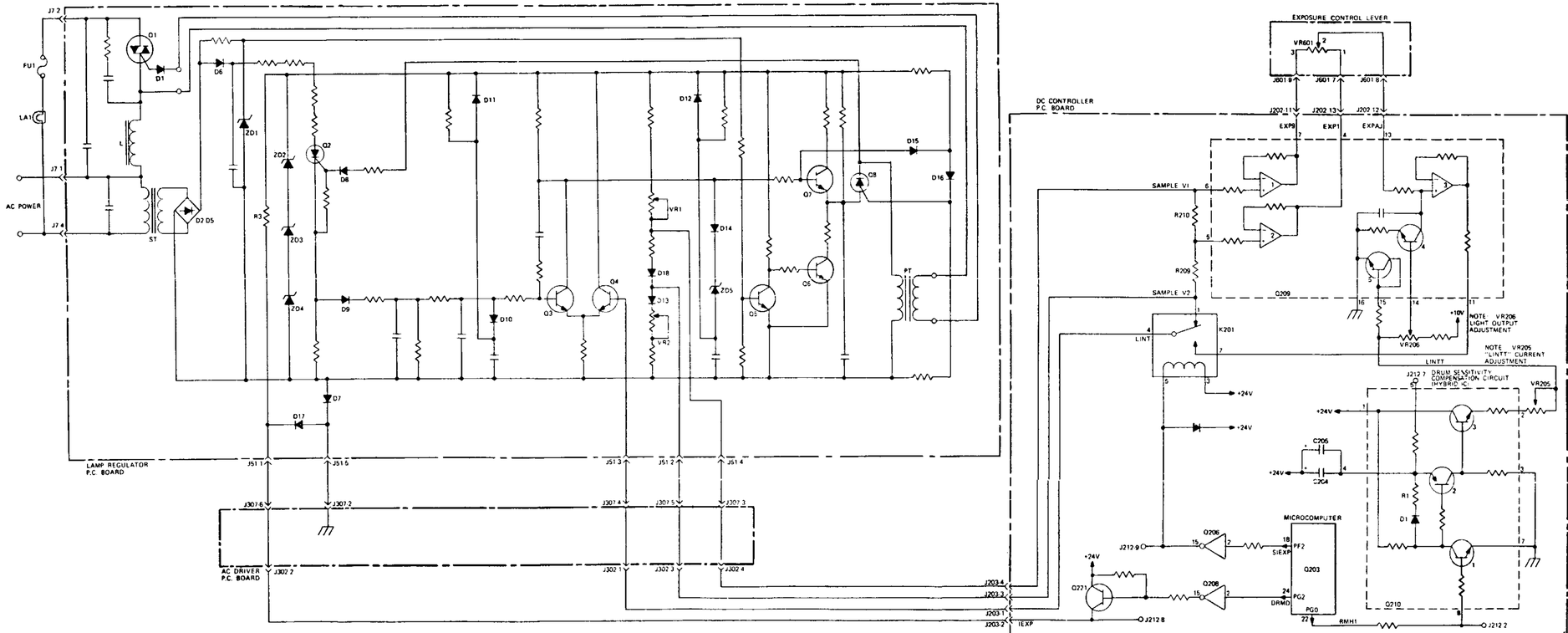
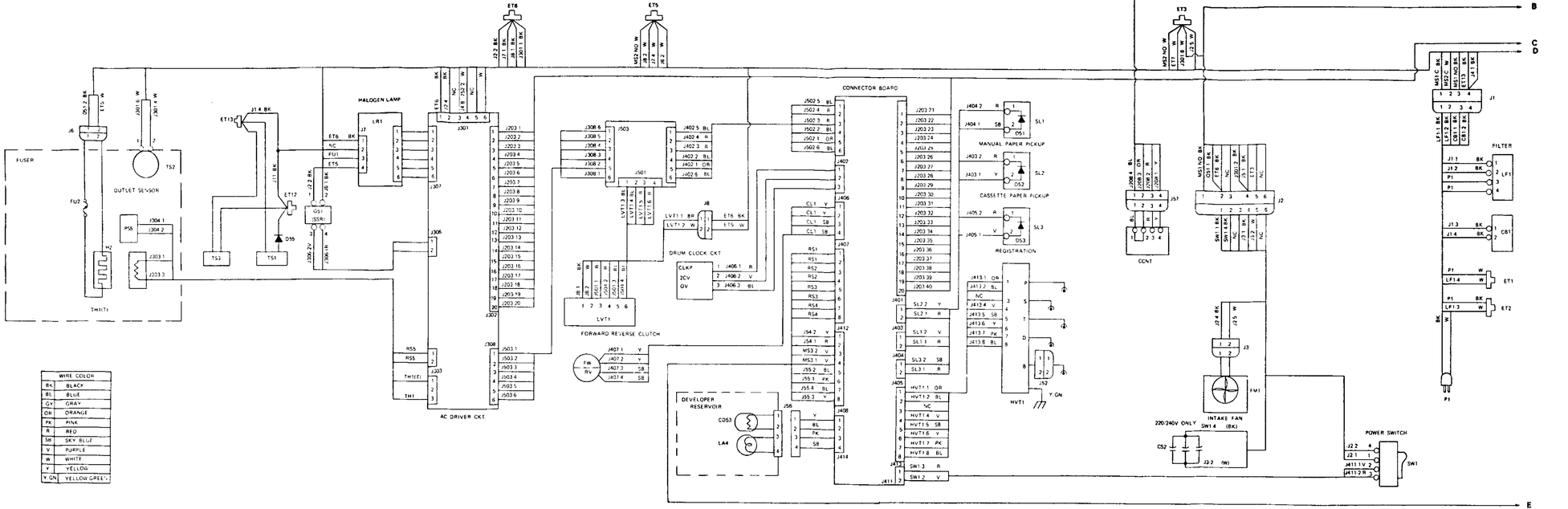


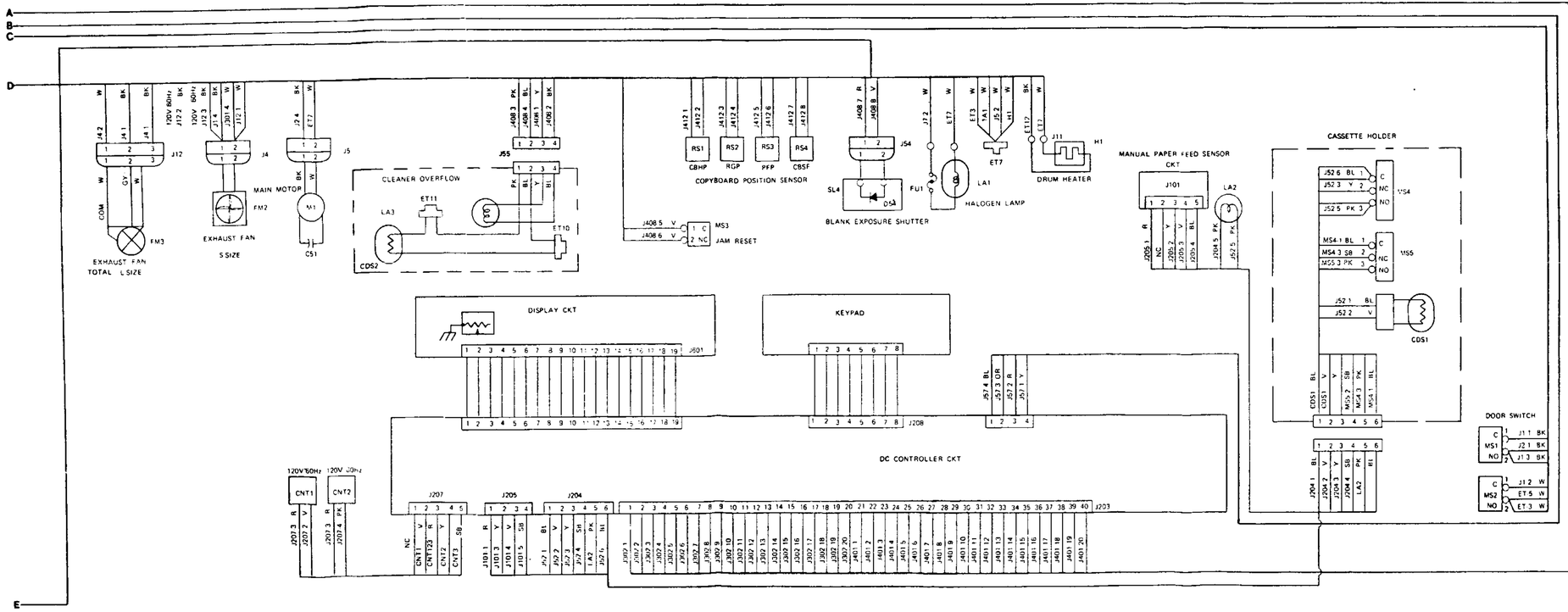
FO-1. Information Section Electrical Schematic



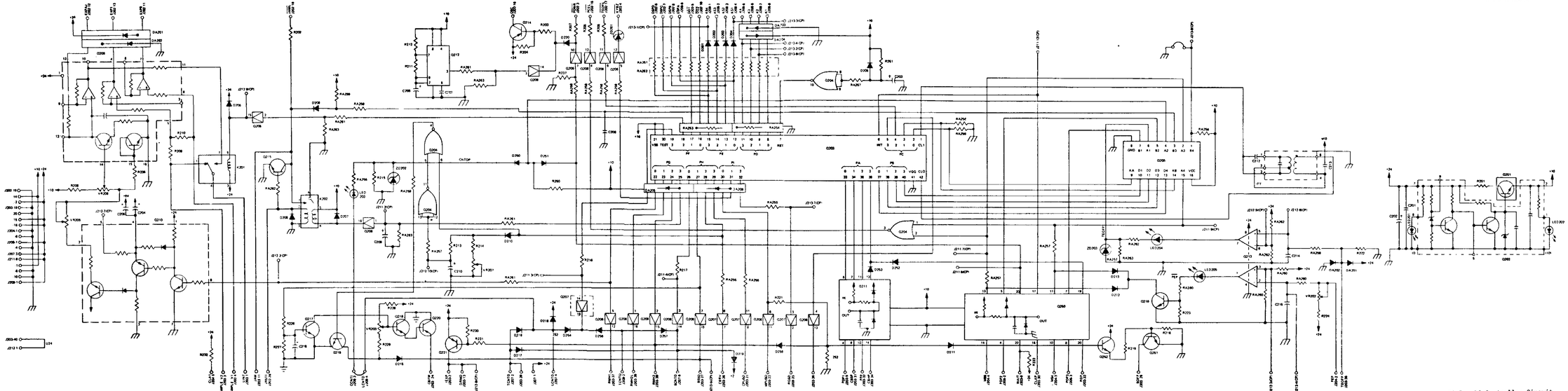
FO-2. Halogen Lamp Circuit Schematic



FO-3. Plain Paper Copier Wiring Diagram (Sheet 1 of 2)



FO-4. Plain Paper Copier Wiring Diagram (Sheet 2 of 2)



FO-5. DC Controller Circuit

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