TM 9-1220-238-14

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS)

FOR

PLOTTING BOARD, FLASH RANGING M18 W/E
NSN 1220-00-133-7039

HEADQUARTERS, DEPARTMENT OF THE ARMY
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OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS) FOR PLOTTING BOARD, FLASH RANGING M18 W/E NSN 1220-00-133-7039

LIST OF ILLUSTRATIONS

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope.

a. This manual contains instructions for the information and guidance of personnel responsible for the operator/crew, organizational, direct support and general support maintenance of board plotting M18. The information contained in this manual is within the scope of supplies and maintenance equipment normally available to using organizations.

b. The prescribed maintenance responsibilities at operator/crew, organizational, direct support and general support maintenance levels are reflected in this manual (Appendix C).

1-2. Forms and Records.

Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38750, the Army Maintenance Management System (TAMMS).

1-3. Reporting of Errors.

Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028. Recommended changes to Publications, and forwarded direct to Commander, Frankford Arsenal, ATTN: SARFA-MA, Philadelphia, PA 19137.

Section II. DESCRIPTION AND DATA

1-4. Description.

a. Board plotting M18 (fig 1-1) is used for computing firing orders (Weapon elevation and azimuth settings) for a battery of artillery by the flash spot ting technique. Three legs provide suitable footing for the support of the board on rough or uneven ground.

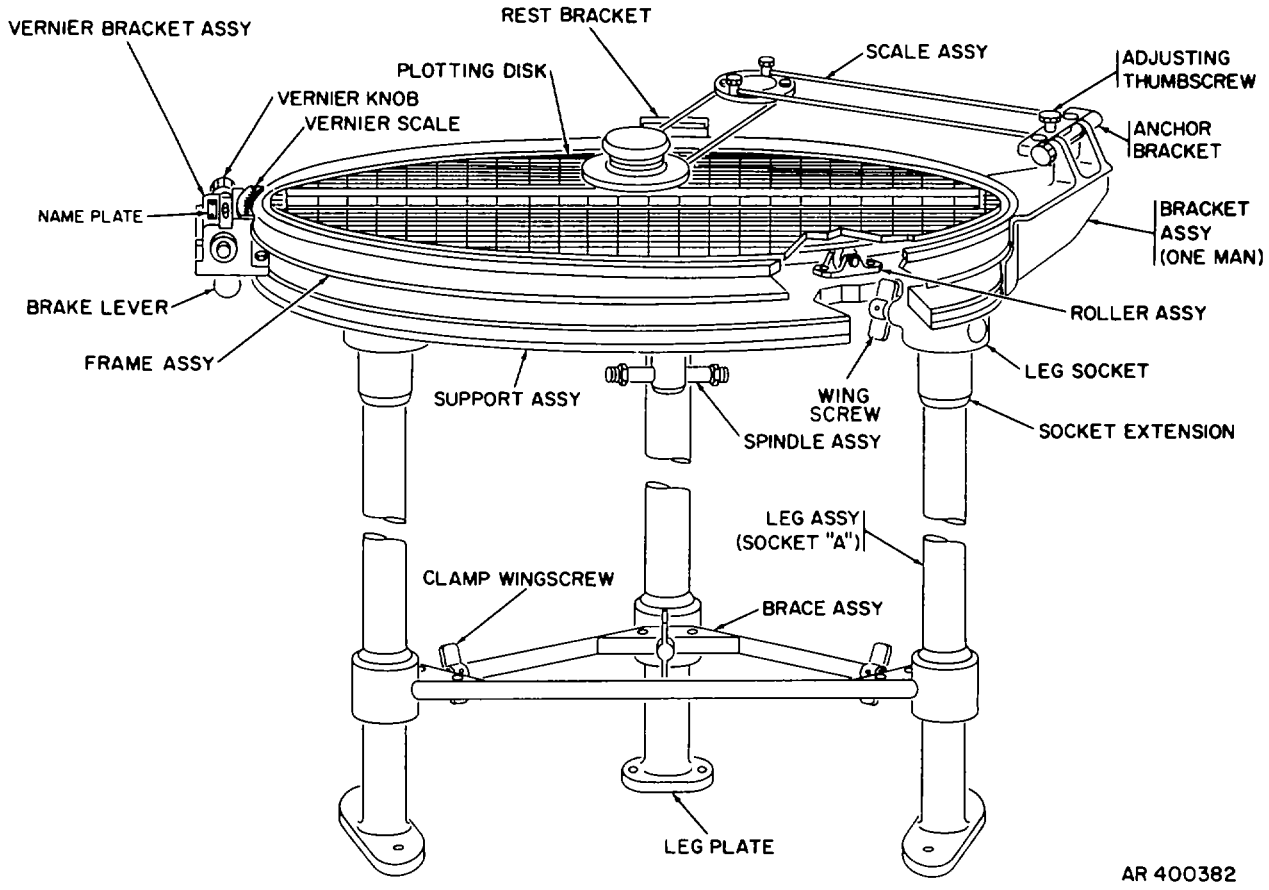

Figure 1-1 Board plotting M18

b. A rest bracket assembly and two removable support brackets for the scale assembly make it possible to install the scale assembly in the position most convenient for a one or two man operation.

c. The plotting disk is reversible. This reduces replacement frequency and enables a fresh surface to be exposed for plotting.

d. The plotting board chest (fig 1-2) is provided to store and transport the board plotting.

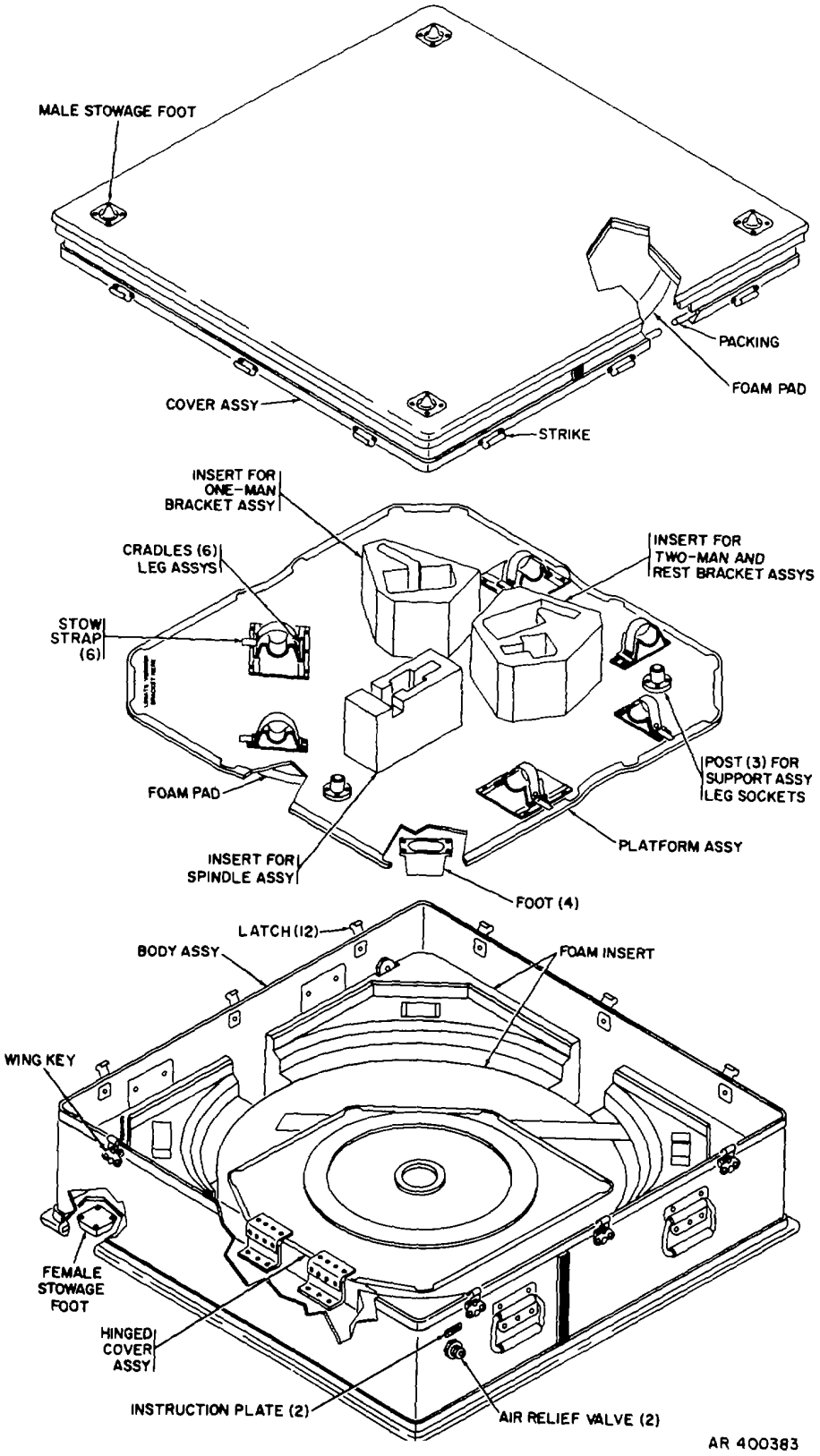

Figure 1-2. Plotting board chest

1-5. Tabulated Data.

a. Board plotting M18

Azimuth calibration.....0 to 6400 mils clockwise
Grid scale.....40 millimeters = 1000 meters
Diameter (without brackets) .....41 in
Height .....35 1/2 in
Weight .....106 lb

b. Plotting board chest

Length.....44 In
Width .....44 in
Height .....11 in
Weight .....118 lb.

c. Plotting board M18 W/E

Total weight (packed in chest).....224lb

Section III. THEORY OF OPERATION

1-6. Scope.

This section contains the overall functional theory of the board plotting. Paragraph 1-8 contains the functional theory with each self test discussed separately.

1-7. Purpose.

The purpose of this section is to familiarize personnel with the function of the board plotting. The information presented provides both a basic and a detailed understanding of the board plotting

1-8. Functional Description.

a. General. The theory of the plotting board is fundamentally simple, and accuracy of the results obtained, will depend to a large degree on the exactness of the operators.

(1) If the base line 00' (fig. 1-3) Is plotted on the grid disk, and the azimuth of the target as observed from each observation post is laid off along the lines OT and O'T, the point of intersection of the two lines will be the true observed position of the target The azimuth of T from any point can be determined easily by measuring the angle between the line connecting that point and T, and grid north line, and the horizontal range of OT or O'T or any other desired line, can be determined readily by scaling off the distance, using a straightedge graduated to the same scale as the grid disk In practice, however, the X and Y coordinates of the point are the information usually desired.

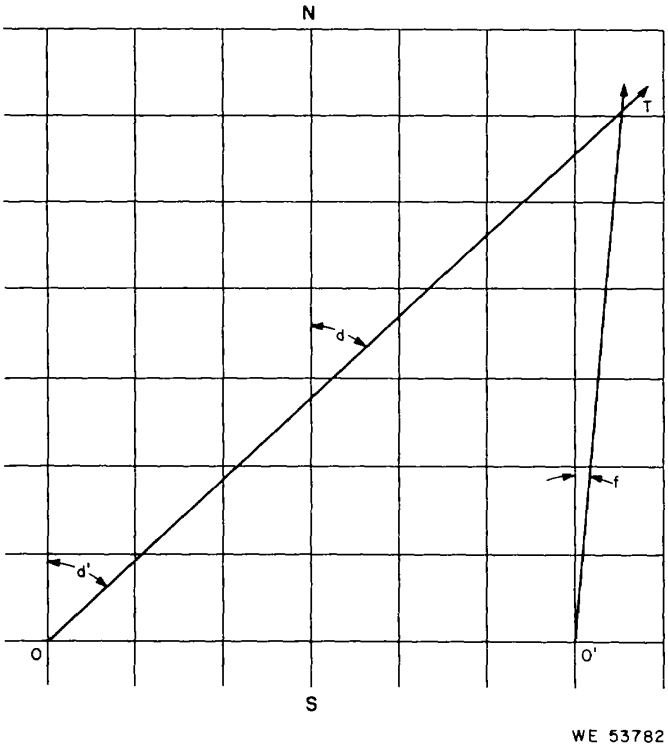

Figure 1-3. Location of target

(2) In the grid system the azimuth of a line such as OT would be the angle d; that is, the horizontal angle measured in a clockwise direction from grid north. In figure 1-3, angle d' is equal to d as the Y grid lines are all drawn parallel.

(3) Assuming that the scale straightedge could be swung in an arc of 1800 and could be moved back and forth across the plotting surface the azimuth of OT and O'T could be easily laid off on the plotting surface.
The azimuth of OT would be angle d' and that of O'T would be angle f.

(4) The same results may be secured by using a plotting surface that can be turned through 360° or 6,400 mils, and a straightedge that is set in a fixed direction and can be moved back and forth across the plotting surface, remaining parallel to its original position.
By keeping the straightedge fixed and rotating the plotting surface, a more precise setting of the azimuth can be made and the plotting can be done much more quickly.

(5) The azimuth and range could be computed as was done in the test problem (g below), but the determination by means of the plotting board offers a more rapid and an equally satisfactory solution

b. Orientation Press the brake lever to release the brake Rotate the grid disk until the graduated edge of the plotting scale coincides with the north grid line and the zero on the azimuth scale coincides with the zero on the vernier scale In order to get exact coincidence of the zeros, clamp the frame assembly by releasing the brake lever and rotate the slow motion vernier knob until this condition Is effected. If this is not possible, the vernier scale or disk must be adjusted as described in d below

c. Setting off Azimuth

(1) When the azimuth is announced, it is set off by pressing the brake lever and rotating the frame assembly until the zero graduation of the vernier is between the nearest 10-mil graduation and the next higher 10-mil reading on the azimuth scale; then the lever is released and the slow motion vernier knob rotated until the numbered graduation on the vernier scale corresponding to the last digit of the announced azimuth coincides with the nearest graduation on the azimuth scale.

(2) As an example, assume that the announced azimuth is 2,204 mils. Set the azimuth scale so that the zero on the vernier scale is opposite the space between the 2,200 and 2,210 graduations (in this case almost in the center as the last digit is 4), then release the brake lever and rotate the slow-motion knob until the graduation indicated by 4 on the vernier scale falls opposite the nearest graduation on the azimuth is 2,208 it will be found necessary to rotate the knob until the 8 graduation on the vernier scale is opposite the 2,360 graduation on the azimuth scale. Readings to one-half mil can be set in a similar manner, using the Intermediate graduations on the vernier scale.

(3) When operating the slow motion vernier knob for vernier scale readings, the brake lever must always be released, leaving the brake engaged, which is the normal position induced by action of the spring against the lever. However, when the disk and frame assembly are rotated rapidly, for approximate setting of azimuth, the lever must be pressed in and held firmly to release the brake and allow freedom of rotation.

d. Plotting and Scaling.

(1) It is first necessary to number the grids, but before this can be accomplished, the set-up must be visualized so that the points representing the observation posts can be plotted in proper relation to the expected target area The observation posts (OP) are then plotted by means of the X and Y coordinates using a plotting scale. These posts are plotted so that they lie between the vernier scale and the target area when the azimuth to the target area is set on the azimuth scale.

(2) The board is then ready for the azimuth from the observation posts. As these are announced from each OP for a single burst or flash, they are set off on the azimuth scale and a group of intersecting lines drawn with the scale assembly through the respective OP's in the direction of the target

(3) The intersection of these plotted lines will mark the position of the target as observed The X and Y coordinates of this point can be determined by referring to the grid origin and scaling the distances to each axis by means of a plotting scale The horizontal range from the target to any OP or gun position can be determined by scaling off the distance, using the scale provided The azimuth of the target with respect of the gun position or directing OP can be determined by means of the azimuth scale and vernier scale.

(4) In actual practice, six sets of observations are plotted, if possible, and a mean point determined as explained in f and g below. Note Always use a 2H or softer pencil for plotting. Erase with a soft rubber eraser containing no grit or abrasives. When possible, place a sheet of vellum, secured by masking tape, over the plotting disk and plot on vellum to preserve the surface of the plotting disk.

e. Location of Hostile Batteries. Location of enemy batteries Is determined by plotting the azimuth of flashes from the enemy guns as observed from two or more observation posts Observed azimuths for a single flash are transmitted from the observation posts to the plotting center They are plotted as explained in d above, and the X and Y coordinates of

the intersection are recorded. This procedure is repeated for as many flashes of the same gun as is practicable, up to a series of six flashes, if possible, at which time a mean of the X and Y values recorded is computed to give a mean center of flashes and, therefore, the observed location of the hostile battery

f. High-Burst Ranging and Center of Impact Adjustment.

(1) The coordinates of the observation posts having been previously plotted, a rough plot of the expected check point is made from coordinates furnished by the firing battery commander if he has sufficient information to do so; otherwise a general area for observation is designated

(2) The azimuths to this point from each OP are determined by rotating the grid disk until the plotting scale passes through the OP and the check point and then reading the plotting scale and vernier scale. These are transmitted to the individual OP's, together with the approximate angle of site

(3) One round is fired and the azimuths are reported and plotted The coordinates of this point are not recorded since it Is plotted only as a check to see if each observer Is sighting properly on the same burst All OP's not seeing the burst are given its approximate azimuth (after it has been plotted) by the method prescribed In (2) above so that the observers will not miss the succeeding rounds

(4) Six rounds are then fired and the azimuths of each burst are reported, plotted, and the coordinates recorded The site of each shot is reported and recorded by the directing OP

(5) A running total of the X and Y coordinates of each burst is recorded and from this the X and Y coordinates of the mean center of bursts is computed and plotted

(6) The range of this point, the center of Impact, is measured to the directing observation post.

(7) The Z coordinate, which is the elevation of the point of burst is calculated by the mil relation using the range and angle of site from the directing OP

g. Test Problem The following test problem (fig. 1-4) is given so that the operators may familiarize themselves with the board and check the accuracy of the results obtained

(1) The coordinates of the observation posts are given as follows:

OP_1X = 26,000.0	Y = 10,000 0
OP_2X =22,300 0	Y = 08,400 0
OP_3X = 20,000 0	Y = 10,000 0
OP_4X = 21,300 0	Y = 13,700 0

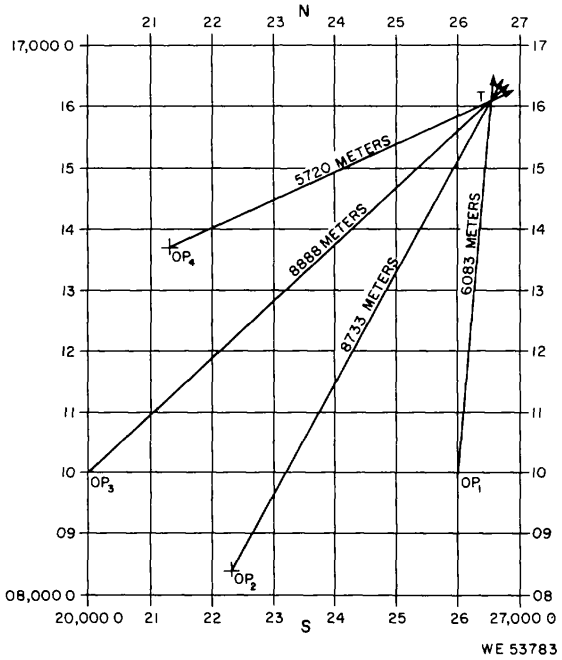

Figure 1-4. Test problem

(2) Plot the various OP's and then lay off the azimuth through each OP.
The Azimuths are as follows:

OP 1 = 84 mils
OP 2 = 511 mils
OP3 = 836 mils
OP 4 =1,167 mils

(3) These lines should intersect at a point, the coordinates of which are as follows

X = 26,500.0; Y = 16,050 0

(4) The range as measured from each OP should be as follows:

OP1 = 6,083 meters
OP2 = 8,733 meters
OP3 = 8,888 meters
OP4 = 5,720 meters

Note: When the angle of the target for two outside observation posts is less than 250 mils, the board is used only as check for locations computed from these two observation posts

(5) Check function of board plotting with a theoretical problem If components cannot be alined properly or malfunction exists after these checks and adjustments, refer problem to organizational maintenance personnel

CHAPTER 2
OPERATING INSTRUCTIONS

Section I. CONTROL AND INDICATORS

2-1. General
This section describes, locates, illustrates, and furnishes the using personnel with sufficient information pertaining to the various controls, indicators, and components provided for the proper operation of the board plotting M18 (fig. 1-1).

2-2 Controls and Indicators
Refer to table 2-1.

Table 2-1. Controls and Indicators

Control or Indicator	Function	Reference
Bracket assembly	Used when board plotting is to be operated by one man.	Figure 2-1
Bracket assembly	Used when board plotting is to be operated by two men.	Figure 2-2
Bracket assembly	To install scale assembly in position for a one (1) man operation.	Figure 2-1
Bracket assembly	To install scale assembly in position for a two (2) man operation.	Figure 2-2
Plotting disk	Permits plotting disk to be rotated to aline its markings with the scale assembly of the board plotting.	Figure 1-1
Vernier scale	Is graduated into 20 equal spaces and numbered every second graduation from 1 to 10 making possible azimuth adjustments of table accurate to ½ mil.	Figure 1-1

Section II. OPERATION UNDER USUAL CONDITIONS

2-3. General
This section contains instructions for the proper care of the material, preparation for use, and operation of the board plotting, M18 (fig. 1-1) and plotting board chest (fig 1-2) under conditions of normal atmospheric conditions. For operation under unusual conditions refer to Section III.

2-4. Care in Handling
a. Board plotting M18 will not stand rough handling or abuse. Inaccuracy or breakage will result from mistreatment. Any instrument that is functioning inaccurately or contains damaged parts must be brought to the attention of organizational maintenance personnel for disposition. Repairs other than those expressly authorized will not be performed by the operator.
b. Keep board plotting, M18 with chest clean and dry as possible. If the board plotting and/or chest is wet wire dry using a clean lint free cloth and allow to dry thoroughly.
c. When not in use keep the instrument inside the chest so that it is protected from dirt, dust, moisture, chipping, scratching, and destruction.

2-5. Preparation for Use
a. Place the chest and board plotting M18 from its stowed position or location. (fig. 1-2)

Caution
Because of its weight and bulk it is necessary for two men to lift and position the board plotting in order to avoid injury to personnel or damage to equipment.

b. Turn wing keys (fig. 1-2) on each of the twelve latches 1/2 turn counter clockwise to on latch cover Lift off cover (fig. 1-2), turn the cover over so that the inside is up, and place the cover on the ground.
c. Release six stow straps (fig. 1-2) attached to the leg cradle assemblies mounted on the platform assembly.
d. Using the built-in support assembly handles located on each side of the vernier bracket assembly, (fig. 1-1) the first man now grasps the table support assembly with both hands under the semi-circular segment.
e. Lift the support assembly off the posts of the platform and the leg from the cradles and carry the support and leg to the desired location (fig. 1-2). The second man then inserts the leg into leg assembly

socket "A," (fig. 1-1), located directly opposite the vernier bracket assembly, and adjacent to either of the handles. When the first leg is in place, the second man returns to the chest, obtains the two remaining legs, and inserts them in the proper support assembly sockets. Tighten the support wing screws (fig. 1-1) in the leg sockets to secure the legs in the support assembly.

f. Loosen the clamps wingscrews (fig. 1-1) in the blocks of the brace. Lower the brace from the stowed position on the leg socket extensions until the brace sleeves seat on the bottom flanges of the leg plate Tighten the three clamps wingscrews to secure the brace in the operating position.

g. Remove the rest bracket assembly and either of the two scale assembly brackets from the foam inserts mounted on top of the platform. If one man is to operate the board plotting, secure the one man bracket assembly to the support assembly 180 degrees away from the vernier bracket assembly, and the rest bracket 90 degrees clockwise from the vernier bracket assembly as shown in fig. 2-1. Secure both bracket assemblies with the thumbscrews provided. If two men are to operate the plotting board, install the two-man bracket on the vernier bracket assembly and the rest bracket 90 degrees counter clockwise from the vernier bracket assembly, utilizing the thumbscrews provided with each bracket (fig. 2-2) Leave the unused bracket stowed within the foam insert on the chest platform.

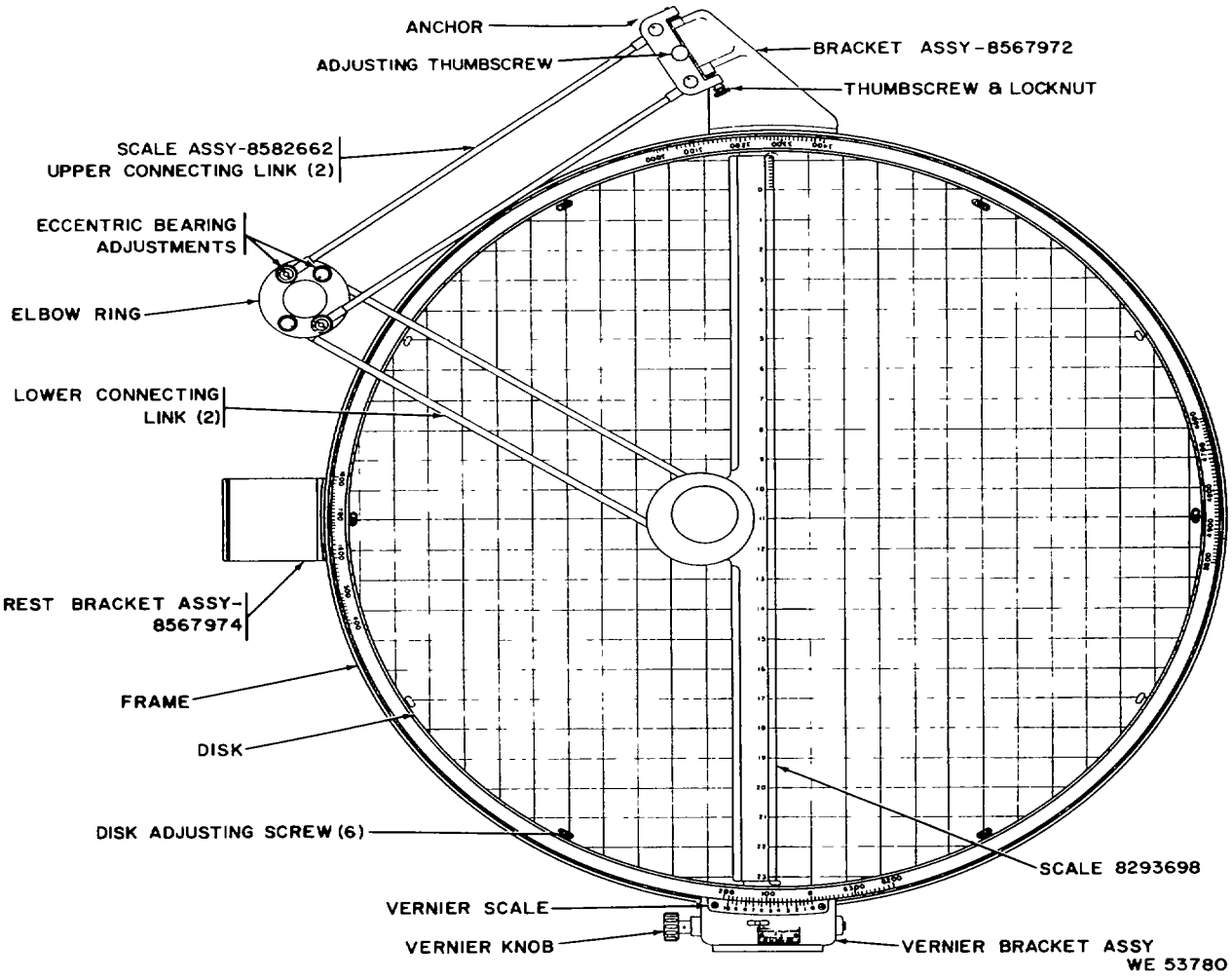

Figure 2.1 Board plotting M18 one-man operation

h. Grasp the platform assembly (fig. 1-2) at the hand cutouts on the sides and lift it out of the chest body Place it temporarily, top side up, on the inside of the chest cover removed in b above.

i. Clean the inner surface of the support bearing with a soft cloth to remove any dust or dirt. Lift the frame assembly, with disk attached, out of the chest and install and aline the frame assembly on the support assembly Check to be certain there is no dirt in the threaded center hole of the frame assembly adapter Release the brake lever by compressing it and allow the frame assembly to seat

j. Remove the stowed spindle assembly from the foam insert on the platform Wipe the spindle and threads with a soft cloth to remove all dirt and dust Slide the spindle assembly (fig. 1-1) upward through the support bearing and thread the spindle assembly into the frame assembly adapter by rotating the spindle clockwise Use the handle In the lower end of the spindle assembly to facilitate tightening Do not tighten the spindle assembly excessively.

k. Lift the hinged cover attached to the chest body supports (fig. 1-2) and remove the scale assembly from the foam insert located on the bottom of the chest. Install the anchor bracket (fig. 1-1) of the scale assembly by engaging the anchor assembly pin and clamping thumbscrew in the support assembly mounting bracket bushings. After checking that the clamping thumbscrew and locknut is free, tighten the clamping thumbscrew finger tight (fig. 2-1) Shake the upper connecting links of the scale assembly gently to be certain the assembly is secure. Check that the clamping thumbscrew is still finger tight, then tighten the locknut

l. Remove dust and dirt from all interior surfaces of the carrying chest, close the hinged cover and replace the chest platform assembly in the chest body. Replace the chest cover on the chest body and turn the latch wing keys 1/2 turn clockwise to lock cover in place Store the carrying chest In a clean, dry place.

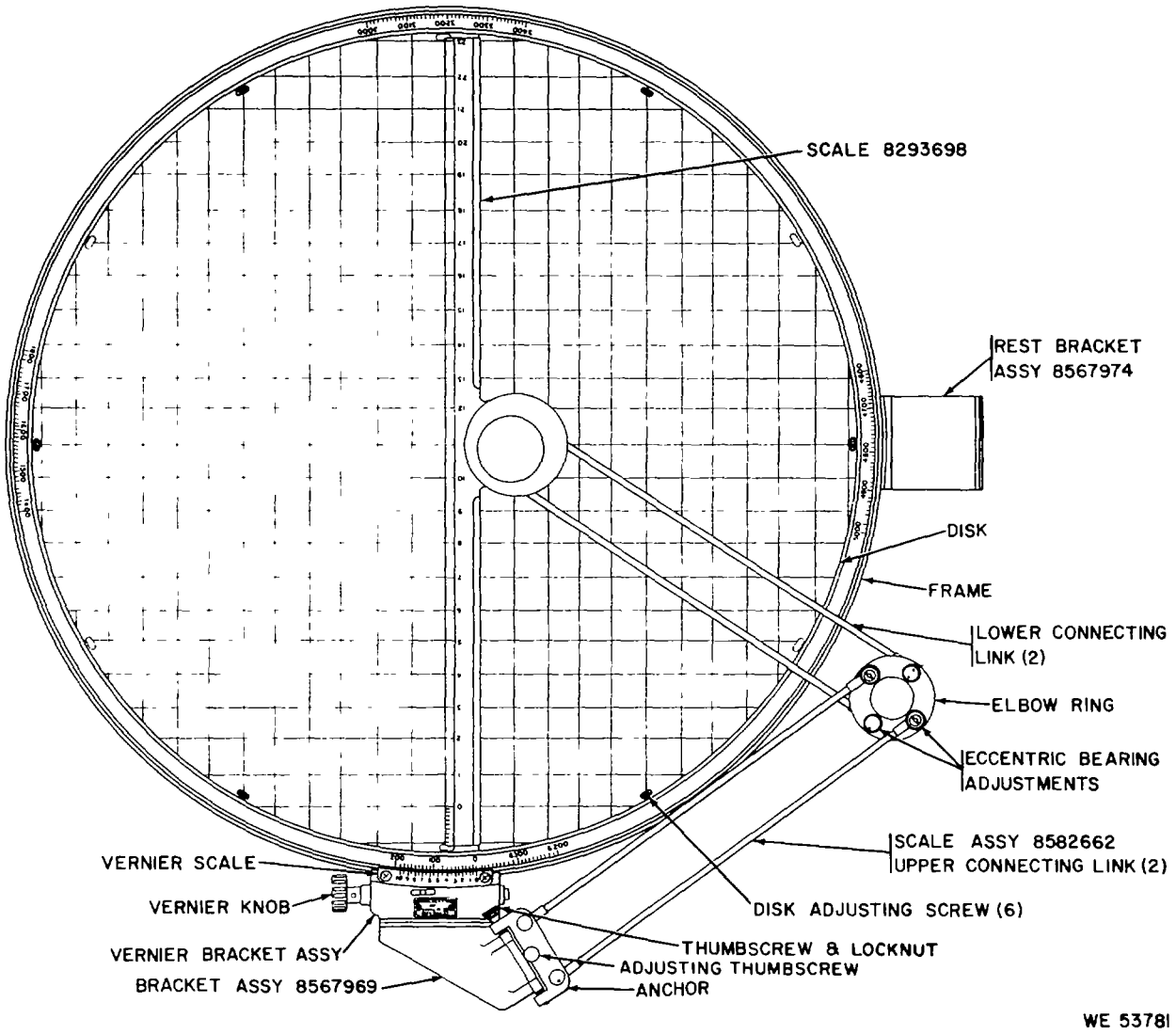

Figure 2.2 Board plotting M18 - Two-man operation

2-6. Operational Checks and Adjustments.

a. Place the scale assembly on the rest bracket as located by either the one or two-man configuration. Press the brake lever and, holding the lever depressed, rotate the frame assembly The frame assembly should rotate smoothly through the entire range of travel without binding. If It does not, recheck the spindle and frame assemblies for proper seating and the vernier bracket and roller assemblies for proper mounting and function.

b. Check to be certain that the scale assembly has been properly installed (para. 2-5k). Move the plotting scale assembly back and forth across the plotting disk The plotting scale shall bear lightly upon the plotting disk without scraping If it scrapes the disk, rotate the adjusting thumbscrew (fig 2-1) clockwise until the plotting scale bears upon the plotting disk with optimum pressure (Lift the scale assembly at the elbow ring to relieve pressure on the adjusting thumbscrew while turning the thumbscrew).

c. Check the surface of the disk assembly to be certain it is not scored, nicked, scratched, stained or damaged to the extent that plotting errors could occur during operation. If such a condition does exist, turn the disk over and utilize the new surface If necessary, wash the plotting surface with a soft cloth and mild soap solution. If both sides of disk are unserviceable, replace the disk assembly

d. Rotate the slow motion vernier knob (fig 1-1) until the index screw is approximately in the center of the vernier bracket assembly aperture. Press the brake lever (fig. 1-1) and rotate the table until the zero graduation on the azimuth scale is roughly in alinement with the zero graduation on the vernier. Release the brake lever Rotate the slow motion knob until the indices are in perfect coincidence. Move the

plotting scale into alinement with the vertical centerline of the plotting disk With the plotting scale alined with the disk centerline at one end of the scale, the opposite end of the scale must be in alinement with the centerline. If it is not, loosen the six disk adjusting screws (fig 2-1) around the edge of the plotting disk with a screwdriver, rotate the disk (without rotating the frame assembly) until the scale and centerline are in alignment, then tighten the screws

Section III. OPERATION UNDER UNUSUAL CONDITIONS

2-7. General.

In addition to the normal operating procedures for usual conditions, special instructions for operation under unusual conditions are contained herein. In addition to the normal preventive maintenance service, special care In cleaning and lubricating must be observed where extremes of temperature, humidity and atmospheric conditions are present or anticipated. Proper cleaning, lubrication, storage and handling of lubricants not only insure operation and functioning but also guard against excessive wear of the working parts and deterioration of the material

2-8. Operation in Extreme Cold.

a. In climates where the temperature is consistently below zero degrees F, It is necessary to prepare material for cold weather operation. For description of operations in extreme cold, refer to TM 9-207.

CAUTION

It is imperative that the approved extreme cold weather practices and precautions be followed: TM 9-207 must be considered an essential supplement to this manual.

b. Exercise the various controls through their entire range; at intervals as required to aid in keeping them from freezing in place and to reduce the effort required to operate them.

c. Never apply heat from strongly concentrated sources directly to an external surface Sudden temperature change may cause breakage or malfunction of the instrument

d. When plotting board Is not in use, pay particular attention to protecting It by stowing the instrument in its chest to prevent accumulation of snow and Ice from entering the working parts. Make certain that the chest Is dry and free from foreign matter.

2-9. Operation in Extreme Heat.

a. Avoid prolonged exposure to the direct rays of the sun; provide shade as much as possible.

b. Perspiration from the hands is a contributing factor to rusting because they contains acid and salt. After handling the Instrument, clean and wipe dry

c. If the board plotting has been exposed to excessively wet and damp conditions, lubricate the moving parts of the vernier bracket assembly with grease MIL-G-23827. Wipe off all excess grease immediately (fig. 1-1) and all clamp wingscrews.

d. Lightly lubricate the adjusting thumbscrew and locknut at the upper end of the scale assembly (fig. 2-1) and all clamp wingscrews on the support and brace assemblies.

2-10. Operation in Humid or Salty Atmosphere.

a. Inspect mechanisms frequently when operating in hot moist areas.

b. Moist and salty atmospheres have a tendency to emulsify oils and grease and destroy their rust preventive qualities Inspect all parts frequently for corrosion

c. When not in use stow the instrument in chest making certain that the chest Is free of foreign matter

2-11. Operation in Dusty or Sandy Conditions.

a. Protect instrument from direct exposure to dust or sand by erecting a vertical barrier to prevent sand or dust to blow on instrument.

b. Under extremely dusty or sandy conditions extra care must be exercised when cleaning the instrument with a clean cloth. Examine and remove all dust and sand from the plotting board and carrying chest before stowing the board plotting

2-12. Preparation for Travel.

a. Replacing board plotting, M18 In the chest is essentially the reverse of the procedure for preparing the board plotting for use (para. 2-5) However, note the following precautions.

b. Locate each component in its proper place. Be certain to clean each item as it is stowed in the carrying chest, if time and field conditions permit. Remove all grease from wingscrew threads of the one-man, two-man and rest brackets to preclude eventual saturation of the foam inserts

c. Strap each leg in the cradle assembly with stow straps provided.

d. Orient vernier bracket assembly on the platform as indicated.

e. Orient the platform assembly In conjunction with the vernier bracket assembly as noted on the corner foam insert in the bottom of the chest Also, be certain the three leg sockets of the support assem-

bly are properly seated over and on the three posts provided, and that the platform is properly centered over the disk. Do not drop the platform into the body assembly.

f. Do not place unauthorized equipment in the chest, particularly loose, heavy objects.

g. Reassemble and latch the cover assembly to the body assembly being certain to orient and match the black painted stripe on the outer surface of the cover and body assemblies

CHAPTER 3
OPERATOR/CREW AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

3-1. Repair Parts.

Repair parts and equipment issued to the using organization for operating and maintaining the board plotting, M18 are listed in Appendix B.

3-2. Tools and Equipment.

Refer to Appendix B section V.

Section II. LUBRICATION AND PAINTING

3-3. General.

Lubrication of the board plotting M18 (fig. 1-1) is required and accomplished by coating the following surfaces with a thin film of aircraft and instrument grease, MIL-G-23827.

a. Apply light coat of grease MIL-G-23827 on shafts (4 and 7, fig B-6) and at bearing surfaces of bracket assembly (26, fig B-6). Replenish as determined and required by operating and field conditions. Keep brake lever (fig. 1-1) clean and free of grease.

b. Apply light coat of grease, MIL-G-23827 to moving peripheral surfaces of bearings (8 and 11, fig. B-2) and screws (7 and 13, fig. B-2) in scale assembly links (9 fig. B-2).

c. Apply light coat of grease MIL-G-23827 to threads of thumbscrews (16 and 17, fig. B-2) on anchor end of scale assembly.

d. Apply light coat of grease on wingscrew threads of bracket assemblies (7,8, fig. B-1) and support leg socket and brace assembly (fig. 1-1).

3-4. Painting.

Paint all exposed surfaces so that the equipment will have the appearance of a new item. Refer to TM 9-254 for detailed instructions on painting. Bearing surfaces, sliding surfaces, mating surfaces, screw threads, and all other critical surfaces must not show traces of paint or primer. Painting of the parts should be done at the most practicable stage of maintenance.

Section III. SERVICE UPON RECEIPT OF MATERIAL

3-5. General.

a. When new, used, or reconditioned material is first received by the using organization, it is the responsibility of the officer in charge to determine whether the material has been properly prepared for service by the supplying organization to be sure it is in condition to perform the function.

b. Make a record of any missing parts, tools, and equipment, and of any malfunctions. Correct any deficiencies as quickly as possible.

3-6. Duties.

The organizational mechanic performs the inspection to determine whether the material has been prepared for service and is in condition to perform its assigned mission. It is the duty of the operator to assist the organizational mechanic in the performance of these services.

3-7. Services.

Upon receipt of plotting board M18 by a using organization, the following operations will be performed.

a. Unpacking

(1) The board plotting, M18 is housed in plotting board chest. Before opening chest, and removing the Instrument carefully check identification tags, serial number and any information that may be continued on paper tags which may be attached to the carrying chest.

(2) Remove board plotting, from chest by releasing twelve wing keys used to secure cover to chest.

CAUTION:
Do not mishandle or abuse the equipment because inaccuracy or breakage will result from mistreatment.

b. Inspection

(1) Upon receipt of the board plotting M18 make a visual inspection for obvious physical damage such as cracked, damaged, loose, bent or broken parts, dented surfaces, nicks, burns, scratches, or chips, loose, missing or binding knobs, corrosion, fungus growth, moisture, and missing parts.

(2) Check that mechanical components operate smoothly without binding or rough motion. Check that moving parts are free from lint, grit and other foreign matter which may hamper the operation of the instrument.

(3) Inspect the instrument for missing com-

ponents, screws, nuts, washers, pins, loose rivets or parts insecurely Fastened.

Section IV. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-8. General.

Preventive maintenance is the systematic care, inspection and servicing of equipment to maintain it in serviceable condition, prevent breakdown and to assure maximum operational readiness The operator's place In the performance of preventive maintenance service is.

a. To perform the daily service checks each day the equipment is operated.

b. To assist the organizational mechanics in the performance of any other scheduled periodic services specified.

c. To assist the organizational mechanic in the lubrication of the materiel as required.

3-9. Responsibility.

Operator's and crew chiefs are personally responsible for assigned equipment. Squad, section and platoon leaders are charged with supervisory responsibility for equipment pertaining to their commands. Unit and organization commanders are required to insure that equipment issued or assigned to their commands are properly maintained In a serviceable condition and that they are properly cared for and utilized.

3-10. Recording Repairs.

Repairs accomplished will be in accordance with procedures and standards prescribed in this manual. Deficiencies discovered before, during and after operation that cannot be corrected by the operator shall be entered on DA Form 2024. Deficiencies immediately corrected by the operator are not recorded, except when such corrections are made by replacing parts which constitute repairs above operational level. Such repairs shall be recorded as applicable.

3-11. General Procedures for All Services and Inspections.

a. The following general procedures apply to operator's (assisting the organizational mechanic) on preventive maintenance services and all inspections.

b. Inspection to see if all items are in good condition, correctly assembled or stowed, secure, not excessively worn, not leaking and adequately lubricated, apply to most items in the preventive maintenance and inspection procedures. Any or all of the checks that are pertinent to board plotting, M18 with equipment (including supporting, attaching or connecting members) will be performed automatically, as general procedures, in addition to any specific procedures given.

(1) Inspection for "good condition" is usually an external visual inspection to determine whether the unit is damaged beyond safe or serviceable limits. Good condition is explained further as meaning "not bent or twisted, not chafed or burred, not broken or cracked, not bare or frayed, not dented or collapsed, not torn or cut and not deteriorated."

(2) Inspection of the materiel to see that it is "correctly assembled" or stowed is usually a visual inspection to see if the materiel is in normal condition and that all parts are present and in proper relative position.

(3) Inspection of the materiel to determine if it is "secure" is usually an external or a check by hand for looseness. Such inspections must include any brackets, lockwashers, locknuts or pins.

(4) "Excessively worn" means a unit worn beyond serviceable limits or to a point likely to result in failure if the unit is not replaced before the next scheduled inspection. Excessive wear of mating parts or linkage connection is usually evidenced by too much backlash or lost motion.

c. Any special instructions required for the specific mechanisms or parts are contained in the pertinent section.

(1) Metal parts. Use dry cleaning solvent (or equivalent) and a clean lint free cloth to clean metal parts. Do not apply solvent to rubber, plastic or foam components.

(2) Rubber parts. Clean rubber parts with warm water and a mild soap, dry, and apply a light coat of powdered talcum.

(3) Plastic surfaces. Moisture due to condensation may collect on the plotting disk when the temperature of the material drops below that of the air. Remove by wiping clean with a soft, lint free cloth.

(4) Polyethylene foam. Wipe clean with a damp cloth.

d. General precautions in cleaning are as follows:

Warning:

(1) Dry cleaning solvents (or equivalent) are flammable and should not be used near an open flame. Fire extinguishers shall be provided when these materials are used. Also, be certain cleaning occurs only in well ventilated areas. Failure to observe these precautions could result in serious injury or loss of life.

(2) Cleaners of this nature normally evaporate quickly and have a drying effect on the skin. Use

protective gloves to prevent cracking of the skin, irritation and/or inflammation.

(3) The utilization of diesel fuel, gasoline or benzine (benzol) for cleaning IS prohibited.

3-12. Preventive Maintenance by Operator.

a. Purpose To assure maximum operational readiness, it is necessary that the equipment be systematically inspected at intervals each day it is operated. Any deficiencies discovered that cannot be corrected by replacing parts, will be reported on DA Form 2404

(1) Exercise care when handling the board plotting, and associated equipment. Do not knock against or drop on hard surfaces which may cause inaccuracy, damage or improper functioning of equipment.

(2) Unnecessary turning of screws or other parts not incident to the functioning of the equipment is forbidden.

(3) Stops are provided to limit the travel of certain components. Do not attempt to force movement or rotation of any control beyond the stop limit.

(4) Keep the equipment as clean and dry as possible, especially before storing or placing it within a container or case

(5) When not in use, keep equipment covered and in the carrying chest provided to protect against dust, moisture, weather and general deterioration.

(6) To prevent excessive damage and wear of threads, never tighten beyond a snug fit or the capable limits thereof.

(7) Equipment that cannot be adjusted or corrected by the authorized procedure must be referred to the responsible personnel.

c. Preventive Maintenance Checks and Services. Table 3-1 and 3-2 lists the schedule for preventive maintenance checks and services which will be performed at the designated intervals and will apply to operator/crew and organizational maintenance personnel who will use, stow, package or ship the equipment.

d. Daily Preventive Maintenance. Each piece of equipment will be inspected each day it is operated. This service is divided into three parts as indicated In (1) through (3) below.

(1) Before operation service. This is a brief service to ascertain that the equipment is ready for operation It is primarily a check to see if conditions affecting the equipment's readiness have changed since the last after operation service.

(2) During operation service. This service consists of detecting unsatisfactory performance.

(3) After operation service. This is basic daily service for the equipment. It consists of correcting, inso far as possible, any operating deficiencies. The board plotting M18 should be prepared to operate upon a moment's notice

3-13. Adjustment and Orientation

a. General. The following procedures may be used by organizational personnel in whole or In part to adjust and orient the vernier bracket assembly, plotting disk and scale assembly. Eccentric Bearings of the scale assembly should not be disturbed unless absolutely necessary and all other adjustments have failed.

b. Clamp board plotting screws (Fig. B-1, 25, and 33).

(1) Check board plotting assembly for stability and proper installation of brace and leg assemblies (2) Be certain wingscrews are not damaged, seat properly and assure stability of the assembly during operation.

c. Vernier Bracket Assembly (fig 1-1)

(1) Rotate vernier knob clockwise to stop Rotate knob counterclockwise to opposite stop and count number of turns required Rotate knob clockwise on half the number of turns counted to the center of the vernier movement.

(2) Loosen two mounting screws holding vernier scale (fig. 2-1 and 2-2) and slide the scale so that the screws are approximately centered in the elongated holes. Tighten screws.

(3) Press and hold the brake lever on the vernier bracket assembly and rotate the frame assembly so that the zero index on the azimuth scale is aligned with the zero index on the vernier scale Release the brake lever.

d. Plotting Disk (fig. 1-1).

(1) Loosen the six adjusting screws around the edge of the plotting disk and center the screws in the elongated holes of the disk.

(2) Tighten the six screws.

e. Plotting Scale Assembly (fig. 2-1 and 2-2).

(1) Tighten thumbscrew and locking nut at the anchor point of the scale assembly on either bracket assembly finger tight Refer to Figures 2-1 and 2-2 for familiarization and location of referenced components during this procedure.

(2) Position scale assembly so that elbow ring is just off edge of disk and that eccentric components on under side of ring are exposed.

(3) Move lower connecting links and scale to upper right of board and close to an engraved line on plotting disk.

(4) Rotate the frame with the vernier knob until line and scale edge are parallel.

(5) Move lower connecting links and scale to lower left of the plotting disk (6) If scale straightedge is not parallel with an engraved line on the plotting disk within 1/64 of an inch, notify direct support personnel to adjust

scale assembly as directed in Chapter 4, paragraph 4-13d.

f. Friction Pad (fig. B-6).

(1) Check the friction pad for wear and/or damage at least once a month or as operating conditions warrants.

(2) Measure the distance from the face of the pad mounted to the shoe to the face of the pad (24) mounted on the upper lip of the slide (25) with the brake lever (13) fully depressed and held in the open position.

(3) The distance shall measure no more than two hundred and forty (0.240) thousandths of an Inch. If the distance is equal to or greater than specified notify direct support personnel and replace the shoe pad as instructed in Chapter 4, paragraph 4-17 cord. The frame assembly with disk attached must be removed to accomplish this procedure.

Table 3-1 Operator/Crew Preventive Maintenance Checks and Services

B-Before Operation **D-During Operation** **A-After Operation**

Time Required: 04 **Time Required: 08**

Interval and Sequence no. B	D	A	Item to be Inspected Procedure	Work Time (M/H)
			BOARD PLOTTING AND EQUIPMENT	01
1			Check for damage, missing parts and cleanliness (Para 3-11a thru c)	
		2		01
			EXPOSED FUNCTIONAL SURFACES	
3			Clean and remove all dirt and foreign matter (Para 3-11d)	01
		4		02
			SCALE ASSEMBLY	
5			Check ease of operation and adjustment (Para 2-6a and b and 4-13d)	01
			VERNIER SCALE	
6			Check for proper function and lubrication (Para 2-6d and 3-3d)	01

Table 3-2 Organizational Preventive Maintenance Checks and Services

Q-Quarterly

Total Man-hours required 05

Sequence Number	Item to be Inspected Procedure	Work Time (M/H)
	VERNIER, PLOTTING AND AZIMUTH SCALES	
1	Check for damage and legibility (Para 3-12a (7) 4-6c and e)	01
	PLOTTING BOARD	
2	Check adjustments and orientation (Para 2-6a thru d)	02
	CARRYING CHEST	
3	Check cleanliness and function of air relief valves (Para 2-5*l* and 5-4d)	01

Section V. TROUBLESHOOTING

3-14. General.

Troubleshooting is a systematic isolation and remedy of malfunctions and defective components by means of symptoms and tests. Close adherence to the procedures covered herein will materially reduce the item required to locate trouble and restore the equipment to normal operation. Operation of the materiel without a preliminary examination could cause further damage to malfunctioning components Remedies provided in this section are to be performed by the operator or at the level of maintenance indicated.

3-15. Procedure.

The troubleshooting procedures described in Table 3-3 is one of determining malfunctions, the probable causes, and the necessary action required to remedy the malfunction. Corrective action that is beyond the scope of capability of the operator will be taken by organizational, direct support or general support personnel as applicable and prescribed in the Maintenance Allocation Chart, Appendix C.

Table 3-3. Troubleshooting (Mechanical)

Item No.	Malfunction	Probable cause	Corrective action
1	Frame assembly rotates with brake on.	a. Broken or weak brake lever. b. Worn or missing brake shoe. c. Crank damaged.	a. Replace spring para 4-17 fig B-6. b. Replace brake shoe, para 4-17 fig B-6 c. Replace crank, para 4-17 fig B-6.
2	Frame assembly binds.	a. Improper assembly of frame and/or spindle Para 2-3 fig 1-1. b. Roller assembly or assemblies, malfunction.	a. Remove frame assembly spindle and re-seat frame. b. Replace roller assembly Para 4-12e(1) and g,(1).
3	Plotting disk surface precludes functional Accuracy.	Surface damage or beyond serviceable life limit.	Turn disk over or replace Para 4-12e fig B-1.
4	Scale assembly scrapes disk surface.	a. Improper thumbscrew Adjustment. b. Bent, scale or links.	a. Adjust thumbscrew. Para 2-3b fig 2-1 or 2-2. b. Replace scale assembly Para 2-3 and d, fig 2-1 or 2-2.
5	Scale assembly cannot be be oriented.	a. Disk, plotting and vernier scales out of adjustment. b. Arm assembly bent or damaged. c. Bearing eccentrics out of adjustment.	a. Adjust and orient Para 3-13c, d, and e fig 2-1 and 2-2. b. Replace scale assembly Para 2-6a and b, fig B-2. c. Adjust eccentrics Para 4-13e fig B-2.
6	Vernier knob falls to orient frame assembly.	a. Brake components worn or damaged. b. Broken or missing pin in shaft, sleeve or Knob. c. Setscrew loose or missing from slide. d. Shaft bent.	a. Replace worn or damaged parts Para 4-17 fig B-6. b. Replace missing pin Para 4-17 fig B-6. c. Tighten or replace setscrew. Para 4-17 fig B-6. d. Replace shaft Para 4-17 fig B-6.
7	Brace assembly binds In stowed or operational position.	a. Bent tubes or sleeves in brace or damaged leg sockets In support Assembly. b Cracked or defective welding.	a. Replace brace or support assembly Para 4-12 fig B-1. b. Replace defective parts Para 4-12 fig B-1
-8	Support loose or unstable.	a. Damaged or missing wing screws. b. Leg foot plates bent or defective welding.	a. Replace wing screws Para 4-12 fig B-1. b. Replace leg Para-4-12 fig B-1.
9	Unable to secure brackets to support assembly.	Thumbscrews broken bent, or missing.	Replace thumbscrews Para 4-14, fig B-3, 4-15, fig B-4, 4-16, fig B-5.

Section VI. DISASSEMBLY AND ASSEMBLY

3-16. General.
This section describes procedures to be utilized in disassembly and assembly of the board plotting M18 which Is designed for minimum of maintenance.

3-17. Board Plotting M18.
a. The mechanical simplicity of assembly and disassembly of the component parts allocated to organizational maintenance is limited to replacement of parts Refer to Figures B-1 through B-8 Illustrated in disassembly sequence, and replace components and/or assemblies as required in reverse order. Refer to paragraphs 3-3 and 3-4 for specific instructions relative to lubrication, painting and cleaning. Refer to paragraph 3-13 for adjustment and orientation of the board plotting

b. Complete disassembly Is not always necessary to make the required replacement or repair. Good judgment should be exercised to keep disassembly and assembly to a minimum.

CHAPTER 4
DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Scope.

This chapter contains specific instructions for the disassembly, repair, assembly, test and adjustment of board plotting M18 and associated equipment. For description and data refer to Chapter 1

Note This manual contains exploded views which depict complete disassembly of the board plotting M18 and partial disassembly of the plotting board chest This should not be construed as authority to disassemble the materiel beyond that required to perform operations authorized in the Maintenance Allocation Chart (MAC) in Appendix C or to replace parts other than authorized in the applicable columns in Appendix B, Repair Parts List

4-2. Replacing Parts.

In subsequent paragraphs it is understood that authorized parts damaged or worn beyond repair are to be replaced and that necessary repairs within the capability of the shop to which the materiel is referred will automatically be accomplished, i.e., straightening, removal of burrs, dents, scratches, rust and providing proper paint finishes.

4-3. General Maintenance Procedures.

TM 9-254 presents general maintenance procedures that are often encountered in preparing fire control materiel. These procedures are presented as guides to maintenance personnel in the performance of their duties.

4-4. Special Tools and Equipment.

No special tools or equipment are required or authorized for plotting board M18 or equipment.

4-5. Troubleshooting.

Refer to Chapter 3, Section V

4-6. Painting.

a. The finishes of selected components are provided to facilitate touchup and/or painting of such components caused by frequent handling and exposure to the elements and are to be applies only as required

b. Plotting Disk (fig. 1-1). Fill lines flush with surface Color black, type I filler, TT-F-325.

c. Vernier Scale (fig. 1-1). Fill lines and figures. Color white, type I filler, TT-F-325.

d. Frame Assembly (fig. 1-1). Fill lines and figures of 6400 MIL scale flush with finished surface Color white, type I filler, TT-F-325.

e. Scale (fig. 1-1). Fill lines and figures color white, type I filler, TT-F-325

f. Anchor (fig 1-1) Semigloss enamel TT-E-529, color black, 27038, FED-STD-595

g. Knob (fig. B-2-2) Mahogany stain, TT-S-711

h. Disk (fig B-2-5). Semigloss enamel, TT-E-529, color black, 27038, FED-STD-595

i. Metal Components Touch up and/or paint olive drab components of plotting board and chest with TT-E-529, alkyd semigloss enamel, color 24087, FEDSTD-595.

j. Lettering Stencil gothic lettering on outside of chest with TT-E-529, color black, 27038, FED-STD595. Stencil gothic lettering on platform assembly and foam insert in bottom corner of chest body with TT-E-529, color white, 27875, FED-STD-595 (fig B-9).

4-7. Bonding.

a. Bonding is to be accomplished only as required. All surfaces must be free of contaminants before application of the proper adhesive to the specific rubber and foam components noted in the following paragraphs.

b. Apply adhesive MMM-A-1617 to mounting surfaces of all rubber material This includes the pad on the rest bracket assembly of the plotting board and all pads, packing and inserts in the plotting board chest. (figs. B-1 and B-9).

c. Apply adhesive 10559167 to mounting surfaces of all foam inserts, pads and holders In the carrying chest. Adhesive must be applied to nondensified surfaces of foam material. (fig B-9).

4-8. Staking.

a. Components listed require staking if removed and/or adjusted. Unless otherwise stated staking shall be in one place.

b. Stake screws (7 and 7(10)) and (13) of arm assembly (6) in two places at threaded ends (fig B-2).

c. Insert screw (8) in slide assembly (23) and stake bottom of screw (fig. B-6).

d. Stake both ends of pin (19) in shoe assembly (18). Shoe (20) must be free to pivot at assembly (fig B-6).

4-9. Lubrication.
Refer to Chapter 3, Section II, paragraph 3-3.

4-10. Cleaning.
Refer to Chapter 3, Section IV, paragraph 3-11.

Section II. DISASSEMBLY AND ASSEMBLY

4-11. General.

This section describes the procedures to be utilized in disassembly and assembly of board plotting M18 and carrying chest which are designed for a minimum of maintenance and long service life.

4-12. Disassembly and Assembly of Board Plotting (Fig B-1).

a. Remove two screws (1) and plate (2) Remove two screw (3) and vernier indicator (4)

b. Loosen nut and thumbscrew (17, 18 fig B-2) and remove scale assembly (5) Loosen two thumbscrews until they discharge from bracket (18) and remove bracket assembly (6)

c. Loosen two thumbscrews until they discharge from support assembly (26) and remove bracket assembly (7)

d. Loosen two thumbscrews until they become disengaged from support assembly (26) and remove bracket assembly (8)

e. Remove six screws (9) and disk (10) by pressing upward against the underside of the disk

f. Remove spindle (11) Press the clamping lever, on bracket assembly (18) and carefully lift the frame assembly (12) from the support assembly (26). Remove three screws (13) adapter (14) and ring (15).

g. Remove two screws (16), two washers (17) and bracket assembly (18) Remove pin (22)

h. Remove two screws (19), two washers (17(20)) and roller assembly (21), from support assembly (26) Remove pin (23), knob (24), and screw (25) from support assembly (26)

i. Remove leg (35) and bracket (34) assembled from support assembly (26). Remove pin (23(27)) and knob (24(28)). Remove two screws (29), two washers (30) and spacer (31) Remove screw (33) from block (32)

j. Assemble all items in reverse sequence

k. Complete disassembly of a unit is not always necessary in order to make the required replacement or repair Good judgment should be exercised to keep disassembly and assembly to a minimum

Section III. DISASSEMBLY AND ASSEMBLY OF MAJOR COMPONENTS

4-13. Disassembly and Assembly of Scale Assembly (Fig. B-2).

a. Remove two screws (1), knob (2), and three screws (3), scale (4) and disk (5) from arm assembly (6).

b. Remove two screws (7), two bearings (8) and link (9). Remove two screws (7(10)), two bearings (11), one end of link (9(15)) and ring (12). Remove two screws (13) two bearings (8(14)) and opposite end of link (9(15)) Remove thumbscrew (16), thumbscrew (17), and nut (18) Remove pin (20) from anchor (19)

c. Assemble all items in reverse sequence of disassembly.

d. Scale assembly must be adjusted when assembled on plotting board Refer to Chapter 3, paragraph 3-13e 1 through 6

e. Adjustment of scale assembly when disassembled are as follows:

(1) Hold upper connecting links stationary.

(2) Utilizing two small spanner wrenches, loosen screws (7) or (7(10)) in eccentric bearing (11) in the lower connecting link (9). Spanner wrench pin holes in screw and bearing are 0093 in diameter.

(3) Rotate the eccentric bearing (11) until approximately one half the angular space is taken up Tighten screws (7 or 7(10)).

(4) Rotate frame assembly (12 fig B-l) with knob (24 fig B-1) until the line on disk is parallel with scale edge.

(5) Move lower connecting links (9) and scale (4) back to upper right side position If scale edge and line on disk are not parallel within 1/64 of an inch, repeat steps (1) through (4) above until scale edge is parallel in both positions on the plotting disk without rotating the frame the frame assembly

(6) Remove stationary hold on upper arms.

(7) Move straight edge of scale (4) to fourth line from right Rotate the frame with the knob until line on the disk is parallel with scale edge

(8) Move the straight edge of scale (4) to fourth line on the left Adjust the eccentric bearing in the upper connecting link as In steps (2) and (3) above until scale edge is parallel at both left and right sides without moving the plotting disk Note When satisfactory adjustment has been obtained, staked the threaded end of both screw (7 and 7(10)) in place

(9) If necessary, loosen the two screws holding the vernier scale (fig. 2-1 or 2-2) and aline the zero index with the azimuth scale zero index. Tighten screws.

4-14. Disassembly and Assembly of Bracket Assembly (Fig. B-3).

Remove two thumbscrews (1) and two washers (2) Assemble in reverse sequence.

4-15. Disassembly and Assembly of Bracket Assembly (Fig. B-4).

Remove two thumbscrews (1) and two washers (2) Assemble in reverse sequence.

4-16. Disassembly and Assembly of Bracket Assembly (Fig. B-5).

Remove two thumbscrews (1) and two washers (2). Assemble in reverse sequence.

4-17. Disassembly and Assembly of Bracket Assembly (Fig. B-6).

a. Remove pin (1), knob (2), pin (1(3)), shaft (4) and sleeve (5) from bracket assembly (26).

b. Remove setscrew (6), shaft (7) and screw (8).

c. Remove pin (9), collar (10), two pins (11 and 9(12)), lever (13), sprang (14) and crank (15) from slide assembly (23) and remove shoe (18) Remove pad (24) If necessary from slide (25).

d. Remove pad (16) and shim (17) if necessary from shoe (20). Remove pin (19) and shoe (20) from link (21) Remove pin (22).

e. Remove insert (27) from bracket (28).

f. Assemble all items in reverse disassembly sequence.

Note The pads (16 and 24) and shim (17) can be replaced without any disassembly of the bracket. Place a new shim (17) and new pad (16) on shoe (20) Depress the lever (13) until the shoe is in a maximum open position. The space between pad (16) and pad (24) should measure 0 240 ± 0 003 Peel the laminated shim, as required, to obtain the specified space Use adhesive MMM-A-1617 to bond shim to shoe, and pad to shim or pad to slide If It is necessary.

4-18. Disassembly and Assembly of Frame Assembly (Fig. B-7).

Remove insert (1) from frame (2) Assemble in reverse sequence.

4-19. Disassembly and Assembly of Support Assembly (Fig. B-8).

Remove items (1) through (9) and assemble in reverse disassembly sequence.

4-20. Disassembly and Assembly of Chest (fig. B-9).

a. Disassembly and repair of the carrying chest Is limited to replacement of the relief valve (4) Refer to figure B-9 for disassembly/assembly sequence In the event that foam and rubber components become loose and require the proper adhesive to restore adequate bonding, refer to paragraph 4-7 for the specific type of adhesive applied.

b. Refer to paragraph 4-6 for instructions and chapter 5 for final Inspection.

CHAPTER 5
FINAL INSPECTION

5-1. General.

Final inspection is completed after repair has been accomplished to insure that the materiel is serviceable according to the following serviceability standards. Any item containing defects disclosed by final inspection will be further adjusted or repaired to place it in a serviceable condition.

5-2. Visual Inspection and Testing.

Visually Inspect and test the board plotting In accordance with paragraph 5-3 below and the carrying chest. In accordance with paragraph 5-4 below Equipment shall present a new appearance and shall show no signs of rust.

5-3. Plotting Board M18.

a. Plotting Scale Flatness. With the plotting board arranged for two-man operation, the plotting scale shall lie flat on any part of the plotting disk from the "7" graduation to the "15" graduation within 0.015 inch when the "11" graduation is at the center of the plotting disk. The ends of the scale shall lie flat within 0.025 inches. (Utilize standard thickness gages).

b. Parallelism. When alined with the fiducial edge of the plotting scale, two grid lines which intersect through the center of the plotting disk, shall be parallel to the fiducial edge of the scale within 0.015 inch throughout their entire length, with the azimuth scale and vernier reading 0 $\pm$ 0.1 mil and 1600 $\pm$ 0.1 mil. (Use pocket optical compactor to check errors in parallelism).

c. Accuracy. Lines drawn forming a centrally located square with sides measuring 15,000 $\pm$ 15 meters shall have both diagonals measure 21,213 $\pm$ 21 meters. The board plotting shall be arranged for two-man operation with the plotting scale and grid lines parallel and a zero setting on the azimuth scale. With this setting the following procedure shall be utilized to form two diagonals:

(1) Using the plotting scale, measure off and establish a point 7500 meters north of the approximate center of the disk.

(2) From the point established above measure off and establish a point 15000 meters south.

(3) Rotate the plotting disk to 1600 mils and repeat procedures in (1) and (2) to establish east and west points.

(4) With the table set in this position, draw an east-west line through the north point and an eastwest line through the south point.

(5) Rotate the plotting disk to zero on the azimuth scale and draw a north-south line through the east point and a north-south line through the west point The lines drawn in (4) and (5) should form a square.

(6) Rotate the plotting disk to a position where the plotting scale bisects the corners of the square accomplished above (7). Both diagonals, as measured on the scale shall be 21,213 $\pm$ 21 meters.

d. Vernier Assembly. The vernier assembly will be visually inspected and knob shall rotate smoothly through its entire range.

e. Board Plotting Table. With the brake lever pressed and held, it shall be possible to rotate the table consisting of the disk and frame assembly through the entire range of travel without binding. With the brake lever released the braking mechanism shall hold the table in a clamped position but allow fine adjustment of the vernier knob.

f. Brake Adjustment. The distance between the face of the brake shoe pad and the face of pad mounted to the lip of the slide (fig. B-6) with the brake lever fully depressed, shall measure no more than two hundred and forty thousandths (0.240) of an inch minus one thousandth (0.001) of an Inch. (Utilize appropriate thickness gages).

g. Scale Assembly. With the board plotting arranged in both the two-man and one-man operation mode, there shall be no binding in any part of the scale assembly when the scale assembly is moved back and forth over the entire plotting disk.

h. Plotting Disk Surface. The plotting disk surface shall have a surface that will allow clear pencil (2H or softer) markings and clean erasures. The surface shall have no defects such as pits, digs, scratches, or stains which may be mistaken for pencil marks. There shall be no signs of delimitation.

5-4. Chest.

a. Fasteners. Fastening devices shall be checked by functional and visual examination when engaged and disengaged The supporting and securing devices within the chest shall be accessible and receive and secure the associated item without interference. The cover and body shall close uniformly without interference when compressed so that the lip edges displace a uniform compression over the surface of the rubber seal. There shall be no signs of delimitation.

b. Handles. All handles shall function without in-

terference and shall support the latched chest assembly when carried with the specified contents. There shall be no evidence of damage to, or separation of the handle assemblies The rubber tube of each handle shall be free of paint.

c. Interface Requirements The board plotting components shall be properly positioned in the space provided. The board plotting components shall then be manually manipulated to assure there is no excess movement in the stowed positions. The cover then shall be closed and latched to the body utilizing normal hand pressure The chest shall then be opened and inspected visually and by touch to assure that the plotting board components have not been displaced.

d. Air Relief Valves. The air relief valves shall be clean and securely mounted Air flow shall not be restricted or obstructed by paint, dirt, dust or other foreign material The valve instruction plates shall be clearly legible and unobstructed by paint.

5-5. Completion of Inspection.

When the board plotting/or chest have been restored to a completely serviceable condition, it shall be certified that the item is acceptable for "Return to User" or for "Return to Stock".

CHAPTER 6
ADMINISTRATIVE STORAGE

Refer to TM 740-90-1 for Instructions on administrative storage of equipment.

APPENDIX A
REFERENCES

A-1. Supply Publications

The following Department of the Army Supply Publications pertain to repair of this materiel

Abrasive materials C5350-IL-A
Brushes, Paints, Sealers and Adhesives. C8000-IL-A
Fuels, Lubricants, Oils and Waxes C9100-IL

A-2. Other Publications

a. General

Accidents Reporting and Records..... AR 385-40
Direct Support Maintenance Activities..... FM-29-23
Federal Supply Code for Manufacturers .... SB 708-42
United States and Canada-Code to
Name (Cataloging Handbook H4-2).
General Support Maintenance Activities..... FM 29-24
The Army Maintenance Management.. ..... TM 38-750
Systems (TAMMS)

b. Maintenance

Adhesives, Rubber Base, General Purpose..... MIL-A-5092
General Maintenance Procedures for..... ..... TM 9-254
Fire Control Materiel
Grease, Aircraft and Instrument..... ..... MIL-G-23827
Gear and Actuator Screw
Recommended Changes to DA Publication. ..... DA Form 2028

c. Operations

Northern operations..... FM 31-71
Operation and Maintenance of Army.. ..... TM 9-207
Materiel in Cold Weather
(0° to -65°F) (TO 36-1-40)

d. Shipment and Storage

Administrative Storage and Equipment ..... TM 740-90-1
Part Equipment and Tools for Army MIL-P-14232/10539750
Material, Packaging and Packaging of.

APPENDIX B
BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED LIST AND ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST (INCLUDING DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS)

CURRENT AS OF 7 June 1974

Section I. INTRODUCTION

B-1. Scope.

This appendix lists basic issue items; items troop installed or authorized repair parts; special tools; test, measurement, and diagnostic equipment (TMDE); and other support equipment required for operation and performance of organizational, direct support, and general support maintenance of board plotting, M18.

B-2. General.

This Basic Issue Items, Items Troop Installed or Authorized, Repair Parts and Special Tools List is divided into the following sections.

a. Section II. Basic Issue Items List. A list in alphabetical sequence of items which are furnished with and which must be turned In with the end item.

b. Section III. Items Troop Installed or Authorized List. Not Applicable.

c. Section IV. Repair Parts List. A list of repair parts authorized for use in the performance of maintenance The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups In ascending numerical sequence, with the parts In each group listed in figure and item number sequence. Bulk materials are listed in NSN sequence

d. Section V. Special Tools List. A list of special tools, TMDE, and support equipment authorized for the performance of maintenance at the organizational level.

e. Section VI. National Stock Number and Part Number Index. A list in ascending numerical sequence of all National stock numbers appearing in the listings, followed by a list, in alphameric sequence, of all part numbers appearing In the listing. National stock number and part numbers are cross-referenced to each illustration figure and item number appearance. This index is followed by a cross-reference list of reference designations to figure and item numbers when applicable.

B-3. Explanation of Columns.

The following provides an explanation of columns In the tabular listings.

a. Illustrations. This column is divided as follows: (1) Figure Number. Indicates the figure number of the illustration in which the item is shown.

(2) Item Number. The number used to identify each item called out in the illustration.

b. Source, Maintenance, and Recoverability Codes (SMR)

(1) Source Code. Source codes are assigned to support Items to indicate the manner of acquiring support items for maintenance, repair, or overhaul of the end items Source codes are entered In the first and second positions of the Uniform SMR Code format as follows:

Code	*Definition*
PA	Item procured and stocked for anticipated or known usage
PB	Item procured and stocked for insurance purpose because essentiality dictates that a minimum quantity be available in the supply systems
PC	Item procured and stocked and which otherwise would be coded PA except that It is deteriorative in nature
PD	Support item, excluding support equipment, procured for initial issue or outfitting and stocked only for subsequent or additional initial issues or outfittings Not subject to automatic replenishment
PE	Support equipment procured and stocked for initial issue or outfitting to specified maintenance repair activities
PF	Support equipment which will not be stocked but which will be centrally procured on demand
PG	Item procured and stocked to provide for sustained support for the life of the equipment It is applied to an item peculiar to the equipment which, because of probable discontinuance or shutdown of production facilities, would prove uneconomical to reproduce at a later time
KD	An item of a depot overhaul repair kit and not purchased separately Depot kit defined as a kit that provides items required at the time of overhaul or repair
KF	An item of a maintenance kit and not purchased separately Maintenance kit defined as a kit that provides an Item that can be replaced at organizational or Intermediate levels of maintenance
KB	Item included in both a depot overhaul/repair kit and a maintenance kit
MO	Item to be manufactured or fabricated at organizational level
MF	Item to be manufactured or fabricated at the direct support maintenance level
MH	Item to be manufactured or fabricated at the general support maintenance level
MD	Item to be manufactured or fabricated at the depot maintenance level

Code	*Definition*
AO	Item to be assembled at organization level
AF	Item to be assembled at direct support maintenance level
AH	Item to be assembled at general support maintenance level
AD	Item to be assembled at depot maintenance level
XA	Item is not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly
XB	Item is not procured or stocked If not available through salvage, requisition

***NOTE*: Support items listed in the RPSTL-TM with assigned maintenance and recoverability codes and no source codes can be requisitioned with justification through normal channels by use of the manufacturer's code and part number. Such support items are not normally stocked.**

***NOTE*: Cannibalization or salvage may be used as a source of supply for any item source coded above except those coded XA and aircraft support items as restricted by AR700-42.**

(2) Maintenance Code. Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered In the third and fourth positions of the Uniform SMR Code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and use the support item The maintenance code entered in the third position will indicate one of the following levels of maintenance.

Code	*Application/Explanation*
C	Crew or operator maintenance performed within organizational maintenance
O	Support item is removed, replaced, used at the organization level
I	Support item is removed, replaced, used by the direct support element of integrated direct support maintenance
F	Support item is removed, replaced, used at the direct support level
H	Support Item is removed, replaced, used at the general support level
D	Support items that are removed, replaced, used at depot, mobile depot, specialized repair activity only

NOTE: Codes "I" and " F" will be considered the same by direct supply units.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i e, all authorized maintenance functions). This position will contain one of the following maintenance codes:

Code	*Application/Explanation*
0	The lowest maintenance level capable of complete repair of the support item is the organizational level
F	The lowest maintenance level capable of complete repair of the support item Is the direct support level
H	The lowest maintenance level capable of complete repair of the support item is the general support level
D	The lowest maintenance level capable of complete repair of the support item is depot level
L	Repair restricted to designated specialized repair activity
Z	Nonreparable No repair is authonzed
B	No repair is authorized. The item may be reconditioned by adjusting, lubricating, etc, at the user level No parts or special tools are procured for the maintenance of this item

(3) Recoverability Code. Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform SFR Code format as follows.

Recoverability Codes	*Definition*
Z	Nonreparable item When unserviceable, condemn and dispose at the level indicated in position 3
0	Reparable item When uneconomically reparable, condemn and dispose at organizational level
F	Reparable item When uneconomically reparable, comdemn and dispose at the direct support level
H	Reparable item When uneconomically reparable, condemn and dispose at the general support level
D	Reparable item When beyond lower level repair capability, return to depot Condemnation and disposal not authorized below depot level
L	Reparable item Repair, condemnation, and disposal not authorized below depot/specialized repair activity level
A	Item requires special handling or condemnation procedures because of specific reasons (i.e. precious metal content, high dollar value, critical material or hazardous material) Refer to appropriate manuals/directive for specific instructions

c. National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation or Government activity) which controls the design and characteristics of the item by means of its engineering drawings specification standards, and inspection requirements, to identify an item or range of items. For BILL and ITIAL, see explanation of description column, para f

NOTE: When a stock numbered item is requisitioned, the repair part received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5-digit numeric code listed in SB 70842 which is used to identify the manufacturer, distributor, or Government agency, etc For BILL and ITIAL, see explanation of description column, para f.

f. Description. Indicates the Federal item name and, if required, a minimum description to identify the item. (In BILL and ITIAL only, the following will be used) The last line for each item in the BILL and ITIAL indicates the part number with the FSCM in parentheses. In the Special Tools List, the initial

basis of issue (BOI) appears as the last line in the entry for each special tool, TMDE, and support equipment. When density of equipments supported exceeds density spread indicated in the basis of issue, the total authorization is Increased accordingly.

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr, etc). When the unit of measure differs from the unit of issue, the lowest unit of Issue that will satisfy the required units of measure will be requisitioned.

h. Quantity Furnished with Equipment. (Basic Issue Items Only). Indicates the quantity of the basic issue item furnished with the equipment.

i. Quantity Authorized. (Items Troop Installed or Authorized Only) Indicates the quantity of the item authorized to be used with the equipment.

j. Quantity Incorporated in Unit. Indicates the quantity of the Item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group or an assembly. A "V" appearing In this column In lieu of a quantity indicates that no special quantity is applicable (e.g. shim, spacers, etc).

B-4. Special Information.

To maintain disassembly sequence in this manual, a number in parentheses will be displayed immediately to the right of the callout number on the illustration.

B-5. How to Locate Repair Parts.

a. When National Stock Number or Part Number is Unknown:

(1) First. Using the table of contents, determine the functional group or subgroup within which the repair part belongs. This is necessary since illustrations are prepared for functional groups or subgroups, and listings are divided into the same groups.

(2) Second. Find the illustration covering the functional group or subgroup to which the repair part belongs.

(3) Third. Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(4) Fourth. Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When National Stock Number or Part Number is Known:

(1) First. Using the index of National stock numbers and Part Number find the pertinent National stock number or part number. This index is in ascending NSN sequence followed by a list of part numbers in ascending alphameric sequence, cross-referenced to the illustration figure number and item number.

(2) Second. After finding the figure number and item number, locate the figure number and item number in the repair position.

B-6. Abbreviations.

Abbreviations	*Explanation*
al Enam	Aluminum enamel
aly	alloy
andz	anodize
blk	black
btn	button
cd pld	cadmium plated
cham	chamfer
cp	cone point
cres	corrosion resistant steel
cskh	countersunk head
dla	diameter
ext	external
fi	flat
fnsh	finish
grdtn eql	graduation equal
h	high
hdl	handle
hex soc	hexagonal socket
id	inside diameter
Intl	internal
l	long
mtg	mounting
nf	national fine
no	number
ns	national special(thread)
oxd	oxide
pnn	pan head
pt	point
sp	special purpose
stl	steel

Section II. BASIC ISSUE ITEMS LIST

(1) ILLUSTRATION (A) FIG.	(1) ILLUSTRATION (B) ITEM	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER & FSCM USUABLE ON CODE	(4) QTY FURN W/EQUIP
B-9	-	1220-00-351-7902	CHEST PLOTTINGBOARD AL ENAM FNSH, 43 L, 43 W, 13.5004, 4HDL 10548700 (19200).	1

SECTION IV. REPAIR PARTS LIST

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						BOARD PLOTTING M18 11728160		
B-1	1	PA-DZ-Z	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE	EA	2
						PNH, CROSS-REC, CRES, PSVT FNSH, NO 440 UNC-2A, 1/4 L		
B-1	2	PA-DZ-Z	9905-00-431-8359	7660275	19200	PLATE, IDENTIFICATION	EA	1
B-1	3	PA-FZ-Z	5305-00-050-9227	MS51957-61	96906	SCREW, MACHINE	EA	2
						PNH, CROSS-REC, CRES, PSVT FNSH, NO 10-24 UNC-2A, 3/8 L	EA	2
B-1	4	PA-FZ-Z	1220-00-460-2590	8567984	19200	VERNIER INDICATOR	EA	1
						AL, BLK-ANDZ, 5437 OA L, GRDTN EQL SP	EA	1
B-1	5	PA-FH-H	1220-00-460-3955	8582662	19200	SCALE ASSEMBLY, BOARD PLOTTING	EA	1
B-1	6	PB-FZ-Z	1220-00-922-0456	8567969	19200	BRACKET ASSEMBLY	EA	1
						TWO MAN		
B-1	7	PB-OZ-Z	1220-00-937-3769	8567974	19200	BRACKET ASSEMBLY	EA	1
						(REST)		
B-1	8	PB-OZ-Z	1220-00-937-3767	8567972	19200	BRACKET ASSEMBLY	EA	1
						(ONE MAN)		
B-1	9	PA-OZ-Z	5305-00-774-9614	MS51960-47	96906	SCREW, MACHINE	EA	6
						FL CSKH, CROSS-REC, CRES, PSVT, FNSH, NO 8-36 UNF-2A, 1/2 L		
B-1	10	PA-OH-H	1220-00-460-2593	8567956	19200	DISK, PLOTTING BOARD	EA	1
						MAGNESIUM ALY, 37.795 OD, 0.125 THK 24 EQL SP, 0.125 THK		
B-1	11	PA-OZ-Z	1220-00-937-3757	8567977	19200	SPINDLE ASSEMBLY	EA	1
B-1	12	PB-FH-D	1220-00-005-5111	10553228	19200	FRAME ASSEMBLY	EA	1
B-1	13	PA-FZ-Z	5305-00-071-2097	MS51958-85	96906	SCREW, MACHINE	EA	3
						PNH, CROSS-REC, CRES, PSVT FNSH, 1/4-28 UNF-2A, 1-1/2 L		
B-1	14	PB-FZ-Z	1220-00-937-3797	8567993	19200	ADAPTER, SPINDLE	EA	1
B-1	15	XB-FZ-Z		8567994	19200	RING, FRAME ASSEMBLY	EA	1
B-1	16	PA-FZ-Z	5305-00-680-4262	MS35308-360	96906	SCREW, CAP, HEXAGON HEAD	EA	2
						CRES, 3/8-24 UNF-2A, 1 L		
B-1	17	PA-FZ-Z	5310-00-180-0277	MS35333-76	96906	WASHER, LOCK	EA	8
						FL, INTL T, CRES, PSVT FNSH, 0.375 ID, 0.670 OD, 0.032 THK		
B-1	18	PA-FH-H	1220-00-937-3760	8567966	19200	BRACKET ASSEMBLY, VERNIER	EA	1
B-1	19	PA FZ-Z	5305-00-940-9547	MS51958-110	96906	SCREW, MACHINE	EA	6
						PNH, CROSS-REC, CRES, PSVT FNSH, 3/8-24 UNF-2A, 718 L		
B-i	21	PA-FZ-Z	1220-00459-7292	8567978	19200	ROLLER ASSEMBLY	EA	3
B-1	22	PA-FZ-Z	5315-00-809-1442	MS16555-647	96906	PIN, STRAIGHT, HEADLESS	EA	2
						CRES, PSVT, FNSH, 1/4 DIA, 7/8 L		
B-1	23	PA-FZ-Z	5315-00-273-7981	MS35672-10	96906	PIN, GROOVED HEADLESS	EA	6
						CRES, 1/16 OD, 3/4 L		
B-1	24	PA-OZ-Z	5355-00-177-5212	7660260	19200	KNOB	EA	6
B-1	25	PA-OZ-Z	1220-00-479-2996	8567982	19200	SCREW, PLOTTING BOARD	EA	3
B-1	26	PB-FH-D	1220-00-0064102	8567964	19200	SUPPORT ASSEMBLY	EA	1
B-1	29	PB-OZ-Z	5305-00-051-2325	MS51958-94	96906	SCREW, MACHINE	EA	12
						PNH, CROSS-REC, CRES, PSVT FNSH, 5/16-24 UNF-2A, 1/2L		
B-1	30	PB-OZ-Z	5310-00-150-4090	8568004-2	19200	WASHER, FLAT	EA	12
						NON-METALLIC		
B-1	31	XB-OZ-Z		10553218	19200	SPACER	EA	6
B-1	32	XB-FZ-Z		7660259	19200	BLOCK	EA	3
B-1	33	PA-OZ-Z	1220-00-460-2592	8567979	19200	SCREW, PLOTTING BOARD	EA	3
B-1	34	PB-FZ-Z	1220-00-006-4103	8567965	19200	BRACE	EA	1
						(WLD AND MACH)		
B-1	35	PB-FZ-Z	1220-00-922-0463	8567971	19200	LEG, WELDED	EA	3

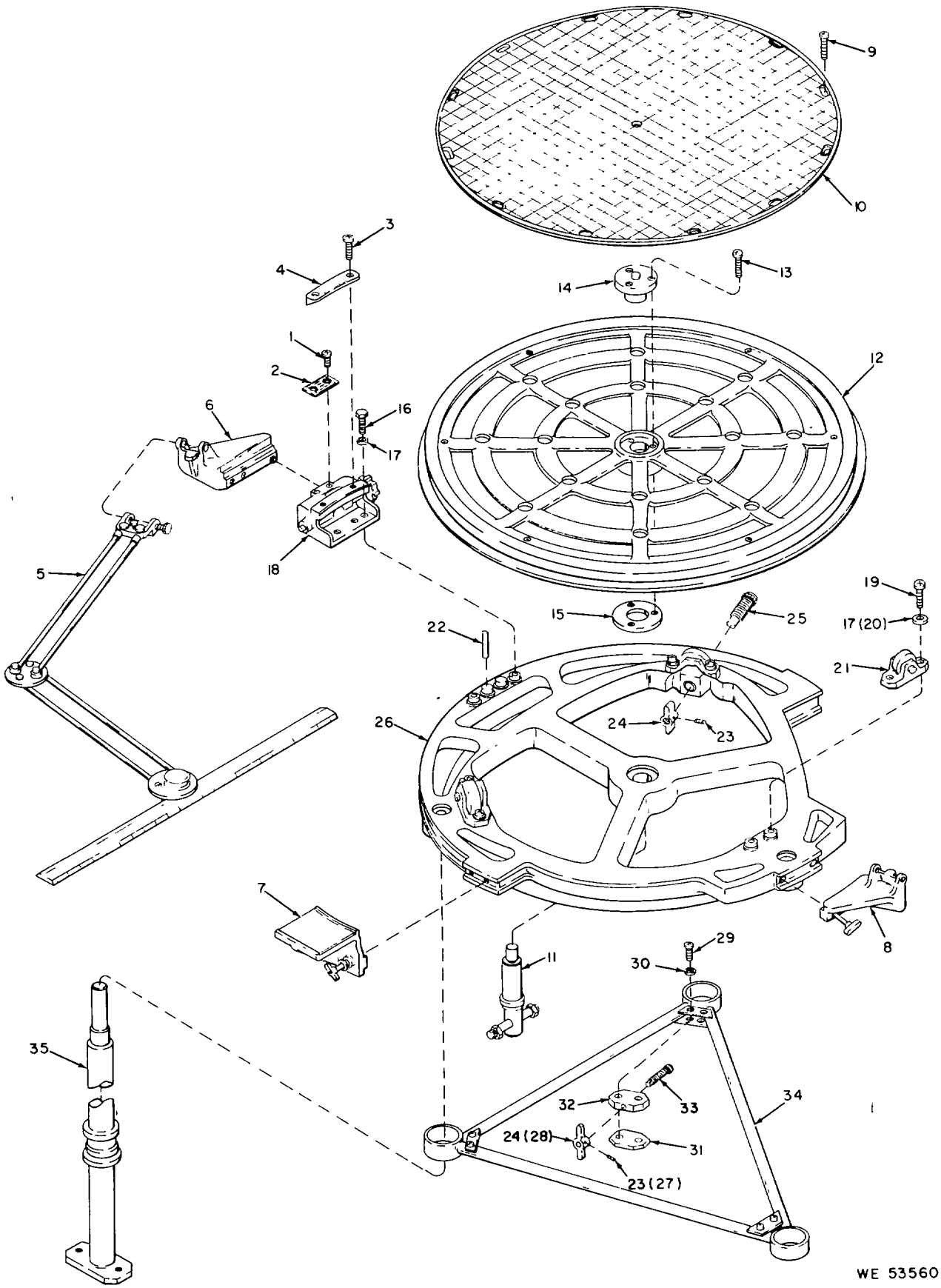

Figure B-1. Board plotting M18

(1) ILLUSTRATION (a) FIG NO.	(b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						SCALE ASSEMBLY, BOARD PLOTTING		
						8582662		
B-2	1	PA-FZ-Z	5305-00-901-3793	MS35492-251	96906	SCREW, WOOD	EA	2
						FLH, CROSS-REC, BRS, BLK OXD		
B-2	2	XB-FZ-Z		5039475	19200	KNOB, WOOD, MAPLE	EA	1
B-2	3	PA-FZ-Z	5305-00-071-1320	MS51960-63	96906	SCREW, MACHINE	EA	3
						FL CSKH, CROSS-REC, CRES, PSVT FNSH,		
						NO 1032 UNF-2A, 3/8 L		
B-2	4	PA-FH-H	6675-00-922-0462	8293698	19200	SCALE, PLOTTING (RIVETED)	EA	1
B-2	5	XB-FZ-Z		8226949	19200	DISK, CRES, 4-3/4 OD, 0.060 THK	EA	1
B-2	6	XA- -		8226958	19200	ARM ASSEMBLY, PLOTTING BOARD		1
B-2	7	XB-FZ-Z		8226940	19200	SCREW, MACHINE	EA	4
B-2	8	PA-FZ-Z	3120-00-007-4868	8226942	19200	BEARING, SLEEVE	EA	4
						1/4 28 UNF-2B, INTL THD, 0.62 OA		
B-2	9	XB-FZZ		8226947	19200	LINK CONNECTING, RIGID (BRAZED)	EA	4
B-2	11	PA-FZ-Z	3120-00-007-4869	8226943	19200	BEARING, ECCENTRIC SLEEVE	EA	2
						1/4-28 UNF-2B, INTL THD, 0.62 OA		
B-2	12	XB-FZ-Z		8226948	19200	RING	EA	1
B-2	13	PA-FZ-Z	5305-000-6300	8226941	19200	SCREW, MACHINE	EA	2
						1/4-28 UNF-2A, 1 OA		
B-2	16	PA-FZ-Z	5305-00-182-9439	8226952	19200	THUMBSCREW	EA	1
						OVAL PT, CRES, NO 10-32NF-2A, 0.870 L		
B-2	17	PA-FZ-Z	5305-00-182-9440	8226953	19200	THUMBSCREW	EA	1
B-2	18	PA-FZ-Z	5310-00-182-4088	8226954	19200	NUT, SPECIAL	EA	1
B-2	19	PA-FZ-Z	1220-00-937-3799	8226957	19200	ANCHOR, ARM ASSEMBLY (PINNED)	EA	1
B-2	20	XA- -		8226955	19200	PIN, SHOULDER, HEADLESS		1
B-2	21	XA- -		8226951	19200	ANCHOR (MACH)		1

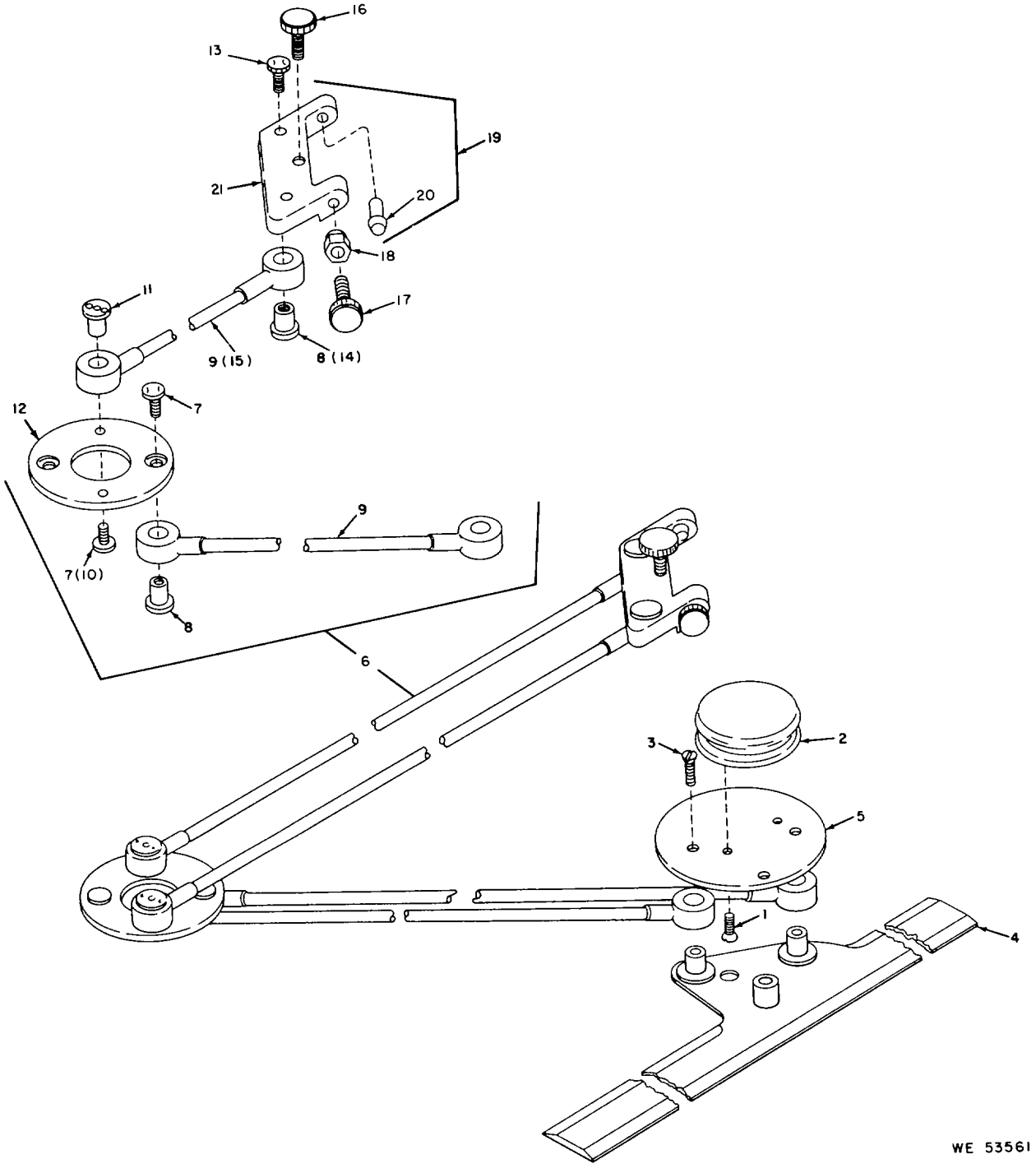

Figure B-2. Scale assembly, board plotting

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION / USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						BRACKET ASSEMBLY 8567969		
B-3	1	PA-OZ-Z	5305-00-497-7408	8567985	19200	THUMBSCREW	EA	2
						CRES, 3/8-24 UNF-2A, 2-5/32 OA		
B-3	2	PA-FZ-Z	5310-00-134-8981	85680045	19200	WASHER, FLAT	EA	2
						PLSTC, 3/4 OD, 063 ID, 0.03 THK		

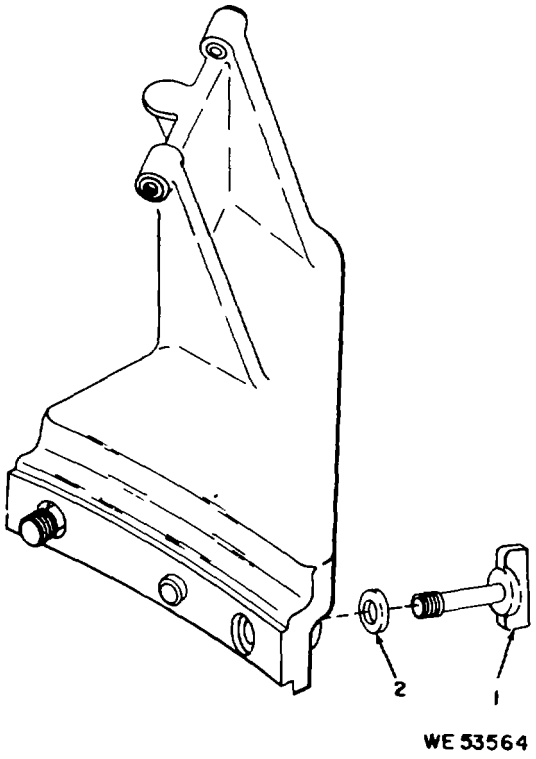

Figure B-3. Bracket assembly

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						BRACKET ASSEMBLY 8567974		
B-4	1	PA-OZ-Z	5305-00-497-7408	8567985	19200	THUMBSCREW	EA	2
						CRES, 3/8-24 UNF-2A, 2-5/32 OA		
B-4	2	PA-OZ-Z	5310-00-134-8981	85680044-5	19200	WASHER, FLAT	EA	2
						PLSTC, 3/4 OD, 063 ID, 0.03 THK		

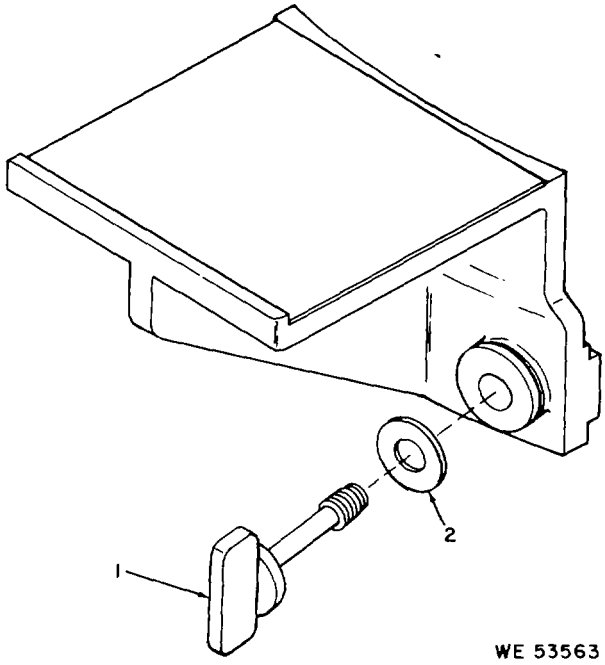

Figure B-4 Bracket assembly

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						BRACKET ASSEMBLY 8567972		
B-5	1	PA-OZ-Z	5305-00497-7408	8567985	19200	THUMBSCREW ..... CRES, 3/8-24 UNF-2A, 2-5/32 OA	EA	2
B-5	2	PA-OZ-Z	5310-00-134-8981	8568004-5	19200	WASHER, FLAT ..... PLSTC, 3/4 OD, 0.63 ID, 0.03 THK	EA	2

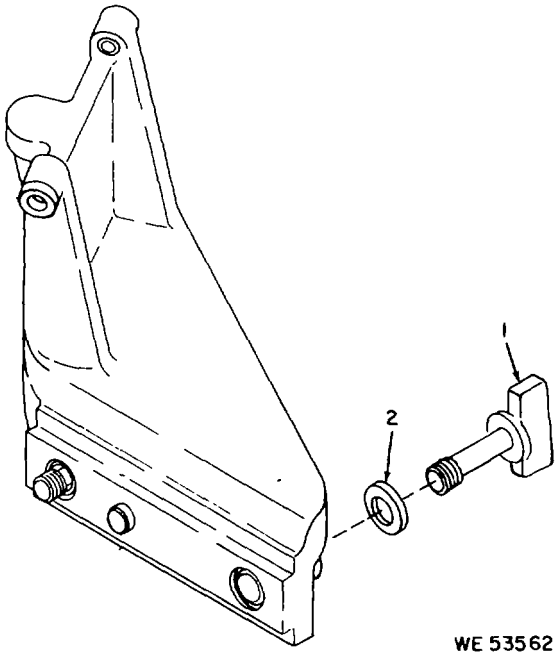

Figure B-5. Bracket assembly

(1) ILLUSTRATION (a) FIG NO.	(b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						BRACKET ASSEMBLY 8567966		
B-6	1	PA-FZ-Z	5315-00-844-2929	MS16555421	96906	PIN, STRAIGHT, HEADLESS	EA	2
						CRES, PSVT FNSH, 3/32 DIA, 5/8 L		
B-6	2	XB-FZ-Z		7660266	19200	KNOB	EA	1
B-6	4	PA-FZ-Z	1240-00-167-995	7660267	19200	SHAFT, PLOTTING BOARD	EA	1
						3 750 OA L, 0.375 OA DIA, 0.031 L OF		
						CHAM, 45 DEG ANGLE OF CHAM		
B-6	5	XB-FZ-Z		7660268	19200	SLEEVE, PLAIN	EA	1
B-6	6	PA-FZ-Z	5305-00-099-7490	MS51974-26	96906	SETSCREW	EA	1
						HEX SOC, CP, ALY STL, CD PLD, NO 8-36		
						UNF-3A, 3/16 L		
B-6	7	XB-FZ-Z		10553224	19200	SHAFT, GUIDE	EA	1
B-6	8	XB-FZ-Z		5180969	19200	SCREW, SLOTTED, HEAD	EA	1
B-6	9	PA-FZ-Z	5315-00-487-2415	MS51987-371	96906	PIN, SPRING	EA	2
						TUBULAR COILED, 1/16 OD, 5/8 L		
B-6	10	XB-FZ-Z		8213715	19200	COLLAR, SHAFT	EA	1
B-6	11	XB-FZ-Z		5046737	19200	PIN, STRAIGHT, HEADED	EA	1
B-6	13	XB-FZ-Z		8643785	19200	LEVER, BRAKE	EA	1
B-6	14	PA-FZ-Z	5360-00-477-0136	MS24585-1193	96906	SPRING, HELICAL, COMPRESSION	EA	1
						SCDP, 10 COILS, 1.120 FREE L 0.300 OD		
						0.042 DIA WIRE		
B-6	15	XB-FZ-Z		5046736	19200	CRANK	EA	1
B-6	16	PA-FZ-Z	1220-00-922-0461	10553220	19200	PAD, FRICTION	EA	1
						PLSTC, 3/8 W, 13/16 L, 1/16 THK		
B-6	17	PA-FZ-Z	5365-00-009-9168	10548475	19200	SHIM, LAMINATED	EA	1
B-6	18	PA-FZ-Z	1220-00-937-3816	10553219	19200	SHOE, CLAMPING (STAKED)	EA	1
B-6	19	XA- -	10553221	19200		PIN, DOWEL, HEADLESS		1
B-6	20	XA- -	10553222	19200		SHOE, CLAMPING		1
B-6	21	XA- -	10553223	19200		LINK, CLAMPING		1
B-6	22	PA-FZ-Z	5315-00-297-0878	MS35672-33	96906	PIN, GROOVED, HEADLESS	EA	1
						CRES, 3/16 OD, 5/8 L		
B-6	23	XB-FZ-Z		10553225	19200	SLIDE ASSEMBLY	EA	1
B-6	24	PA-FZ-Z	1220-00-922-0457	10553227	19200	PAD, FRICTION	EA	1
						PLSTC, 1/4 W, 2-5/16 L, 1/16 THK		
B-6	25	XA- -		10553226	19200	SLIDE, CASTING		1
B-6	26	XB-FZ-Z		8567967	19200	BRACKET ASSEMBLY	EA	1
B-6	27	PA-FZ-Z	1220-00-003-8403	8567990	19200	INSERT, THREADED	EA	2
						CRES, 5/8-11 UNC-2A, EXT THD,		
						3/8-24 UNF-2A, INTL THD, 0.50 OA		
B-6	28	XA- -		8567959	19200	BRACKET		1

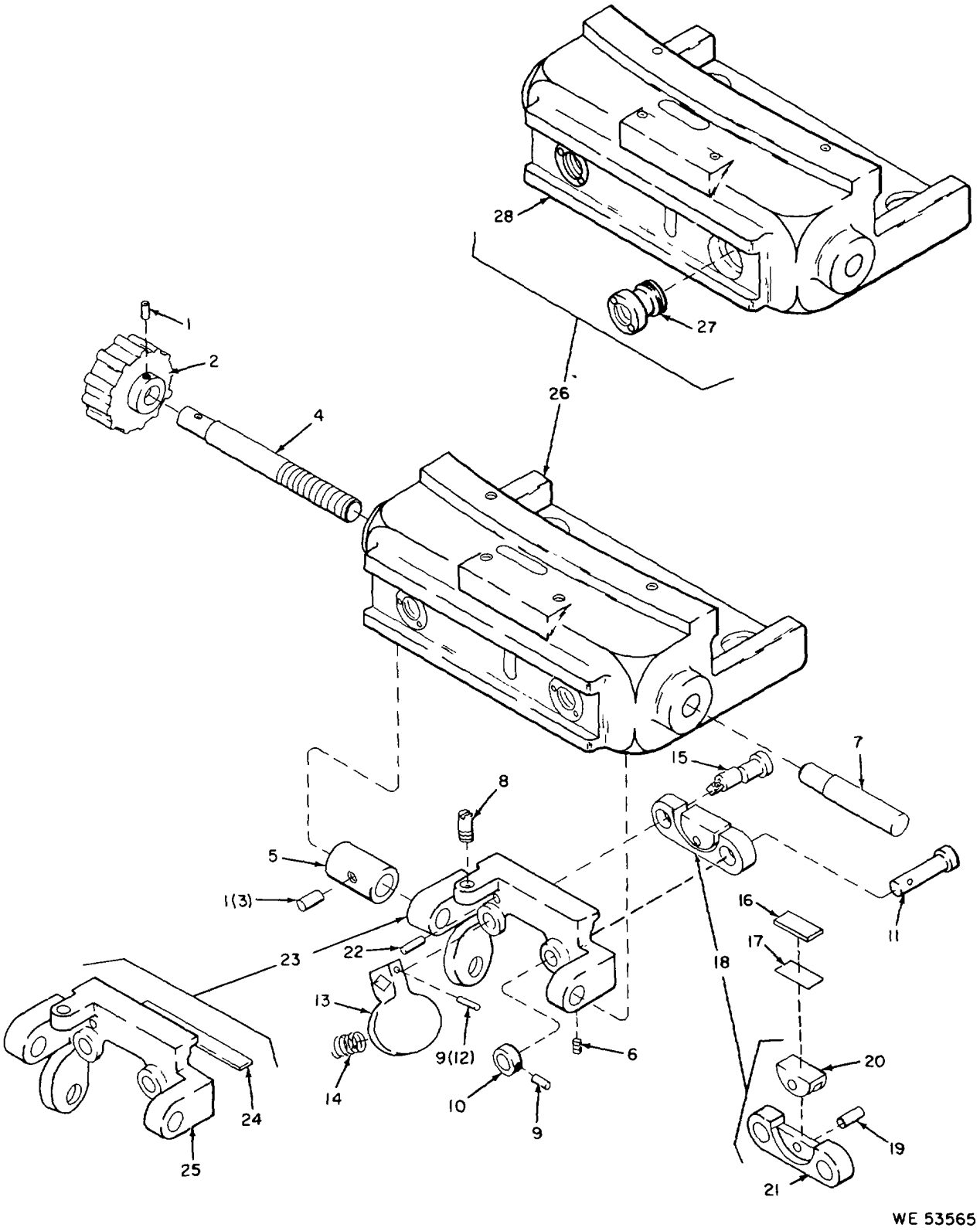

Figure B-6. Bracket assembly

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						FRAME ASSEMBLY 10553228		
B-7	1	PA-FZ-Z	1220-00-003-1078	8567986	19200	INSERT, PLAIN..... CRES, 0.4381 DIA, 71 OA	EA	6
B-7	2	XB-FZ-Z		8567957	19200	FRAME (CEM AND MACH).....	EA	1

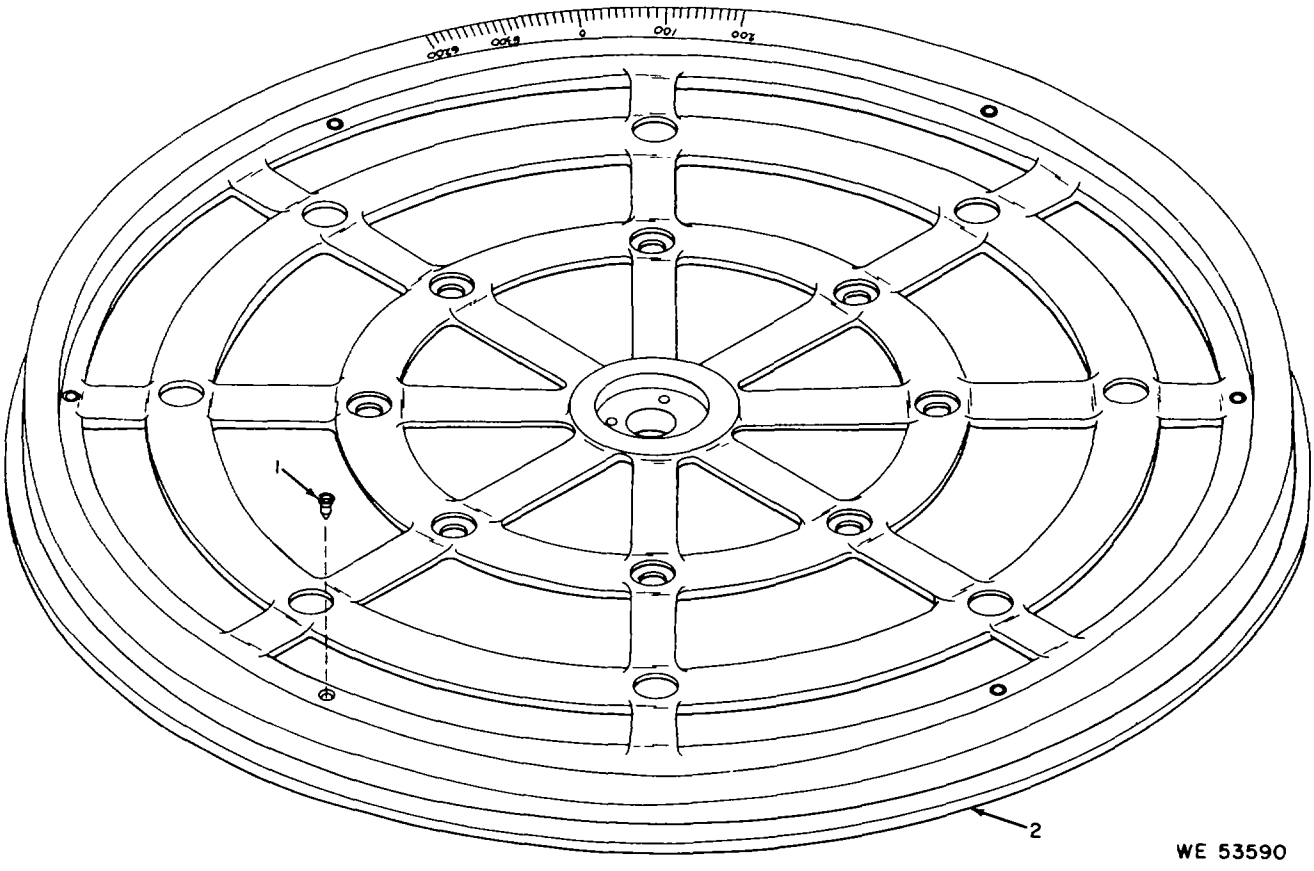

Figure B-7. Frame assembly

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						SUPPORT ASSEMBLY 8567964		
B-8	1	PA-FZ-Z	5305-00-050-9232	MS51957-66	96906	SCREW, MACHINE PNH, CROSS-REC, CRES, PSVTFNSH, 10-24-UNC-2A, 7/8 L	EA	3
B-8	2	PA-FZ-Z	5310-00-150-4091	8568004-3	19200	WASHER, FLAT PLSTC, 3//8 OD, 0.200 ID, 0.060 THK	EA	3
B-8	3	PA-HZ-Z		8567996	19200	BUSHING PLSTC, 2 496 OD, 1 3/8 ID, 1500 THK	EA	1
B-8	4	PA-DZ-Z		8567989	19200	INSERT, THREADED CRES, 5/8-11 UNC 2A, EXT THD, 0 520 OA	EA	10
B-8	5	PA-FZ-Z		8568004-4	19200	WASHER, FLAT PLSTC, 1 1/8 OD, 0.630 ID, 0030 THK	EA	10
B-8	6	PA-FZ-Z	1220-00-003-8402	8567991	19200	INSERT, THREADED CRES, 7/8-9 UNC 2A, 31/32 OA	EA	3
B-8	7	PA-FZ-Z	5365-00409-8676	8568004-6	19200	WASHER, FLAT PLSTC, 1 1/16 OD, 0.880 ID, 0037 THK	EA	3
B-8	8	PA-FZ-Z	12204-00-004-4332	8567987	19200	INSERT, THREADED CRES, 5/8-11 UNC-2A, 0.810 OA	EA	6
B-8	9	PA-FZ-Z	5310-00-009-8677	8568004-7	19200	WASHER, FLAT PLSTC, 13/16 OD, 0630 ID, 0.03 THK	EA	6
B-8	10	XA		8567958	19200	SUPPORT	EA	

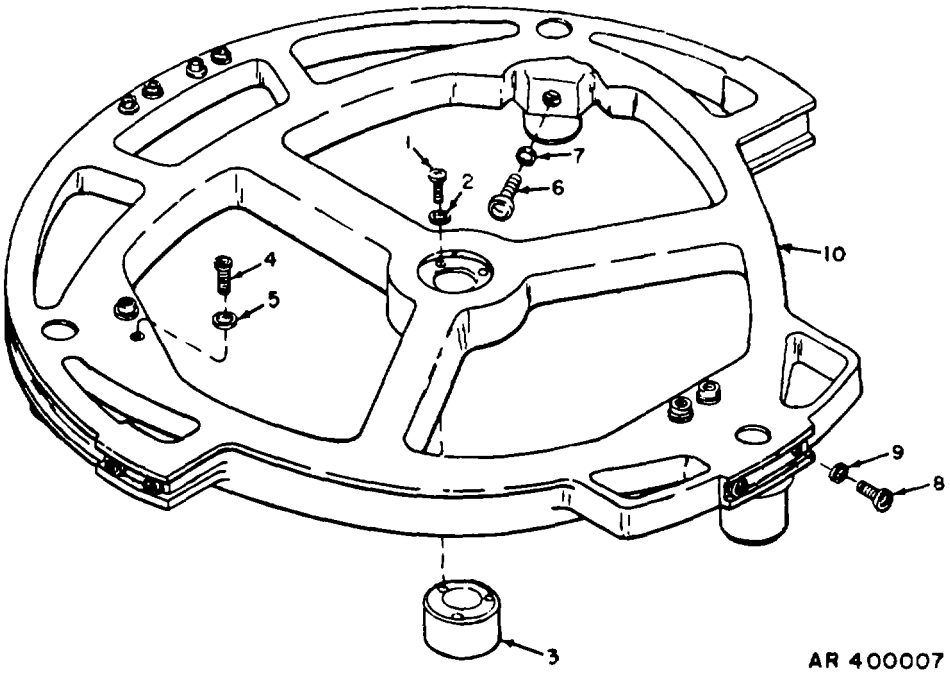

Figure B-8. Support assembly

SECTION V. Special Tools List

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						EQUIPMENT		
B-9		PA-CH-H	1220-00-351-7902	10548700	19200	CHEST, PLOTTING BOARD	EA	1
						AL ENAM FNSH, 43 L, 43 W, 13500H, 4 HDL		
						REPAIR PARTS FOR EQUIPMENT		
						CHEST, PLOTTING BOARD 10548700		
B-9	1	XA- -		10548704	19200	COVER ASSEMBLY		1
B-9	2	XA- -		10548701	19200	PLATFORM ASSEMBLY		1
B-9	3	XA- -		10548703	19200	BODY ASSEMBLY		1
B-9	4	PA-FZ-Z	4820-00460-3870	11727741	19200	VALVE, RELIEF, PRESSURE-VACUUM	EA	2
						W/RLSE BTN, 1-1/8 HEX, 7/832NS MTG		
						NUT		

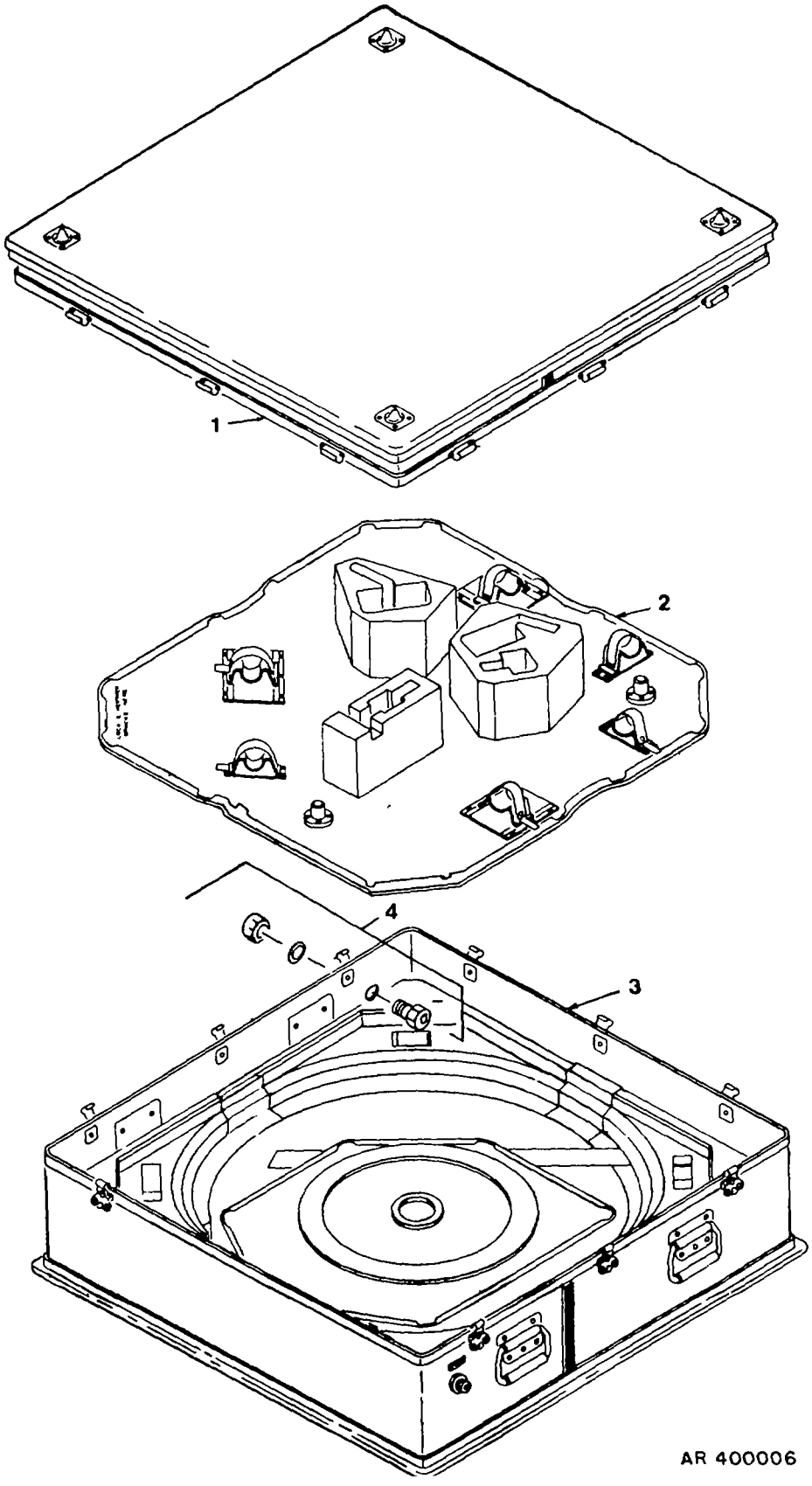

Figure B-9. Chest plotting board

SECTION VI. National Stock Number and Part Number Index

STOCK NUMBER	FIG.	ITEM
1220-00-003-1078	B-7	1
1220-00-003-8402	B-8	6
1220-00-003-8403	B-6	27
1220-00-004-4332	B-8	8
1220-00-005-5111	B-1	12
1220-00-006-4102	B-1	26
1220-00-006-4103	B-1	34
1220-00-351-7902	B-9	
1220-00-459-7292	B-1	21
1220-00-460-2590	B-1	4
1220-00-460-2592	B-1	33
1220-00-460-2593	B-1	10
1220-00-460-3955	B-1	5
1220-00-479-2996	B-1	25
1220-00-922-0456	B-1	6
1220-00-922-9457	B-6	24
1220-00-422-0461	B-6	16
1220-00-022-0463	B-1	35
1220-00-937-3757	B-1	11
1220-00-937-3760	B-1	18
1220-00-937-3767	B-1	8
1220-00-937-3769	B-1	7
1220-00-037-3797	B-1	14
1220-00-937-3799	B-2	19
1220-00-937-3816	B-6	18
1240-00-167-6995	B-6	4
3120-00-007-4868	B-2	8
3120-00-0074869	B-2	11
4820-00-460-3870	B-9	4
5305-00-006-6300	B-2	13
5305-00-050-9227	B-1	3
5305-00-050-9232	B-8	1
5305-00-051-2325	B-1	29
5305-00-054-5647	B-1	1
5305-00-071-1320	B-2	3
5305-00-071-2097	B-1	13
5305-00-099-7490	B-6	6
5305-00-182-9439	B-2	16
5305-00-182-9440	B-2	17
5305-00-497-7408	B-3	1
5305-00-497-7408	B-4	1
5305-00-497-7408	B-5	1
5305-00-680-4262	B-1	16
5305-00-774-9614	B-1	9
5305-00-901-3793	B-2	1
5305-00-940-9547	B-1	19
5310-00-009-8677	B-8	9
5310-00-134-8981	B-3	2
5310-00-134-8981	B-4	2
5310-00-134-8981	B-5	2
5310-00-150-4090	B-1	30
5310-00-150-4091	B-8	2
5310-00-180-0277	B-1	17
5310-00-182-4088	B-2	18
5315-00-273-7981	B-1	23
5315-00-297-0878	B-7	22
5315-00-687-2415	B-6	9
5315-00-809-1442	B-1	22
5315-00-844-2929	B-9	1
5355-00-177-5215	B-1	24
5360-00-477-0136	B-6	14
5365-00-009-8676	B-8	7
5365-00-009-9168	B-6	17
6675-00-922-0462	B-2	4
9905-00-431-8359	B-1	2

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
MS16555-621	96906	B-6	1
MS16555-647	96906	B-1	22
MS24585-1193	96906	B-6	14
MS35308-360	96906	B-1	16
MS35333-76	96906	B-1	17
MS35492-251	96906	B-2	1
MS35672-10	96906	B-1	23
MS35672-33	96906	B-6	22
MS51957-13	96906	B-1	1
MS51957-61	96906	B-1	3
MS51957-66	96906	B-8	1
MS51958-85	96906	B-1	13
MS51958-94	96906	B-1	29
MS51958-110	96906	B-1	19
MS51960-47	96906	B-1	9
MS51960-63	96906	B-2	3
MS51974-26	96906	B-6	6
MS51987-371	96906	B-6	9
10548475	19200	B-6	17
10548700	19200	B-9	
10548701	19200	B-9	2
10548703	19200	B-9	3
10548704	19200	B-9	1
10553218	19200	B-1	31
10553219	19200	B-6	18
10553220	19200	B-6	16
10553221	19200	B-6	19
10553222	19200	B-6	20
10553223	19200	B-6	21
10553224	19200	B-6	7
10553225	19200	86	23
10553226	19200	B-6	25
10553227	19200	B-6	24
10553228	19200	B-1	12
11727741	19200	B-9	4
5039475	19200	B-2	2
5046736	19200	B-6	15
5046736	19200	B-6	11
5180969	19200	B-6	8
7660259	19200	B-1	32
7660260	19200	B-1	24
7660266	19200	B-6	2
7660267	19200	B-6	4
7660268	19200	B-6	5
7660275	19200	B-1	2
8213715	19200	B-6	10
8226940	19200	B-2	7

SECTION VI. National Stock Number and Part Number Index—Continued

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
8226941	19200	B-2	13	8567977	19200	B-1	11
8226942	19200	B-2	8	8567978	19200	B-1	21
8226943	19200	B-2	11	8567979	19200	B-1	33
8226947	19200	B-2	9	8567982	19200	B-1	25
8226948	19200	B-2	12	8567984	19200	B-1	4
8226949	19200	B-2	5	8567985	19200	B-3	1
8226951	19200	B-2	21	8567985	19200	B-4	1
8226952	19200	B-2	16	8567985	19200	B-5	1
8226953	19200	B-2	17	8567986	19200	B-7	1
8226954	19200	B-2	18	8567987	19200	B-8	8
8226955	19200	B-2	20	8567989	19200	B-8	4
8226957	19200	B-2	19	8567990	19200	B-6	27
8226958	19200	B-2	6	8567991	19200	B-8	6
8293698	19200	B-2	4	8567993	19200	B-1	14
8567956	19200	B-1	10	8567994	19200	B-1	15
8567957	19200	B-7	2	8567996	19200	B-8	3
8567958	19200	B-8	10	8568004-2	19200	B-1	30
8567959	19200	B-6	28	8568004-3	19200	B-8	2
8567964	19200	B-1	26	8568004-4	19200	B-8	5
8567965	19200	B-1	34	8568004-5	19200	B-3	2
8567966	19200	B-1	18	8586004-5	19200	B-4	2
8567967	19200	B-6	26	8568004-5	19200	B-5	2
9567969	19200	B-1	6	8568004-6	19200	B-8	7
8567971	19200	B-1	35	8568004-7	19200	B-8	9
8567972	19200	B-1	8	8582662	19200	B-1	5
8567974	19200	B-1	7	8643785	19200	B-6	13

APPENDIX C
MAINTENANCE ALLOCATION CHART (MAC)

Section I. INTRODUCTION

C -1. General.

This Maintenance Allocation Chart designates overall responsibility for the performance of maintenance functions on the board plotting M18. The implementation of field maintenance tasks upon this plotting board will be consistent with the assigned maintenance operations

C-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.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an end item in proper operating condition, i e., to clean, to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

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

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

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisions 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. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) in a manner to allow the proper functioning of an equipment/system.

i. Repair. The application of maintenance services (imput, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, disassembly, module/component/assembly end item or system

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (e.g., DMWR) in pertinent technical publications. 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 equipments/components

l. Symbols. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

C-3. Explanation of Format.

Purpose and use of the format are as follows and will be explained in the introductory portion of the MAC.

a. Column 1. Group Number. Column 1, lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly

b. Column 2. Functional Group. Column 2, lists the next higher assembly group and the item names of components, assemblies, subassemblies, and modules within the group or which maintenance is authorized.

c. Column 3. Maintenance Functions. Column 3, lists the twelve maintenance functions defined in C-2 above. Each maintenance function required for an item shall be specified by the symbol among those listed in d below which indicates the level responsible for the required maintenance Under this symbol there shall be listed an appropriate work measurement time value determined as indicated in e below.

d. Use of Symbols. The following symbols will

be used:

C Operator/crew
O Organizational
F Direct support
H General support
D Depot

e. Work Measurement Time. The active repair time required to perform the maintenance function will be included directly below the symbol identifying the category of maintenance. The manpower figures will be developed under conditions (real or simulated) corresponding to those that would be considered normal for TOE units operating in the field. The skill levels used to obtain the measurement times will approximate those found in typical TOE units. Active repair time specified is the average aggregate time to restore an item (subassembly, assembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, fault isolation/diagnostic time, and quality assurance/quality control time in addition to the time required to perform specific maintenance functions identified for the tasks authorized in the maintenance allocation chart. This time may be the established time standard developed through maintenance engineering analysis, or can be derived from the calculation of a statistically weighted time estimate incorporating the optimistic (a), most likely (m), and pessimistic (b) estimated for the work to be accomplished using the formula:

$$t = \frac{a+4m+b}{6}$$

This time will be expressed in man-hours and carried to one decimal place (tenths of hours).

f. Column 4. Tools and Equipment. This column will be used to specify, by code, those tools and test equipment required to perform the designated function.

NOTE: A table, suitably coded and explained, listing the tool, test, and support equipment required by the level to perform the maintenance functions will be included as a supplement to the MAC.

g. Column 5. Remarks. Self-explanatory

Nomenclature of End Item or Component BOARD, PLOTTING, FLASH RANGING, M18 W/E

SECTION II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Functional Group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild		
1	Board, Plotting M18 W/E	C 0.1		C 0.2					C 0.2	F 0.2	D 5.0		See Table C-1	
1.1	Board, Plotting M18	C 0.1		C 0.2						F 0 0.2	D 4.5			
1.1.1	Support Assembly Group	C 0.1		C 0.2						F 3.0				
1.1.1.2	Roller Assembly	C 0 1							F 0.2					
1.1.1.3	Frame Assembly	C 0.1		C 0.1					F 1.0					
1.1.2	Brace Assembly Group	C 0.1		C 0.1						F 0.5				
1.1.2.1	Brace Assembly	C 0.1		C 0.1					F 0.5					
1.1.3	Scale Assembly	C 0.1		C 0.1	F 0.3				F 0.3	F 0.5				
1.1.4	Bracket Assembly Assembly	C 0.1		C 0.1					F 0.2	F 0.2				
1.1.5	Bracket Assembly, Rest	C 0.1		C 0.1					F 0.1	F 0.2				
1.1.6	Bracket, Vernier Assembly	C 0.1		C 0.1	F 0.6				F 0.5	F 1.0				
1.1.7	Spindle Assembly	C 0.1		C 0.1					C 0.1					
1.1.8	Leg	C 0.1		C 0.1					C 0.1					
1.1.9	Disk, Plotting	C 0.1		C 0.1					O 0.2					
1.2	Chest, Packing (Reusable Container)	C 0.1		C 0.1					C 0.1	F 0.2	D 1.5			

TABLE C-1. TOOL AND TEST EQUIPMENT

(1) TOOL OR TEST EQUIPMENT REF CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL/NATO STOCK NUMBER	(5) TOOL NUMBER
1	F, H	Tool Set, Aircraft Armament Repairman	4933-00-987-9816(B)	

INDEX

By Order of the Secretary of the Army

CREIGHTON W. ABRAMS,
General, United States Army,
Chief of Staff.

Official

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

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