OPERATOR, ORGANIZATIONAL, FIELD, AND DEPOT MAINTENANCE MANUAL

LEVEL, SURVEYING: PRECISE TILTING; 3 LEVELING SCREWS; ELEC. ILLUMINATION, 10 IN. TELESCOPE (MILITARY MODEL 10-X) W/TRIPOD FSN 6675-227-5449

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

JUNE 1962

Changes in force: C1, C2 and C4

***TM 5-6675-230-15**
C4

CHANGE
NO. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *1 June 1978*

Operator, Organizational, Field, and
Depot Maintenance Manual

LEVEL, SURVEYING: PRECISE TILTING; 3 LEVELING SCREWS; ELEC. ILLUMINATION, 10 INCH TELESCOPE (MILITARY MODEL 10-X) W/TRIPOD
NSN 6675-00-227-5449

Current as of 6 January 1978

TM 5-6675-230-15, 6 June 1962, is changed as follows:

Title page and Table of Contents pages are changed as shown above.

Page 1. The appendices in the Table of Contents are superseded as follows:

APPENDIX
- A. REFERENCES
- B. COMPONENTS OF END ITEM LIST
- C. ADDITIONAL AUTHORIZATION LIST
- D. MAINTENANCE ALLOCATION CHART
- E. REPAIR PARTS AND SPECIAL TOOLS (Not Applicable)
- F. EXPENDABLE SUPPLIES AND MATERIAL LIST (Not Applicable)

Page 3. Paragraph 1***b***. is superseded as follows:

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the Components of End Item List. Appendix C contains the Additional Authorization List. Appendix D contains the Maintenance Allocation Chart. Appendix F contains the Expendable Supplies and Material List. The organizational, Field, and Depot Maintenance Repair Parts and Special Tool Lists are listed in TM 5-6675-230-25P.

Page 3. Paragraph 1***d***. is superseded as follows:

d. Reporting Errors and Recommending Improvements. You can help improve this manual. If you find any mistake or if you know of a way to improve the procedure, please let us know. Mail your letter. DA Form 2028 (Recommended Changes to Publication and Blank Forms), or DA Form 2028-2 located in the back of this manual, directly to: Commander, US Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MTPS, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished to you.

Page 17. Paragraph 22 is superseded as follows: 22. Tools and repair parts issued with, or authorized for, the surveying level are listed in the Basic Issue Items List (Appendix B).

Page 35. Paragraph 74***b***. is superseded as follows:

b. Appendix A contains the publications applicable to field and depot maintenance. Appendix B contains the Components of End Item List. Appendix C contains the Additional Authorization List. Appendix D contains the Maintenance Allocation Chart. Appendix E contains the Repair Parts and Special Tools (Not Applicable to this manual). Appendix F contains Expendable Supplies and Material List.

Page 45. Appendix I is superseded. Add Appendix A as follows:

*Supersedes C3, 30 April 1973.

APPENDIX A

REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved for Army Users

A-2. Lubrication

C9100-IL	Identification List for Fuels, Lubricants, Oils and Waxes

A-3. Maintenance

TM 38-750	The Army Maintenance Management Systems (TAMMS)
TM 5-6675-230-25P	Organizational, Direct, General Support, and Depot Maintenance Repair Parts and Special Tools List: Level, Surveying

A-4. Shipment and Storage

TB 740-97-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TM 740-90-1	Administrative Storage of Equipment

A-5. Destruction of Material to Prevent Enemy Use

TM 750-244-3	Destruction of Material to Prevent Enemy Use.

Page 51. Appendix II is superseded.
Add Appendix B as follows:

APPENDIX B

COMPONENTS OF END ITEMS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists integral components of and basic issue items for the Electric Illumination 10 in. Telescope (Model 10-X) to help you inventory items required for safe and efficient operation.

B-2. General

The Components of End Item List is divided into the following sections:

a. Section II, Integral Components of the End Item. These items, when assembled, comprise the Electric Illumination 10 in. Telescope (Model 10-X) and must accompany it whenever it is transferred or turned in. These illustrations will help you identify these items.

b. Section III, Basic Issue Items. These are minimum essential items required to place the Electric Illumination 10 in. Telescope (Model 10-X) in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the Electric Illumination 10 in. Telescope (Model 10-X) during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on Table(s) of Organization and Equipment (TOE)/Modification Table of Organization and Equipment (MTOE) authorization of the end item.

B-3. Explanation of Columns

a. Illustration. This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration on which the item is shown (if applicable).

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

b. National Stock Number (NSN). Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. Part Number (P/N). Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

d. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code. "USABLE ON" codes are included to help you identify which component items are used on the different models. Identification of the codes used in these lists are:

Code	*Used On*

g. Quantity Required (Qty Reqd). This column lists the quantity of each item required for a complete major item.

h. Quantity. This column is left blank for use during inventory. Under the Rcv'd column, list the quantity you actually receive on your major item. The Date columns are for use when you inventory the major item at a later date; such as for shipment to another site.

Section II. INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (a) FIGURE NO.	(b) ITEM NO.	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
Not Illustrated		6675-00-354 0237	F293 (06995)	Bag, Instrument, Rubber		ALS	1				
Not Illustrated		6675-00-160 7525	F298 (06995)	Bottle, Metal, Oil		ALS	1				
Not Illustrated		6675-00-160 7515	F283 (06995)	Container, Protecting Glass Diaphragm		ALS	1				
Not Illustrated		6675-00-160 7450	F2 (06995)	Cap, Lens		ALS	1				
Not Illustrated		6675-00-160 7457	F58 (06995)	Cap Dust, Eyepiece		ALS	1				
Not Illustrated		6675-00-160 7451	F3 (06995)	Sunshade, Telescope		ALS	1				
Not Illustrated		6675-00-160 7452	F4 (06995)	Sunshade, Telescope		ALS	1				
3		6675-00-160 7513	F244 (06995)	Case Assembly, Transportation		ALS	1				
7				Tripod Assembly consisting of:		ALS	1				
7		6675-00-160 7497	F211A (06995)	Tripod Assembly		ALS	1				
7		6675-00-428 6674	F238AY (06995)	Battery Box		ALS	1				
7 (no call out)		6675-00-354-0236 0236	F231NEWAY (06995)	Cable Assembly		ALS	1				

Section III. BASIC ISSUE ITEMS

(1) ILLUSTRATION (a) FIGURE NO.	(b) ITEM NO.	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
				TM 5-6675-230-15 Operator. Organizational. Field and Depot Maintenance Manual		ALS	1				
9		5315-00-160-7522	F292 (06995)	Pin. Adjusting, straight		ALS	2				
14		5120-00-160-7517	F285 (06995)	Remover and replace glass diaphragm (combina-tion tool)		ALS	I				
22			P287 (06995)	Wrench. Spanner		ALS	I				
Not Illustrated		8330-00-965-1722	KK-C-300 (81348)	Chamois		ALS	I				
Not Illustrated		7920-00-205-1427	MILB43363 (81349)	Brush, dust		ALS	I				
Not Illustrated		6240-00-797-3750	F142 (06995)	Lamp Incandescent		ALS	2				
Not Illustrated		6240-00-797-3750	F85 (069951	Lamp Incandescent		ALS	2				
20		5120-00-160-7523	F294 (06995)	Remover and Replacer, Trunnion Shaft		ALS	I				

Appendix C is added as follows:

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists additional items you are authorized for the support of the Electric Illumination 10 in. Telescope (Model 10-X).

C-2. General

This list identifies items that do not have to accompany the Electric Illumination 10 in. Telescope (Model 10-X) and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA or JTA.

C-3. Explanation of Listing

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "USABLE ON" codes are identified as follows:

Code	***Used On***
Not Applicable	

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	PART NUMBER & FSCM	(2) DESCRIPTION	USABLE ON CODE	(3) U/M	(4) (QTY) AUTH
6135-00-120-1020	BA 30 (81349)	Battery, Dry 1.5 Volts	ALS	EA	6

Page 47. Appendix II is superseded as follows:

APPENDIX D

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

D-1. General

The maintenance allocation chart lists all maintenance and repair functions authorized the various echelons.

D-2. Maintenance

Maintenance is any action taken to keep materiel in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of materiel includes the following:

a. Service. To clean, preserve, and replenish fuel and lubricants.

b. Adjust. To regulate periodically to prevent malfunction.

c. Inspect. To verify serviceability and detect incipient electrical or mechanical failure by scrutiny.

d. Test. To verify serviceability and detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, and the like.

e. Replace. To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

f. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.

g. Aline. To adjust two or more components of an electrical system so that their functions are properly synchronized.

h. Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

i. Overhaul. To restore an item to completely serviceable condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

D-3. Explanation of Columns

a. Functional Group. The functional group is a numerical group set up on a functional basis. The applicable Functional Grouping Indexes (obtained from the Corps of Engineers Functional Grouping Indexes) are listed on the maintenance allocation chart in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Components and Related Operation. This column contains the Functional Grouping Index heading, subgroup headings, and a brief description of the part starting with the noun name. It also designates the operations to be performed such as service, adjust, inspect, test, replace, repair, and overhaul.

c. Echelons of Maintenance. This column contains the various echelons of maintenance by number designation. An "X" indicates the lowest echelon responsible for performing the function, but does not necessarily indicate repair parts stockage at that level. Higher echelons are authorized to perform the indicated functions of lower echelons.

d. Remarks. This column lists specific maintenance functions, special tools, cross-references, instructions, and the like pertinent to the operation being performed.

Section II. MAINTENANCE ALLOCATION CHART

Functional Group	Components and related operation	Echelon of maintenance 1	2	3	4	5	Remarks
67	PRECISION INSTRUMENTS MECHANICAL AND ELECTRICAL						
6700	Level, Surveying						
	Level						
	Service	X					
	Adjust	X					
	Inspect	X					
	Test	X					
	Replace	X					
	Repair		X				
	Rebuild					X	
6700.1	Accessories						
	Container						
	Replace	X					
	Bag, instrument caver						
	Replace	X					
6701.1	Telescope Assembly						
	Barrel, telescope						
	Replace					X	
	Repair					X	
	Slide focusing						
	Service			X			
	Replace			X			
	Repair			X			
	Gear assembly focusing						
	Replace			X			
	Repair			X			
	Pinion, focusing						
	Service			X			
	Replace			X			
	Sight alining						
	Replace		X				
6701.2	Optics (Reflecting and Transmitting Types)						
	Lens assembly, Objective						
	Service	X					Clean
	Replace		X				
	Eyepiece, inverting						
	Service	X					Clean and lubricate.
	Replace		X				
	Mirrors						
	Service	X					
	Replace		X				
	Prism, single						
	Service			X			
	Replace			X			
	Prism, right-left						
	Service	X					
	Adjust			X			
	Replace					X	
	Diaphragm						
	Service	X					
	Replace		X				
	Housing, protective, prism						
	Replace			X			
	Cap, dust						
	Replace	X					

Section II. MAINTENANCE ALLOCATION CHART (Cont'd)

Functional Group	Components and related operation	Echelon of maintenance 1	2	3	4	5	Remarks
6701.2	Optics (Reflecting and Transmitting Types (Cont'd)						
	Sunshade						
	Replace	X					
	Lens assembly focusing						
	Service			X			Clean
	Replace			X			
	Cap assembly, eye focusing						
	Service	X					
	Replace	X					
	Tube, cap assembly						
	Replace		X				
6702.1	Structural Parts						
	Post, center crossbar						
	Service			X			Clean and lubricate.
	Replace			X			
	Cap, dust, center post						
	Replace			X			
	Clamp assembly						
	Service			X			Clean and lubricate.
	Replace			X			
	Head assembly, leveling						
	Replace			X			
	Screw assembly, leveling						
	Service	X					
	Replace		X				
	Bar, cross						
	Replace			X			
	Shaft, axis						
	Service			X			
	Replace			X			
	Plunger and screw, tangent						
	Service	X					
	Replace		X				
6702.2	Operating or Precision Parts						
	Screw, vertical tilting						
	Service			X			
	Replace			X			
	Repair			X			
6703.1	Batteries						
	Battery, dry						
	Replace	X					
	Box, battery						
	Replace		X				
	Cable assembly, battery						
	Replace		X				
	Repair		X				
6703.2	Fuses and lamps						
	Shield assembly						
	Service	X					Clean
	Replace		X				
	Repair		X				
	Light assembly						
	Replace		X				

Section II. MAINTENANCE ALLOCATION CHART (Cont'd)

Functional Group	Components and related operation	Echelon of maintenance 1	2	3	4	5	Remarks
6703.2	Fuses and lamps (Cont'd)						
	Holder, lamp (socket)						
	Replace		X				
	Lamp, incandescent						
	Replace	X					
6703.8	Controls, Indicators and Special Components						
	Contacts, electrical						
	Service	X					Clean
	Replace		X				
6703.10	Miscellaneous Wiring and Fittings						
	Wiring external						
	Replace		X				
	Repair		X				
	Fittings, internal						
	Replace			X			
6706	Compass and levels						
	Level assembly, circular						
	Service	X					
	Adjust	X					
	Replace	X					
	Vial, level, telescope						
	Service	X					
	Adjust	X					
	Replace	X					
6707	Tripods						
	Tripod						
	Service	X					Lubricate
	Replace	X					
	Repair	X					
	Leg assembly, tripod						
	Replace	X					
	Repair	X					
	Head, tripod						
	Replace	X					
6708	Carrying and Packing Cases						
	Case, instrument carrying						
	Replace	X					
	Repair	X					

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25A, Operator maintenance requirements for Surveying Equipment.

☆U.S. GOVERNMENT PRINTING OFFICE : 1992 0 - 311-831 (PO 60693)

CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY'
WASHINGTON, D.C., *24 March 1965*

Operator, Organizational, Field and Depot Maintenance Manual

LEVEL, SURVEYING: PRECISE TILTING; 3 LEVELING SCREWS; ELECTRIC ILLUMINATION, 10 IN. TELESCOPE (MILITARY MODEL 10-X) W/TRIPOD (FSN 6675-227-5449)

TM 5-6675-230-15, 6 June 1962, is changed as follows:

Page 3, paragraph 1.

d. (Superseded) The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen or typewriter. The original and one copy will be forwarded direct to Commanding General, U.S. Army Mobility Equipment Center, ATTN: SMOME-MMP, Post Office Drawer 58, St. Louis, Mo. 63166. One information copy will be provided to the individual's immediate supervisor (e.g., officer, noncommissioned, supervisor, etc.).

Paragraph 3, line 4. Delete "10 power" and substitute: 30 power.

Page 6, paragraph 9*a*.

(2) Superseded) Set up the tripod by spreading the legs and lock in position. See A, figure 5.

Page 8, paragraph 10*a*.

a. (Superseded) *Short Distance*. For short distances, the tripod, with the level attached and the tripod shoes pointed forward, may be carried over the operator's shoulder. When entering uncleared terrain, the tripod, with the level attached and the tripod shoes pointed to the rear, is carried under the operator's arm.

Paragraph 10*a*. Caution deleted.

Page 11.

15. Level Operation

(Superseded)

a. Preparation for Operation.

(1) Set up the tripod as outlined in paragraph 9.

(2) Install the surveying level on the tripod. as outlined in paragraph 9.

Note

When installing the surveying level, position the instrument so the reflecting mirrors can receive the greatest amount of natural light.

(3) If the unit is to be used for night operation, install the illumination system as shown in figure 7.

b. Adjustment. Level adjustment should be performed at the beginning of each day and whenever the instrument has been subject to shock.

(1) *Circular level.*

(a) Observe the circular level (fig. 6) and adjust the leveling screws (fig. 8) until the bubble of the circular level is centered within the black circle.

(*b*) Loosen the center clamp control (fig. 6) and turn the telescope 180°. Observe the circular level, the bubble should still be centered.

(*c*) If the bubble is not centered, adjust the leveling screws to compensate for one-half of the leveling correction and the vial adjusting screws (fig. 9) for the remaining half.

(2) *Level vial.*

(a) When the level vial is centered, the line of sight of the telescope is horizontal. The following procedure is known as the "peg test".

(b) Drive two turning point pins about 100 meters apart on fairly level ground. Set the level midway between the pins.

(c) Following the procedure in b above, observe the level rod reading on each pin. For convenience call one pin A and the other B.

(d) The difference in rod readings (B-A) is the true difference of elevation of the pins.

(e) Move the instrument close to pin A and set up so that the level eyepiece is within 10 mm (millimeter) of the level rod.

(f) Take rod reading A on pin A by following the procedure described in *b* above, reading through the objective lens. Use point of a sharp pencil on face of rod to determine reading A'. Take rod reading B' on pin B following the same procedure.

(g) If the instrument is in adjustment (B'-A') will equal (B-A). If it does not, calculate the correct rod reading on pin B by: B'= B + A'- A.

(h) With the tilting screw, move the telescope until the horizontal line of the telescope reticule crosshairs read B' on the rod at pin B.

(i) Taking care not to disturb the telescope, center the level vial by adjusting the level vial vertical adjusting nuts. Check that the telescope has not moved from rod reading B' and insure that the adjusting nuts are tight.

(j) Final fine adjustment is accomplished with the prism adjusting screw.

(k) Repeat the peg test to check the adjustment. After final adjustment, the difference between (B-A) and (B' -A') should not exceed 4-mm when the distance A to B is 100 meters.

c. Operation.

(1) Center the bubble of the circular level (fig. 6) within the black circle with the leveling screws (fig. 8).

(2) Focus the telescope reticule to obtain a sharp image of the reticule lines with the threaded eyepiece (fig. 6).

(3) Move the lifting cam lever (fig. 6) to the horizontal position. This allows the telescope to rest directly on the tilting screw. Before the instrument is removed from the tripod, the lifting cam lever must be placed in the vertical position.

(4) Loosen the center clamp control (fig. 6) and., using the telescope sights, point the instrument at the level rod.

(5) Tighten the center clamp control and, observing the telescope, align the instrument with the level rod using the tangent screw (fig. 6).

(6) Focus the telescope with the focusing control (fig. 6). Test the parallax by moving the eye up and down. Any apparent movement of the level rod with respect to the telescope reticule indicates that parallax exist. It is eliminated by further adjustment of the focusing control and the threaded eyepiece.

(7) Observe the level vial using the magnifying lens (fig. 1). The level vial will appear as depicted in figure 10. Center the level vial by using the tilting screw (fig. 6).

(8) Make a final check of parallax and then read the level rod as required. After reading the level rod, check to see that the level vial is still centered. If it is not still level, void the rod reading and repeat (6) through (8) above.

d. Night Operation.

(1) *General.* Electric illumination of the telescope diaphragm and levels is accomplished with an illumination system consisting of batteries, lamps, and dimmer switches. Illumination of the telescope diaphragm and level is controlled by the dimmer switch (fig. 2) located in the telescope barrel. The illumination of the circular level is controlled by the dimmer switch (fig. 2) located below the circular level.

(2) *Operation.*

(a) Place the dimmer switches in the ON position.

(b) Operate the surveying level as in *c* above.

Note

During operation, brightness of the illumination system can be controlled using the dimmer switches.

Page 27.

59. General

(Superseded)

The surveying level is equipped with a nonadjustable glass diaphragm (reticule). The stadia constant is 1:100.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

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USAAVNBD (2)
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USASETAF (2)
USARJ (10)
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USASMC (1)
MDW (1)
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Corps (2)
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USA Mob Equip Cen (46)
Engr Cen (5)
USAREUR Engr Proc Cen (2)
USAREUR Engr Sup Con Agcy (10)
Chicago Proc Ofc (10)
Engr Fld Maint Shops (2)
Fld Comd, DASA (8)
AMS (3)
USAREURCOMZ (2)
MAAG (1)
JBUSMC (1)
Units organized under following TOE's (2 copies each except as indicated):

5-38	5-267 (1)
5-45	5-278 (5)
5-48	5-279 (2)
5-49	5-327
5-55	5-500 (IA, IB)
5-56	39-51
5-167	39-61
5-237 (5)	
5-262 (5)	

NG: State AG (3).
USAR: Same as active Army except allowance is one copy to each unit.
For explanation of abbreviations used, see AR 320-50.

TAGO 1350A

☆U.S. GOVERNMENT PRINTING OFFICE : 1965

GPO 892-390

TECHNICAL MANUAL
Operator, Organizational, Field, and Depot Maintenance

LEVEL, SURVEYING: PRECISE TILTING; 3 LEVELING SCREWS; ELECTRIC ILLUMINATION 10 IN. TELESCOPE (MILITARY MODEL 10-X) W/TRIPOD FSN 6675-227-5449

TM 5-6675-230-15
CHANGES No. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *16 July 1963*

TM 5-6675-230-15, 6 June 1962, is changed as follows:

Page 3, paragraph 1.

d. (Superseded) Report all deficiencies in this manual on DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8, or 9). Submit recommendations for changes, additions, or deletions to the Commanding Officer, U.S. Army Mobility Support Center, ATTN: SMOMS-MM, P.O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

e. (Superseded) Report all equipment improvement recommendations as prescribed by TM 38-750.

2. Record and Report Forms
(Superseded)

a. DA Form 2258 (Depreservation Guide of Engineer Equipment).

b. For other record and report forms applicable to operator and organizational maintenance, refer to TM 38-750.

Page 18.

26. General
(Superseded)

To insure that the surveying level is ready for operation at all times, it must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary Preventive Maintenance Services to be performed are listed and described in paragraphs 27 and 29. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

27. Daily Preventive Maintenance Services
(Superseded)

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 10.1 for the Daily Preventive Maintenance Services.

Page 18. Paragraph 28 Rescinded.

Page 19.

29. Quarterly Preventive Maintenance Services
(Superseded)

a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by Organizational Maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 10.2 for the Quarterly Preventive Maintenance Services.

PREVENTIVE MAINTENANCE SERVICES DAILY		
TM5-6675-230-15	MILITARY MODEL 10-X	LEVEL

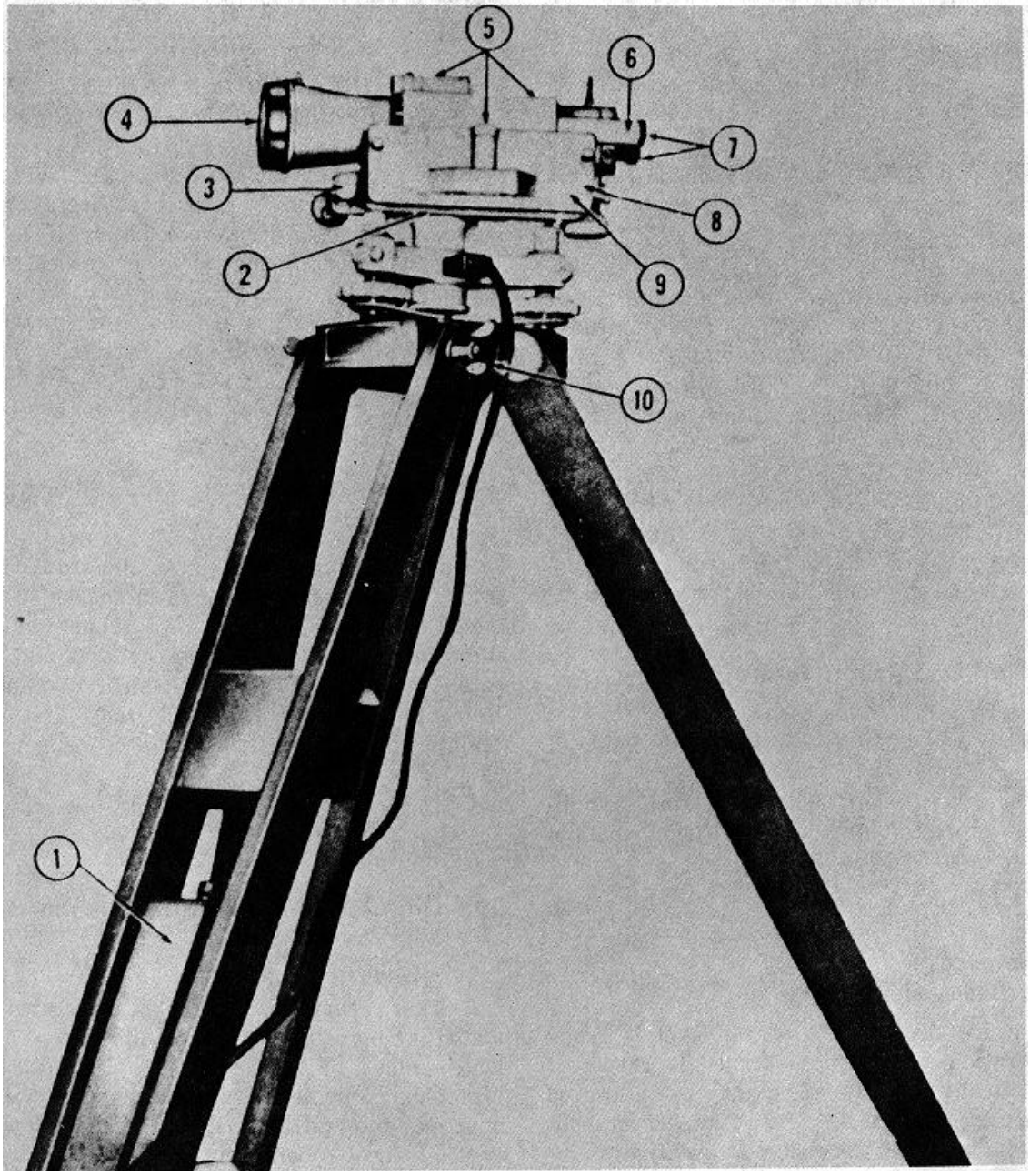


Figure 10.1. (Added) Daily preventive maintenance services.

ITEM		PAR REF
1	BATTERY BOX. Tighten loose electrical connections. Replace dead batteries.	44
2	LEVEL VIAL MIRROR. Clean dirty mirror.	54
3	LEVEL VIAL. Replace defective level.	58
4	OBJECTIVE LENS. Clean dirty lens.	50
5	LAMPS. Replace burned-out lamps.	41 42 43
6	DIAPHRAGM. Clean dirty diaphragm.	60
7	LENSES. Clean dirty lenses.	51 52
8	CIRCULAR LEVEL. Replace defective level.	57
9	CIRCULAR LEVEL MIRROR. Clean dirty mirror.	55
10	TRIPOD. Clean dirty tripod head and legs.	65
	NOTE 1. ADJUSTMENTS. Make all necessary adjustments during operation.	

MSC 6675-230-15/10.1

Figure 10.1-Continued.

PREVENTIVE MAINTENANCE SERVICES QUARTERLY		
TM5-6675-230-15	**MILITARY MODEL 10-X**	**LEVEL**

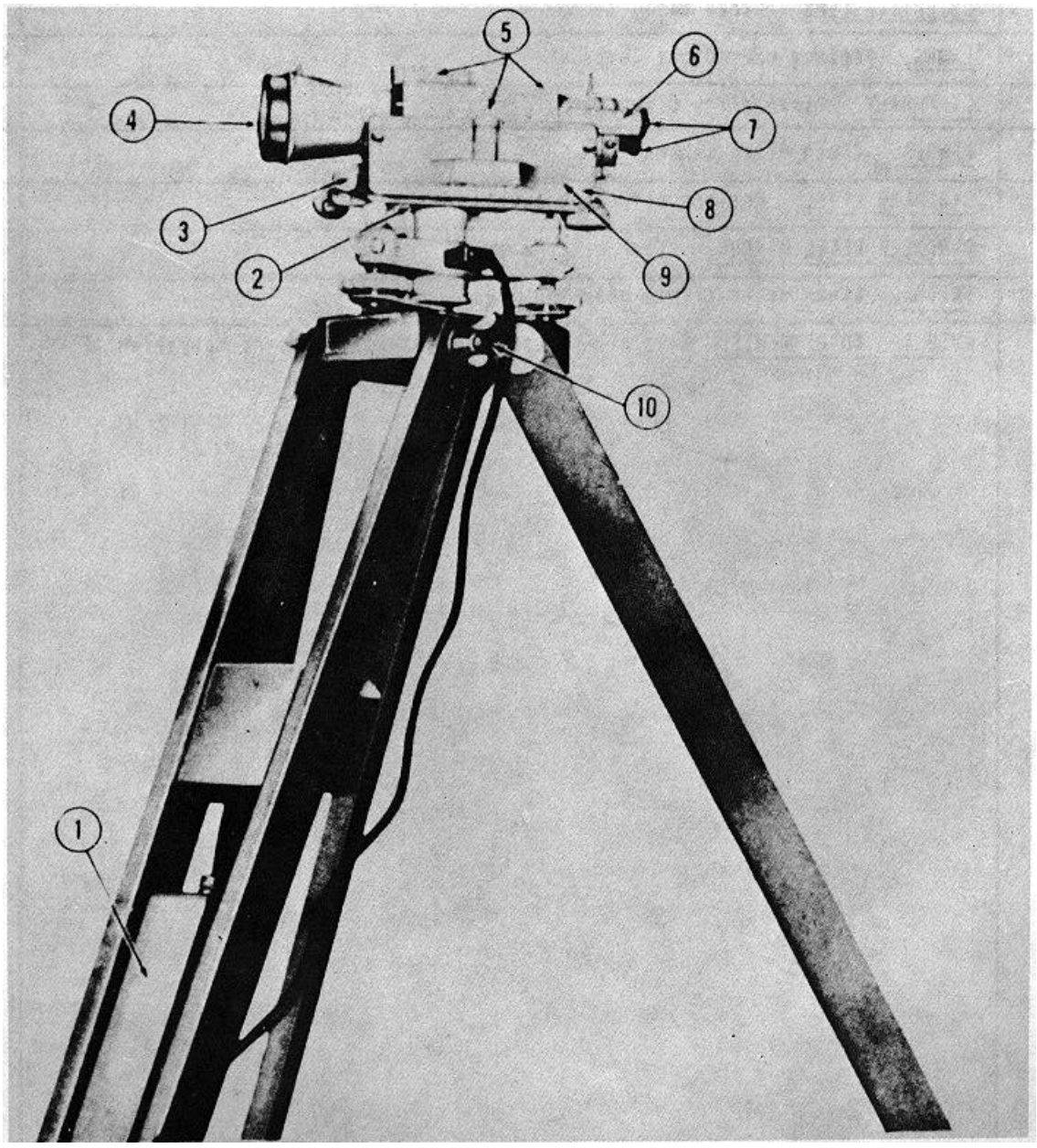


Figure 10.2. (Added) Quarterly preventive maintenance services.

ITEM		PAR REF
1	BATTERY BOX. Tighten loose electrical connections. Replace dead batteries.	44
2	LEVEL VIAL MIRROR. Replace defective mirror.	54
3	LEVEL VIAL. Replace defective level.	58
4	OBJECTIVE LENS. Replace defective lens.	50
5	LAMPS. Replace burned-out lamps.	41 42 43
6	DIAPHRAGM. Replace defective diaphragm.	60
7	LENSES. Replace defective lenses.	51 52
8	CIRCULAR LEVEL. Replace defective level.	57
9	CIRCULAR LEVEL MIRROR. Replace defective mirror.	55
10	TRIPOD. Replace defective head and legs.	65 66
	NOTE 1. ADJUSTMENTS. Make all necessary adjustments during operation.	

MSC 6675-230-15/10.2

Figure 10.2-Continued.

Page 33. Paragraph 72.

b. (Superseded) *Inspection*. When equipment has been placed in limited storage, all scheduled preventive maintenance services, including inspection, shall be suspended and preventive maintenance inspection shall be performed as specified herein. Refer to AR 743-505.

Page 35.

75. Record and Report Forms
(Superseded)

For record and report forms applicable to field and depot maintenance, refer to TM 38-750.

Page 45, paragraph 4. Delete: “TM 5-505, Maintenance of Engineer Equipment"

Add: TM 38-750 The Army Equipment Record System and Procedures.

Paragraph 6.

Add: AR 743-505 Limited Storage of Corps of Engineers Mechanical Equipment.

Page 52.

4. Comments and Suggestions
(Superseded)

Suggestions and recommendations for changes to the Basic Issue Items List shall be submitted on DA Form 2028 to the Commanding Officer, U.S. Army Mobility Support Center, ATTN: SMOMS-MM, P.O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

Page 53, Basic Issue Items List, Group 6700.1. Delete lines 3 and 4 in their entirety and substitute the following two items:

Section II. BASIC ISSUE ITEMS LIST

Source codes				Federal stock No.	Description	Unit of Issue	Expend-ability	Quantity author-ized	Quantity issued with equip-ment	Illustration	
Tech-nical Service	Source	Mainte-nance	Recover-ability							Fig.	Item.
10	X2	0		9150-252-6382	LUBRICATING OIL: OCW watch, 5 cc bottle.			1	*		
10	X2	0		9150-576-4262	GREASE, AIRCRAFT AND INSTRUMENT: GL, 1-oz tube.			1	*		

By Order of the Secretary of the Army:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:
J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:
Active Army:
USASA (2)
DCSLOG (1)
CNGB (1)
TSG (1)
CofEngrs (3)
CSigO (1)
CofT (1)
USA Maint Bd (1)
USAARTYBD (2)
USAARMBD (2)
USAIB (2)
USAARADBD (2)
USAAESWBD (2)
USAAVNBD (2)
UNCONARC (3)
USAMC (5)
OS Maj Comd (5) except
USARJ (10)
MDW (1)
Armies (2)
Corps (2)
USA Corps (2)
Div (2)
Engr Bde (1)
USMA (2)
Svc College (2)
Br. Svc Sch (2) except
USAES (100)
GENDEP (OS) (10)
Engr Dep (OS) (10)
Army Dep (2)
USA Trans Tml Comd (2)
Army Tml (1)
USAMOCOM (2)
USAOSA (2)
Div Engr (2)
Engr Dist (2)
Engr Fld Maint Shops (2)
USAERDL (3)
Engr Cen (5)
AMS (3)
Chicago Engr Proc Ofc (10)
USA Mob Spt Cen (36)
ESCO (10)
Fld Comd, DASA (8)
USACOMZEUR (2)
USAREUR Engr Sup Con Agc (10)
USAREUR Engr Proc Cen (2)
MAAG (1)
JBUSMC (1)
Units org under fol TOE:
(2 copies UNOINDC)
5-38
5-46
5-48
5-49
5-55
5-56
5-167
5-237 (5)
5-262 (5)
5-267 (1)
5-278 (5)
5-279
5-327
5-348
5-500 (IA IB)
39-51
39-61

NG: State AG (3).
USAR: Same as Active Army except allowance is one copy to each unit.
For explanation of abbreviations used, see AR 320-50.

GPO 622-205

TAGO 5338A

U.S. GOVERNMENT PRINTING OFFICE : 1987 0 - 181-421 (70543)

PIN : 026289-001

TECHNICAL MANUAL
No. 5-6675-230-15
TECHNICAL ORDER
No. 49A5-12-1

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE

WASHINGTON 25, D. C., *6 June 1962*

OPERATOR, ORGANIZATIONAL, FIELD, AND DEPOT MAINTENANCE MANUAL LEVEL, SURVEYING: PRECISE TILTING; 3 LEVELING SCREWS; ELECTRIC ILLUMINATION, 10 in. TELESCOPE (MILITARY MODEL 10-X) W/TRIPOD FSN 6675-227-5449

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of the personnel to whom the Military Model 10-X Surveying Level is issued. Chapters 1 through 5 provide information on the operation, daily preventive maintenance services, and organizational maintenance of the equipment, accessories, and components. Chapter 6 provides information for field and depot maintenance (3d, 4th, and 5th echelons). This manual also provides descriptions of the main units and their functions in relationship to other components.

b. Appendix I contains a list of publications applicable to this manual. Appendix II contains the Maintenance Allocation Chart. Appendix III contains the list of basic issue items authorized the operator of this equipment. The Organizational, Field, and Depot Maintenance Repair Parts and Special Tool Lists are listed in TM 5-6675-230-25P.

c. Numbers in parentheses on illustrations indicate quantity. Numbers preceding nomenclature callouts onillustrations indicate the preferred maintenance sequence.

d. Report all deficiencies in this manual on DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8 or 9). Submit recommendations for changes, additions, or deletions to the Commanding Officer, U.S. Army Engineer Maintenance Center, Corps of Engineers, ATTN: EMCDM-S.P.O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

e. Report unsatisfactory equipment performance and suggestions for equipment improvement as specified in AR 750-5.

2. Record and Report Forms

For record and report forms applicable to the operator and organizational maintenance, refer to TM 5-505.

Note

Applicable forms, excluding Standard Form 46 (United States Government Motor Vehicle Operator's Identification Card) which is carried by the operator, will be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

3. Description

The Military Model 10-X Surveying Level (figs. 1 and 2) is a precision instrument used for running bench mark levels. The instrument consists primarily of a 10 inch, 10 power telescope with a dioptric scaled eyepiece mounting, bronze crossbar casting, bronze three screw leveling head, circular spirit level with a 45° angle reflecting mirror, prismatic level reading device with a spirit level vial, and a tilting screw with graduated drum head. The level is mounted on a tripod with a battery case from which power is supplied for electric illumination of the instrument for night operation.

4. Identification and Tabulated Data

a. Identification. The serial number and manufacturer's name are engraved on the right side of the telescope as shown in figure 2.

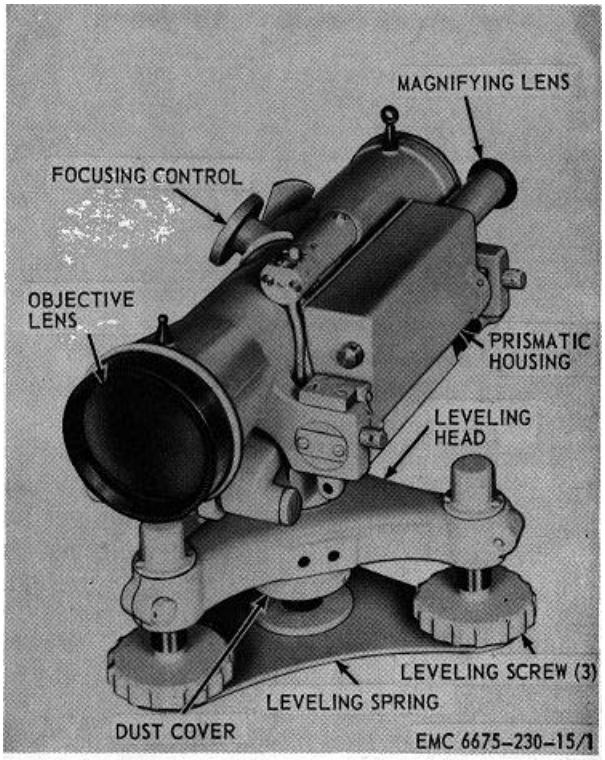


Figure 1. Surveying level, left front, three-quarter view.

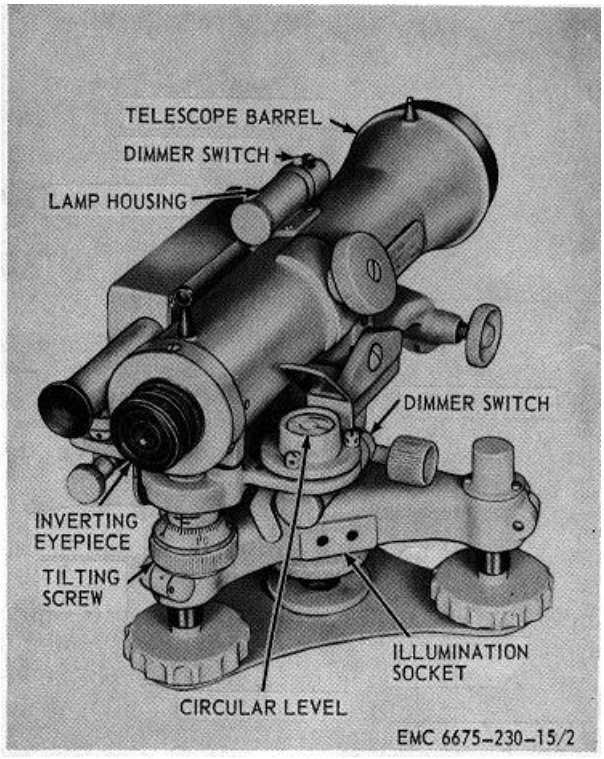


Figure 2. Surveying level, right rear, three-quarter view.

b. Tabulated Data.

(1) *General*.

Manufacturer	C. L. Berger and Son
Model	Military 10-X
Telescope	30 diameters (power)
Shortest focusing distance	10 ft
Normal range	10 to 1,000 ft
Aperture	1-3/4 in.
Field of view	1°, (degree), 30' (minutes) of arc.
Sensitivity of spirit level vial.	30" (seconds) per 2 mm (millimeters) spacing.
Sensitivity of circular spirit level.	5'
Illumination system lamps.	Green bead, clear, 3.8 v (volts) 0.3 amp (amperes)
Illumination system batteries.	BA 30 (quantity of 3)

(2) *Dimensions and weights.*

Surveying level	10 lb
Case with fittings	8 lb
Tripod length	65 in.
Tripod weight	15 lb

5. Differences in Models

This manual covers only the Military Model 10-X Surveying Level. No known unit differences exist for the model covered by this manual.

CHAPTER 2.
INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

6. Unloading the Equipment

a. Surveying Level. All surveying levels are shipped in a shipping case. Unloading the instrument can be accomplished by one man, as the loaded weight of the shipping case is only 33 pounds.

b. Tripod and Accessories. The tripod and accessories used with the surveying level are shipped in a separate shipping container. The total weight of the tripod and accessories is 25 pounds.

7. Unpacking the Equipment

a. Surveying Level.

(1) Remove the surveying level from the carrying case as shown by figure 3.

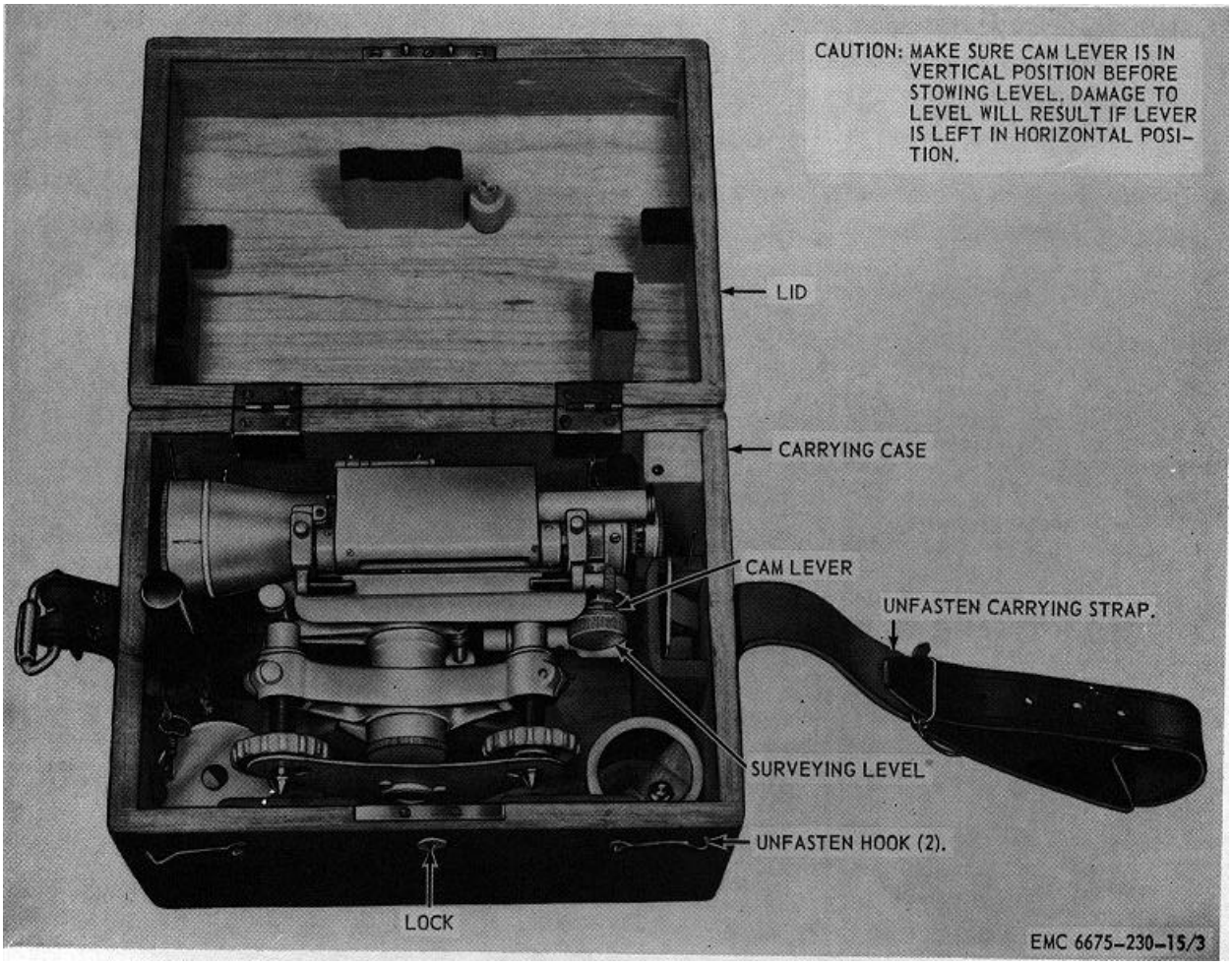


Figure 3. Surveying level, stowed in carring case.

(2) Remove pressure-sensitive tape and fiberboard protectors from lenses.

b. Tripod and Accessories.

(1) Remove the tripod from the shipping case.
(2) Unfasten strap and set up tripod. See figure 4.

c. Depreservation.

(1) Remove all protective covering from the unit.
(2) Remove any preservative oil from exposed threads and unpainted or unplated surfaces.
(3) Oil exposed threads with clock oil as necessary.

8. Inspecting and Servicing Equipment

a. Perform the quarterly preventive maintenance services (par. 29).

b. Inspect the surveying level for cracks or breaks.

c. Inspect the mirrors and lens for cracks or scratches.

d. Correct all deficiencies or report them to field maintenance.

9. Installation or Setting-Up Instructions

a. Tripod.

(1) Transport the tripod to the worksite. Select, as near as possible, a level position.
(2) Set the tripod over the station point, spread legs and lock in position. See A, figure 5.

b. Surveying Level.

(1) Transport surveying level to worksite and remove from carrying case. See figure 3.
(2) Install surveying level on tripod head. See B, figure 5.

Note. In the event of a damaged circular level or level vial, refer to paragraphs 57 and 58 for installation of the spare level

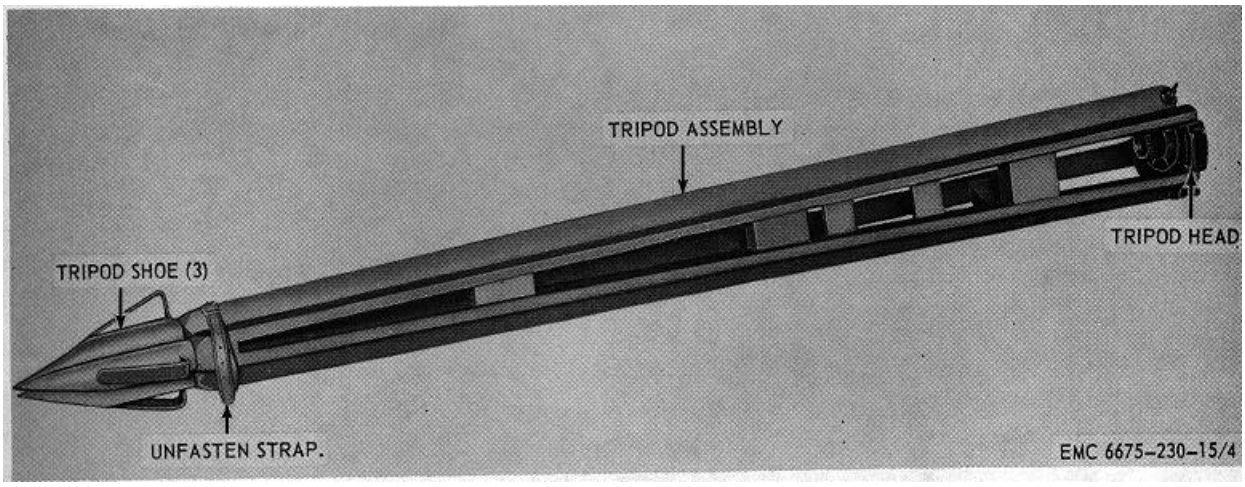


Figure 4. Tripod, secured position.

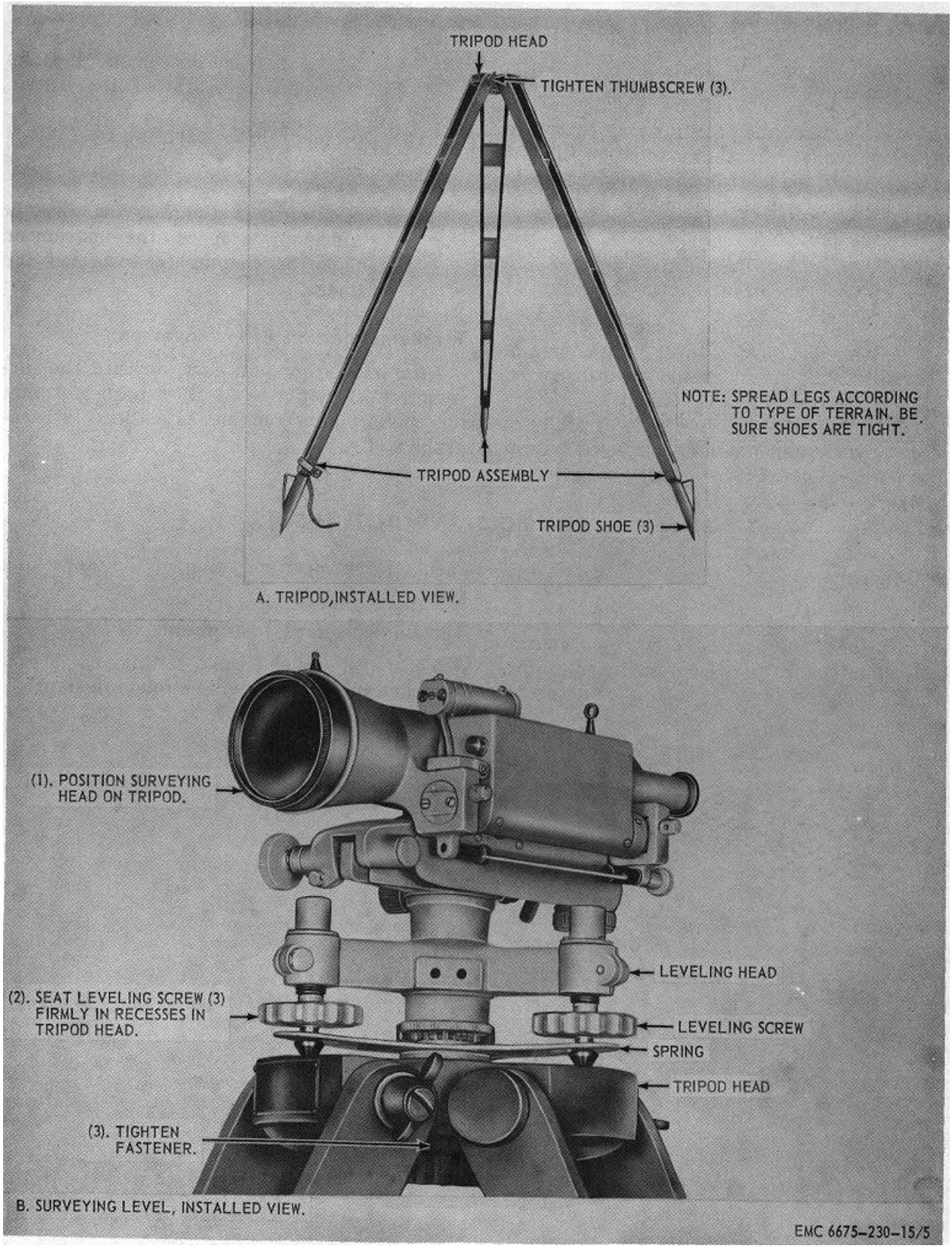


Figure 5. Surveying level and tripod, removal and installation.

Section II. MOVEMENT TO A NEW WORKSITE

10. Dismantling for Movement

a. Short Distance. For short distances in cleared level areas, the operator may carry the instrument while it is still mounted on the tripod (fig. 5). If the instrument is carried while mounted on the tripod, it should always be in the upright position.

***Caution*: Never carry the instrument over the shoulder.**

b. Long Distances.

(1) When carrying the surveying level for long distances or over rough terrain, the instrument should be transported in the carrying case (fig. 3).

(2) Handle the carrying case carefully to avoid sudden jolts, continued vibration, or other shocks that might damage the delicate parts of the instrument.

(3) Do not drop the carrying case into a vehicle or on the ground during transportation.

***Caution:* If the carrying case is accidentally dropped, the instrument should be thoroughly inspected for damage.**

11. Reinstallation After Movement

After movement to a new worksite, the surveying level should be installed by performing the applicable instructions as outlined in paragraph 9 (fig. 5).

Section III. CONTROLS AND INSTRUMENTS

12. General

This section describes, locates, illustrates, and furnishes the operator, crew, or organizational maintenance personnel sufficient information about the various controls and instruments for proper operation of the surveying level.

13. Controls and Instruments

The purpose and normal settings of all controls and instruments will be found in figure 6.

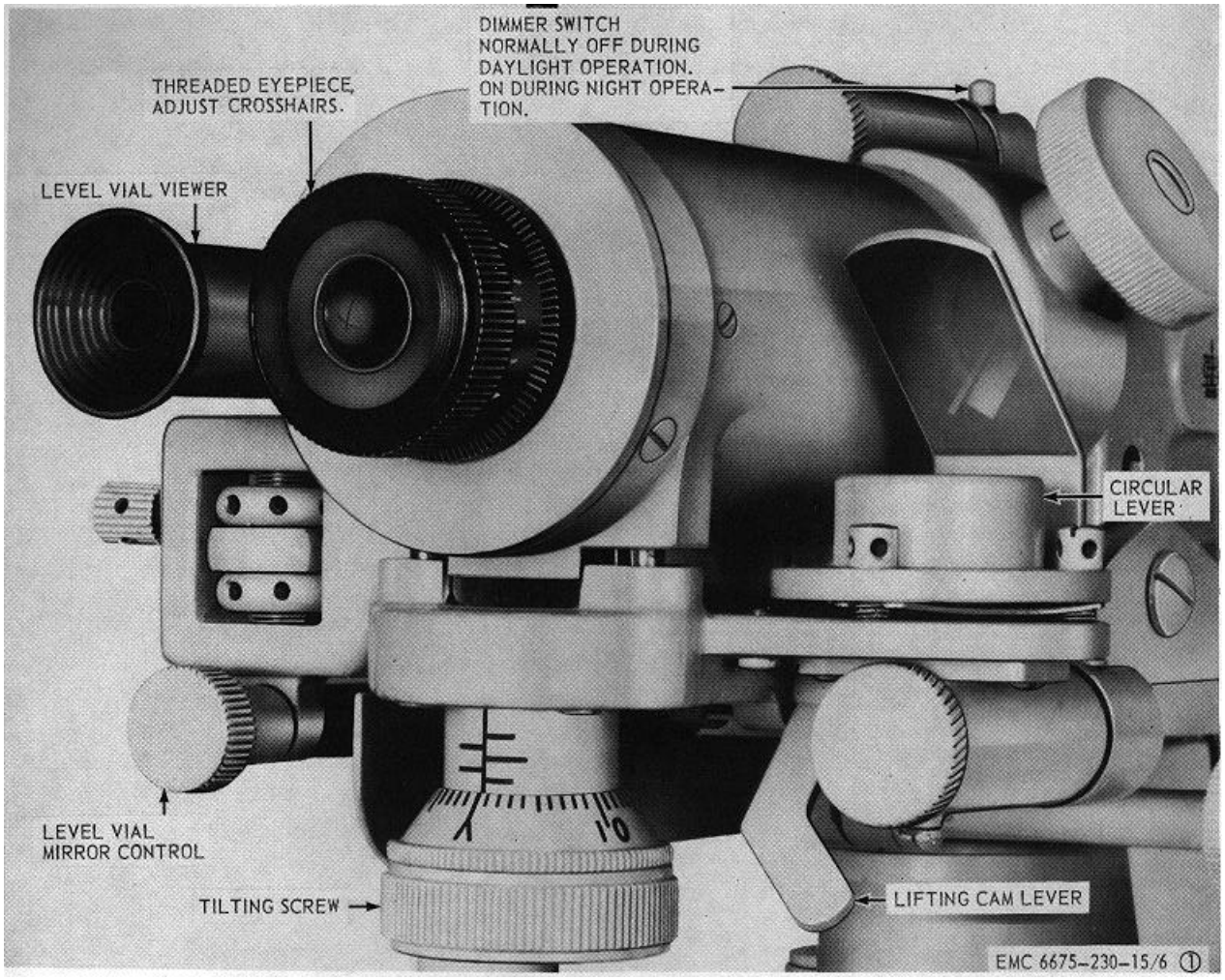


Figure 6. Controls and instruments.

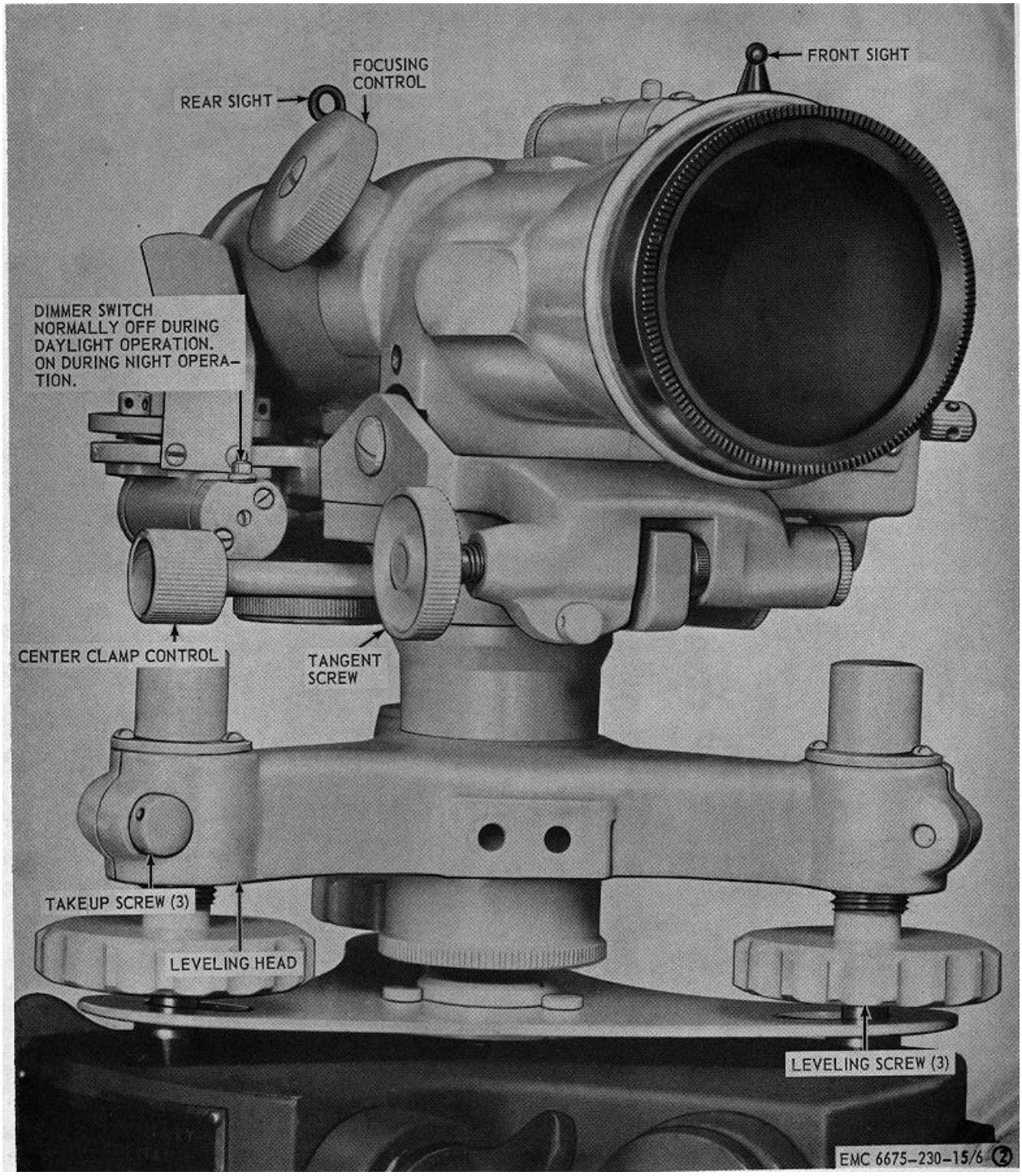
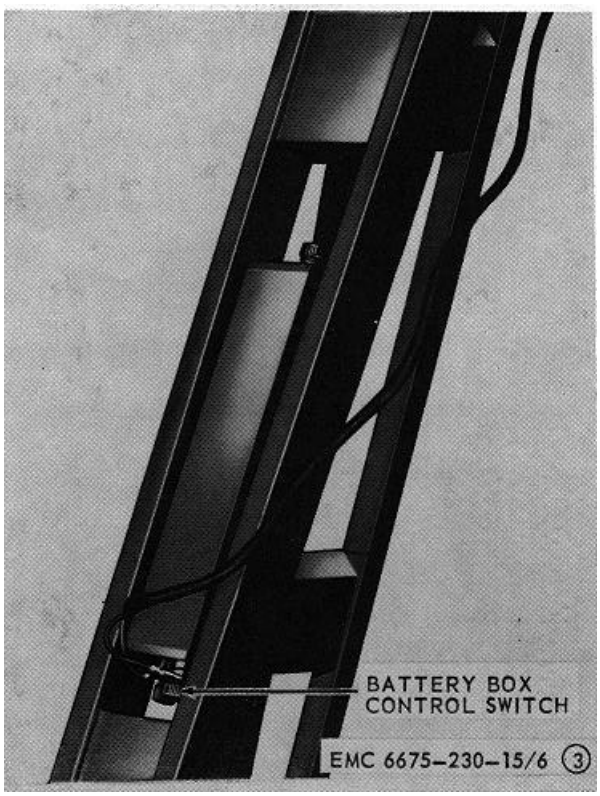


Figure 6-Continued.



3

Figure 6-Continued.

Section IV. OPERATION OF EQUIPMENT

14. General

a. The instructions in this section are published for the use of the personnel responsible for operation of the surveying level.

b. The operator must know how to perform every operation of which the surveying level is capable. This section gives instructions on handling and setting up the surveying level, basic motions, adjustments, and how to coordinate motions and adjustments to perform the specific tasks for which the surveying level is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

15. Level Operation

a. Preparation for Operation.

(1) Set up the tripod as outlined in paragraph 9.

(2) Install the surveying level on the tripod as outlined in paragraph 9.

***Note*. When installing the surveying level, position the instrument so the reflecting mirrors can receive the greatest amount of natural light**.

(3) If the unit is to be used for night operation, install the illumination system as shown in figure 7.

(4) Adjust the leveling screw as follows:

(*a*) Observe the circular level (fig. 6) and adjust the leveling screws (fig. 8) until the bubble of the circular level is centered within the black circle.

(*b*) Loosen the center clamp control (fig. 6) and turn the telescope 180°. Observe the circular level. The bubble should still be centered.

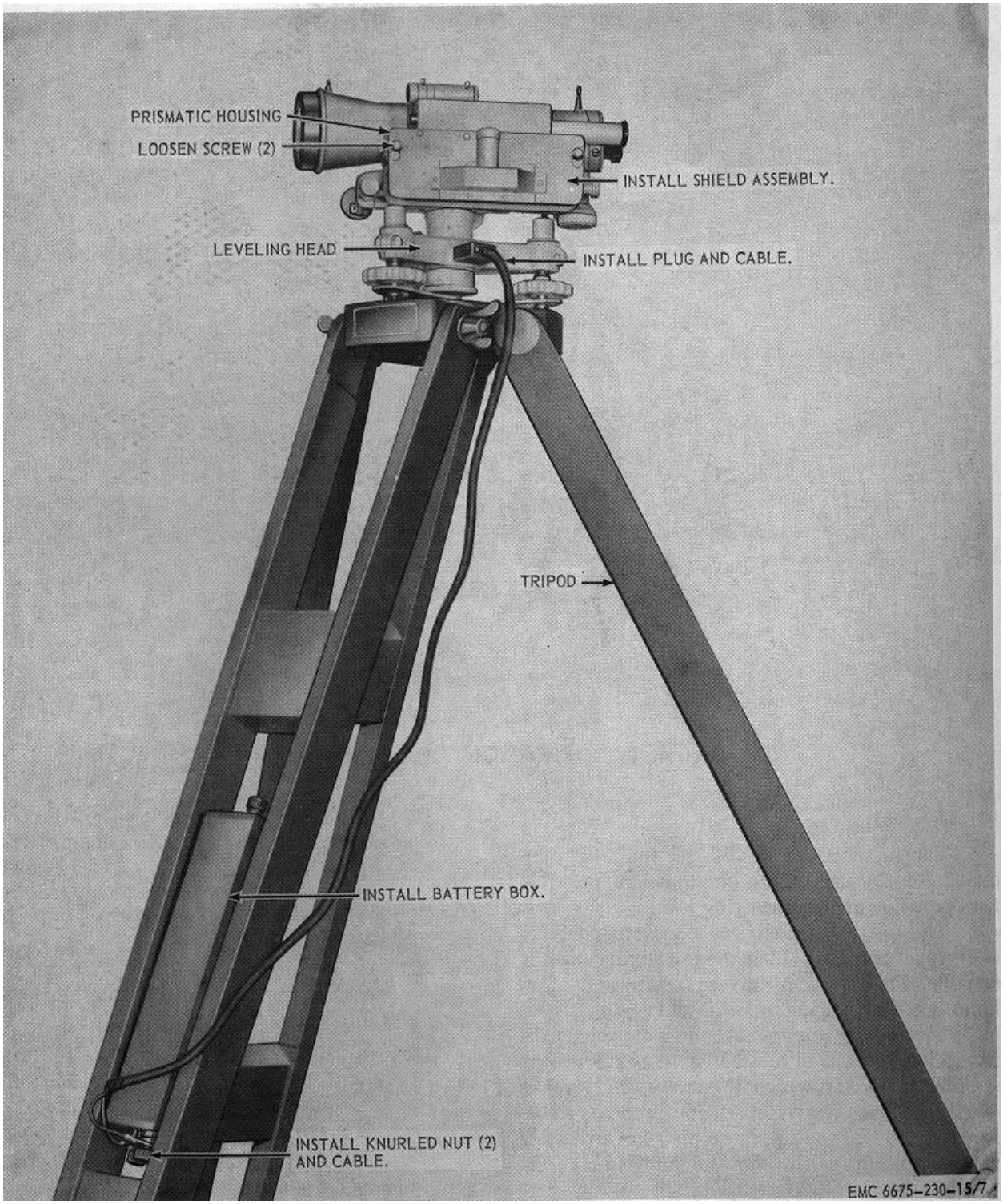


Figure 7. Illumination system, installation and removal.

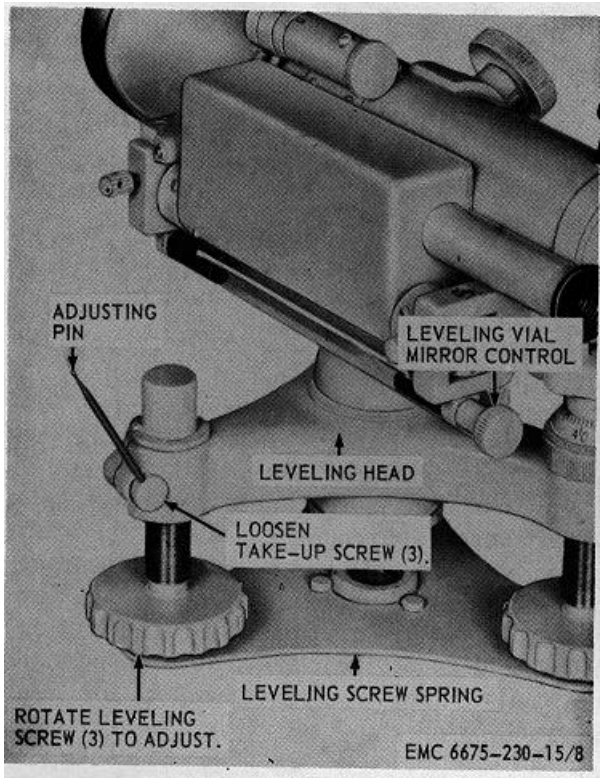


Figure 8. Leveling screw, adjustment.

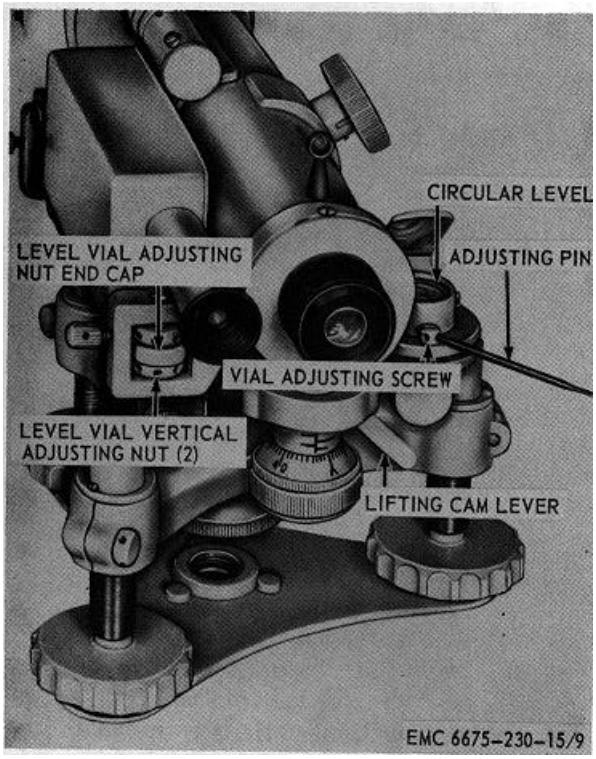


Figure 9. Circular level and level vial, adjustment.

(*c*) If the bubble is not centered, it will be necessary to adjust the leveling screws to compensate for one-half of the leveling correction and the vial adjusting screws (fig. 9) for the remaining half.

(5) Adjust the tilting screw (fig. 6) and cam lever as follows:

(*a*) The lifting cam lever (fig. 6) is provided to protect the tilting screw from damage. With the cam lever in the vertical position, the telescope is raised off the tilting screw. With the cam lever in the horizontal position, the telescope is resting on the tilting screw and is ready for use. When moving the unit from station to station, make sure the cam lever is in the vertical position.

(*b*) The index of the tilting screw knob should normally be about center position in order that the run of the screw may accomplish fine leveling without exceeding the run. Place the tilting screw knob in the center of its scale.

Note. The tilting screw is used to make both vertical and differential adjustments.

(6) Adjust the level vial as follows:

(*a*) Observe the level vial using the magnifying lens (fig. 1). The level vial will appear as depicted in figure 10.

(*b*) If the level vial is out of adjustment and cannot be adjusted using the tilting screw, it will be necessary to adjust using the adjusting nuts (fig. 9). Insert the adjusting pin in the top nut and loosen the nut. Use the adjusting pin to adjust the upper or lower nut until the level appears centered as depicted in figure 10. Tighten the upper nut.

Note. Adjustment of the level vial with the adjusting nuts is only a rough adjustment. Fine adjustment is accomplished using the tilting screw.

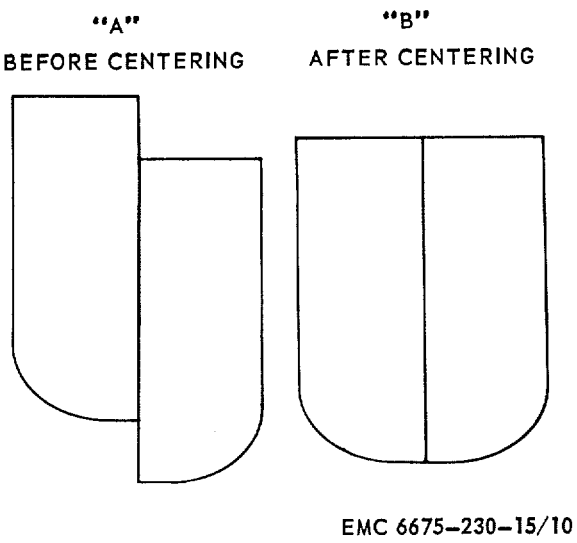


Figure 10. Level vial, adjustment.

(7) Adjust the eyepiece as follows:

(*a*) The threaded eyepiece (fig. 6) adjusts the crosshairs into vertical and horizontal .line of collimation in conjunction with the internal diaphragm.

(*b*) Rotate the eyepiece until the crosshairs on the diaphragm lineup.

b. Daylight Operation.

(1) Loosen the center clamp control and aline the telescope on the sighting point using the exterior sights. Tighten the center clamp control.

(2) Focus the telescope for clearest resolution of sighting point using the focusing control (fig. 6).

(3) Minor horizontal connections can be made using the tangent screw (fig. 6).

(4) Vertical correction can be made using the tilting screw.

c. Night Operation.

(1) General. Electric illumination of the telescope diaphragm and levels is accomplished with an illumination system consisting of batteries, lamps, and dimmer switches. Illumination of the telescope diaphragm and level is controlled by the dimmer switch (fig. 2) located on the telescope barrel. The illumination of the circular level is controlled by the dimmer switch (fig. 2) located below the circular level.

(2) Operation.

(*a*) Place the dimmer switches in the ON position.

(*b*) Operate the surveying level as in b above.

Note. During operation, brightness of the illumination system can be controlled using the dimmer switches.

16. Operation in Extreme Cold (Below 0° F.)

With proper precautions and servicing, the surveying level can be used in extreme cold. Its use is only limited by the endurance of operating personnel and conditions effecting visibility. The instrument should be kept out of doors or in unheated buildings for short periods of nonuse. Extreme changes -in temperature will induce internal stresses effecting accuracy, and lenses and prisms may become fogged. Surveying levels to be used under conditions of extreme cold should be cleaned and all possible lubricant removed before being put into use. Snowfall, winds, and refraction of light are some of the difficulties encountered under low temperature conditions.

Caution: Avoid subjecting the surveying level to sudden changes in temperature.

17. Operation in Extreme Heat

The surveying level and operator should be protected by a surveyor's unbrella when sights have to be taken in direct sunlight. Direct rays of the sun can cause internal stress and distortion in the instrument. Heat waves produce poor sighting conditions. Long sights increase and short sights decrease the amount of sighting errors. Taking sights during the cooler morning and late evening hours will also minimize error magnitude. The use of suitable dark glasses by the operator will reduce eye strain and fatigue. If the instrument is kept in a cool storage place, it should be brought out of storage some time before use to allow metal temperature to approach that of the outside air.

18. Operation in Dusty or Sandy Areas

Special care must be taken of an instrument being used in dusty or sandy areas. If dust or sand is allowed to remain on threaded or sliding surfaces, moving parts of the surveying level will soon bind, and the instrument will

become inaccurate or inoperable. The instrument should be brushed frequently and carefully wiped clean. Be extremely careful not to scratch lenses and prisms during cleaning operation. Always protect the instrument from blowing dust and sand. Cover instrument when not in use.

19. Operation Under Rainy or Humid Conditions

In humid areas, a slight lowering of the temperature will cause condensation of moisture and fogging of lenses and prisms. Try to keep the surveying level warmer than the surrounding air. Corrosion due to high humidity can be partially eliminated by using warm, dry storage areas and by the use of desiccants. Dry the instrument thoroughly after use and wipe the metal parts with a soft, lint-free cloth lightly moistened in watch oil. Refrain from getting oil on lenses and prisms.

20. Operation in Salt Water Areas

Salt air is highly corrosive to many metals, particularly brass from which many of the surveying level parts are made. Salt, combined with brass, produces a green deposit (vendigris) which must be guarded against, and removed as soon as it is noticed. Wipe the instrument frequently with a soft, lint-free cloth lightly moistened in fresh water, and dry thoroughly. After cleaning, rub the metal parts with a soft, lint-free cloth lightly moistened with watch oil. If the instrument is exposed to direct salt spray, it should be cleaned thoroughly, and returned to an instrument shop for overhauling and cleaning as soon as possible. Cleaning intervals should be shortened considerably for the surveying levels which will be exposed to salt air.

CHAPTER 3

OPERATOR AND ORGANIZATIONAL MAINTENANCE

INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE

TOOLS AND EQUIPMENT

21. Special Tools and Equipment

The special tools required to perform organizational maintenance on the surveying level are listed in table I and in TM 5-6675-230-25P. References and illustrations indicating the use of these tools are listed in the table. The five-digit code preceding the stock number is the Federal Supply Code number for the manufacturer of the tool. No special equipment is required by organizational maintenance personnel for performing maintenance on the surveying level.

Table I. Special Tools

Item	FSN or part No.	Ref.		Use
		Fig.	Par.	
Pin, Adjusting, Straight (2 rqr).	5315-160-7522	8	15	Removal and adjustment of holding screws.
Remover and Replacer: Glass Diaphragm.	5120-160-7517	13 17	58 57	Removal and installation of ball head screw on level vial casing, and removal and installation of dia-phragm.

22. Basic Issue Tools and Equipment

Tools and repair parts issued with, or authorized for, the surveying level are listed in the Basic Issue Items List (app. III).

23. Organizational Maintenance Repair Parts

Organizational maintenance repair parts are listed and illustrated in TM 5-66715-230-25P.

Section II. LUBRICATION

24. General Lubrication Information

All parts of the surveying level must be cleaned and lubricated at the same time as all moving parts, both smooth and threaded surfaces, are fitted within extremely fine tolerances. Any attempt to lubricate the surveying level without cleaning will result in damage to the instrument 'and usually render it unfit for use. Unless specifically called for, no lubrication will be performed in the field.

Note. Never perform any unspecified lubrication operation or use lubricants other than those that are specially approved for use on the instrument.

25. Detailed Lubrication Information

a. Care of Lubricants. Special care should be taken to see that all surveying instrument lubricants are absolutely free of contamination. Containers must be stored in a clean, dry place and wiped free of dirt or dust before they are opened. All lids or bottle tops must be airtight.

b. Lubricants. No lubricants other than those approved for use on surveying instruments will be stocked. Approved lubricants are noncorrosive, highly refined, and must be free of all paint-removing ingredients. Ordinary machine oil is not an approved lubricant. The following lubricants are approved for use on this surveying level:

(1) OCW: oil, clock and watch.
(2) GL: grease, aircraft and instrument.

Section III. PREVENTIVE MAINTENANCE SERVICES

26. General

To insure that the equipment is ready for operation at all times, it must be inspected systematically before operation, during operation, and after operation, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive services will be performed before operation. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation if a deficiency is noted during operation which would damage the equipment if operation were continued. After-operation services will be performed by the operator after every operating period. After-operation services will be performed at intervals based on the normal operation of the equipment. Reduce interval to compensate for abnormal conditions. Defects or unsatisfactory operating characteristics beyond the scope of the operator to correct must be reported at the earliest opportunity to organizational maintenance. Responsibility for performance of preventive maintenance services rests not only with the operator but also with the entire chain of command from section chief to commanding officer (AR !750-5).

27. Operator's Daily Services

a. General. The intervals at which specific daily services are to be performed by the operator or crew are indicated by an X in the appropriate column as follows:

B-Before operation
D-During operation
A-After operation

b. Additional Daily Services (Not Illustrated). An X in the appropriate column;(s) indicates the interval at which the service is to be performed.

Intervals			
B	D	A	Procedure
X	X	X	Inspection. Perform the inspection services listed in paragraph 8.
X	--	X	Cleaning. Clean the outside surfaces of the instrument. Clean and polish all external lens and prism surfaces.
X	--	X	Carrying case. Inspect the carrying case for cracks and breaks. Be sure the instrument fits securely in the case.
X	--	X	Accessories and tools. See that all accessories and tools used with the surveying level are clean, in good condition, and properly stowed.
X	--	X	Publications. See that a copy of this technical manual and DA Form 285 (Accident Report) are on or with the equipment and in condition.

28. Organizational Maintenance

a. Preventive maintenance is performed by organizational maintenance personnel at quarterly intervals. A quarterly interval is equivalent to 3 calendar months, or 250 hours of operation, whichever occurs first.

b. The preventive maintenance services to be performed at quarterly intervals are listed consecutively (starting with number 1) and are described in paragraph 29. The service refers to a

Preventive Maintenance Service "Title" on DA Form 464 (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment) and indicates the service to be performed. The number listed under "Inspection" indicates the minimum inspection requirements for the equipment.

29. Quarterly Preventive Maintenance Service

Service		
Inspection	Quarterly	GENERAL
1	1	*Before operation services*. Inspect and perform services listed in daily before-operation services (par. 27).
3	3	*Tools and equipment*. Inspect condition of tools and equipment assigned to the unit. Inspect condition of earring case.
	3	See that tools and equipment assigned to surveying level are clean, serviceable, and properly stowed or mounted. See that carrying case is in good condition and closes and fastens properly.
5	5	*Publications*. See that a copy of TM 5-6675-230-15, TM 5-6675-230-215P, and DA Form 285 are on or with the equipment and in serviceable condition.
6	6	*Appearance*. Inspect general appearance of the surveying level, paying special attention to uncleanness, legibility of identification markings, and condition of paint.
	6	See that deficiencies are corrected or reported to field maintenance.
7	7	*Modification*. See that all modification work orders applying to surveying level have been completed and recorded on DA Form 478 (Organizational Equipment File), DA Form 5-73 (Record of Engineer Equipment Requiring Repair Parts Support), and DA Form 5-73a (Change to Record of Engineer 'Equipment Requiring Repair Parts Support), as applicable.

Section IV. TROUBLESHOOTING

30. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the surveying level and its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any trouble beyond the scope of organizational maintenance will be reported to field maintenance, 3d echelon.

31. Lighting System Faulty or Fails to Function

Probable cause	*Possible remedy*
Lamp burned out	Replace lamp (pars. 41 and 42).
Batteries defective	Replace batteries (par. 44).
Wiring and/or plug defective.	Inspect wiring and plug. Repair or replace wiring or plug.
Lamp housing switches defective.	Replace switches (par. 42).

32. Tripod Legs Will Not Lock in Positions

Probable cause	*Possible remedy*
Leg clamp screws loose or stripped.	Tighten or replace leg clamp screws (par. 66).
Tripod head cracked	Replace tripod head (par. 65).

33. Circular Level Bubble Does Not Stay in Center

Probable cause	*Possible remedy*
Leveling screws loose	Tighten takeup screws.
Circular level tension spring defective.	Replace tension spring (par. 57).

34. Object Being Sighted Not Clearly Visible

Probable cause	*Possible remedy*
Telescope out-of-focus --------	Adjust focusing control until sharp image is obtained (par. 15).

35. Surveying Level Will Not Seat Properly on Tripod Head

Probable cause	*Possible remedy*
Instrument fastener loose or worn.	Tighten or replace fastener (par. 65).
Tripod head bent or broken.	Replace tripod head (par. 65).
Threads in center nut worn or stripped.	Replace center nut (par. 57).

36. Level Crossbar Fails to Function

Probable cause	*Possible remedy*
Lifting cam lever defective or broken.	Report a defective lifting cam lever to field maintenance.
Lifting cam lever and shaft broken.	Report a defective lifting cam lever and shaft to field maintenance.

37. Surveying Level Will Not Rotate on Leveling Head

Probable cause	*Possible remedy*
Center clamp lock screw too tight.	Loosen clamp lock screw (par. 15).
Center clamp bearing surface scored.	Replace center clamp.

38. Instrument Will Not Stay on Line

Probable cause	*Possible remedy*
Tripod installed incorrectly.	Install tripod correctly (par. 9).

39. Level Vial Bubble Does Not Line Up

Probable cause	*Possible remedy*
Level improperly adjusted.	Refer to paragraph 15 for proper operation of instrument.
Lifting cam lever in vertical position.	Place lifting cam lever in horizontal position (par. 15).

Section V. ILLUMINATION SYSTEM

40. General

The surveying level is equipped with an illumination system for night operation. The system consists of two lamp housings, one for the internal slide and one for the circular level, and a shield assembly with lamp that provides illumination of the prismatic housing and level vial. Power for illumination is supplied by three BA-30 dry-cell (flashlight) batteries which are encased in the Bakelite battery box. Necessary leads and plug are provided.

41. Shield Assembly

a. Removal and Disassembly. Refer to figures 7 and 11 and remove and disassemble the shield assembly.

b. Cleaning, Inspection, and Repair.

(1) Clean all metal parts with an approved cleaning solvent and dry.

(2) Inspect housing for cracks and breaks. Repair or replace housing.

(3) Inspect lamp socket, lamp, and contact for damage or wear. Replace damaged parts as required.

c. Reassembly and Installation. Refer to figures 7 and 11 and reassemble and install the shield assembly.

42. Circular Level Lamp Housing and Switch a. Removal.

(1) Refer to figure 12 and remove the circular level lamp housing and switch.

(2) Pull lamp socket (fig. 13) from lamp housing and remove and install lamp.

Note. The lamp socket is press-fitted into the lamp housing and is easily removed to replace the illumination lamp.

b. Cleaning, Inspection, and Repair.

(1) Clean metal parts with an approved cleaning solvent and dry.

(2) Inspect housing for bends, cracks, and breaks. Replace a defective housing.

(3) Inspect for burned-out lamp and defective lamp socket. Replace defective parts as required.

c. Installation.

(1) Refer to figure 13 and install lamp.

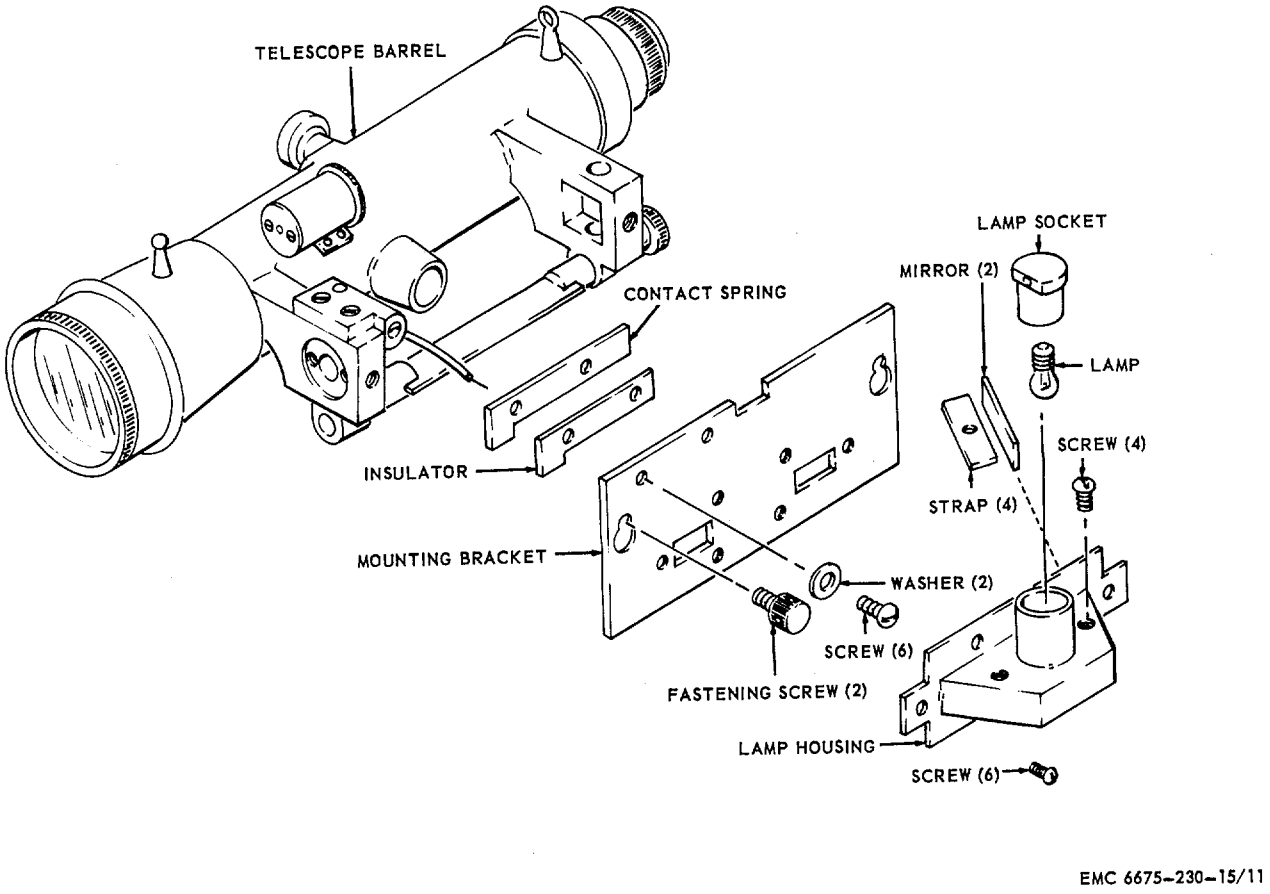


Figure 11. Shield assembly, disassembly and reassembly.

(2) Refer to figure 12 and install the circular level lamp housing.

43. Telescope Barrel Lamp Housing

a. Removal.

(1) Refer to figure 13 and remove the telescope barrel lamp housing.

(2) Lamp removal is the same as that described in paragraph 42.

b. Cleaning, Inspection, and Repair. Clean and inspect parts. Replace parts as necessary.

c. Installation.

(1) Refer to paragraph 42 and install the lamp.

(2) Refer to figure 13 and install the telescope barrel lamp housing.

44. Batteries and Battery Box.

a. Removal

(1) Refer to figure 7 and remove the battery box and cable.

(2) Refer to figure 14 and remove the battery box cover and batteries.

b. Cleaning, Inspection, and Repair.

(1) Clean battery box with cloth dampened in an approved cleaning solvent.

(2) Inspect battery box 'for chips, cracks, and breaks. Replace a defective battery box.

(3) Inspect for dead batteries. Replace batteries as required.

c. Installation.

(1) Refer to figure 14 and install the battery box cover and batteries.

(2) Refer to figure 7 and install the battery box and cable.

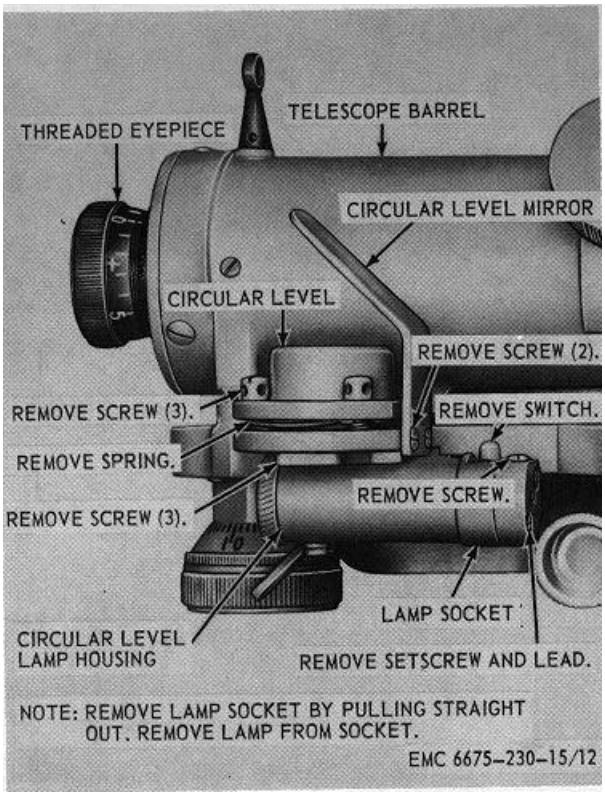


Figure 12. Threaded eyepiece, circular level, and mirror, removal and installation.

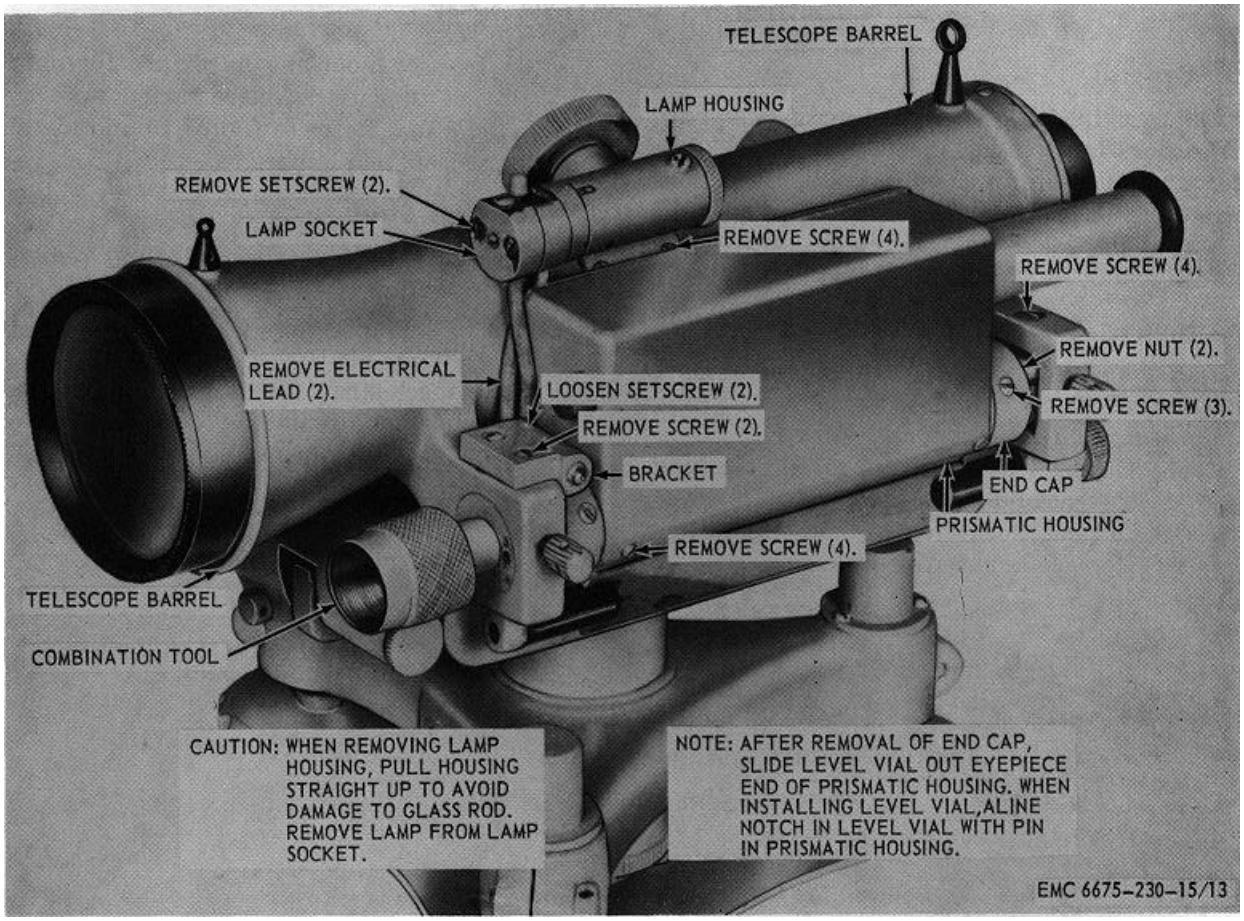


Figure 13. Level vial and illumination assembly, removal and installation.

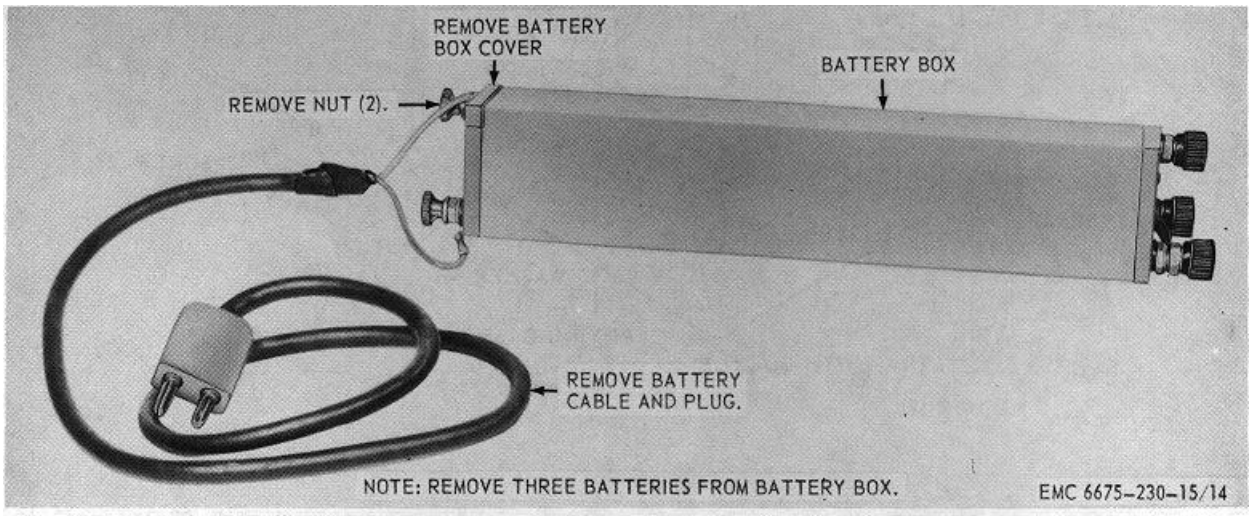


Figure 14. Batteries, removal and installation.

Section VI. CARRYING CASE

45. General

The carrying case is made of mahogany, with all corners lockjointed, glued, and nailed, providing ample reinforcement. Rubber cushions on bottom of case absorb shocks. The case has a hinged lid, lock, key, carrying strap with padded handle, and adjustable buckle.

46. Hinges, Lock, and Latches

a. Removal. Refer to figure 15 and remove the hinges, lock, and latches.

b. Cleaning, Inspection, and Repair.

(1) Clean with an approved cleaning solvent and dry.

(2) Inspect lock for proper operation. Replace inoperative lock.

(3) Inspect mounting hardware for damage. Replace defective parts.

c. Installation. Refer to figure 15 and install the hinges, lock, and latches.

47. Carrying Strap

a. Removal. Refer to figure 15 and remove the carrying strap.

b. Cleaning, Inspection, and Repair.

(1) Wipe strap free of dust and dirt.

(2) Inspect strap for frayed and cracked condition. Replace a defective strap.

(3) Inspect mounting hardware. Replace defective parts as required.

c. Installation. Refer to figure 15 and install the carrying strap.

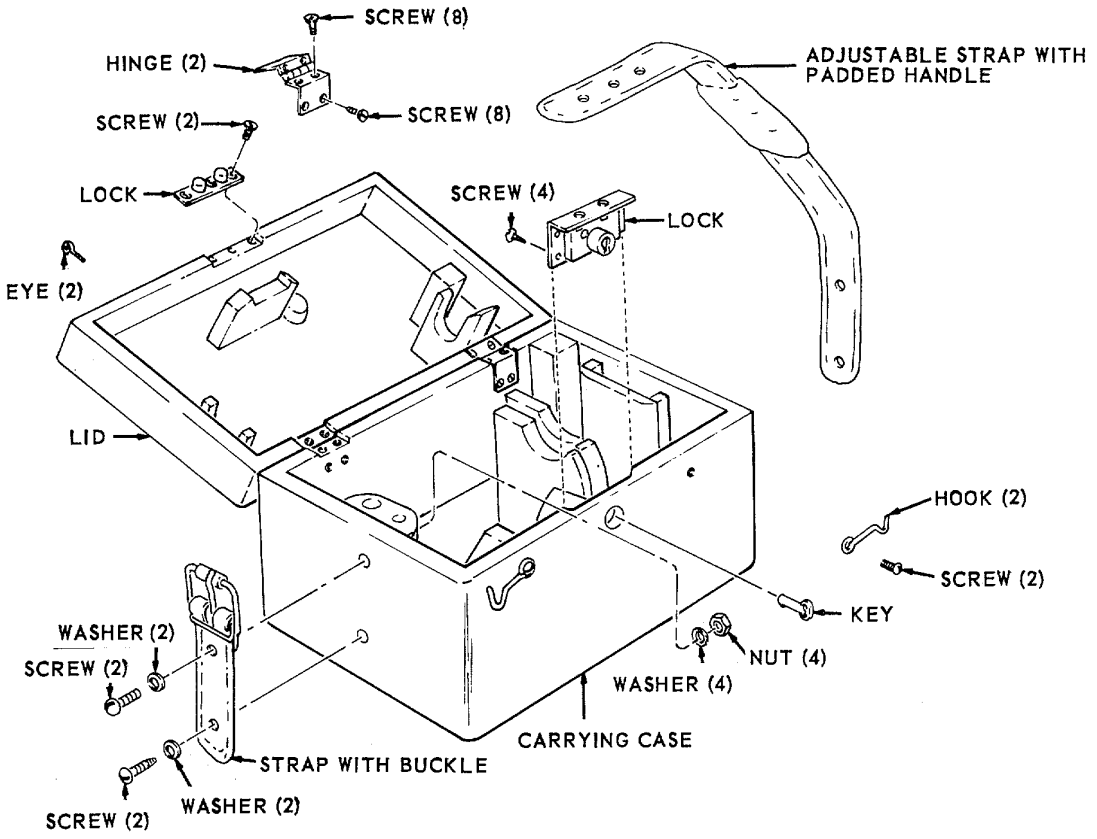


Figure 15. Carrying case, partially exploded view.

Section VII. EYEPIECES

48. General

The surveying level is equipped with front and rear alining sights, objective lens, threaded eyepiece, and magnifying eyecap and tube. The alining sights are used to line up an object to be surveyed. The threaded eyepiece works in conjuction with the interior diaphragm for collimation of the crosshairs and sighting of surveying rod through objective lens. The magnifying eyecap and tube permit operator to view spirit level vial while setting up instrument.

49. Alining Sights

a. Removal. Refer to figure 16 and remove the alining sights.

b. Cleaning, Inspection, and Repair.

(1) Clean sights with an approved cleaning solvent and dry.

(2) Inspect sights for cracked or broken condition. Replace a defective sight as necessary.

c. Installation. Refer to figure 16 and install the alining sights.

50. Objective Lens

a. Removal. Refer to figure 16 and remove objective lens.

b. Cleaning, Inspection, and Repair.

(1) Clean lens with approved lens cleaner and tissue using a circular motion.

(2) Inspect lens for chipped and cracked 'condition. Replace a defective lens.

c. Installation. Refer to figure 16 and install the objective lens.

51. Threaded Eyepiece

a. Removal. Refer to figure 12 and remove the threaded eyepiece.

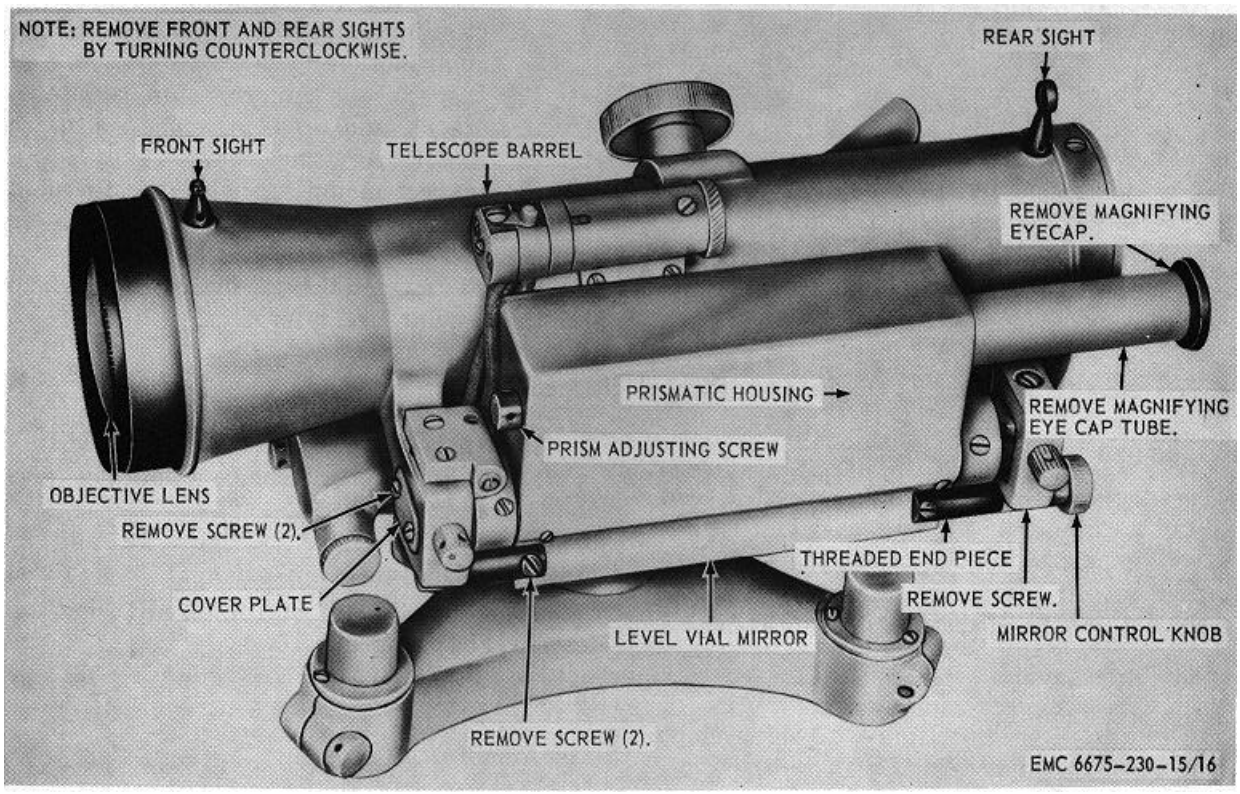


Figure 16. Sights, lens, and mirror, removal and installation.

b. Cleaning, Inspection, and Repair.

(1) Clean the eyepiece with lens cleaner and tissue, using a circular motion.

(2) Inspect for proper operation and chipped or cracked lenses. Replace a defective eyepiece.

c. Installation. Refer to figure 12 and install the threaded eyepiece.

52. Magnifying Eyecap and Tube

a. Removal. Refer to figure 16 and remove the magnifying eyecap and tube.

b. Cleaning, Inspection, and Repair.

(1) Clean with an approved cleaning solvent and dry.

(2) Inspect tube for cracks and breaks. Replace a defective tube.

(3) Inspect eyecap for cracked lens. Replace damaged eyecap as required.

c. Installation. Refer to figure 16 and install the magnifying eyecap and tube.

Section VIII. MIRROR ASSEMBLIES

53. General

The surveying level is equipped with two polished-steel reflecting mirrors, used to observe the circular level and level vial. The mirrors are so located that the operator can observe them from the eyepiece end of the level.

54. Level Vial Mirror

a. Removal. Refer to figure 16 and remove the level vial mirror.

b. Cleaning, Inspection, and Repair.

(1) Wipe mirror with lint-free cloth dampened in an approved cleaning solvent, using a circular motion.

(2) Inspect the mirror for scratches, crack and breaks. Replace a defective mirror as required.

c. Installation. Refer to figure 16 and install the spirit level vial mirror.

55. Circular Level Mirror

a. Removal. Refer to figure 12 and remove the circular level mirror.

b. Cleaning, Inspection, and Repair.

(1) Clean the mirror with an approved cleaning solvent and dry, using a circular motion.

(2) Inspect the mirror for scratches, cracks, and breaks. Replace a defective mirror as necessary.

(3) Inspect mounting hardware for damage. Replace damaged parts as required.

c. Installation. Refer to figure 12 and install the circular level mirror.

Section IX. LEVEL ASSEMBLIES

56. General

The surveying level is equipped with a level vial and a circular level. The level vial is used to level the horizontal axis of the telescope barrel, and the circular level is used to level the instrument at time of installation on the tripod.

57. Circular Level

a. Removal. Refer to figure 12 and remove the circular level and spring.

b. Cleaning, Inspection, and Repair.

(1) Wipe the level with a lint-free cloth moistened in an approved cleaning solvent and .dry.

(2) Inspect the level for cracked and chipped lens. Replace a defective level as required.

c. Installation. Refer to figure 12 and install the circular level and spring.

d. Adjustment. Adjust the circular level as described in paragraph 15.

58. Level Vial

a. Removal.

(1) Refer to figure 16 and remove the cover plate.

(2) Install combination tool (fig. 13) and remove level vial.

b. Cleaning, Inspection, and Repair.

(1) Wipe the level with a lint-free cloth dampened in an approved cleaning solvent and dry.

(2) Inspect the level for chipped or cracked condition. Replace a defective level.

(3) Inspect mounting hardware for damage. Replace damaged parts as required.

c. Installation. Refer to figures 16 and 13 and install the level vial.

d. Adjustment. Adjust the level vial as described in paragraph 15.

Section X. DIAPHRAGM

59. General

The surveying level is equipped with a nonadjustable glass diaphragm (plano-glass disk), ruled for cross and stadia lines, used to line up on surveying stake.

60. Diaphragm

a. Removal.

(1) Refer to figure 12 and remove the threaded eyepiece.

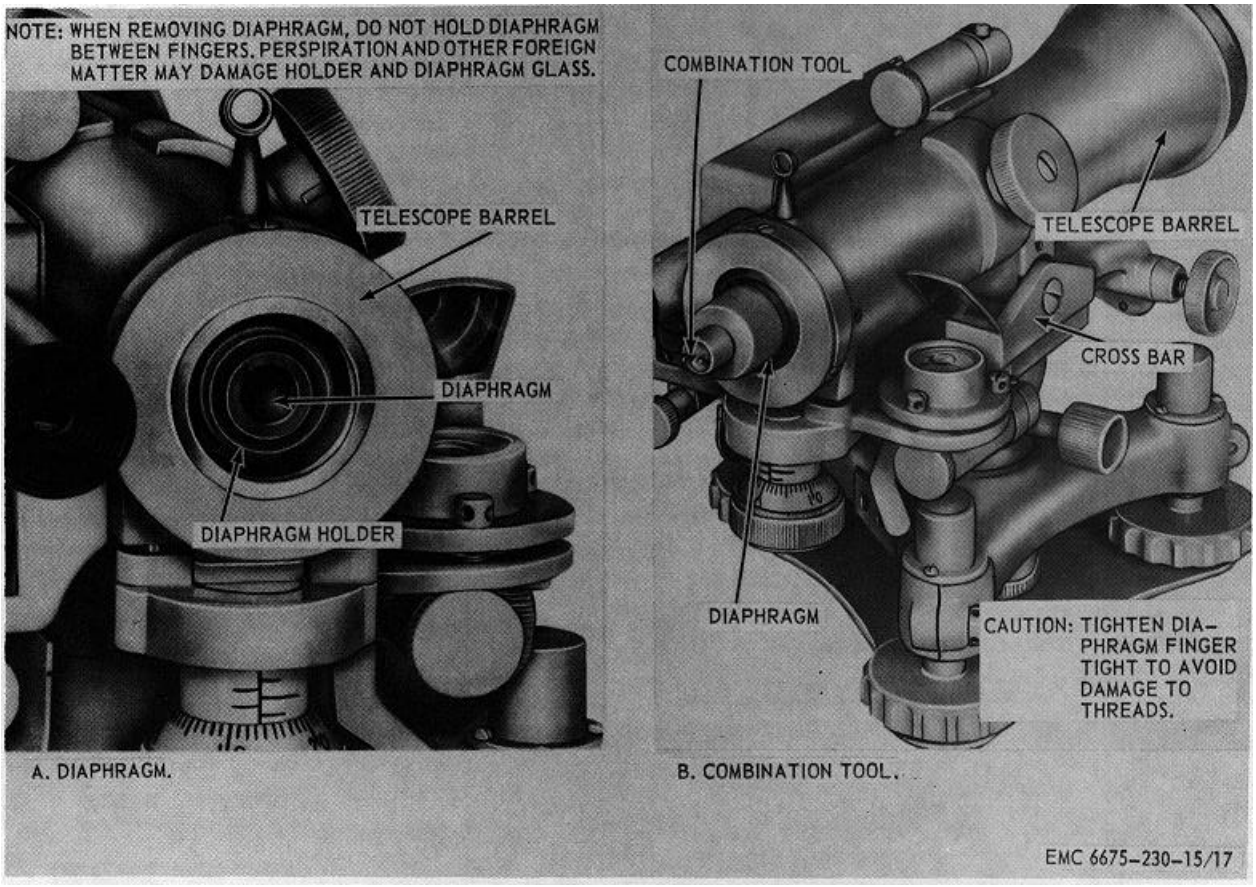
(2) Remove the diaphragm (fig. 17).

b. Cleaning, Inspection, and Repair.

(1) Clean the diaphragm with a lint-free cloth dampened in an approved cleaning solvent and dry.

(2) Inspect the diaphragm for chips and cracks. Replace a defective diaphragm.

(3) Inspect mounting hardware for damage. Replace damaged parts as required.



Figured 17. Diaphragm, removal and installation

Caution: Refrain from touching diaphragm glass or holder with bare hands. If touched, clean them at once with lens cleaner and tissue, using a circular motion.

c. Installation.

(1) Refer to figure 17 and install the diaphragm.

(2) Refer to figure 12 and install the threaded eyepiece.

Section XI. LEVELING AND TANGENT SCREWS

61. General

The surveying level is equipped with three leveling screws, with protective dust caps, and tangent screw and plunger. The leveling screws and protective dust caps are mounted on the leveling head, and the tangent screw and plunger are mounted on the crossbar.

62. Leveling Screws

a. Removal.

(1) Refer to figure 8 and loosen takeup screws with adjusting pin.

(2) Refer to figure 18 and remove the leveling screws and leveling screw spring.

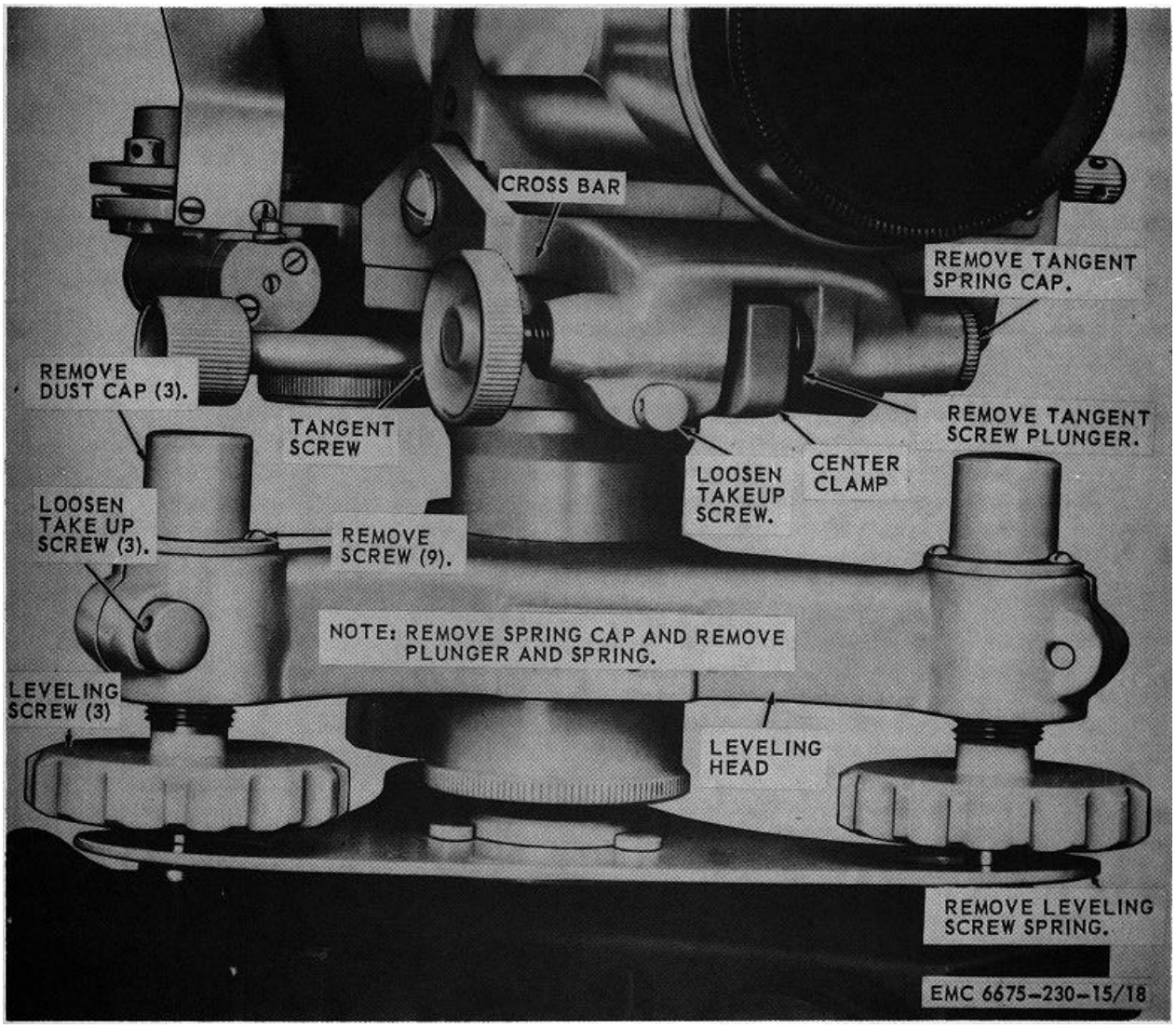


Figure 18. Leveling and tangent screws, removal and installation.

(3) Refer to figure 18 and remove leveling screw dust caps.

b. Cleaning, Inspection, and Repair.

(1) Clean the leveling screws and spring with an approved cleaning solvent and dry.

(2) Inspect leveling screws for bends, cracks, or stripped threads. Replace defective screws.

(3) Inspect spring for cracked or broken condition. Replace a damaged spring as required.

Note. The leveling screws should be removed and installed two at a time for ease of removal and installation of leveling spring.

c. Installation.

(1) Refer to figure 18 and install the leveling screw dust caps.

(2) Refer to figure 18 and install the leveling screws and spring.

(3) Refer to figure 8 and tighten takeup screws.

63. Tangent Screw and Plunger

a. Removal. Refer to figure 18 and remove the tangent screw, spring, and plunger.

b. Cleaning, Inspection, and Repair.

(1) Clean with an approved cleaning solvent and dry.

(2) Inspect screw, plunger, and cap for chipped, cracked, or worn conditions. Replace defective parts as required.

(3) Inspect spring for wear and proper tension. Replace a damaged spring.

c. Installation. Refer to figure 18 and install the tangent screw, spring, and plunger.

Section XII. TRIPOD ASSEMBLY

64. General

The surveying level is equipped with a nonextension, three-leg tripod, with tripod head and instrument fastener. The tripod head is grooved to receive the leveling screws of the instrument. The legs are equipped with offset shoes and spurs, for stable mounting, and two flat battery-box mounting plates. A leather strap and buckle are provided for securing the tripod in a closed position.

65. Tripod Head

a. Removal and Disassembly. Refer to figure 19 and remove and disassemble the tripod head.

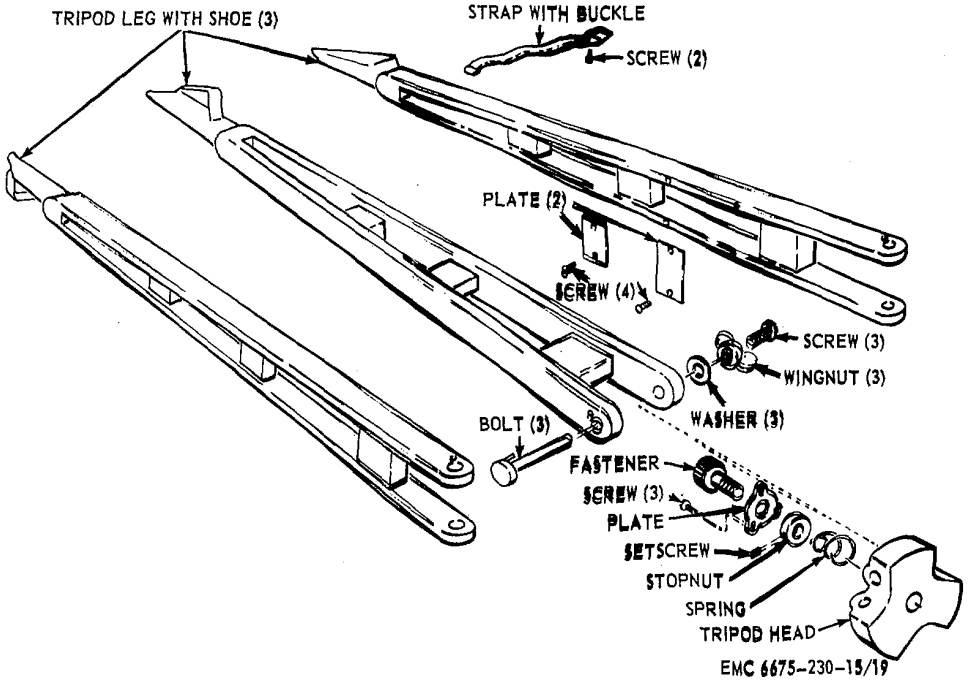


Figure 19. Tripod assembly, disassembly and reassembly.

b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry.

(2) Inspect head for cracks and breaks. Weld cracks or replace head.

(3) Inspect the fastener, spring, and plate for damage. Replace damaged parts as required.

c. *Reassembly and Installation*. Refer to figure 19 and reassemble and install the tripod head.

66. Tripod Legs

a. Removal and Disassembly. Refer to figure 19 and remove and disassemble the tripod legs.

b. Cleaning, Inspection, and Repair.

(1) Wipe legs free of dirt and dust with cloth.

(2) Inspect legs for splintered, cracked, or broken condition. Replace a defective leg as required.

(3) Inspect mounting hardware for damage. Replace damaged parts as required.

c. Reassembly and Installation. Refer to figure 19 and reassemble and install the tripod legs.

CHAPTER 4

DEMOLITION OF SURVEYING LEVEL TO PREVENT ENEMY USE

67. General

When capture or abandonment of the surveying level !to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued with cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all surveying levels and all corresponding repair parts.

68. Demolition to Render the Surveying Level Inoperative

a. Demolition by Mechanical Means. Using a hammer, bar, or other suitable tools, break all lenses, level vials, level barrel, slight glass, and leveling screws. Destroy the battery box, batteries, carrying case, and tripod. Rip the instrument cover apart.

b. Burning. Pack oil soaked rags, canvas, or other flammable material around the surveying level, tripod, and carrying case and set fire to the pile. Be sure burning is thorough and complete before leaving.

c. Submersion. Remove the surveying level from the carrying case. Submerge the instrument, carrying case, and tripod in a body of water to insure water damage and provide concealment. Salt water will damage metal parts more than fresh water.

d. Scattering and Concealment. Remove all easily accessible parts such as the threaded eyepiece, objective lens, leveling screws, and tangent screw. Scatter them through dense foliage, bury them in dirt or sand, or throw them in a lake, stream, or other body of water.

69. Training

All operators should receive thorough training in the destruction of surveying levels. Refer to FM 5-25. Simulated destruction, using all of the methods listed above, should be included in the operator training program. It must be emphasized in training that demolition operations are usually necessitated by critical situations when time available for earring out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction of equipment, and be able to carry out demolition instructions without reference to this or any other manual.

CHAPTER 5

SHIPMENT AND LIMITED STORAGE

Section I. SHIPMENT WITHIN ZONE OF INTERIOR

70. Preparation of Equipment for Shipment

a. General. Detailed instructions for the preparation of the level for domestic shipment are outlined in this paragraph.

b. Inspection. Perform a complete inspection of the surveying level as outlined in paragraph 8.

c. Cleaning and Drying. Remove dust and dirt from the surveying level; dry thoroughly. Refer to TM 38-230 for choice and application of cleaning and drying methods.

Caution: Clean external lens and mirror surfaces with approved lens cleaner and lens tissue only.

d. Painting. Paint all surfaces of the level, tripod, and carrying case on which the paint has been removed or damaged. Refer to TB ENG 60 for detailed cleaning and painting instructions.

e. Preservation. Coat exposed threads and unpainted or unplated metal surfaces with type P-7 medium preservative oil conforming to Specification MIL-L-3150. Wrap preserved surfaces with greaseproof paper and secure with pressure sensitive tape or twine. Tape should be applied over paper and should not contact 'lenses or instrument surfaces.

Caution: Preservatives must not contact lenses, mirrors, instrument finish, or nonmetallic surfaces.

f. Packing.

(1) Place the surveying level in the carrying case.

(2) Apply fiberboard or other suitable cushioning, if necessary, to prevent movement of the level within the carrying case.

(3) Pack the carrying case in a suitable fiberboard or nailed wood box, Refer .to TM 38-230 for general packaging instructions and choice and fabrication of a suitable container.

(4) Collapse the tripod to the minimum dimensions; secure the strap.

(5) Remove the batteries from the battery case.

(6) Pack the tripod and accessories in a suitable fiberboard or nailed wood box. Refer to TM 38-230 for general packaging instructions and choice and fabrication of a suitable container.

(7) Marking. Marking will conform to the requirements of MIL-STD-129.

Apply fragile labels to three surfaces of the surveying level shipping container.

71. Loading Equipment for Shipment

Be sure the surveying level is properly stowed in the carrying case and the carrying case is securely fastened.

Section II. LIMITED STORAGE

72. Preparation of Equipment for Storage

a. General. Detailed instructions for the preparation of the surveying level for limited storage are outlined in this paragraph.

b. Inspection. Perform a complete inspection of the surveying level as outlined in paragraph 8.

c. Cleaning and Drying. Remove dust and dirt from the surveying level; dry thoroughly.

Refer to TM 38-230 for choice and application of cleaning and drying methods.

Caution: Clean external lens and mirror surfaces with approved lens cleaner and lens tissue only.

d. Painting. Paint all surfaces of the level, tripod, and carrying case on which the paint has been removed or damaged. Refer to TB ENG 60 for detailed cleaning and painting instructions.

e. Preservation. Coat exposed threads and unpainted or unplated metal surfaces with type P-7 medium preservative oil conforming to Specification MIL-L-3150. Wrap preserved surfaces with greaseproof paper and secure with pressure sensitive tape or twine. Tape should be applied over the paper and should not contact lenses or instrument surfaces.

Caution: Preservatives must not contact lenses, mirrors, instrument finish, or nonmetallic surfaces.

f. Packing.

(1) Place the surveying level in the carrying case.

(2) Collapse the tripod to the minimum dimensions and secure the strap. Remove the batteries and store separately.

(3) Pack the tripod and accessories in a suitable carton or box.

g. *Storage*. Store the surveying level and tripod in a dry, dust-free location.

73. Inspection and Maintenance of Equipment in Storage

Frequency of inspections will be prescribed by the unit commander, taking into consideration such factors as the physical condition of the storage area, weatherproofing, security from tampering or pilferage, and humidity and temperature conditions. Any preservative or packaging material removed as a result of inspection will be replaced prior to return to storage.

CHAPTER 6
FIELD AND DEPOT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

74. Scope

a. The following instructions are for field and depot maintenance personnel. They contain information on equipment maintenance that is beyond the scope of the tools, equipment, personnel, or supplies normally available to organizational maintenance.

b. Appendix I includes the publications applicable to field and depot maintenance. Appendix II contains the Maintenance Allocation Chart. The Field and Depot Maintenance. Repair Parts and Special Tool Lists are listed in TM 5-6675-230-25P.

75. Record and Report Forms

For record and report forms ,applicable to field and depot maintenance, refer to TM 5-505.

Note.

Applicable forms, excluding Standard Form 46, (United States Government Motor Vehicle Operator's Identification Card) which is carried by the operator will be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

76. Description

For a complete description of the surveying level, see paragraph 3.

77. Tabulated Data

a. *General.* Tabulated data is listed in paragraph 4. Engineering data, such as tolerances, wear limits, and the like are not available.

b. Time Standards. Table II lists the number of man-hours required for various operations in the maintenance and repair of the surveying level. The man-hours listed are not intended to be rigid standards. Under adverse conditions the operations will take considerably longer; but under ideal conditions with highly skilled mechanics, most of the operations can be accomplished in considerably less time.

Table II. Time Standards
Lubrication and Service

Clean (general)
Use soft cloth, free of dirt and oil, only on exterior parts not to include lens and mirrors. Do not use water or oil when cleaning.
Clean (special)

Table II. Time Standards-Continued Man-hours

Use linen or other lint free cloth moistened with alcohol to clean glass surfaces and mirrors. Use stiff tooth brush to clean threads and lubricate sparingly with latest issue watch oil. For use in arctic temperatures, lubricate with powdered graphite.

	Remove and Replace
67	PRECISION INSTRUMENTS, MECHANICAL AND, ELECTRICAL
6700	Level, Surveying Level
6700.1	Telescope Assembly Sight, front or rear 0.1
	Gear assembly, focusing 0.2
	Pinion, focusing 0.1
	(When gear assembly is removed.)
	Barrel, telescope 2.0
	(Includes removal and replace eyepiece assembly, objective lens assembly, diaphragm, diaphragm mount, tilting screw assembly, ... trunnion axis, level and prism housing assembled, lamp housing, focusing slide, and level mirror.)
	Slide, focusing 0.5
	(Includes remove and replace objective lens assembly, focusing gear assembly, and focusing lens assembly.)

Table II. Time Standards-Continued — *Man-hours*

6701.2	Optics (Reflecting and Transmitting Types)	
	Cap assembly, eye magnifying	0.1
	Tube, and stop	0.1
	Mirror, circular	0.3
	Mirror assembly, level	0.2
	Lens assembly, objective	0.1
	Eyepiece, inverting -	0.1
	Diaphragm (Includes remove and replace objective lens assembly.)	0.4
	Lens and cell assembly, focusing (Includes remove and replace object lens assembly, and focusing slide.)	0.6
	Housing, protective, prism (Includes remove and replace level and prism holder with prisms.)	1.5
	Prisms, right and left (Includes remove and replace protective housing and single prism.)	1.8
	Prism, single (Includes remove and replace level.)	1.3
6702.1	Structural Parts	
	Head assembly, leveling (Includes remove and replace leveling screw assemblies and center post.)	0.6
	Screw assembly, leveling (all)	0.3
	Plunger and screw, tangent	0.1
	Bar, cross -	2.0

Table II. Time Standards-Continued — *Man-hours*

	(Includes remove and replace axis shaft, cable terminal stud, tangent components, lifting cam and tilting screw.)	
	Trunnion, axis	0.2
	Rocker, crossbar (Includes remove and replace telescope and crossbar as an assembly, remove and replace clamp and leveling head.)	0.5
6702.2	Operating or Precision Parts	
	Screw, shoulder, vertical tilting	0.6
6703.1	Batteries	
	Battery	0.1
	Battery box	0.2
6703.2	Fuses and Lamps	
	Shield assembly	0.2
	Light, panel	0.1
	Socket, electric, lamp	0.2
6703.8	Controls, Indicators and Special Components	
	Contacts	0.1
6703.10	Miscellaneous Wiring and Fittings	
	Stud, terminal	0.3
6706	Compass and Levels	
	Level assembly, circular	1.0
	Vial, level, telescope	1.8
6707	Tripods	
	Tripod	0.1
	Leg assembly	0.2
	Head, tripod	0.4
6708	Carrying and Packing Cases	
	Case, instrument	0.1

Section III. SPECIAL TOOLS AND EQUIPMENT

78. Special Tools and Equipment

The special tools required to perform field and depot maintenance on the surveying level are listed in table III and TM 5-6675-23025P. References and illustrations indicating the use of these tools are listed in the table.

The five-digit numbers preceding the stock number is the Federal Supply Code Number for the manufacturer of the tool(s). No special equipment is required by field and depot maintenance personnel for performing maintenance on the surveying level.

Table II. Special Tools

Item	FSN or Dart No.	Ref. Fig.	Ref. Par.	Use
Remover and Replacer, Trunnion shaft.	5120-160-7523	20	88	Removal of trunnion shaft
Wrench, Spanner	5120-374-2439	22	90	Removal and installation of crossbar center nut

79. Field and Depot Maintenance Repair Parts

Field and depot maintenance repair parts are listed and illustrated in TM 5-6675-230-25P.

80. Specially Designed Tools and Equipment

There are not specially designed tools or equipment required for field and depot maintenance on the surveying level.

Section IV. TROUBLESHOOTING

81. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the surveying level or its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

82. Telescope Barrel Will Not Tip

Probable cause	*Possible remedy*
Lifting cam defective	-.Replace lifting cam (par. 91).
Lifting cam lever bent or broken.	Replace lever (par. 91).
Tilting screw too tight and/or defective.	Loosen or replace tilting screw (par. 93).

83. Telescope Will Not Focus Properly

Probable cause	*Possible remedy*
Inverting eyepiece lens dirty, cracked, or broken.	Clean or replace eyepiece (par. 51).
Objective lens dirty, cracked, or broken.	Clean or replace objective lens (par. 50).
Glass diaphragm lens dirty, cracked, or broken.	Clean or replace diaphragm (par. 60)!.
Focusing lens dirty or defective.	Clean or replace focusing lens (par. 88).
Focusing slide jammed or broken.	Clean or replace defective slide (par. 88).
Focusing pinion or shaft defective.	Replace pinion or shaft (par. 88).

84. Illumination System Fails to Operate

Probable cause	*Possible remedy*
Illumination socket defective.	Replace leveling head (par. 90).

85. Telescope Barrel Loose on Crossbar

Probable cause	*Possible remedy*
Trunnion shaft worn or broken.	Replace trunnion shaft (par. 95).
Crossbar cracked or broken.	Replace crossbar (par. 91),.

86. Telescope Will Not Retain Level

Probable cause	*Possible remedy*
Leveling head bent or cracked.	Replace leveling head (par. 90).
Leveling screws bent or stripped.	Replace leveling screws (par. 62).
Surveying level mounted on tripod incorrectly.	Reinstall level (par. 9).

Section V. TELESCOPE BARREL MAINTENANCE INSTRUCTIONS

87. General

The telescope barrel consists of the interior focusing slide and lens, fixed lens, and focusing pinion and gear assembly. The fixed lens is mounted in the objective end of the barrel.

88. Telescope Barrel

a. Removal.

(1) Remove mirrors, level, diaphragm, and lamp housing (par. 54-60).

(2) Refer to figure 20 and remove the telescope barrel.

Note.

Hold the telescope barrel firmly when extracting trunnion shaft to avoid dropping and possible damage to interior lenses.

b. Disassembly. Refer to figure 21 and disassemble the telescope barrel.

c. Cleaning, Inspection, and Repair.

(1) Clean all metal parts with an approved cleaning solvent and dry thoroughly.

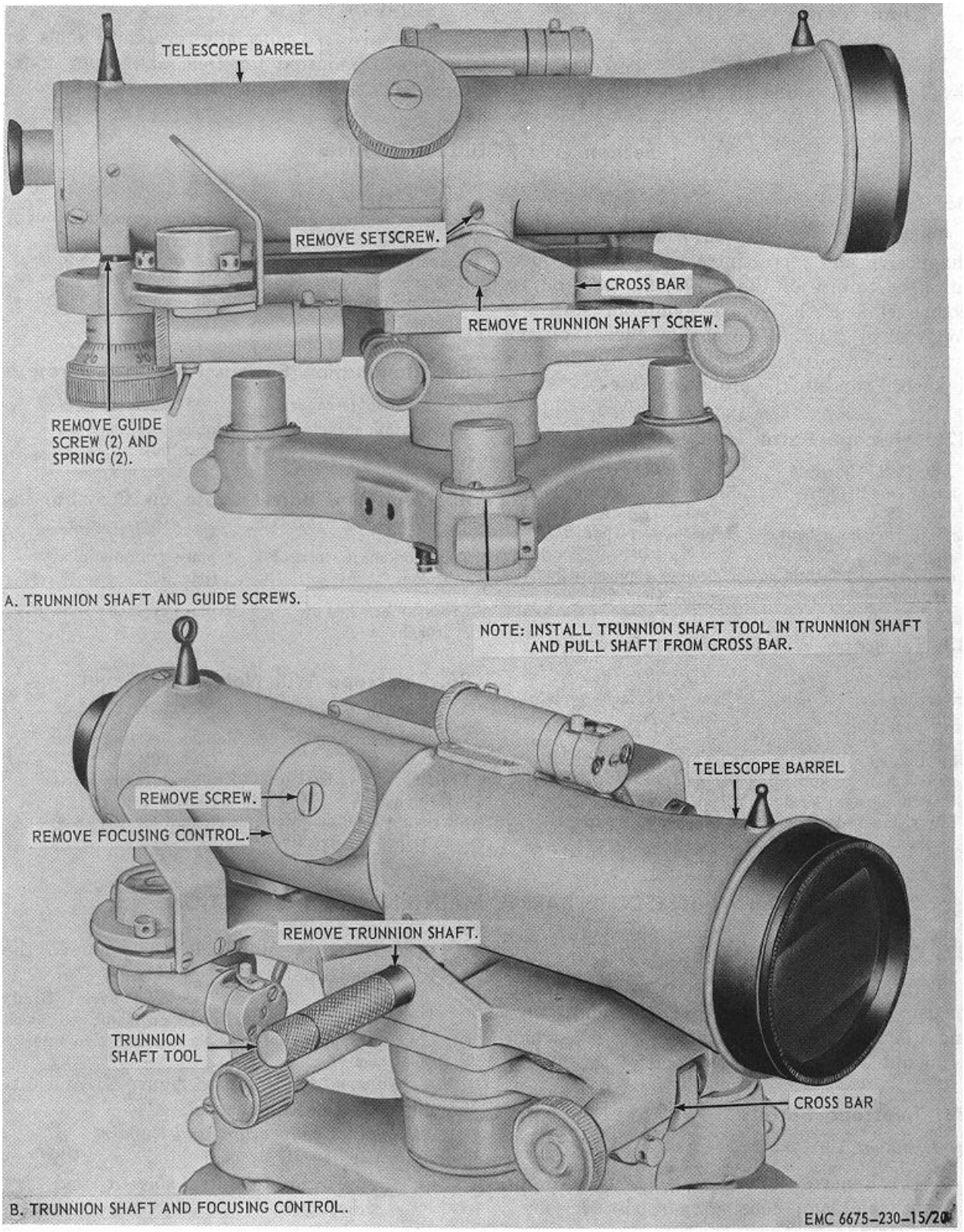
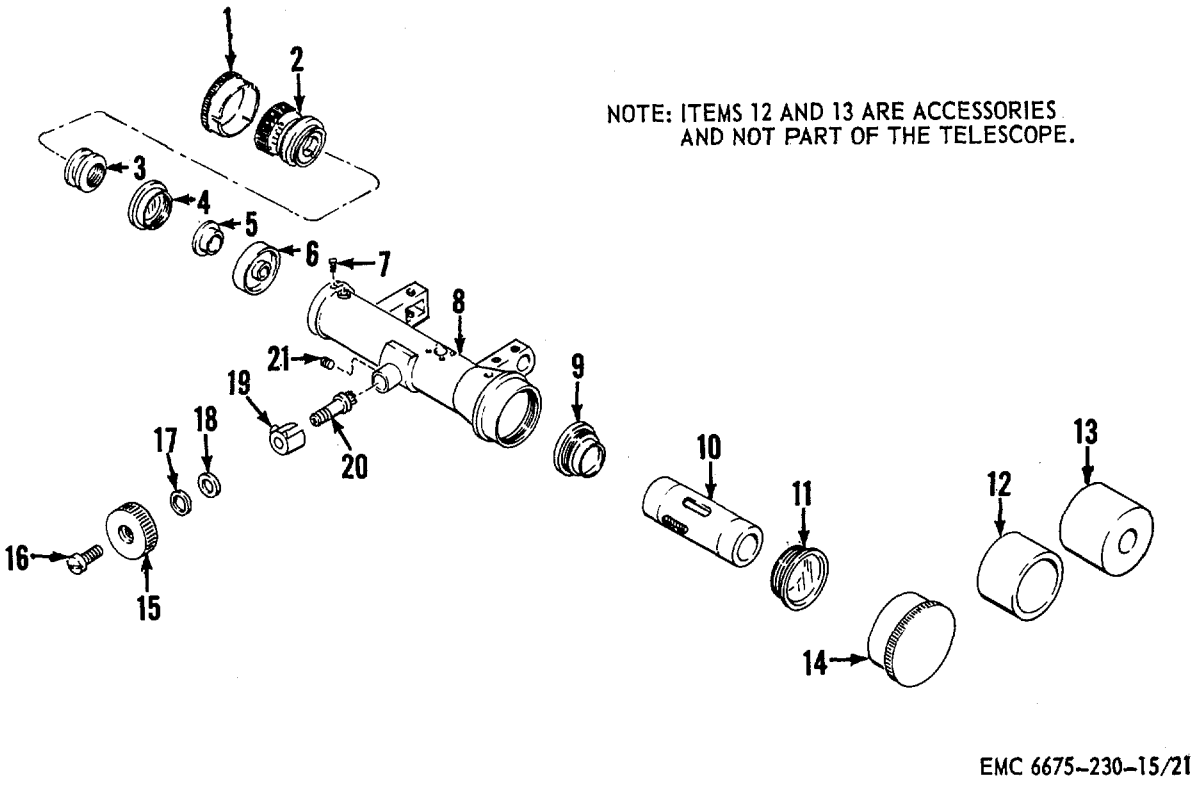


Figure 20. Telescope barrel, removal and installation.



1	Dust cover	12	Sunshade
2	Eyepiece	13	Sunshade
3	Lens holder	14	Dust cover
4	Eyepiece mounting	15	Focusing pinion head
5	Diaphragm	16	Pinion head screw
6	Diaphragm holder	17	Washer, steel (spec)
7	Screw, brass (spec)	18	Washer, brass (spec)
8	Telescope barrel	19	Bushing
9	Focusing lens	20	Focusing pinion
10	Focusing slide	21	Setscrew (spec)
11	Objective lens		

Figure 21. Telescope barrel, disassembly and reassembly.

(2) Inspect the lenses for scratches, chips, cracks, and fungus etching. Clean lenses with an approved cleaner and lens tissue. Dry and polish with lens tissue using a circular motion. Replace a defective lens.

Caution:

Repeated cleaning of the lenses will eventually result in dimness of the sighting image and a loss of definition. If it becomes necessary to clean the lenses, clean only the exterior surfaces, if practical. Exercise care to leave no finger marks on the lenses surfaces.

(3) Inspect the slide and track for wear, chips, and cracks. Replace a defective slide assembly.

(4) Inspect the barrel for wear, burred threads, cracks, and breaks. Repair or replace barrel as required.

d. Reassembly. Refer to figure 21 and reassemble the barrel assembly.

e. Installation.

(1) Refer to figure 20 and install the barrel assembly.

(2) Install mirror, level, diaphragm, and lamp housing (pars. 54-60).

Section VI. CROSSBAR, CENTER CLAMP, AND LEVELING HEAD MAINTENANCE INSTRUCTIONS

89. General The leveling head is a three-post frame, which is the base of the level and which works in conjunction with the three leveling screws and contains the battery socket for illumination. The center clamp works to serve two purposes: It works in conjunction with the tangent screw and plunger, and it is used to lock the circular movement of the level. The crossbar contains the tilting screw, lifting cam and lever, crossbar center, and wiring.

90. Leveling Head and Center Clamp

a. Removal.

(1) Remove the leveling screws, tangent screw and plunger, leveling spring, and dust cap (pars. 62-63).
(2) Remove the telescope barrel (par. 88).
(3) Refer to figure 22 and remove the leveling head and clamp.

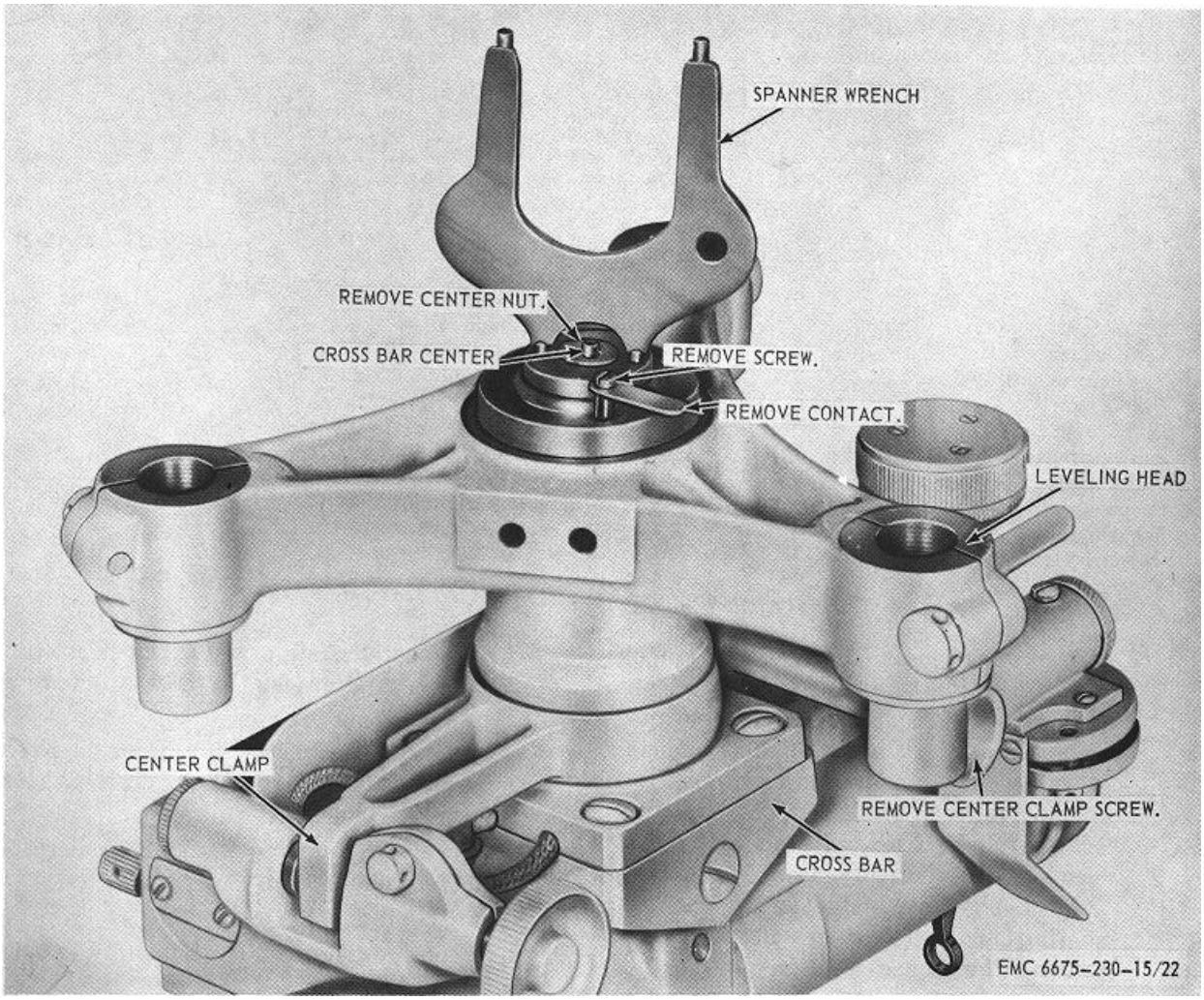


Figure 22. Leveling head and center clamp, removal and installation.

b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the leveling head for stripped threads, cracks, and chips. Replace a defective leveling head.

(3) Inspect the center clamp for worn, bent, cracked, or chipped conditions. Replace a damaged clamp as required.

(4) Inspect mounting hardware for damage. Replace damaged parts as required.

c. Installation.

(1) Refer to figure 22 and install the leveling head and clamp.

(2) Install the telescope barrel (par. 88).

(3) Install leveling spring, tangent screw and plunger, dust cap, and leveling screws (par. 62-63).

91. Crossbar, Crossbar Center, and Lifting Cam

a. Removal.

(1) Remove leveling head and clamp (par. 90).

(2) Refer to figure 23 and remove the the crossbar, crossbar center, and lifting cam.

b. Cleaning, Inspection, and Repair.

(1) Clean parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect crossbar and center and lifting cam for worn, scratched, and chipped conditions. Replace as required.

c. Installation.

(1) Refer to figure 23 and install the crossbar, crossbar center, and lifting cam.

(2) Install leveling head and clamp (par. 90).

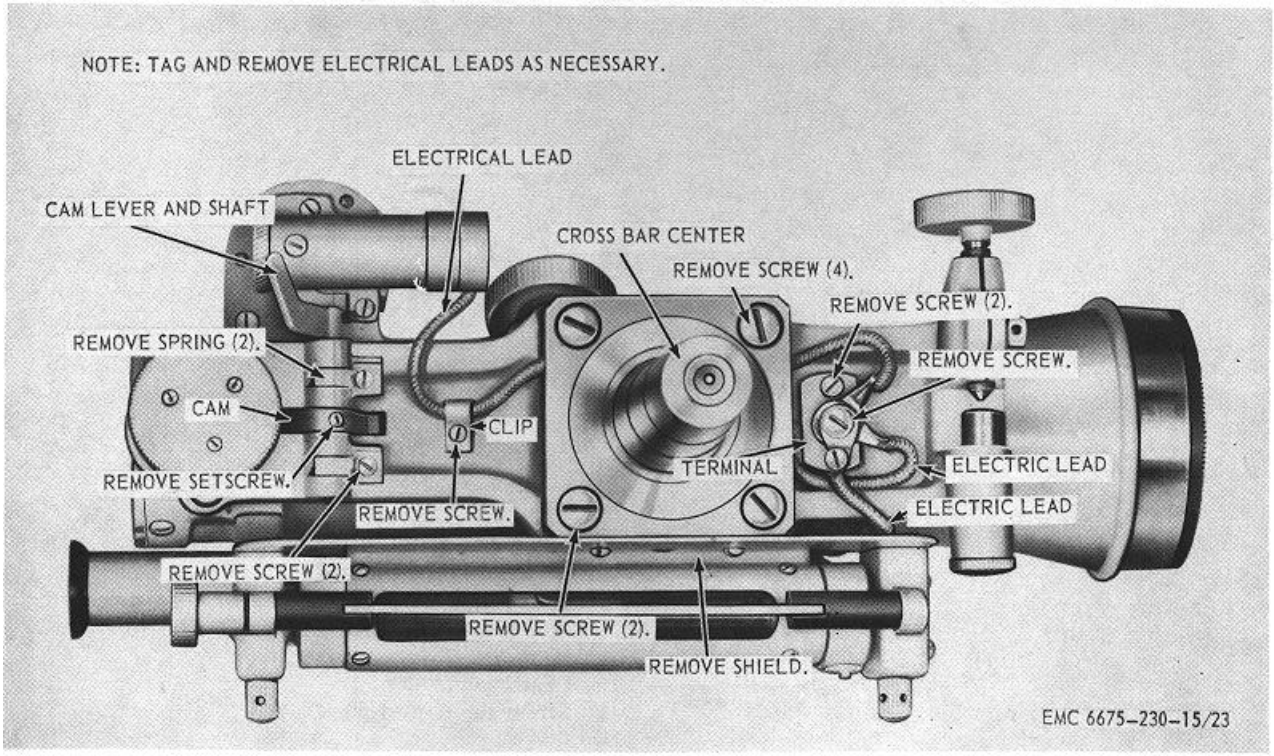


Figure 23. Crossbar, crossbar center, and lifting cam, removal and installation.

Section VII. TILTING SCREW

92. General

The tilting screw is positioned on the cross-bar at the eye end of the telescope. The tilting screw stud rotates, contacting the under side of the telescope, and produces a rocker-like movement of the telescope.

93. Tilting Screw

a. Removal and Disassembly. Refer to figure 24 and remove and disassemble the tilting screw.

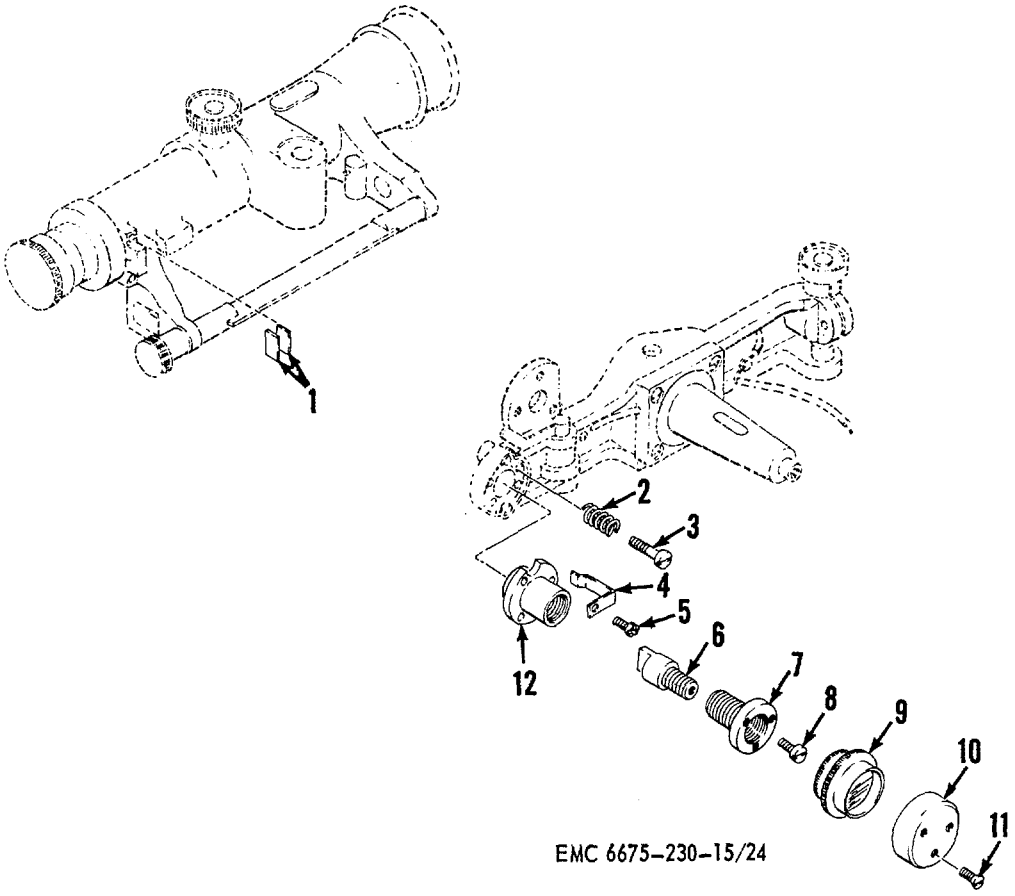
b. Cleaning, Inspection, and Repair.

(1) Clean all parts with an approved cleaning solvent and dry thoroughly.

(2) Inspect the drumhead, drum, and threaded socket for damage. Replace worn or defective parts as required.

(3) Inspect stop screw for wear and stripped threads. Replace a damaged stop screw as required.

(4) Inspect mounting hardware for damage. Replace damaged parts as required.



1 Spring (2 rqr)
2 Spring (2 rqr)
3 Screw (spec) (2 rqr)
4 Clip
5 Screw (spec) (2 rqr)
6 Tilting screw stud
7 Tilting screw bushing
8 Stop screw
9 Drum
10 Drumhead
11 Screw (spec) (3 rqr)
12 Socket

Figure 24. Tilting screw, disassembly and reassembly.

c. Reassembly and Installation. Refer to figure 24 and reassemble and install the tilting screw.

Note.
Upon reassembly, lubricate the tip of the tilting screw in accordance with paragraph 25.

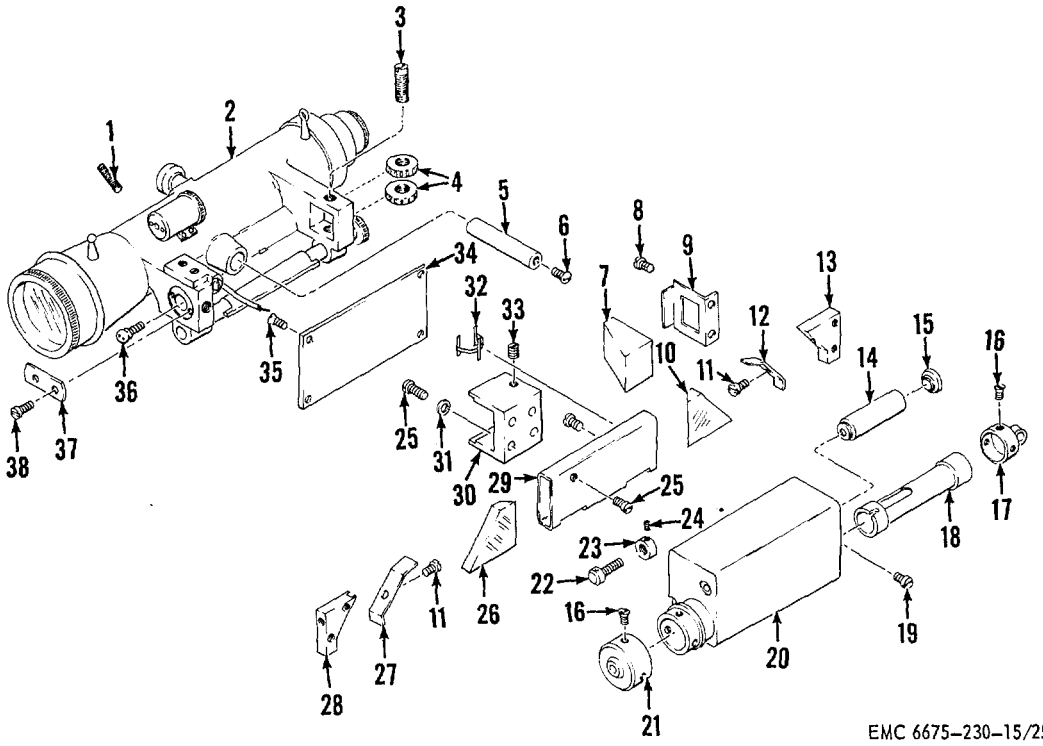
Section VIII. PRISMS

94. General

The telescope is equipped with a prism housing mounted -on the left side of the barrel. The prism housing contains the right and left prisms, single prism, holders, brackets, and shield. The prism housing also contains the spirit level vial.

95. Prisms

a. Removal and Disassembly.
(1) Refer to figures 16 and 13 and remove level vial.
(2) Refer to figure 25 and remove and disassemble the prisms.



1 Setscrews (spec)
2 Telescope barrel
3 Capstan stem screw
4 Level vial adjusting nut (2 rqr)
5 Trunnion shaft
6 Trunnion shaft screw
7 Prism, 45-degree
8 Screw (spec)(2 rqr)
9 Single prism mounting
10 Prism, right, 45-degree
11 Screw (spec) (2 rqr)
12 Prism bracket, right
13 Prism mounting, right
14 Magnifying eye tube
15 Magnifying eye cap
16 Screw (spec) (6 rqr)
17 Adjustable end cap
18 Level vial
19 Screw (spec) (4 rqr)
20 Prism housing
21 Nonadjustable end cap
22 Capstan head adjusting screw
23 Locknut (spec)
24 Setscrew (spec)
25 Screw (spec) (4 rqr)
26 Prism, left, 45-degree
27 Prism bracket, left
28 Prism mounting, left
29 Prism shield
30 Rectangular mounting for twin prisms
31 Washer (spec) (4 rqr)
32 Tension spring '(2 rqr)
33 Setscrew (spec)
34 Cover plate
35 Screw (spec) (4 rqr)
36 Ball head screw
37 End thrust plate
38 Screw (spec) (2 rqr)'

Figure 25. Prisms, disassembly and reassembly.

b. Cleaning, Inspection, and Repair.

(1) Clean all metal parts with an approved cleaning solvent and dry.
(2) Inspect mounting hardware for damage. Replace damaged parts as required.
(3) Inspect prisms for chipped and cracked conditions. Clean prisms with approved lens cleaner and lens tissue using a circular motion. Replace defective prisms as required.
(4) Inspect prism housing, holders, brackets, and shield for cracked and broken conditions. Replace damaged parts as required.

c. Reassembly and Installation.

(1) Refer to figure 25 and reassemble and install the prisms.
(2) Refer to figures 16 and 13 and install the level vial.

d. Adjustment. Adjust the prisms (par. 15).

APPENDIX I

REFERENCES

1. Dictionaries of Terms and Abbreviations

AR 320-5	Dictionary of United States Army Terms
AR 320-50	Authorized Abbreviations and Brevity Codes

2. Operating Instructions

TM 5-232	Elements of Surveying
TM 5-233	Construction Surveying
TM 5-234	Topographic Surveying
TM 5-235	Special Surveys

3. Preservation and Painting

TB ENG 60	Preservation and Painting of Serviceable Corps of Engineers Equipment

4. Preventive Maintenance

AR 750-5	Organizational Policies and Responsibilities for Maintenance Operation
TM 5-505	Maintenance of Engineer Equipment

5. Publication Indexes

DA Pam 108-1	Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings
DA Pam 310-1	Index of Administrative Publications
DA Pam 310-2	Index of Blank Forms
DA Pam 310-3	Index of Training Publications
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders
DA. Pam 310-5	Index of Graphic Training Aids and Devices
DA Pam, 310-25	Index of Supply Manuals-Corps of Engineers

6. Shipment and Limited Storage

TM 38-230	Preservation, Packaging, and Packing of Military Supplies and Equipment

7. Supply Publications

TM 5-6675-230-25P	Level, Surveying: Precise Tilting; 3 Leveling Screws; Elec. Illumination, 10 in. Telescope (Military Model 10-X) W/Tripod FSN 6675-227-5449

8. Training Aids

FM 5-25	Explosives and Demolition
FM 21-5	Military Training
FM 21-6	Techniques of Military Instruction
FM 21-30	Military Symbols

APPENDIX II

MAINTENANCE ALLOCATION

1. General

The maintenance allocation chart lists all maintenance and repair functions authorized the various echelons.

2. Maintenance

Maintenance is any action taken to keep materiel in a serviceable condition or to restore it to serviceability when it is unserviceable. Maintenance of materiel includes the following:

a. Service. To clean, preserve, and replenish fuel and lubricants.

b. Adjust. To regulate periodically to prevent malfunction.

c. Inspect. To verify serviceability and detect incipient electrical or mechanical failure by scrutiny.

d. Test. To verify serviceability and detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, and the like.

e. Replace. To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

f. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to, inspecting, cleaning, preserving, adjusting, replacing, welding, riveting, and straightening.

g. Aline. To adjust two or more components of an electrical system so that their functions are properly synchronized.

h. Calibrate. To determine, check, or rectify the graduation of an instrument, weapon, or weapons system, or components of a weapons system.

i. Overhaul. To restore an item to completely serviceable condition as prescribed by service ability standards developed and published by heads of technical services. This is accomplished through employment of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

3. Explanation of Columns

a. Functional Group. The functional group is a numerical group set up on a functional basis. The applicable Functional Grouping Indexes (obtained from the Corps of Engineers Functional Grouping Indexes) are listed on the maintenance allocation chart in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Components and Related Operation. This column contains the Functional Grouping Index heading, subgroup headings, and a brief description of the part starting with the noun name. It also designates the operations to be performed such as service, adjust, inspect, test, replace, repair, and overhaul.

c. Echelons of Maintenance. This column contains the various echelons of maintenance by number designation. An "X" in the appropriate echelon column in line with an indicated maintenance function authorizes that echelon to perform the function. The "X" indicates the lowest echelon responsible for performing the function, but does not necessarily indicate repair parts stockage at that level. Higher echelons are authorized to perform the indicated functions of lower echelons.

d. Remarks. This column lists specific maintenance functions, special tools, crossreferences, instructions, and the like pertinent to the operation being performed.

Maintenance Allocation Chart

Functional Group	Components and related operation	Echelons of maintenance 1	2	3	4	5	Remarks
67	PRECISION INSTRUMENTS MECHANICAL AND ELECTRICAL						
6700	Level, Surveying						
	Level						
	Service	X					
	Adjust	X					
	Inspect	X					
	Test	X					
	Replace	X					
	Repair	X					
	Rebuild	---	---	---	---	X	
6700.1	Accessories						
	Container						
	Replace	X					
	Bag, instrument caver						
	Replace	X					
6701.1	Telescope Assembly						
	Barrel, telescope						
	Replace	---	---	---	---	X	
	Repair	---	---	---	---	X	
	Slide focusing						
	Service	---	---	X			
	Replace	---	---	X			
	Repair	---	---	X			
	Gear assembly focusing						
	Replace	---	---	X			
	Repair	---	--	X			
	Pinion, focusing						
	Service	---	---	X			
	Replace	---	---	X			
	Sight alining						
	Replace	---	X				
6701.2	Optics (Reflecting and Transmitting Types)						
	Lens assembly, Objective						
	Service	X					Clean
	Replace	---	X				
	Eyepiece, inverting						
	Service	X					Clean and lubricate.
	Replace	---	X				
	Mirrors						Polished metal.
	Service	X					
	Replace	---	X				
	Prism, single						
	Service	---	---	X			
	Replace	---	---	X			
	Prism, right-left						
	Service	X					
	Adjust	---	---	X			
	Replace	---	---	---	---	X	

Functional Group	Components and related operation	Echelons of maintenance 1	2	3	4	5	Remarks
	Diaphragm						
	Service	X					Clean outer surfaces.
	Replace	---	X				
	Housing, protective, prism						
	Replace	---	---	X			
	Cap, dust						
	Replace	X					
	Sunshade						
	Replace	X					
	Lens assembly focusing						
	Service	---	---	X			Clean
	Replace	---	---	X			
	Cap assembly, eye focusing						
	Service	X					
	Replace	X					
	Tube, cap assembly						
	Replace	---	X				
6702.1	Structural Parts						
	Post, center crossbar						
	Service	---	---	X			Clean and lubricate.
	Replace	---	---	X			
	Cap, dust, center post						
	Replace	---	---	X			
	Clamp assembly						
	Service	---	---	X			Clean and lubricate.
	Replace	---	---	X			
	Head assembly, leveling						
	Replace	---	---	X			
	Screw assembly, leveling						
	Service	X					
	Replace	---	X				
	Bar, cross						
	Replace	---	---	X			
	Shaft, axis						
	Service	---	---	X			
	Replace	---	---	X			
	Plunger and screw, tangent						
	Service	X					
	Replace	---	X				
6702.2	Operating or Precision Parts						
	Screw, vertical tilting						
	Service	---	---	X			
	Replace	---	---	X			
	Repair	---	---	X			
6703.1	Batteries						
	Battery, dry						
	Replace	X					
	Box, battery						
	Replace	---	X				
	Cable assembly, battery						
	Replace	---	X				
	Repair	---	X				

Functional Group	Components and related operation	Echelons of maintenance 1	2	3	4	5	Remarks
6703.2	Fuses and lamps						
	Shield assembly						
	Service	X					Clean
	Replace	---	X				
	Repair	---	X				
	Light assembly						
	Replace	---	X				
	Holder, lamp (socket)						
	Replace	---	X				
	Lamp, incandescent						
	Replace	X					
6703.8	Controls, Indicators and Special Components						
	Contacts, electrical						
	Service	X					Clean
	Replace	---	X				
6703.10	Miscellaneous Wiring and Fittings						
	Wiring external						
	Replace	---	X				
	Repair	---	X				
	Fittings, internal						
	Replace	---	---	---	---	X	
6706	Compass and Levels						
	Level assembly, circular						
	Service	X					
	Adjust	X					
	Replace	X					
	Vial, level, telescope						
	Service	X					
	Adjust	X					
	Replace	X					
6707	Tripods						
	Tripod						
	Service	X					Lubricate
	Replace	---	X				
	Repair	---	X				
	Leg assembly, tripod						
	Replace	---	X				
	Repair	---	X				
	Head, tripod						
	Replace	---	X				
6708	Carrying and Packing Cases						
	Case, instrument carrying						
	Replace	---	X				
	Repair	---	X				

APPENDIX III
BASIS ISSUE ITEMS LIST

Section I. INTRODUCTION

1. General

Section II lists the accessories, tools, and publications required in 1st echelon maintenance and operation, initially issued with, or authorized for the surveying level.

2. Explanation of Columns

a. Source Codes. The information provided in each column is as follows:

(1) Technical service. This column lists the basic number (or symbol) of the technical service assigned supply responsibility for the part. Those spaces left blank denote Corps of Engineers supply responsibility. General Engineer supply parts are identified by the letters "GE" in parentheses, following the nomenclature in the description column. Other technical services basic numbers (or symbols) are:

9-Ordnance
10-Quartermaster
12-Adjutant General

(2) *Source.* The selection status and source of supply for each part are indicated by one of the following code symbols:

(a) P-applied to high-mortality repair parts which are stocked in or supplied from the technical service depot system, and authorized for use at indicated maintenance echelons.

(b) P1-applied to repair parts which are low-mortality parts, stocked in or supplied from technical service depots, and authorized for installation at indicated maintenance echelons.

(3) Maintenance. The lowest maintenance echelon authorized to use, stock, install, or manufacture the part is indicated by the following code symbol:

O-Organizational Maintenance
(1st and 2d Echelon)

b. Federal Stock Numbers. When a Federal stock number is available for a part, it will be shown in this column, and used for requisitioning purposes.

c. Description.

(1) The item name and a brief description of the part are shown.

(2) A five-digit Federal supply code for manufacturers and/or other technical services is shown in parentheses followed by the manufacturer's part number. This number will be used for requisitioning purposes when no Federal stock number is indicated in the Federal Stock Number column. *Example:* (08645) 86453

(3) The letters "GE", shown in parentheses immediately following the description, indicate General Engineer supply responsibility for the part.

d. Unit of Issue. Where no abbreviation is shown in this column, the unit of issue is "each".

e. Expendability. Those items classified as nonexpendable are indicated by letters "NX". Items not indicated by "NX" are expendable.

f. Quantity Authorized. This column lists the quantities of repair parts, accessories, tools, or publications authorized for issue to the equipment operator or crew as required.

g. Quantity Issued with Equipment. This

column lists the quantities of repair parts, accessories, tools, or publications that are initially issued with each item of equipment. Those indicated by an : asterisk are to be requisitioned through normal supply channels as required.

h. Illustrations. This column is subdivided into two columns which provide the following information:

(1) Figure number. Provides the identifying number of the illustration.

(2) Item number. Provides the referenced number for the part shown in the illustration.

3. Index to Federal Supply Code for Manufacturers

06995 --__ C. L. Berger and Son

4. Comments and Suggestions

Suggestions and recommendations for changes to the Basic Issue Items List will be submitted on DA Form 2028 (Recommended Changes to DA Technical Manual Parts Lists or Supply Manual 7, 8 or 9) to the Commanding Officer, U. S. Army Engineer Maintenance Center, Corps of Engineers, ATTN: EMCDMS, P. O. Box 119, Columbus 16, Ohio. Direct communication is authorized.

Section II. BASIC ISSUE ITEMS LIST

Source codes				Federal stock No.	Description	Unit of Issue	Expend-ability	Quantity author-ized	Quantity issued with equip-ment	Illustration	
Tech-nical Service	Source	Mainte-nance	Recover-ability							Fig.	Item.
					GROUP 26-ACCESSORIES, PUBLICATIONS, TEST EQUIPMENT AND TOOLS						
					2602.2-COMMON TOOLS						
10	P	O	--	5120-236-3245	SCREWDRIVER, FLAT TIP: flared tip, wooden handle, blade 1-1/2 in. lg, 3/16 in. wd, overall lg 4 in.			1	*		
10	P	O	--	7920-285-3078	BRUSH: camel's hair, 1-1/4 in. lg, 1/2 in. dia, overall lg 5 in.			1	*		
10	P	O	--	5120-227-7311	SCREWDRIVER, FLAT TIP: plastic handle, 3/32 in. wd, 1-5/8 in. lg blade.			1	*		
					2602.3-SPECIAL TOOLS						
5	P1	0	--	5315-160-7522	PIN, ADJUSTING, STRAIGHT 0.0625 in dia on one end, other end 0.072 in. dia, 2 in. lg (06995) F-292.			2	2		
10	P1	F	--	5120-160-7523	REMOVER AND REPLACER, TRUN-NION SHAFT: bronze, No. 10-32 thd size, 1-1/2 in. lg (06995) F-294.			1	1		
10	P1	O		5120-16.0-7517	REMOVER AND REPLACER: glass dia-phragm (06995) F-285.			1	1		
10	P1	F	--	5120-374-2439	WRENCH, SPANNER: 7/16 in. between pin centers, dia of pins 0.095 in., one end, other end 1-7/32 in. between pin centers, dia of pins 0.107 in. (06995) F-287.			1	1		

Section II. BASIC ISSUE ITEMS LIST

Source codes				Federal stock No.	Description	Unit of Issue	Expend-ability	Quantity author-ized	Quantity issued with equip-ment	Illustration	
Tech-nical Service	Source	Mainte-nance	Recover-ability							Fig.	Item.
					2602.4-PUBLICATIONS						
12	P	--	--	----------	DEPARTMENT OF THE ARMY OPER-ATOR, ORGANIZATIONAL, FIELD AND DEPOT MAINTENANCE MAN-UAL TM 5-6675-230-15.			2	2		
12	P		---	----------	DEPARTMENT OF THE ARMY RE-PAIR PARTS AND SPECIAL TOOL LISTS TM 5-6675-230-25P.			2	2		
					GROUP 67-PRECISION INSTRUMENTS MECHANICAL AND ELECTRICAL						
					6700.1-ACCESSORIES						
	P1	O	---	6675-354-0237	BAG, INSTRUMENT: rubber (06995) F-293.			1	1		
	P1-	O	---	6675-160-7525	BOTTLE, METAL, CONTAINING OIL (06995) F-298.			1	1		
	P1	O	---	6675-160-7515	CONTAINER, PROTECTING, GLASS DIAPHRAGM (06995) F-283.			1	1		
					6701.2 OPTICS (REFLECTING AND TRANSMITTING TYPES)						
	P1	O	---	6675-160-7450	CAP, LENS (06!995) F-2			1	1		
	P1	O	---	6675-160-7457	CAP, DUST, EYEPIECE (06995) F-58 -			1	1		
	P1	O	---	6675-160-7451	SUNSHADE, INVERTING, TELE-SCOPE (06995) F-3.			1	1		
	P1	O	---	6675-160-7452	SUNSHADE, INVERTING, TELE-SCOPE (06995) F-4.			1	1		
					6703.1-BATTERIES						
11	P	O	---	6135-120-1020	BATTERY, DRY 1.5 v			3	*		
					6703.2-FUSES AND LAMPS						
	P	O	---	6240-797-3750	LAMP, INCANDESCENT (GE) 3.7 v, 0.30 amp; G 3-1/2 bulb.			10	10		
					6706-COMPASS AND LEVELS						
	P1	O	---	6675-160-7514	VIAL ASSEMBLY, CIRCULAR LEVEL (06995) F-282.			1	1		
	P1	O	---	6675-160-7462	VIAL, LEVEL, WITH END CAPS (06995)' F-66.			1	1		

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BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

G. H. DECKER,
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Chief of Staff.

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CURTIS E. LEMAY
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Official:

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Distribution:
Active Army:
- USASA (2)
- DCSLOG (1)
- CNGB (1)
- Tech Stf, DA (1) except
  - CofEngrs (3)
- Army Maint Bd (1)
- USCONARC (3)
- USAARTYBD (2)
- USAARMBD (2)
- USAIB (2)
- USARADBD (2)
- USAABELCTBD (2)
- USAAVNBD (2)
- ARADCOM (2)
- ARADCOM Rgn (2)
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  - Eastern Ocean Engr Dist (1)
  - Philadelphia Engr Dist (1)
  - Rock Island Engr Dist (1)
  - St Louis Engr Dist (1)
  - St Paul Engr Dist (1)
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  - North Central Div Engr (none)
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NG: None.
USAR: Same as active Army except allowance is one copy to each unit.
For explanation of abbreviations used, see AR 320-50.

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