TECHNICAL MANUAL
OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

THEODOLITE, DIRECTIONAL; 0.002 MIL GRADUATION, 5.9 IN. LG. TELESCOPE, DETACHABLE TRIBRACH, W/ACCESSORIES AND TRIPOD

(WILD HEERBRUGG MODELS)

(MODEL T2-56-C-MIL) NSN 6675-00-682-4635

(MODEL T2-56-M-MIL) NSN 6675-00-796-9439

(MODEL T2-63MIL) NSN 6675-00-983-8027

(MODEL T2-66-C-MIL) NSN 6675-00-937-2954

(MODEL T2-68MIL) NSN 6675-00-089-8885

THEODOLITE, DIRECTIONAL (REFERENCE), (WILD HEERBRUGG MODELS T2-56-C-MIL, T2-56-M-MIL, T2-63MIL, T2-66-C-MIL, T2-67MIL, AND T2-68MIL) NSN 6675-00-988-5225

HEADQUARTERS, DEPARTMENT OF THE ARMY

28 JUNE 1977

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 January 1987

Operator, Organizational, Direct Support and General Support Maintenance Manual

THEODOLITE, DIRECTIONAL;
0.002 MIL GRADUATION, 5.9 IN. LG. TELESCOPE,
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T2-63MIL, T2-66-C-MIL,
T2-67MIL, AND T2-68MIL)
NSN 6675-00-988-5225

TM 5-6675-296-14, 28 June 1977, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature-pointing hand.

Remove pages	Insert pages
3-1 and 3-2	3-1 and 3-2
4-1 and 4-2	4-1 and 4-2

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

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R.L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-25A, Operator, Organizational, Direct Support and General Support Maintenance requirements for Theodolite, Directional, .002 mil Grad, 5.9-in Telescope.

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *12 September 1980*

Operator, Organizational, Direct Support
and General Support Maintenance Manual

THEODOLITE, DIRECTIONAL; 0.002 MIL GRADUATION
5.9 IN. LG. TELESCOPE, DETACHABLE TRIBRACH,
W/ACCESSORIES AND TRIPOD (WILD HEERBRUGG MODELS)
(MODEL T2-56-C-MIL) NSN 6675-00-682-4635
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THEODOLITE, DIRECTIONAL (REFERENCE), (WILD HEERBRUGG
MODELS
T2-56-C-MIL, T2-56-M-MIL, T2-63MIL, T2-66-C-MIL,
T2-67MIL, AND T2-68MIL) NSN 6675-00-988-5225

TM 5-6675-296-14, 28 June 1977, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
	iii and iv	iii and iv
Chapter 2	2-7 and 2-8	2-7 and 2-8
Chapter 3	3-11 and 3-12	3-11 and 3-12
Chapter 4	4-5 and 4-6	4-5 and 4-6
	4-15 and 4-16	4-15 and 4-16
	4-39 thru 4-41	4-39 thru 4-41
		4-42
Appendix B	B-5 and B-6	B-5 and B-6

2. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

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E. C. MEYER
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Chief of Staff

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To be distributed in accordance with DA Form 12-25A, Operator Maintenance Requirements for Surveying Equipment.

TECHNICAL MANUAL
No. 5-6675-296-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *28 June 1977*

OPERATOR, ORGANIZATIONAL,

DIRECT SUPPORT, AND GENERAL SUPPORT

MAINTENANCE MANUAL

THEODOLITE, DIRECTIONAL: 0.002 MIL GRADUATION

5.9 IN. LG. TELESCOPE, DETACHABLE TRIBRACH,

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THEODOLITE, DIRECTIONAL (REFERENCE, (WILD HEERBRUGG MODELS

T2-56-C-MIL, T2-56-M-MIL, T2-63MIL, T2-66-C-MIL,

T2-67MIL, AND T2-68MIL) NSN 6675-00-988-5225

REPORTING OF ERRORS

You can help to improve this manual by calling attention to errors and by recommending improvements. Your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), and /or DA Form 2028-2 (Recommended Changes to Equipment Technical Manuals), may be used. Copies of DA Form 2028-2 are attached in the back of the manual for your use. Please mail your recomended changes directly to Commander, U.S. Army Troop Support Command, ATTN: DRSTS-MPP, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished directly to YOU.

*. This publication supersedes TM 5-6675-296-12, 20 January 1970 and TM 5-6675-296-35, 20 January 1970, including all changes.

WARNING

Severe eye damage can result from performing observations against direct sunlight without utilizing the telescope sunglass filter.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (CONTINUED)

LIST OF TABLES

CHAPTER I

INTRODUCTION

Section I. GENERAL

1-1. Scope.

a. This manual contains instructions for maintenance of the Wild Heerbrugg Theodolite Models T2-56-C-MIL, T2-56-M-MIL, T2-63MIL, T2-66-C-MIL, T2-68MIL and the Wild Heerbrugg Theodolite (Reference) Model T2-67MIL including all models mentioned above, when modified for missile application. These instructions cover Operator, Organizational, Direct Support and General Support maintenance levels.

b. Numbers in parentheses following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred maintenance sequence.

1-2. Maintenance Forms and Records

a. Maintenance forms and records that you are required to use are as follows:

(1) DA Form 2402 (Exchange Tag).

(2) DA Form 2404 (Equipment Inspection and Worksheet).

(3) DA Form 2407 (Maintenance Request Used for Requesting Support Maintenance).

(4) DA Form 2407-1 (Continuation Sheet Used for Requesting Support Maintenance).

b. For additional forms and records pertaining to your particular equipment, refer to TM 38-750, The Army Maintenance Management System (TAMMS).

1-3. Administrative Storage

a. Preparation of Equipment.

(1) Select the best available site for storage and seperate stored equipment from equipment in use. Conspicuosly mark the area Administrative Storage. Covered area is preferred.

(2) Store equipment so as to provide maximum protection from the elements.

(3) Prior to storage, perform the next scheduled major preventive maintenance service. Inspect and approve equipment prior to storage.

b. Care of Equipment.

(1) Perform regularly scheduled inspection of equipment.

(2) Keep equipment in an optimum state of readiness.

(3) Rotate items in accordance with a rotational plan that will keep the equipment in an operational condition.

c. Removal of Equipment From Administrative Storage.

(1) Restore equipment to normal operating condition in accordance with pertinent technical manuals.

(2) Resume the maintenance service schedule in effect at the commencement of storage.

d. For further instructions, refer to TM 740-90-1.

1-4. Destruction of Army Material to Prevent Enemy Use

a. General. When capture or abandonment of the theodolites to any 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, ordera are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all theodolites and all corresponding repair parts.

b. Demolition by Mechanical Means. Using a hammer, bar, or other suitable tool, break all lenses, level vials, eyepieces, U-standard, tribrach, base assembly, and theodolite hood. Destroy the tripod, battery box, hand light, and accessory case. Rip the field pack apart.

c. Demolition by Burning. Pack oil-soaked rags, canvas, or other flammable material around the theodolite, base plate, horizontal base, theodolite hood, tripod, battery box, field pack, and accessory case and set fire to the pile. Be sure the burning is thorough and complete before leaving.

d. Demolition by Submersion. Remove the theodolite from the carrying case. Submerge the instrument and all of its accessories in a body of water to insure water damage and provide concealment. Salt water will do the greatest damage to metal parts.

1-5. Quality Assurance/Quality Control (QA/QC)

Information not available cm QA/QC.

1-6. Reporting Equipment Improvement Recommendations (EIR)

EIR's will be prepared on DA Form 2407, Maintenance Request. Instructions for preparing EIR's are provided in TM38-750, The Army Maintenance

Management System (TAMMS). EIR's should be mailed directly to Commander, U. S. Army Troop Support Command, ATTN: DRSTS-MPP, 4300 Goodfellow Blvd., St. Louis. MO, 83120. Amply will be furnished directly to you.

Section II. DESCRIPTION AND DATA

1-7. Description

The Wild Heerbrugg Theodolite Model T2-56-C-MIL (figures 1-1 and 1-12, T2-56-M-MIL (figures 1-2, 1-3, T2-63MIL, T2-66-C-MIL and T2-67MIL (figures 1-4 thru 1-7), and T2-68MIL (figures 1-8 thru 1-11) are precision, directional-type surveying and tracking instruments. They have both vertical and horizontal circle scales, calibrated in mils for reading the value of angles. Such readings are observed through the microscope eyepiece (figure 1-3). A micrometer assembly (figure 1-2) is provided for the interpolation of angle value readings to 0.002-mil accuracy. A detachable tribrach (figure 1-2) containing three leveling screws, a circular level, and a star-shaped base plate is mounted to the horizontal base. The base plate is provided with a threaded center to accommodate the tripod bridge screw for securing the theodolite on the tripod head. Illumination of the vertical, horizontal, and micrometer circles during daylight operation is accomplished by adjusting the illumination mirrors (figure 1-3). A battery-powered illumination system is provided for night or dark-day operations. Diagonal eyepieces for attachment to the telescope and microscope eyepieces for high-angle and astronomical observations are contained in the accessory case. The Reference Theodolite, NSN 6675-00-988-5225, covers Model T2-67MIL (mentioned above), and is a modified version of any one of the other above mentioned T2 model Theodolites, which have been adapted for missile application. The maintenance paragraphs of this manual contain detailed descriptions of its components. Differences between models are included.

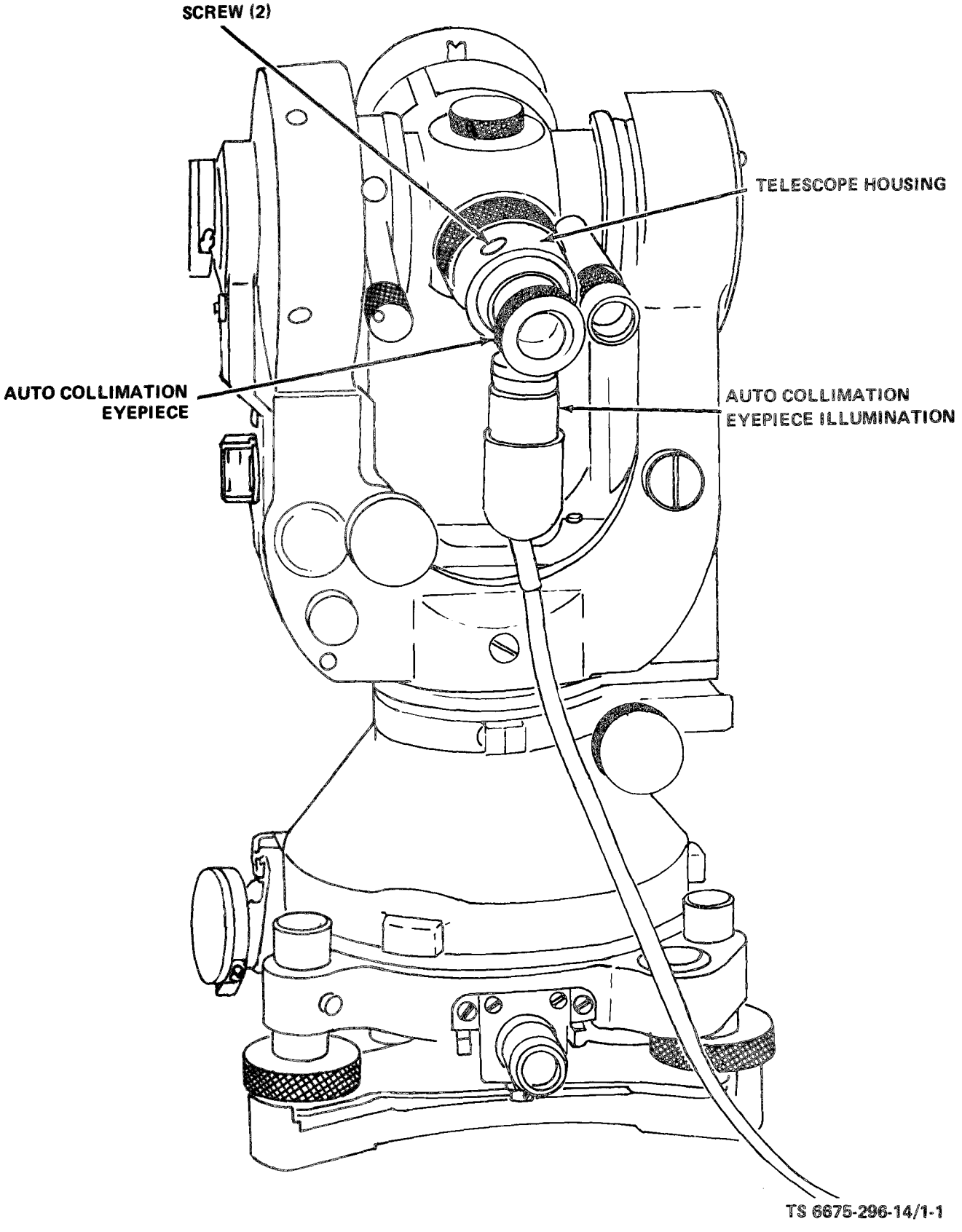


Figure 1-1. Theodolite (Model T2-56-C-MIL), with auto collimation eyepiece installed, front view.

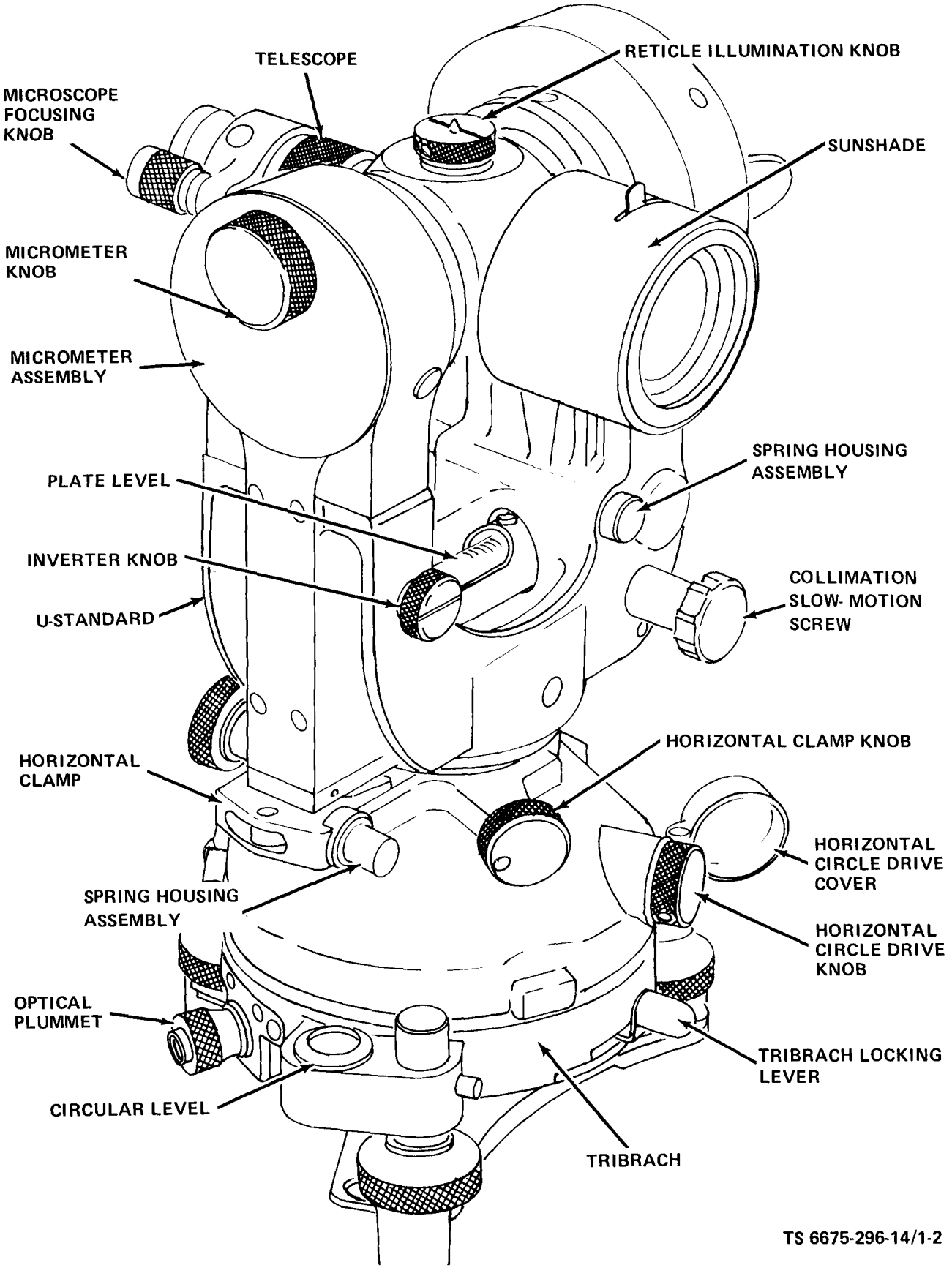


Figure 1-2. Theodolite (Model T2-56-M-MIL), right front, three-quarter view.

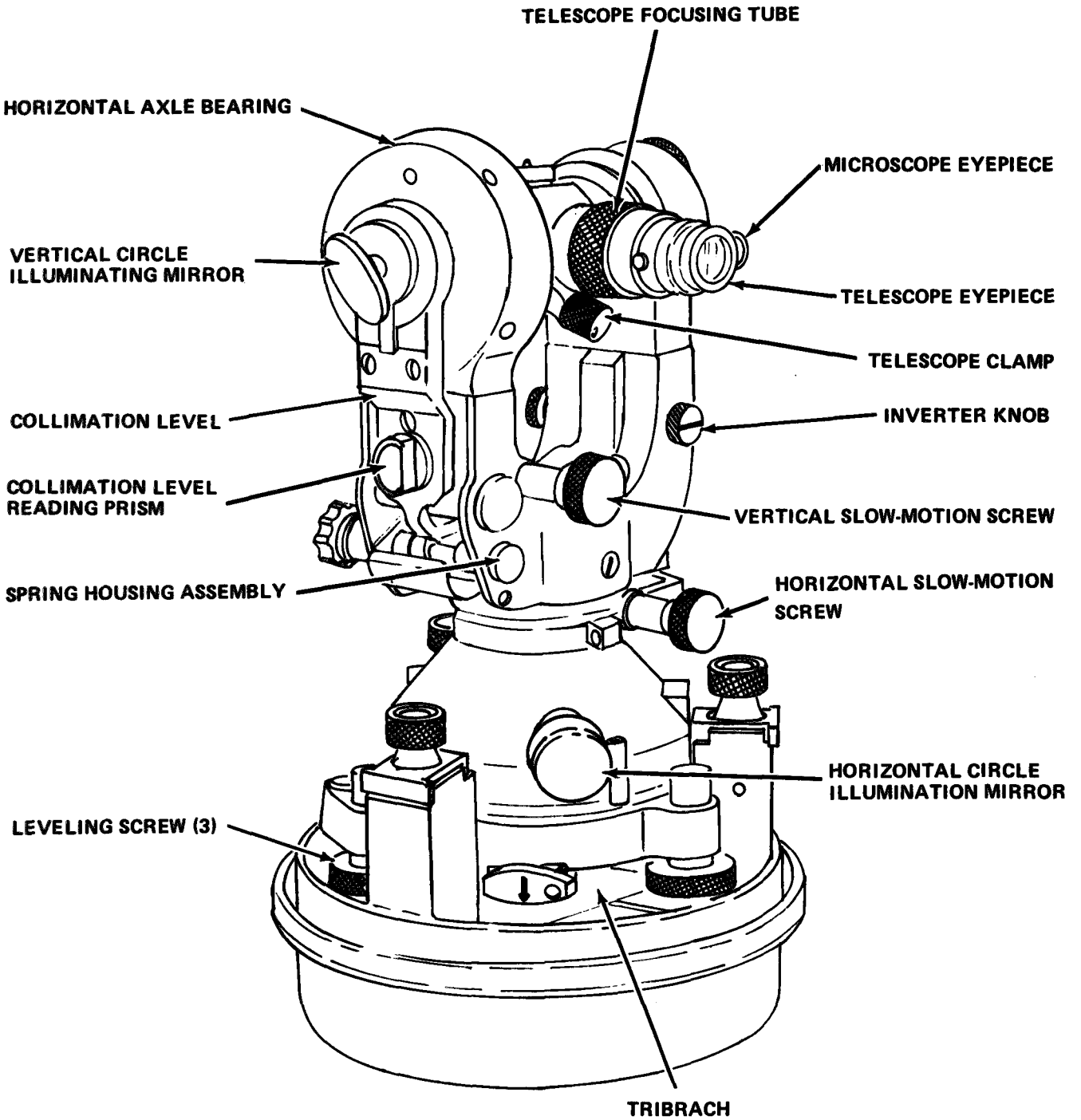


Figure 1-3. Theodolite (Model T2-56-M-lWL), left rear, three-quarter Lieu.

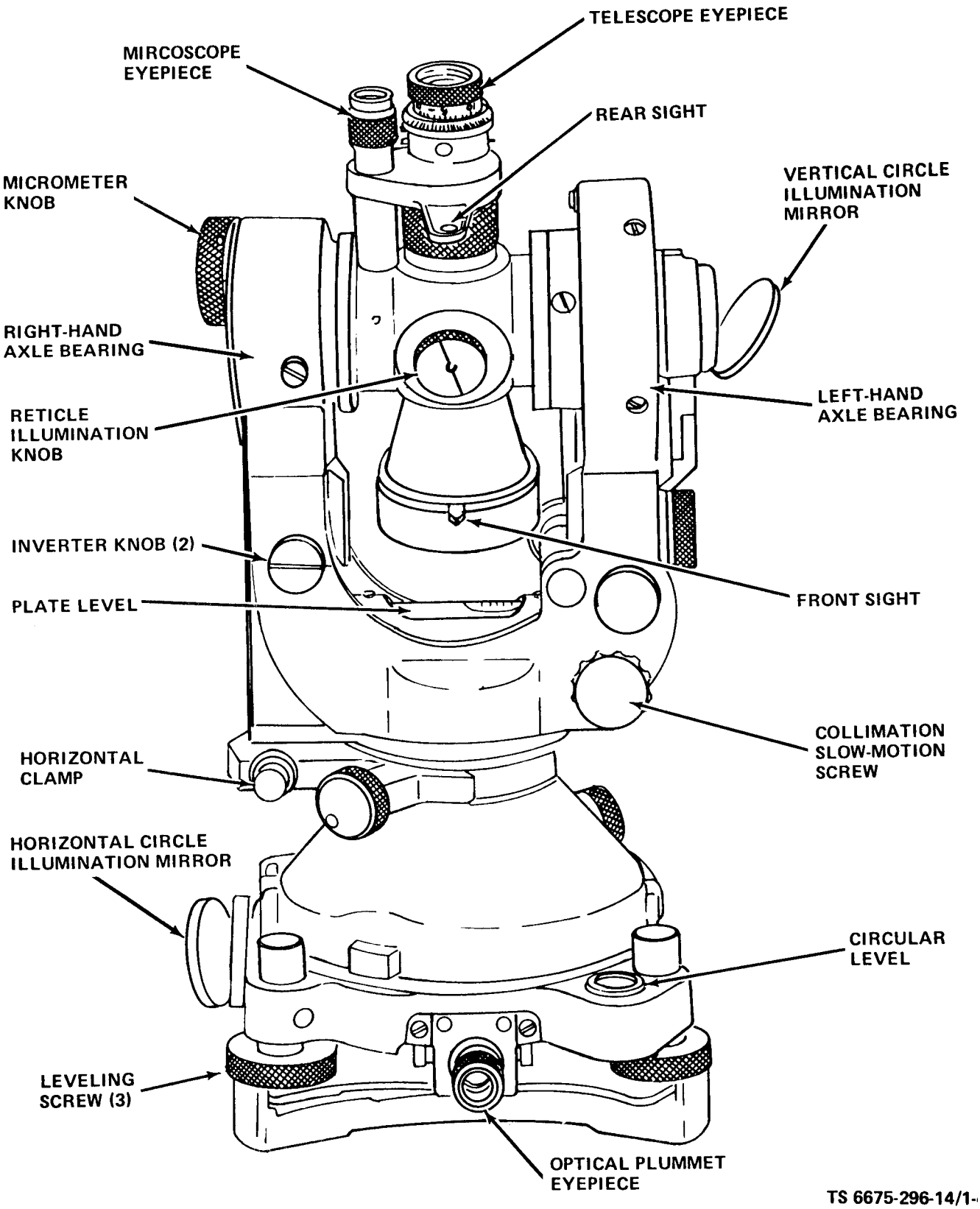


Figure 1-4. Theodlite (Models T2-63MIL, T2-66-C-MIL and T2-67MIL), front view.

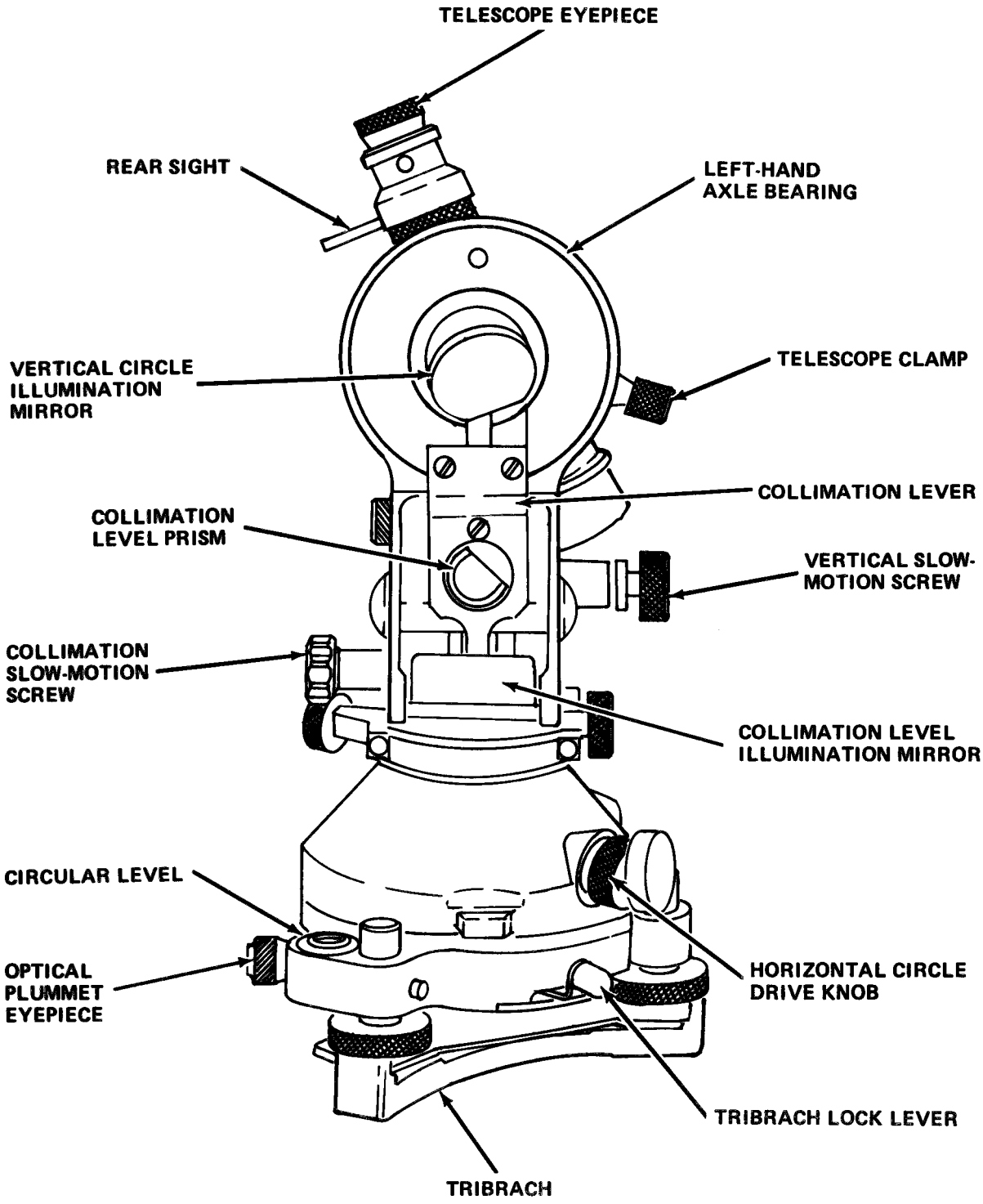


Figure 1-5. Theodolite (Models T2-63MIL, T2-66-C-MIL and T2-67MIL), left side view.

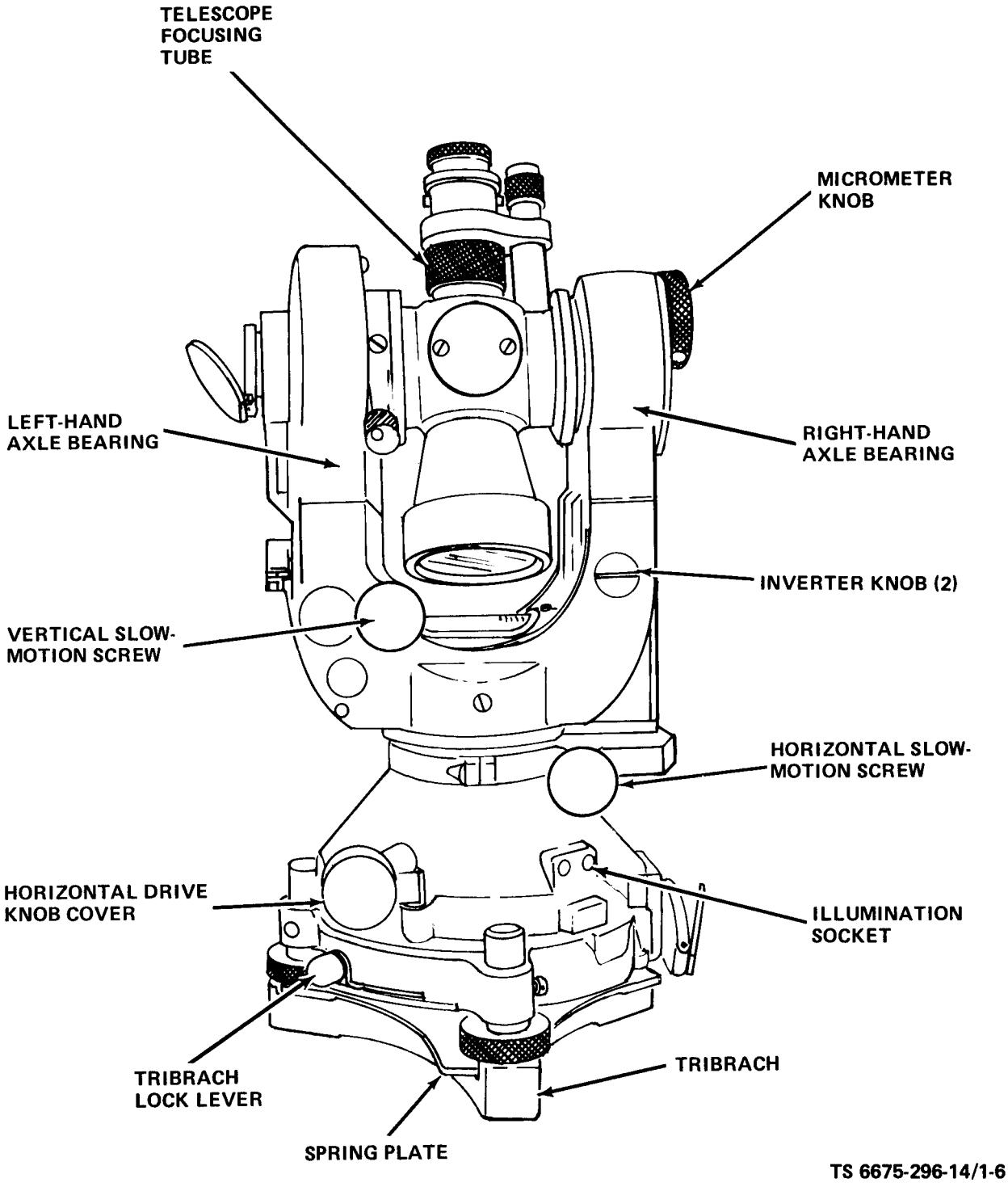


Figure 1-6. Theodolite (Models T2-63MIL, T2-66-C-MIL and T2-67MIL), rear view.

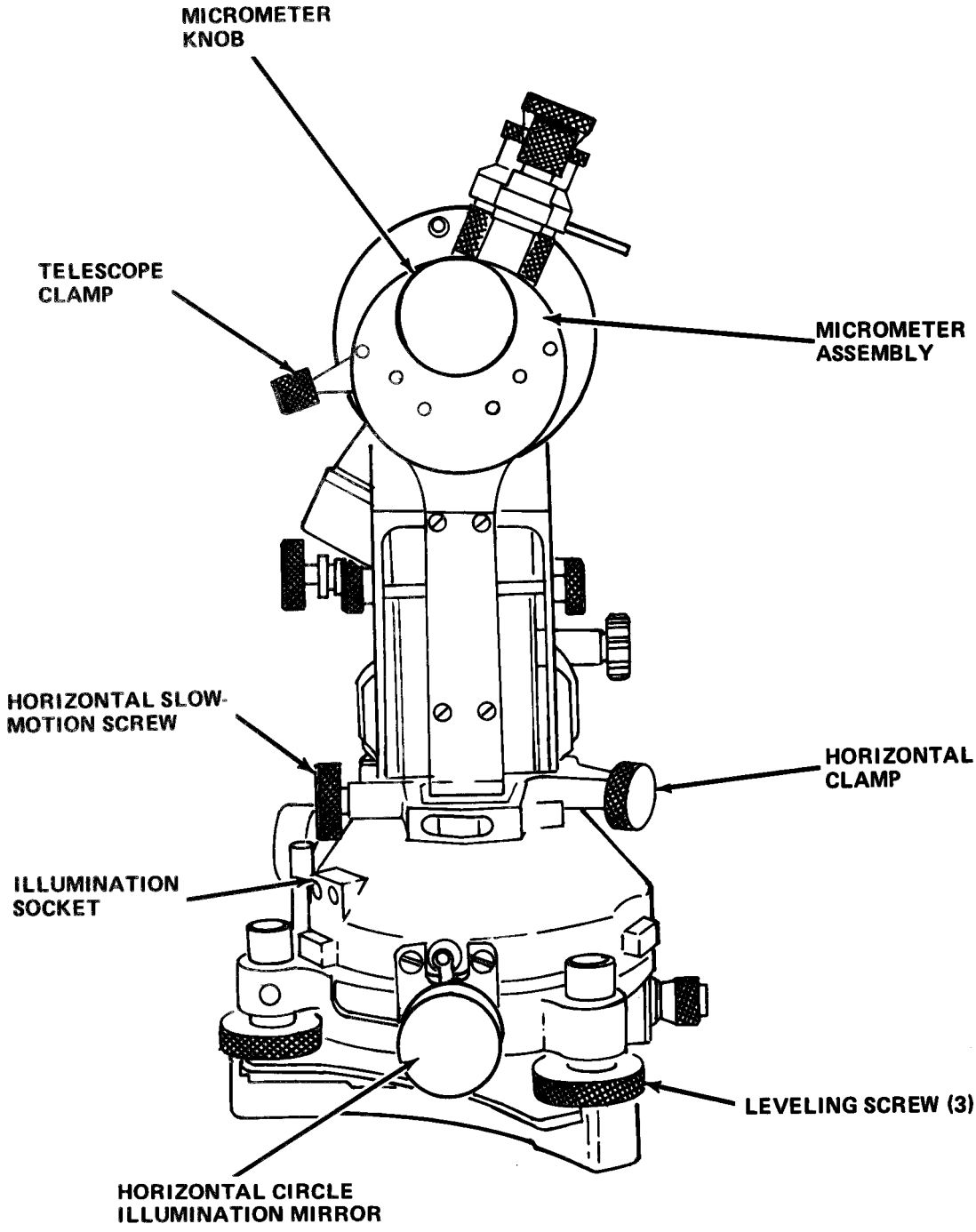


Figure 1-7. Theodolite (Models T2-63MIL, T2-66-C-MIL and T2-67MIL), right side view.

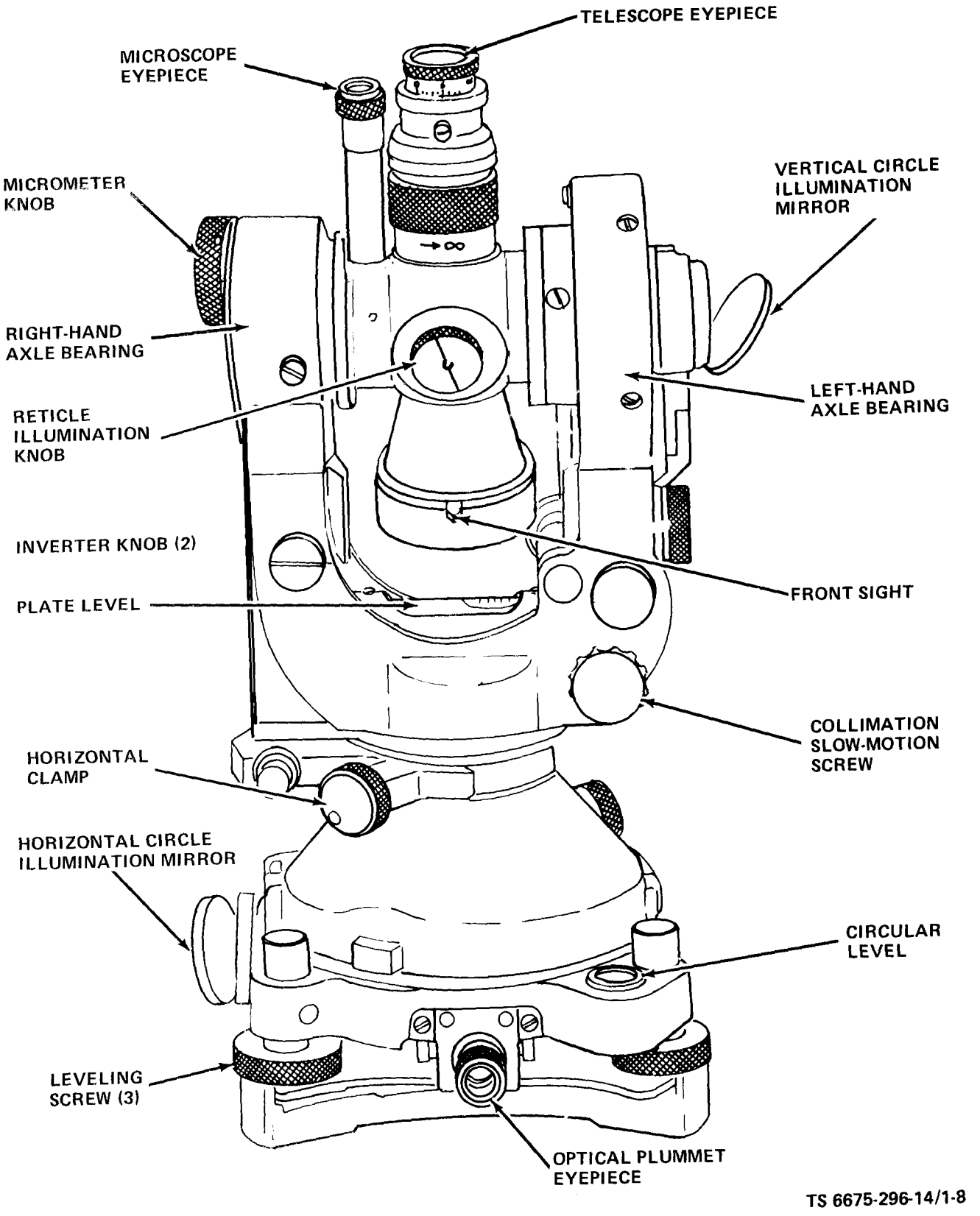
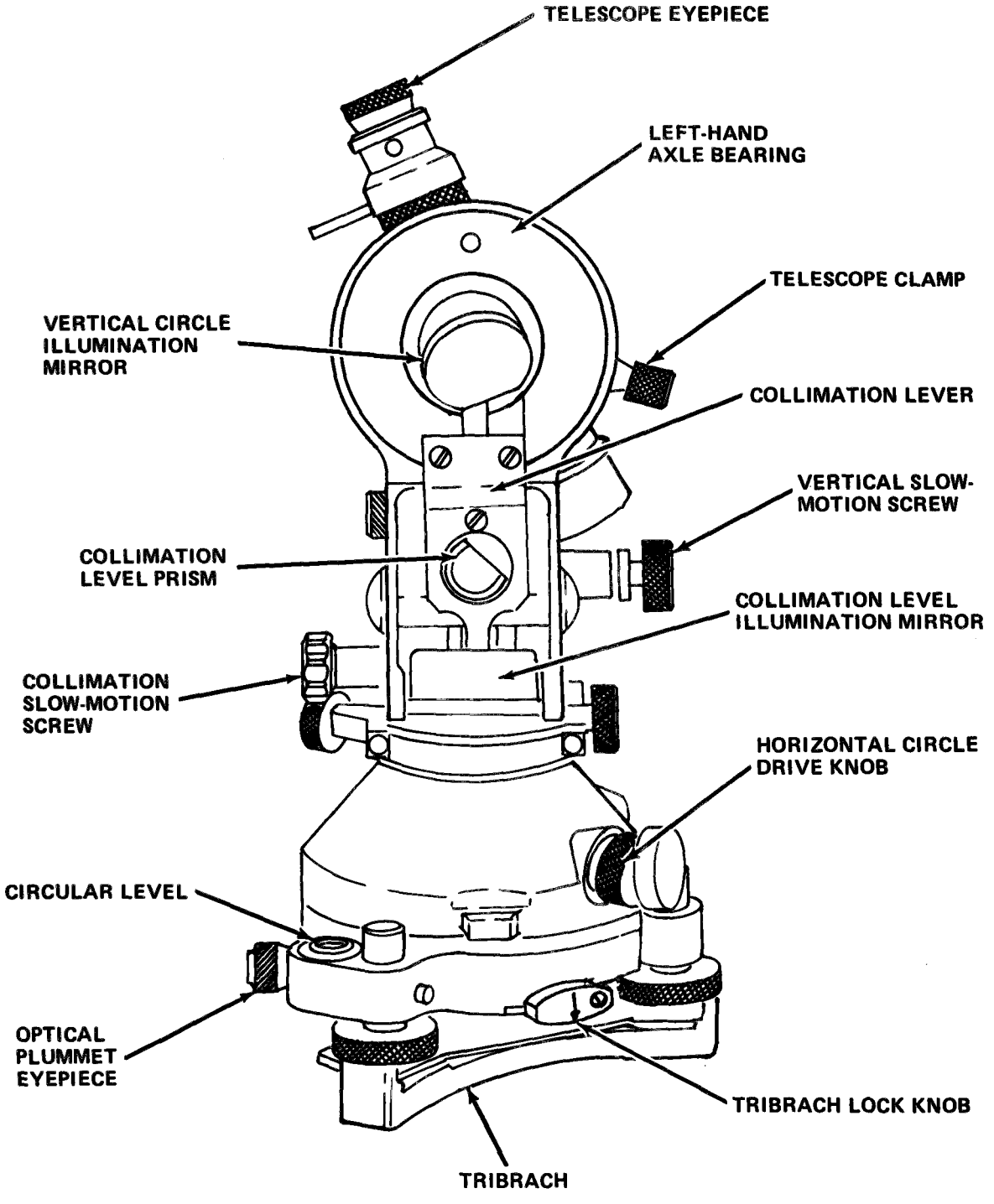


Figure 1-8. Theodolite (Model T2-68MIL), front view.



TS 6675-296-14/1-9

Figure 1-9. Theodolite (Model T2-68MIL), left side view.

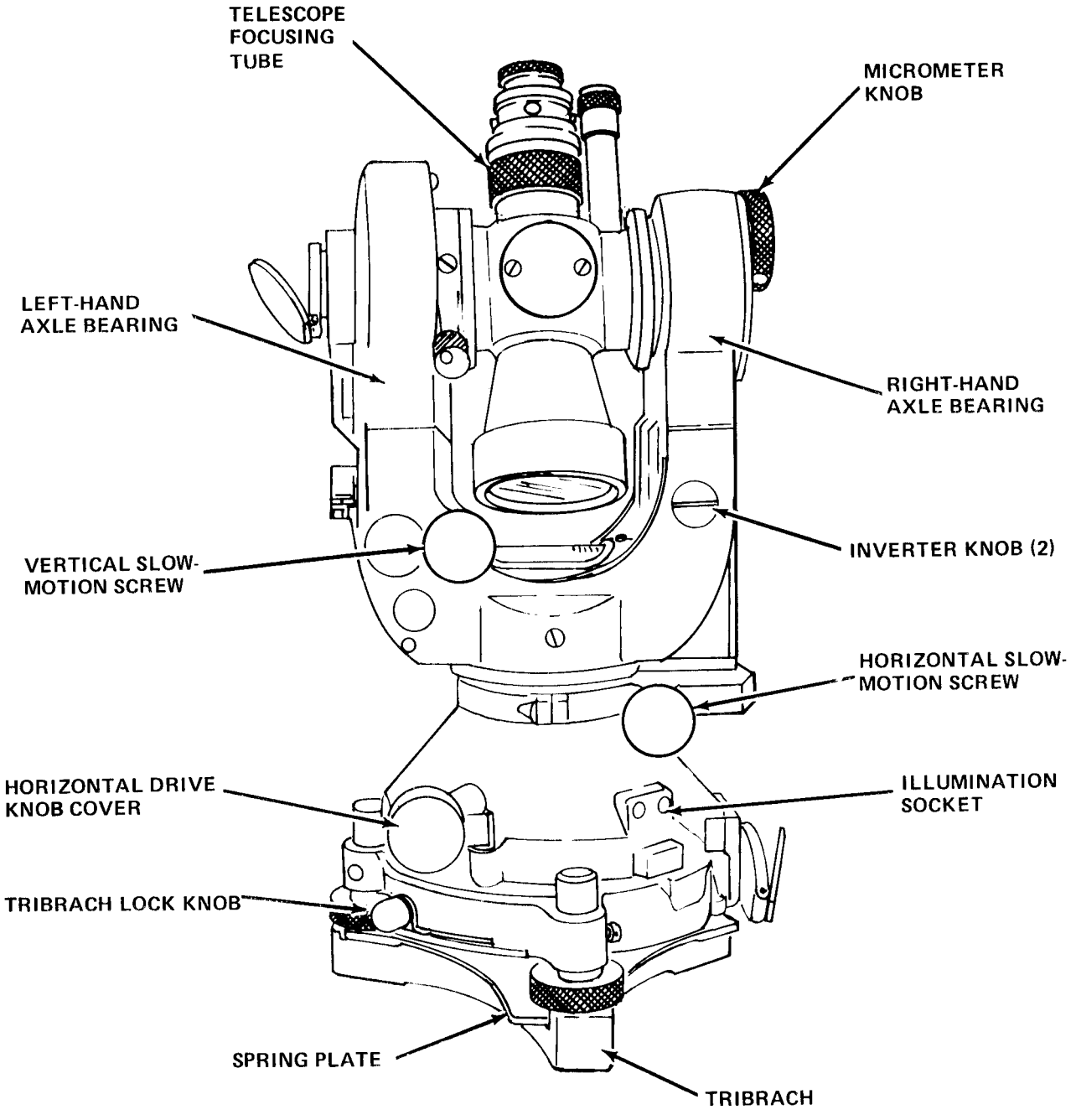


Figure 1-10. Theodolite (Model T2-68MZL), rear view

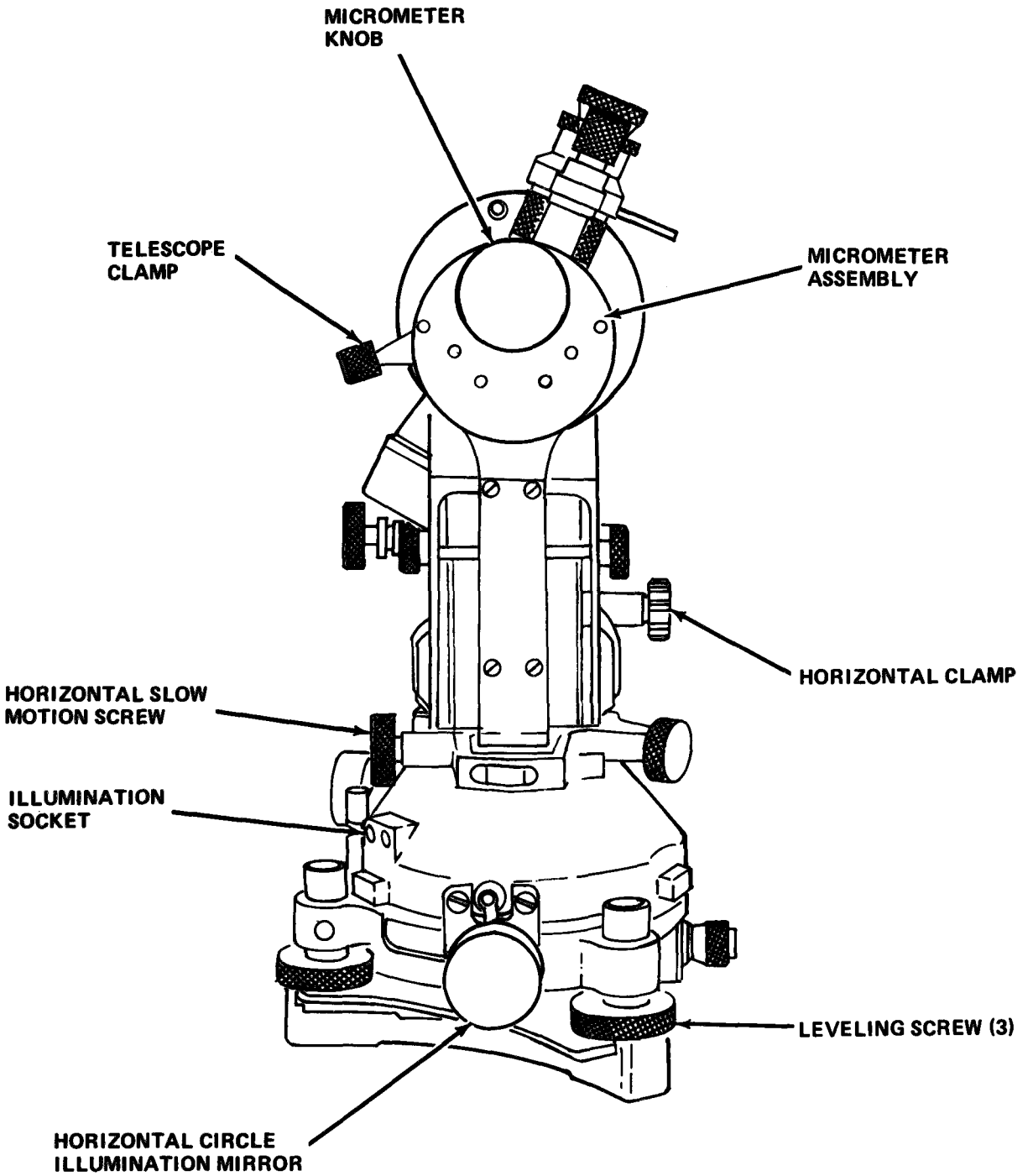


Figure 1-11. Theodolite (Model T2-68MIL). *right side view.*

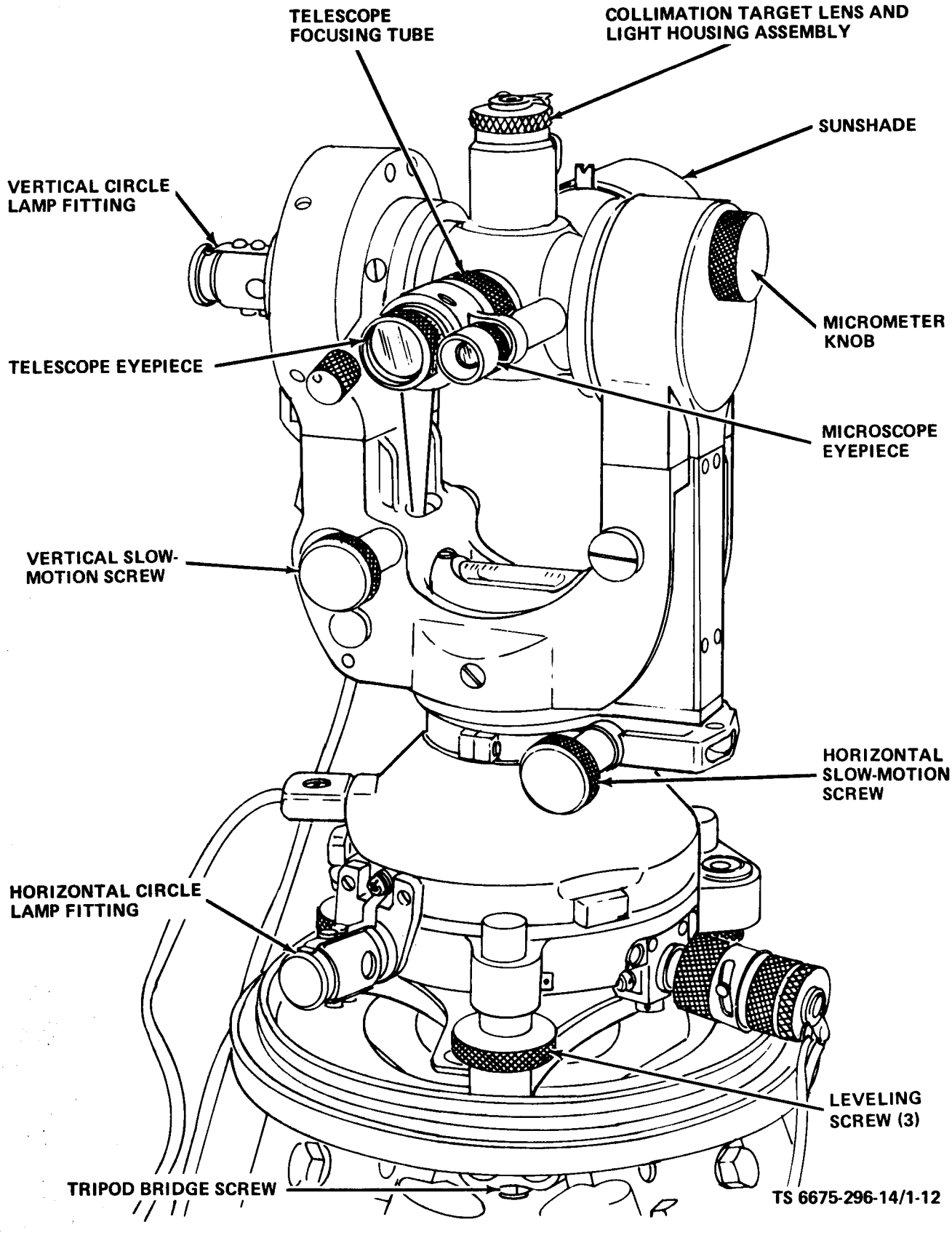


Figure 1-12. Theodolite (Model T2-56-C-MIL), modified for missile application, front view.

1-8. Differences Between Models

a. This manual covers the Wild Heerbrugg Models T2-56-MIL, T2-56-M-MIL, T2-63MIL, T2-66-C-MIL and T2-68MIL Theodolite and the Reference Theodolite T2-67MIL, with modified models (above). Instructions are similar for all models unless otherwise specified. Known differences are indicated ill paragrahps below.

b. The Model T2-56-C-MIL Theodolite comes equipped with an auto collimation eyepiece.

c. The Model T2-63MIL, T2-66-C-MIL, and T2-67MIL Theodolites are equipped with a rear sight on the telescope.

d. The Model T2-68MIL Theodolite tribrach uses a clamp knob arrangement for locking, all others use a lock lever.

e. Three arrangements of microscope and telescope eyepieces are used. The Models T2-56-C-MIL, T2-56-M-MIL eyepieces are the same; Models T2-63MIL, T2-66-C-MIL, and T2-67MIL eyepieces are the same. Model T2-68MIL eyepiece is arranged differently than the others.

1-9. Tabulated Data

a. Identification. The theodolite and carrying case have the following identification markings:

(1) *Theodolite.* The manufacturer's name, model, and serial number are engraved on the u-standard.

(2) *Carrying Case Hood. The* manufacturer's model and serial number are stenciled on the carrying case of the hood.

b. Tabulated Data

General.

Manufacturer	Wild Heerburgg Ltd. Heerbrugg, Switzerland
Model	T2-56-C-MIL-T2-56-M-MIL, T2-63MIL, T2-66-C-MIL, T2-67MIL, T2-68MIL
Telescope	28X
Telescope length	5.9in. (15cm)
Shortest focusing distance	4.5 ft. (1.37m)
Longest aiming distance at which centimeter can be read	1,000 ft. (305 m)
Longest aiming distance at which mil can be evaluated	465 ft. (141.8m)
Normal range	6 to l2 miles (9.65Km to 19.3 Km)
Diameter of field	29 ft. at 1,000 ft. (8.8m at 305m)
Accuracy of circle readings	0.002" Mils.
Multiplication constant	100
Addition constant	0
Glass circles	6.400 mile
Sensitivity of plate level	20 sec. per 2 mm
Sensitivity of collimation level.	30 sec. per 2 mm
Graduation interval of horizontal circle	0.2mil
Graduation interval of vertical circle	0.2mil
Magnification of microscope	30 diameters, plus or minus 2 diameters
Lamp	21/2 v (3 amp) miniature screwbase
Battery	BA 30

(2) Dimensions and Weights.

Tripod	
Extended	63 in. (1.6m)
Folded	38.5 in. (0.98m)
Weight	14.41b. (6.5Kg)
Theodololite	12.31b. (5.6Kg)
Shipping case w/theodolite	36 lb. (15.9 Kg)
Carrying case	4.8 lb. (2.2Kg)
Shipping crate w/tripod, battery box, accessory case, and field pack	82 lb. (37.2Kg)

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. OPERATING PROCEDURES

2-1. General

a. The instructions in this section are published for the information and guidance of the personnel responsible for the operation of the theodolite.

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

2-2. Controls and Instruments

The purpose of controls and instruments and their normal and maximum reading are illustrated in figure 2-1.

a. Horizontal and Vertical Circle Scales.

(1) The vertical circle scale or the horizontal circle scale may be observed in the upper portion of the micrometer window through the microscope eyepiece, when the bisecting line of the inverter knob is placed in position to correspond with the scale used.

(2) Two separate images are visible, divided by a horizontal line. The double image represents diametrically opposite parts of the applicable circle.

b. Micrometer Scale.

(1) The micrometer scale may be observed in the lower portion of the micrometer window, through the microscope eyepiece when measuring either horizontal or vertical angles.

(2) The micrometer scale is used with both horizontal and vertical circle scales, and is accurate to 0.002 mil. Estimates maybe made to 0.001 mil.

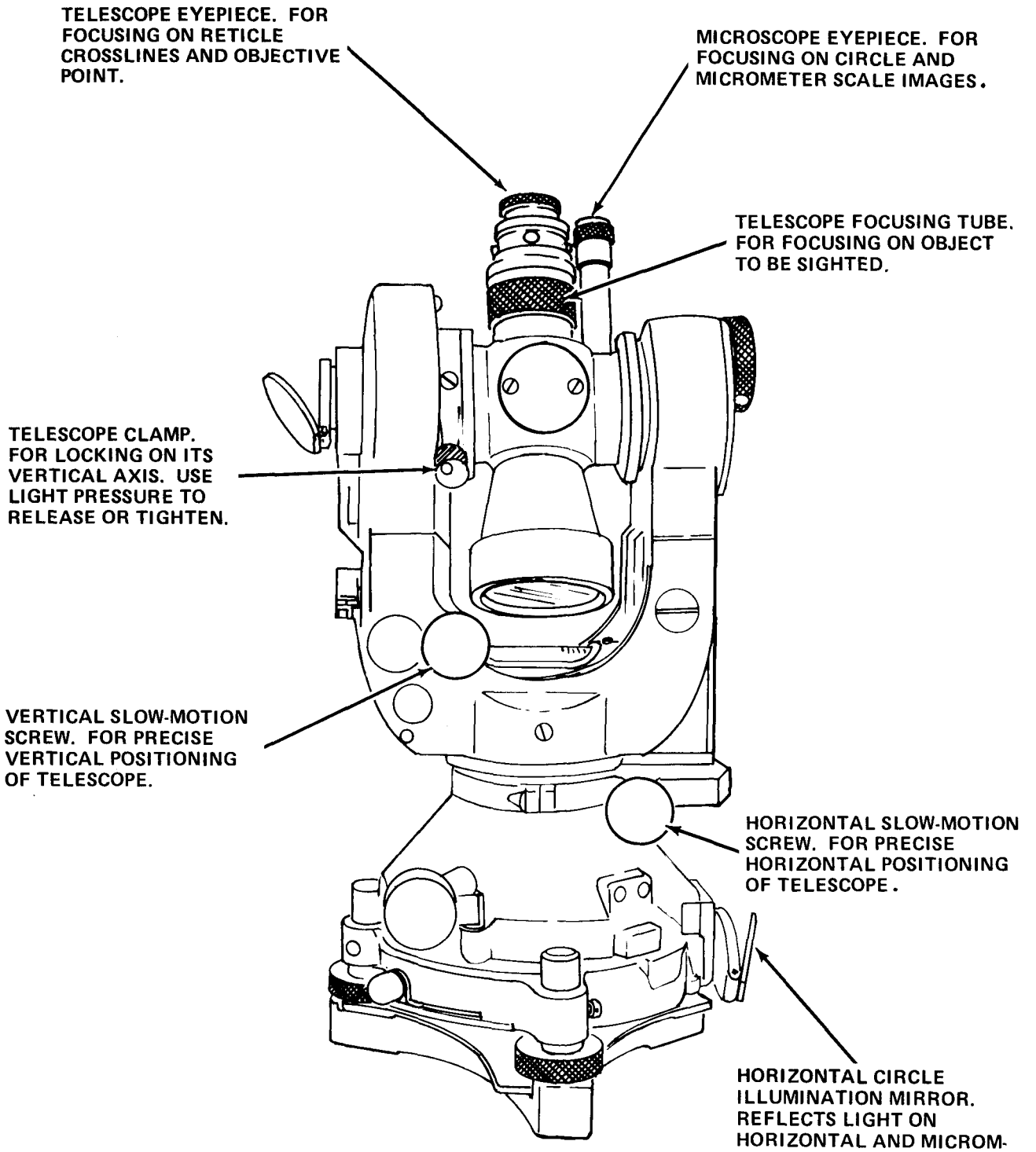


Figure 2-1. Controls and instruments (sheet 1 of 4).

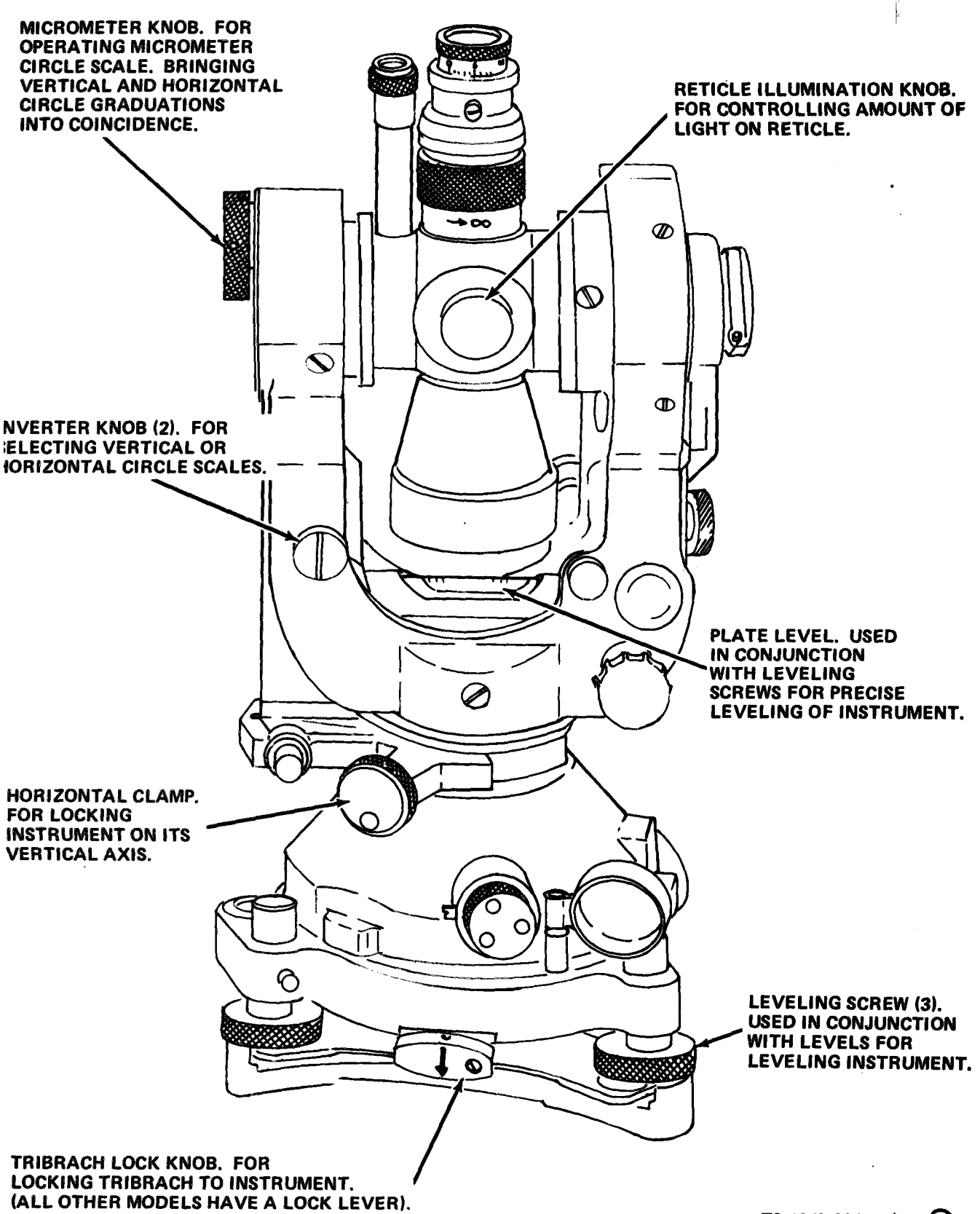
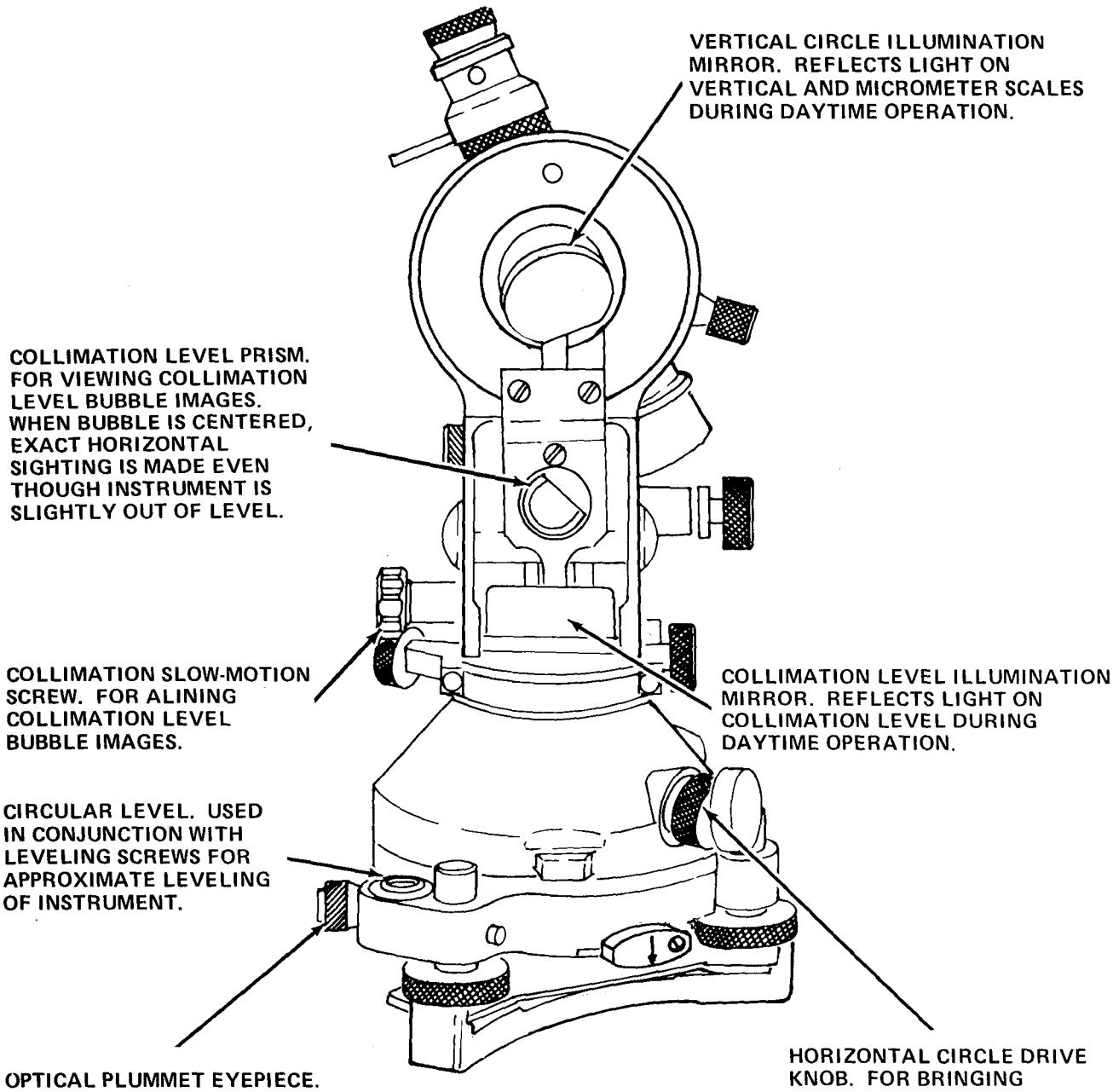
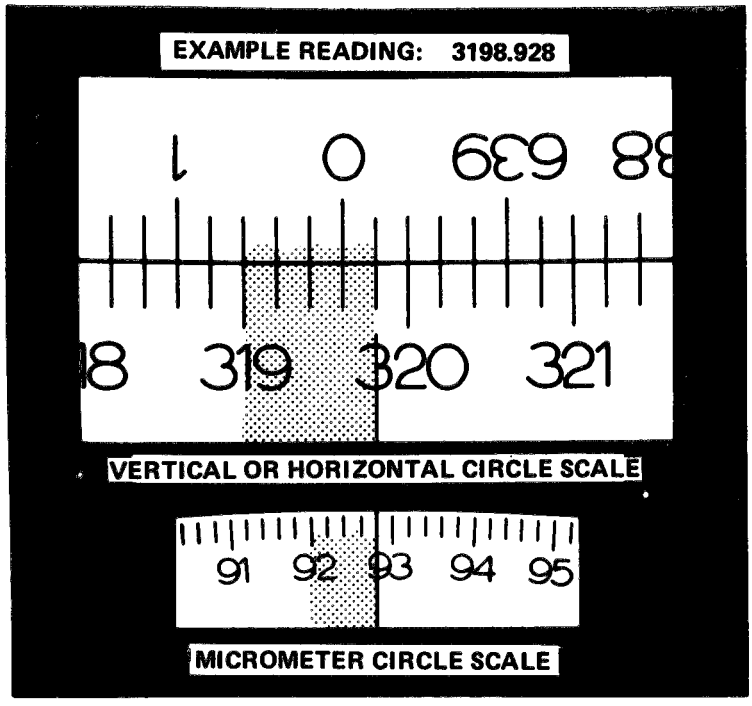


Figure 2-1. Controls and Instruments (Sheet 2 of 4).



TS 6675-296-14/2-1 ③

Figure 2-1. Controls and instruments (sheet 3 of 4).



VERTICAL OR HORIZONTAL CIRCLE SCALE

1. CALIBRATED IN NUMBERED AND UNNUMBERED LINES TOTALING 6,400 MILS.
2. DISTANCE BETWEEN NUMBERED LINES REPRESENTS 10 MILS. DISTANCE BETWEEN UNNUMBERED LINES REPRESENTS 2 MILS.
3. FOR MEASURING ANGLES IN MILS AND TENS OF MILS.

MICROMETER CIRCLE SCALE

1. CALIBRATED IN NUMBERED AND UNNUMBERED LINES FROM 00 TO 100.
2. DISTANCE BETWEEN NUMBERED LINES REPRESENTS 0.010 MIL. DISTANCE BETWEEN UNNUMBERED LINES REPRESENTS 0.002 MIL.
3. USED TO MEASURE INDIVIDUAL THOUSANDTHS OF A MIL ON BOTH VERTICAL AND HORIZONTAL SCALES.

TS 6675-296-14/2-1 (4)

Figure 2-1. Controls and instruments (sheet 4 of 4).

c. Reading the Scales.

(1) The reading is accomplished after bringing the telescope exactly on target.

NOTE

A fixed verticle line will be observed in the center of the horizontal or verticle circle (as applicable) and the micrometer circle scales. This vetical line rnarks the middle of the field of view and forms a pointer to aid in the coincidence adjustment. Do not take readings from this line.

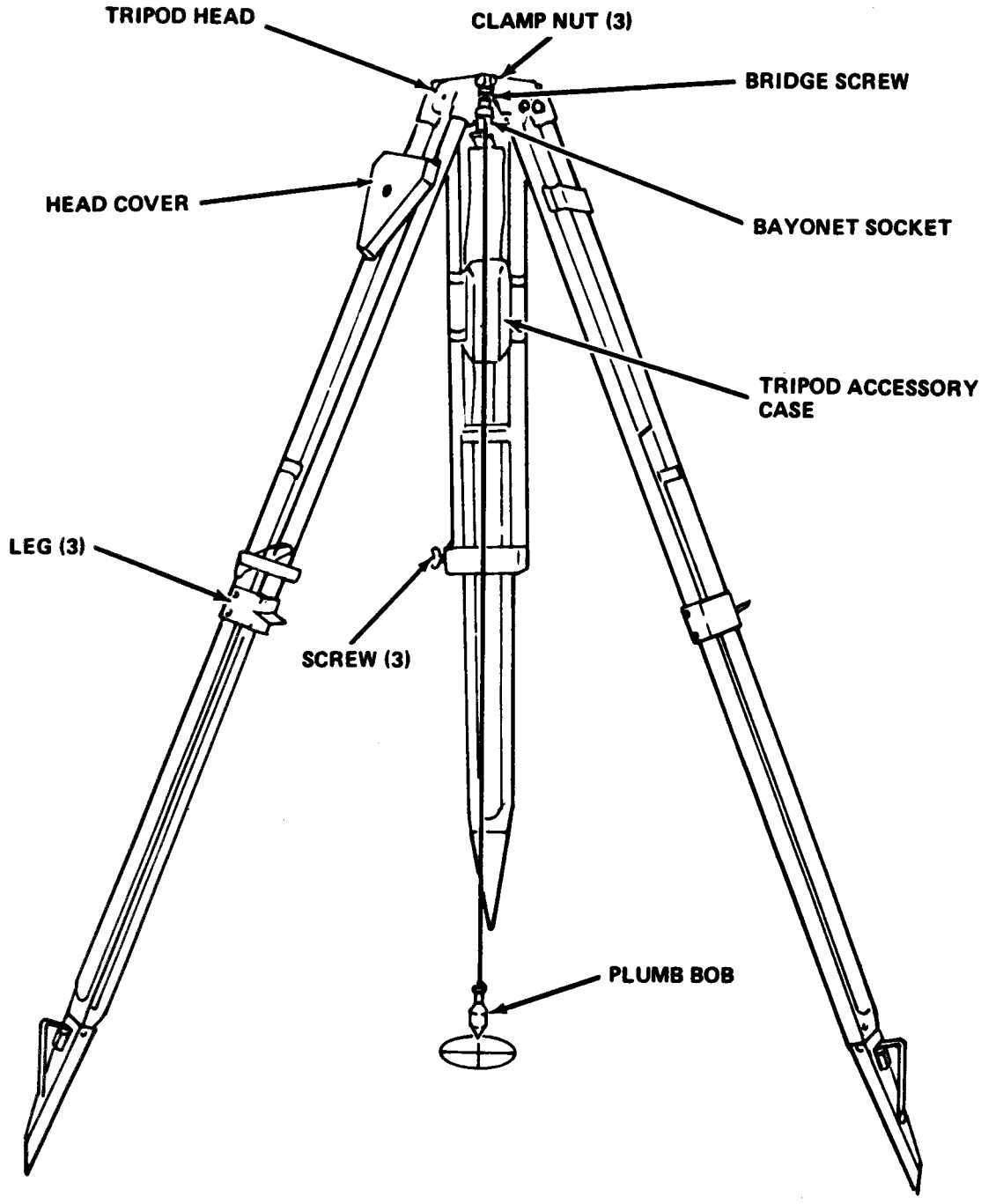
(2) The coincidence adjustment is made by turning the micrometer knob until the graduation lines of the upper half of the vertical or horizontal circle scale meet those of the lower half of the scale to form a straight line in the middle of the field of view.

(3) To read the scale, whether for the horizontal or vertical circle, start at the first upright whole number (in the lower portion of the double image) to the left of the vertical line. For example, refer to sheet 4 of figure 2-1 and start with 319. Count the graduations to the next numbered graduation to the right of the vertical line on the upper portion of the double image. This graduation is 639 and it is referred to as diametrically across from 319. Each graduation

equals 1 mil. Therefore, the reading is 3198 mils. The lower or micrometer scale is used to refine this reading to thousandths of a mil. Start at the first number to the left on the vertical line and count the graduations to the line. Each graduation represents 0.002 mils. Therefore, the complete reading is 3198.928 mils.

2-3. Operation of Equipment

a. Set up the tripod and plumb bob as indicated on figure 2-2.



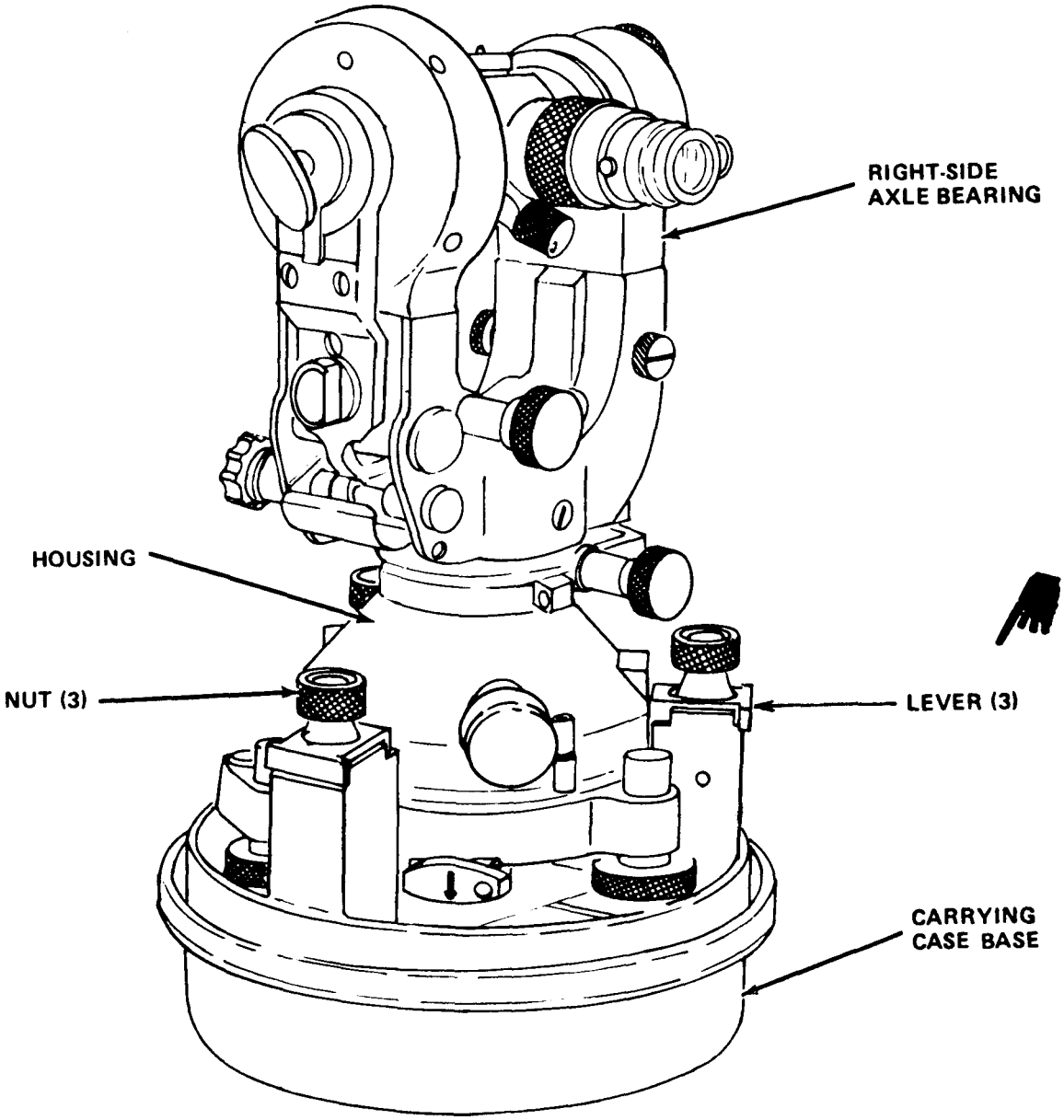
STEP 1. UNFOLD AND EXTEND LEGS TO DESIRED LENGTH, TIGHTEN SCREW (3).
STEP 2. TIGHTEN CLAMP NUT (3).
STEP 3. REMOVE PLUMB BOB FROM TRIPOD ACCESSORY CASE. INSERT BAYONET SOCKET INTO BRIDGE SCREW. SECURE BY TURNING CLOCKWISE 1/4 TURN.
STEP 4. POSITION TRIPOD SO THAT PLUMB BOB IS 1/2-INCH FROM STATION POINT.
STEP 5. SET LEGS FIRMLY IN GROUND WITH FOOT PRESSURE.
STEP 6. REMOVE PLMB BOB ASSEMBLY AND RETURN TO TRIPOD ACCESSORY CASE.
STEP 7. REMOVE HEAD COVER. STOW ON BRACKET.

TS 6675-296-14/2-2

Figure 2-2. Tripod and plumb bob, removal and installation.

b. Remove the theodolite from the carrying case as indicated on figure 2-3.

NOTE: THEODOLITE MODEL T2 - 68MIL SHOWN, REMOVE ALL MODELS IN A SIMILAR MANNER.

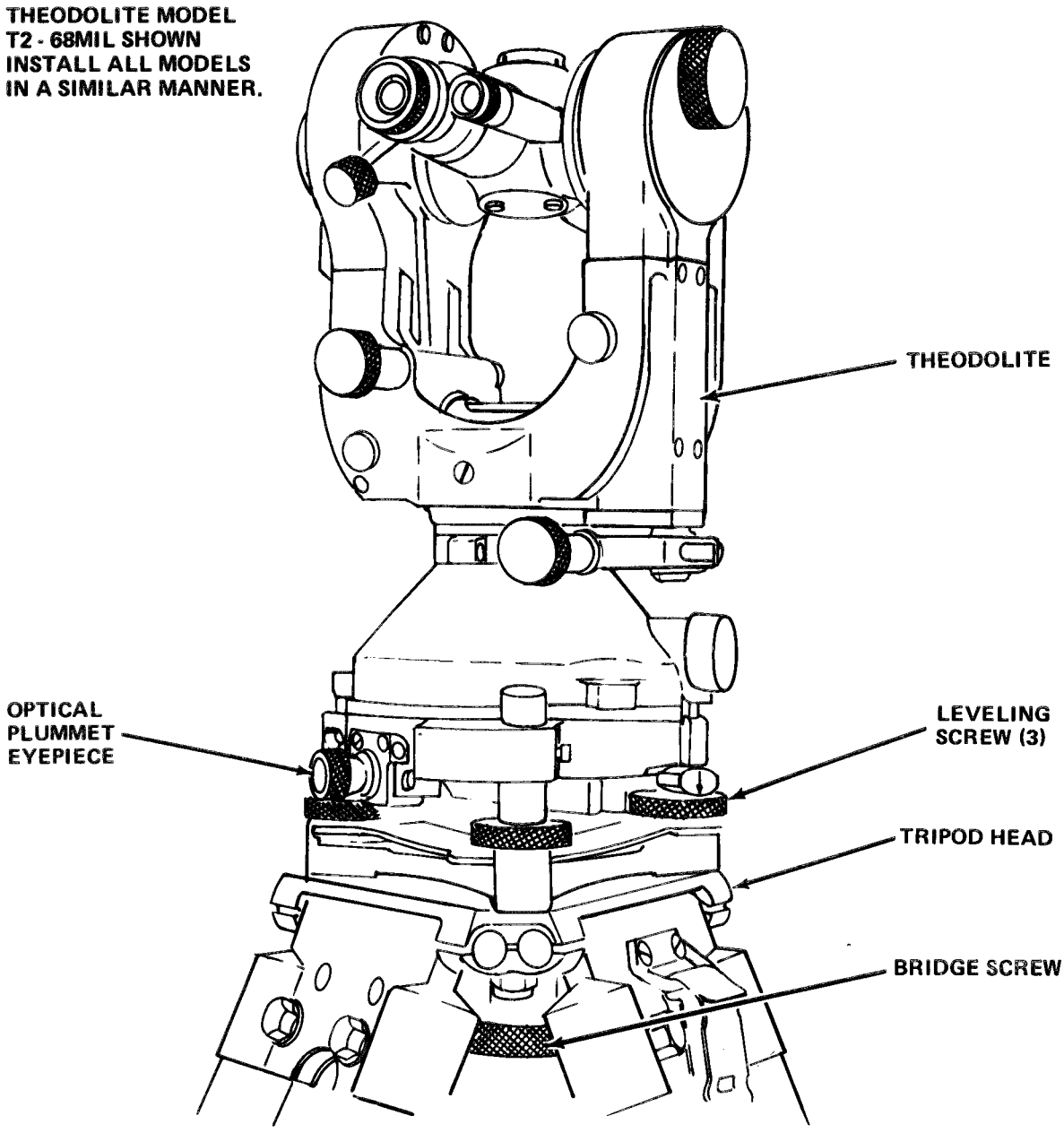


STEP 1. LOOSEN THE THREE NUTS AND PULL LEVERS AWAY FROM CARRYING CASE BASE.
STEP 2. GRASP THE RIGHT-SIDE AXLE BEARING WITH ONE HAND AND PLACE THE OTHER HAND BELOW THE HOUSING; LIFT THE THEODOLITE FROM THE CARRYING CASE BASE.
STEP 3. PLACE THE THEODOLITE ON A FIRM, LEVEL SURFACE.

TS 6675-296-14/2-3

Figure 2-3. Theodolite Carrying Cas Base, removal and installation.

c. Install the theodolit the tripod as indicated on figure 2-4.



STEP 1. POSITION THEODOLITE ON TRIPOD HEAD AND SECURE LOOSELY WITH BRIDGE SCREW.
STEP 2. CENTER CIRCULAR LEVEL BUBBLE USING LEVELING SCREWS.
STEP 3. SIGHT THROUGH OPTICAL PLUMMET EYEPIECE AND ADJUST EYEPIECE UNTIL THE CIRCULAR MARKS ARE CLEARLY VISIBLE.
STEP 4. CAREFULLY MOVE THEODOLITE ON TRIPOD HEAD UNTIL THE STATION POINT IS CENTERED ON THE EYEPIECE CIRCULAR MARKS.
STEP 5. TIGHTEN BRIDGE SCREW.

TS 6675-14/2-4

Figure 2-4. Theodolite, removal and installation.

d. If necessary, install the illumination system (fig. 2-5).

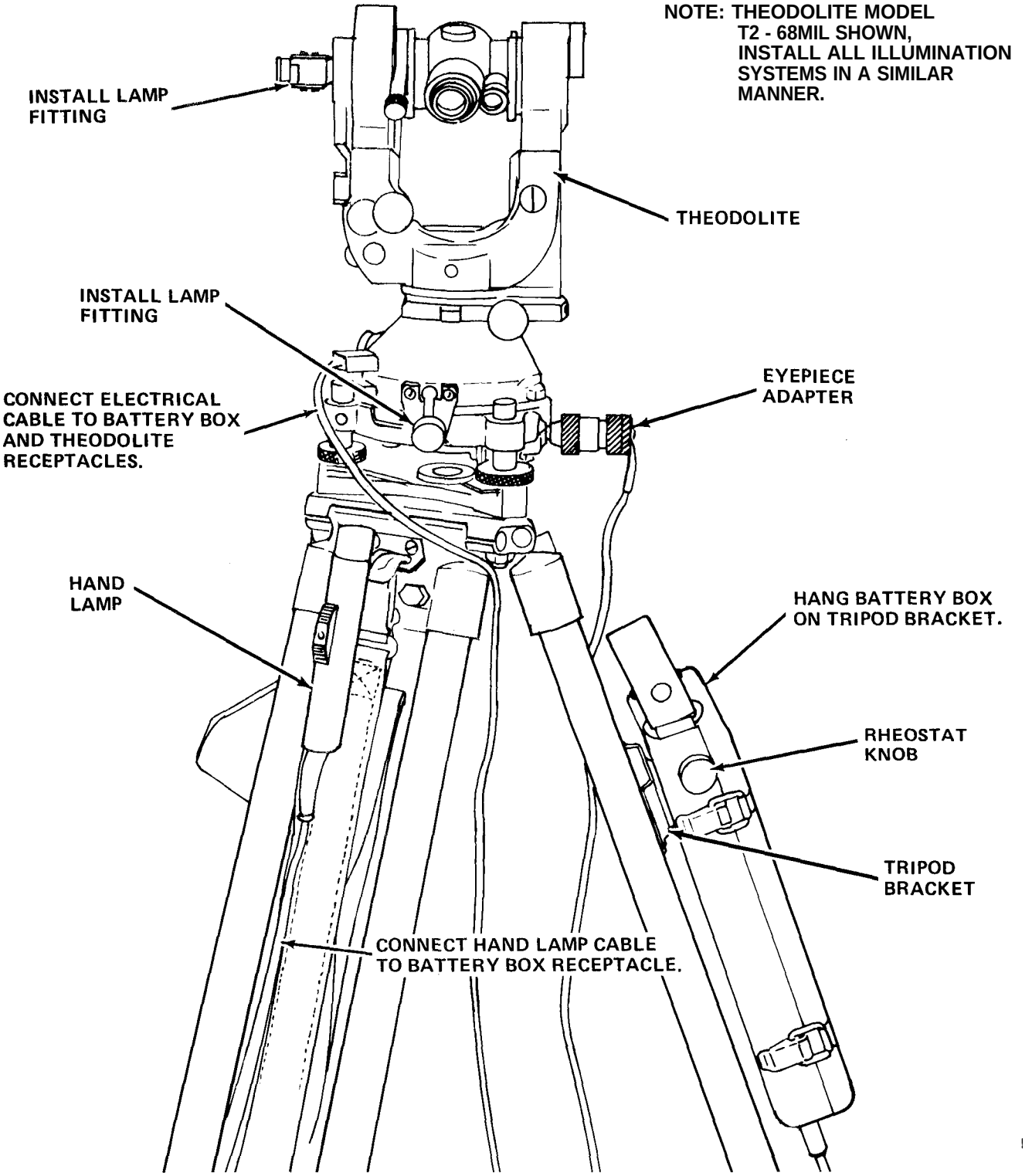


Figure 2-5. Illumination system, removal and installation.

NOTE

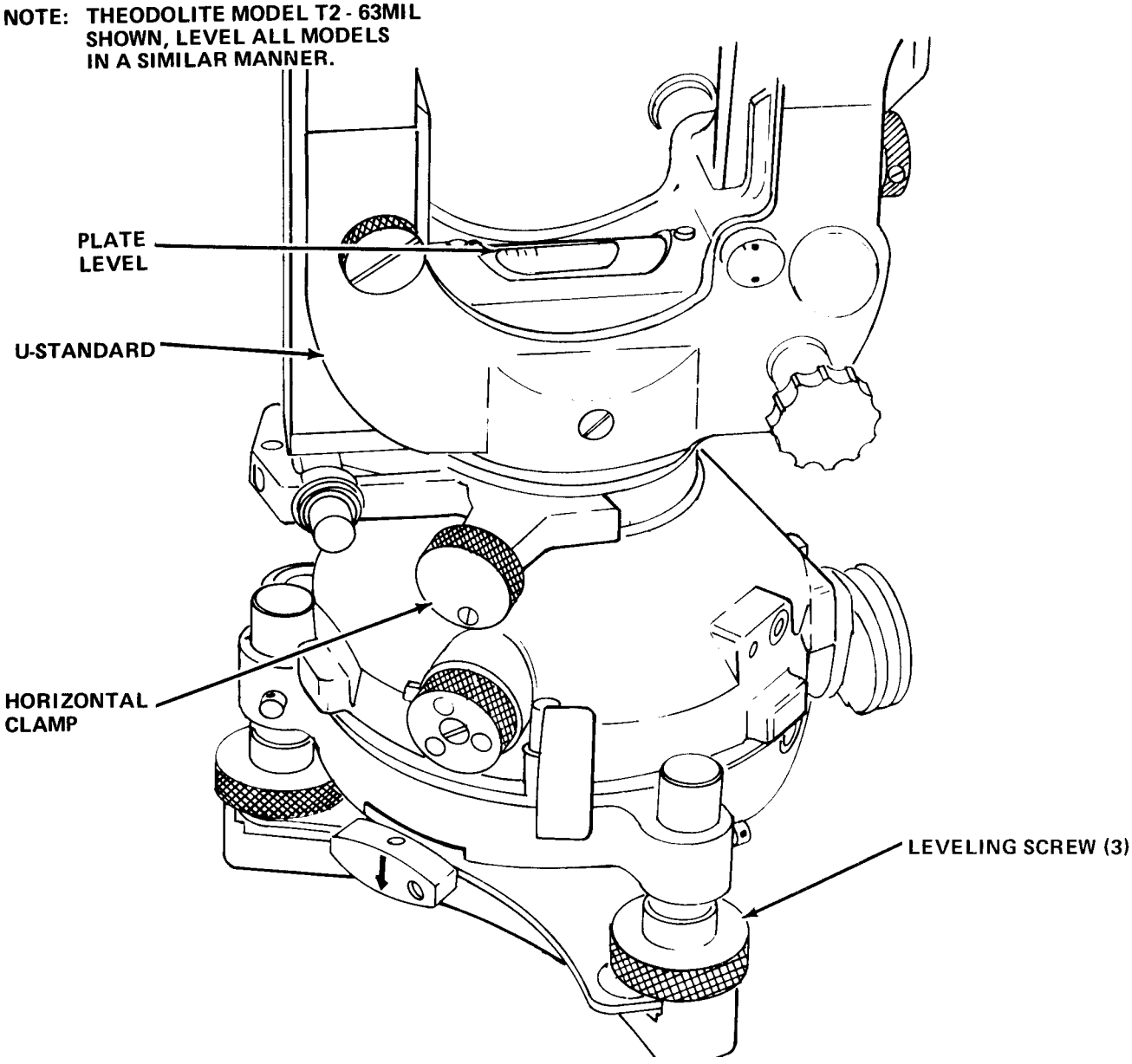
To operate the illumination system, turn the rheostat knob until desired brilliance is obtained. Place the hand light switch in the ON positoin.

e. Install the telescope eyepiece sunglass filter as necessary.

WARNING

Severe eye damage can result from per. forming observations against direct sunlight without utilizing the telescope sunglass filter.

f. **Refer to figure 2-6 and level the theodolite.**



STEP 1. UNLOCK THE HORIZONTAL CLAMP. ROTATE THE U-STANDARD UNTIL THE PLATE LEVEL IS PARALLEL TO A LINE JOINING ANY TWO LEVELING SCREWS. LOCK THE CLAMP.

STEP 2. TURN THE TWO LEVELING SCREWS THAT ARE PARALLEL WITH THE PLATE LEVEL SIMULTANEOUSLY, BUT IN OPPOSITE DIRECTIONS UNTIL THE LEVEL BUBBLE IS CENTERED.

STEP 3. UNLOCK THE HORIZONTAL CLAMP. ROTATE THE U-STANDARD 90° AND LOCK THE CLAMP. TURN THE THIRD LEVELING SCREW UNTIL THE LEVEL BUBBLE CENTERED.

STEP 4. UNLOCK THE HORIZONTAL CLAMP. ROTATE THE U-STANDARD 180° AND LOCK THE CLAMP. TURN THE SAME LEVELING SCREW AS IN STEP 3 AND REMOVE ONE-HALF OF ANY BUBBLE DISPLACEMENT THAT MAY EXIST.

NOTE: IF AFTER STEP 4 THE PLATE LEVEL BUBBLE IS MORE THAN TWO DIVISIONS FROM CENTRALITY, THE CORRECTION IS MADE WITH THE PLATE LEVEL ADJUSTING SCREW.

TS 6675-296-14/2-6

Figure 2-6. Theodolite leveling.

g. Focus the telescope as follows:

(1) Direct the telescope toward a Uniformly light background. Adjust the telescope eyepiece (fig. 2-1, sheet 1) until the crosslines are sharp and black.

NOTE

Observe the setting on the eyepiece. Tbis setting will remain constant for the same observer but will vary for other Observers.

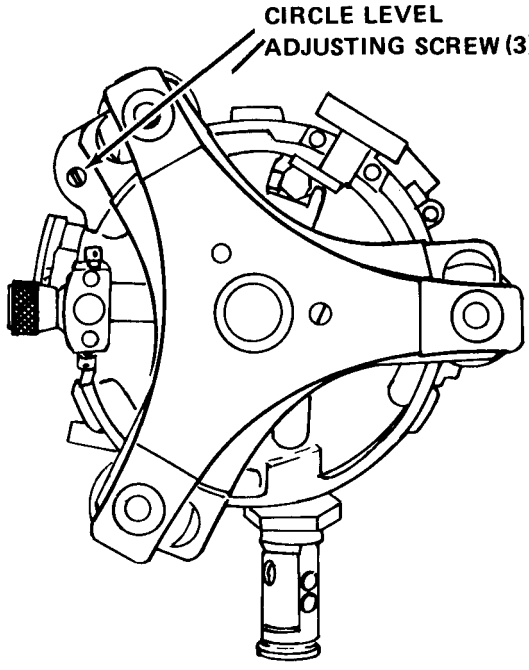
(2) Adjust the telescope focusing tube (fig. 2-1, sheet 1) to bring into view a clear image of the object being sighted.

h. The horizontal and vertical circle reading scales are both observed through the microscope eyepiece (fig. 2-1, sheet 1). When the line of the inverter knob (fig. 2-1, sheet 2) is in a horizontal position, the horizontal circle image (fig. 2-1, sheet 4) appears in the upper window. When the inverter knob is turned with the line in the vertical position, the vertical circle image appears in the upper window. Simultaneously with either of the circle images, the image of the micrometer scale is always visible in the lower window.

2-4. Adjustments

a. *General*. There are two types of adjustments made on the theodolite; instrument and operational adjustments. Instrument adjustments bring the theodolite into proper operating condition with respect to the interrelationship of its parts and are not normally made in the field. Operational adjustments bring the theodolite into proper relationship with the terrain being surveyed, and are required each time the theodolite is set up for actual surveying operations. This paragraph covers instrument adjustments.

b. *Circular Level*. Refer to figure 2-7 and adjust the circular level.



NOTE: THEODOLITE MODEL T2 - 63MIL SHOWN, ADJUST ALL MODELS IN A SIMILAR MANNER.

STEP 1. LEVEL THE THEODOLITE.

STEP 2. IF THE CIRCULAR LEVEL IS NOT CENTERED IN THE VIAL, THE CIRCULAR LEVEL IS OUT OF ADJUSTMENT. TIGHTEN OR LOOSEN THE THREE ADJUSTING SCREWS TO BRING THE LEVEL BUBBLE TO CENTER.

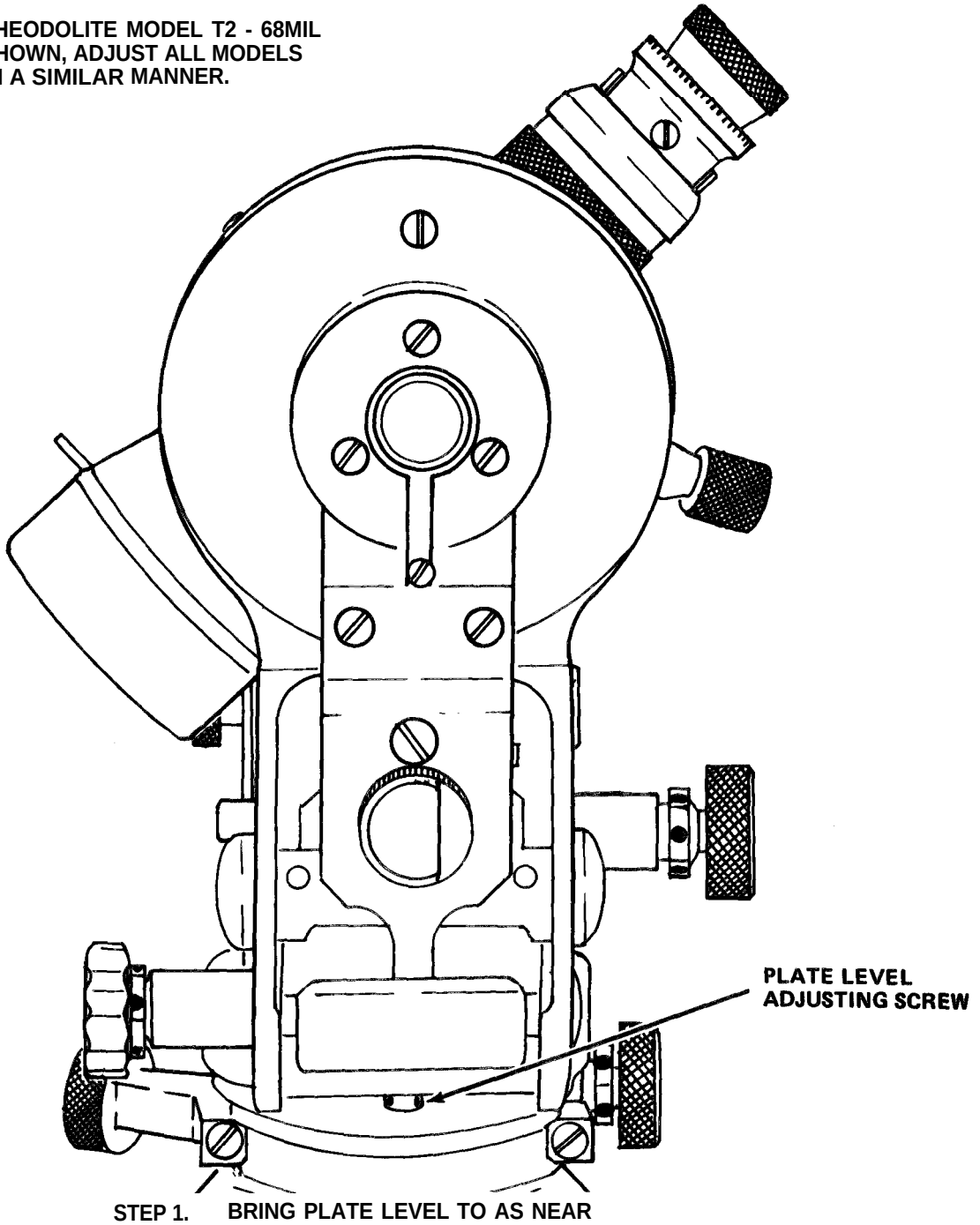
NOTE: NONE OF THE THREE ADJUSTING SCREWS SHOULD BE TIGHTENED ALL THE WAY. THEY SHOULD FLOAT ON THE ADJUSTING SPRINGS.

TS 6675-29614/2-7

Figure 2-7. Circular level, adjustment.

c. Plate Level. Refer to figure 2-8 and adjust the plate level.

NOTE: THEODOLITE MODEL T2 - 68MIL SHOWN, ADJUST ALL MODELS IN A SIMILAR MANNER.



STEP 1. BRING PLATE LEVEL TO AS NEAR CENTER AS POSSIBLE.

STEP 2. WITH THE THEODOLITE IN THIS POSITION, CORRECT ONE-HALF OF THE BUBBLE ERROR BY TURNING THE LEVELING SCREW.

STEP 3. USING THE ADJUSTING PIN, TURN THE PLATE LEVEL ADJUSTING SCREW TO CORRECT THE OTHER HALF OF THE ERROR.

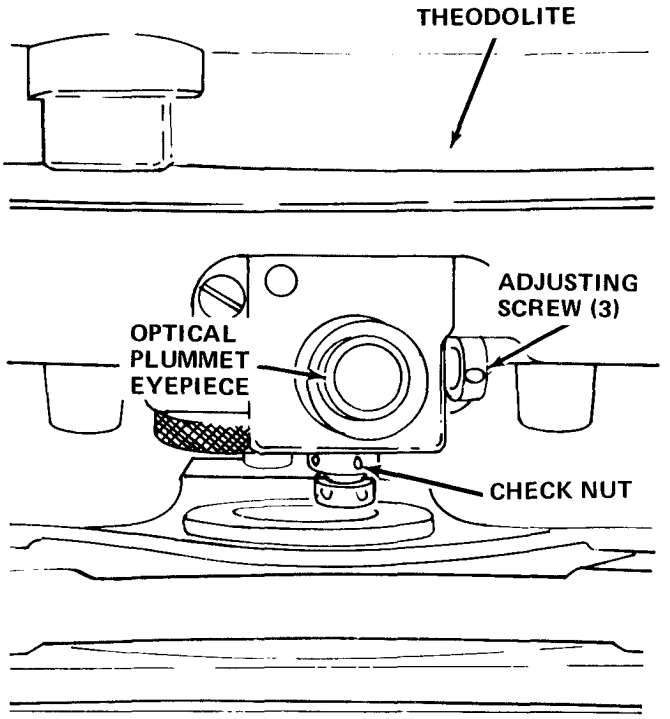
STEP 4. REPEAT THE ABOVE STEPS UNTIL THE BUBBLE REMAINS CENTERED REGARDLESS OF THE POSITION TO WHICH THE THEODOLITE IS TRAVERSED.

TS 6675-296-14/2-8

Figure 2-8. Plate level, adjustment.

d. Optical Plummet. Refer to figure 2-9 and adjust the optical plummet.

NOTE: THEODOLITE MODEL T2 - 68MIL SHOWN, ADJUST ALL MODELS IN A SIMILAR MANNER



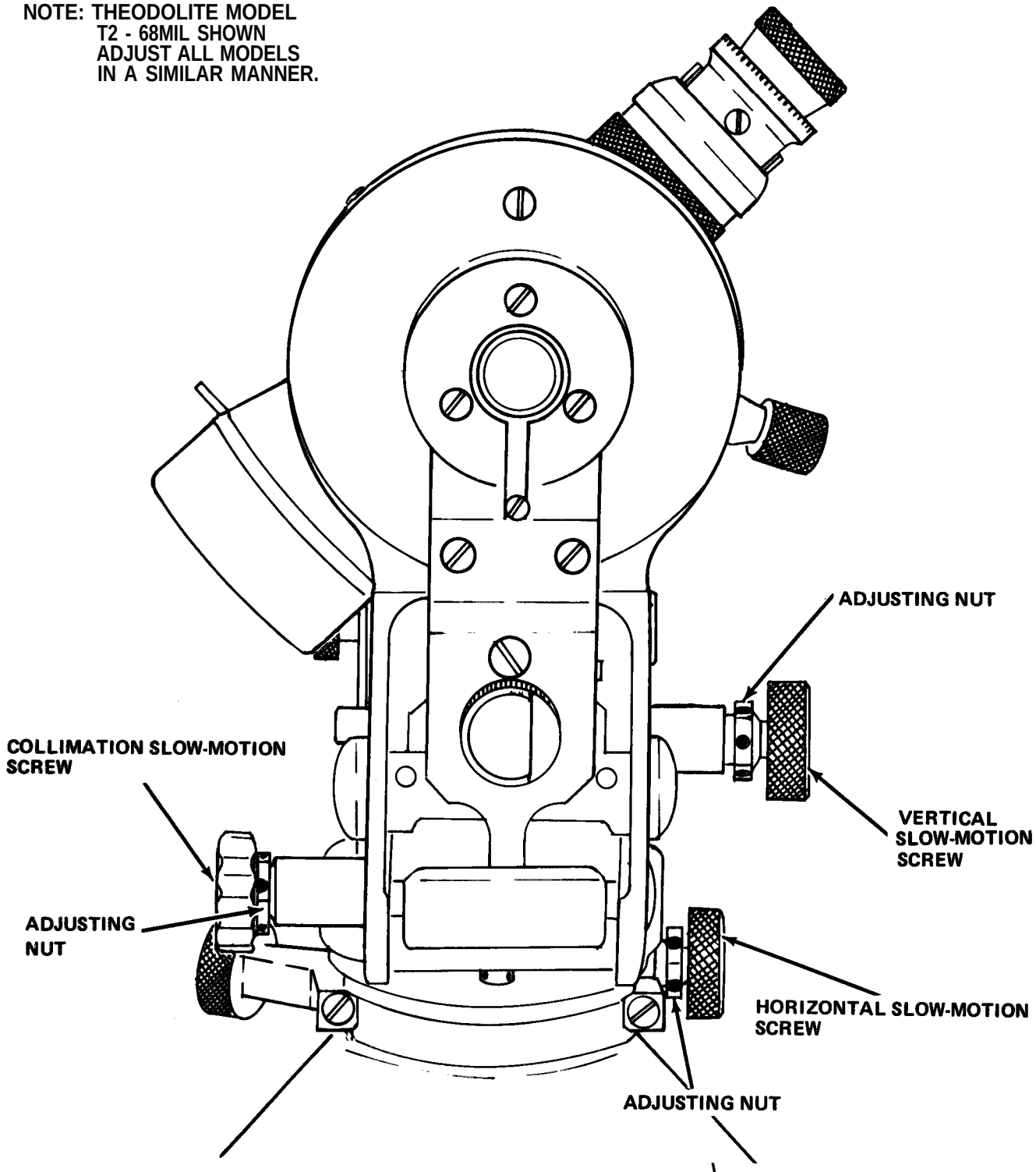
STEP 1. OBSERVE STATION POINT THROUGH OPTICAL PLUMMET EYEPIECE. IF STATION POINT IS NOT CENTERED IN THE EYEPIECE CIRCULAR MARKS, USE ADJUSTING PIN TO TURN THE TWO HORIZONTAL ADJUSTING SCREWS FOR LATERAL ALINEMENT. FOR VERTICAL ALINEMENT, LOOSEN CHECK NUT AND VERTICAL ADJUSTING SCREW.

STEP 2. WHEN THE STATION POINT IS CENTERED IN THE EYEPIECE CIRCULAR MARKS, TIGHTEN THE CHECK NUT.

TS 6675 -296-14/2-9

Figure 2-9. optical plummet, adjustment.

e. Collimation Slow-Motion Screw. Refer to figure 2-10 and adjust the collimation slow-motion screw.



TS 6675-296-14/2-10

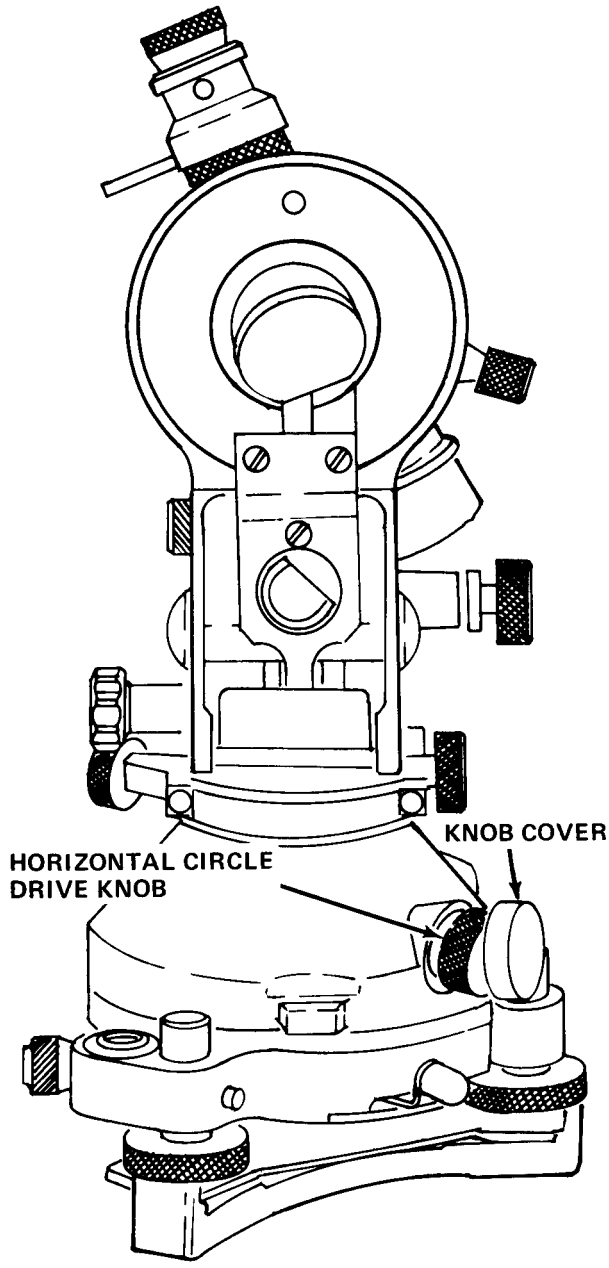
Figure 2-10. Collimation, vertical and *horizontal slow-motion screw, adjustment.*

f. Vertical Slow-Motion Screw. Refer to figure 2-10 and adjust the vertical slow-motion screw.

g. Horizontal Slow-Motion Screw. Refer to figure 2-10 and adjust the horizontal slow-motion screw.

h. Horizontal Circle Drive Knob. Refer to figure 2-11 and adjust the horizontal circle drive knob.

NOTE: THEODOLITE MODEL T2 - 63MIL SHOWN. ADJUST ALL MODELS IN A SIMILAR MANNER.



STEP 1. OPEN THE KNOB COVER.
STEP 2. TURN THE DRIVE KNOB UNTIL THE THREE SCREWS CAN BE SEEN THROUGH THE HOLES IN THE KNOB.
STEP 3. LOOSEN THE THREE SCREWS JUST ENOUGH TO MOVE THE KNOB. MOVE THE KNOB UP OR DOWN UNTIL IT TURNS SMOOTHLY WITHOUT WHIPLASH.
STEP 4. TiGHTEN THE THREE SCREWS AND CLOSE THE KNOB COVER.

TS 6675-296-14/2-11

Figure 2-11. Horizontal circle drive knob, adjustment.

i. Leveling Screws. Refer to figure 2-12 and adjust the Leveling screws.

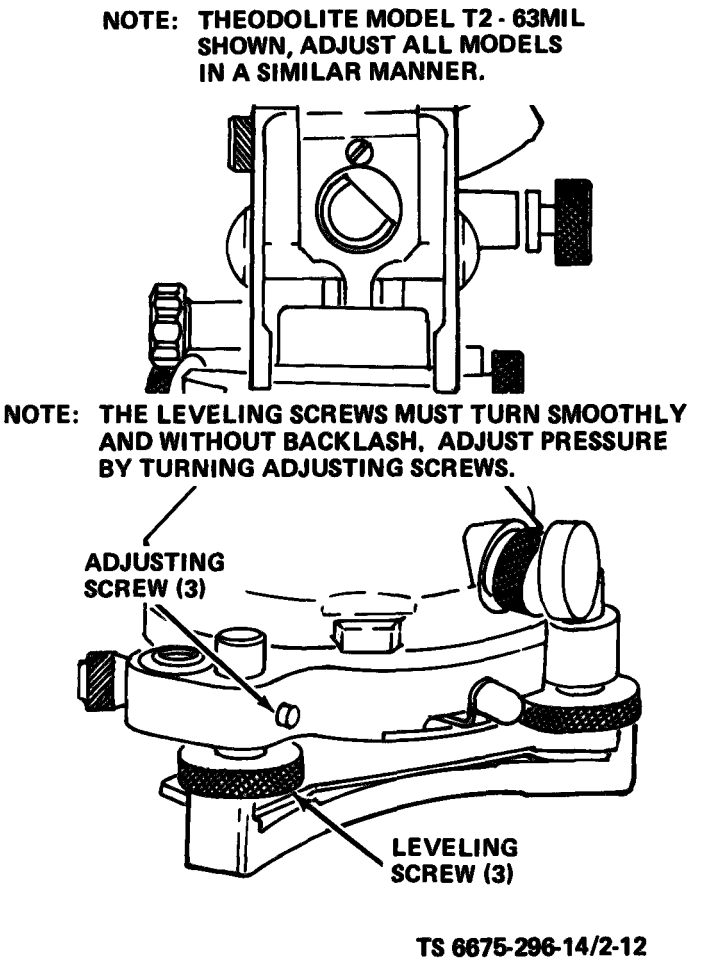
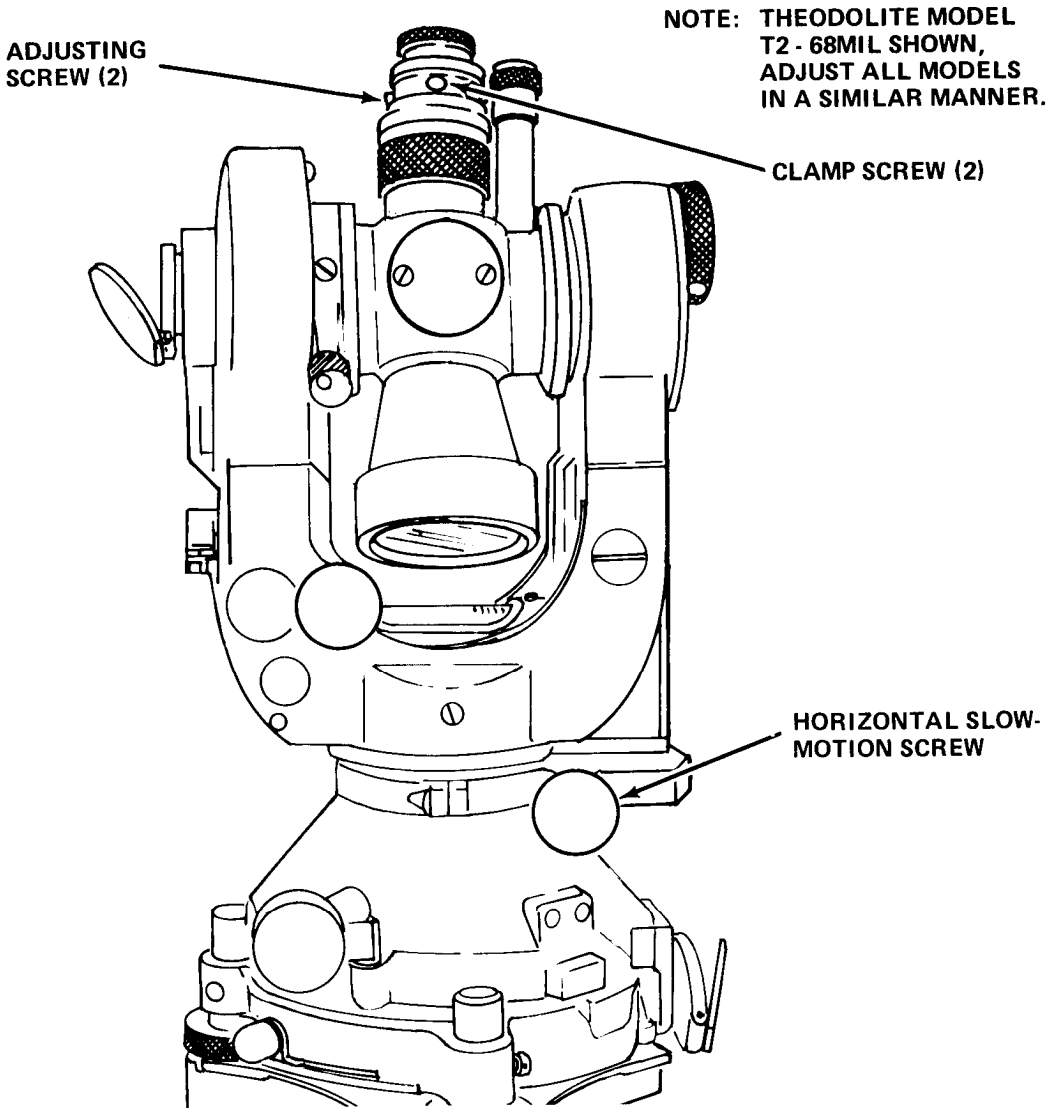


Figure 2-12. Leveling screws, adjustment.

j. Horizontal Collimation Error. Refer to figure 2-13 and adjust the theodolite horizontal collimation error.



STEP 1. SIGHT A WELL DEFINED OBJECT WITH THE VERTICAL CROSSLINE. MAKE THE COINCIDENCE OF GRADUATION LINES AND RECORD THE SCALE READINGS.

STEP 2. REVERSE THE TELESCOPE POSITION AND SIGHT THE OBJECT. MAKE THE COINCIDENCE OF THE GRADUATION LINES AND RECORD THE SCALE READINGS.

STEP 3. THE DIFFERENCE BETWEEN THE TWO READINGS, REDUCED BY 3200 MILS IS TWICE THE COLLIMATION ERROR.

STEP 4. SET THE MICROMETER SCALE AT ONE-HALF THE FIGURE COMPUTED BY STEP 3. MAKE THE COINCIDENCE OF THE GRADUATION LINES BY TURNING THE HORIZONTAL SLOW-MOTION SCREW.

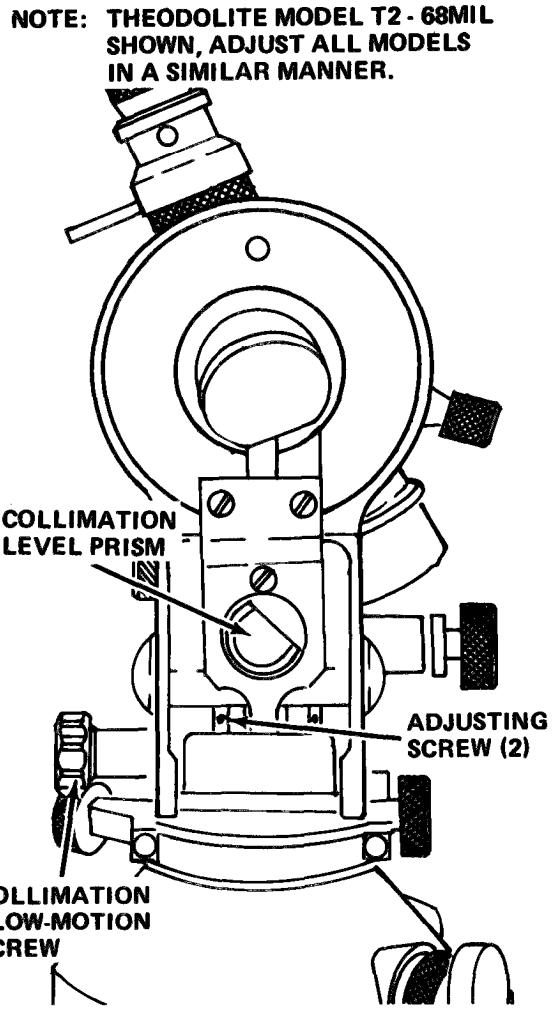
STEP 5. WITH THE TELESCOPE IN THIS POSITION, CENTER THE VERTICAL CROSSLINE ON THE OBJECT AS FOLLOWS:

A. SLIGHTLY LOOSEN THE TWO CLAMP SCREWS.
B. TO MOVE THE CROSSLINE TO THE RIGHT, LOOSEN LEFT ADJUSTING SCREW AND TIGHTEN RIGHT ADJUSTING SCREW BY AN EQUAL DEGREE.
C. TO MOVE CROSSLINE TO THE LEFT, LOOSEN RIGHT ADJUSTING SCREW AND TIGHTEN LEFT ADJUSTING SCREW BY AN EQUAL DEGREE.
D. TIGHTEN THE TWO CLAMP SCREWS.

TS 6675-296-14/2-13

Figure 2-13. Horizontal collimation error, adjustment.

k. Vertical Collimation Error. Refer to figure 2-14 and adjust the theodolite vertical collimation error.



STEP 1. SIGHT A WELL DEFINED OBJECT WITH THE HORIZONTAL CROSSLINE. COINCIDE THE COLLIMATION LEVEL BUBBLE BY TURNING COLLIMATION SLOW-MOTION SCREW. MAKE THE COINCIDENCE OF THE GRADUATION LINES AND RECORD THE SCALE READINGS.

STEP 2. REVERSE THE TELESCOPE POSITION AND SIGHT THE OBJECT. COINCIDE THE COLLIMATION LEVEL BUBBLE, MAKE THE COINCIDENCE OF THE GRADUATION LINES AND RECORD THE SCALE READINGS.

STEP 4. THE TOTAL OF THE TWO READINGS, REDUCED BY 6,400 MILS, IS TWICE THE COLLIMATION ERROR. COMPUTE THE ZENITH DISTANCE AND SET THE MICROMETER SCALE AT THE CORRECT READING.

STEP 4. MAKE THE COINCIDENCE OF THE GRADUATION LINES.

STEP 5. COINCIDE THE COLLIMATION LEVEL BUBBLE BY LOOSENING ONE ADJUSTING SCREW AND TIGHTENING THE OTHER ADJUSTING SCREW BY AN EQUAL DEGREE.

TS 6675-296-14/2-14

Figure 2-14. Verticle collimation error, adjustment

Section II. OPERATION UNDER UNUSUAL CONDITIONS

2-5. Operation in Extreme Cold (Below 0° F (-18°C))

With proper precautions and servicing, the theodolite can be used in extreme cold. Its use is limited only by the endurance of operating personnel and conditions affecting visibility. The theodolite should be kept out-of-doors or in unheated buildings for short periods of non-use. Extreme temperature changes will induce internal stresses affecting accuracy and lenses, and prisms may become fogged. Theodolites to be used under conditions of extreme cold should be cleansed, and all lubricants should be removed before the instruments are used. Snowfall, winds, and refraction of light are some of the conditions encountered at low temperatures. Winterization eyepiece and control knob covers are provided for protection against contact with bare metal surfaces. During operation in extreme cold, avoid breathing on telescope/microscope lenses and theodolite mirrors.

CAUTION

Avoid subjecting the theodolite to sudden changes in temperature.

2-6. Operation in Extreme Heat

Operation of the theodolite in extreme heat and under direct rays of the sun can cause internal stresses and distortion in the instrument and produce poor sightings because of heat waves. If possible, the theodolite and instrument man should be protected from direct sunlight by an umbrella or other suitable means. Under these conditions, shorter sightings will decrease the amount of sighting errors. Taking sightings during early morning and late evening will also minimize error magnitude. The use of suitable dark glasses by the instrument man will reduce eyestrain and fatigue. If the theodolite is kept in a cool storage place, it should be removed from storage in sufficient time before use to allow the temperature of the metal to approach that of the outside air.

2-7. Operation in Dusty or Sandy Areas

Special care must be given instruments which are being used in dusty or sandy areas, since both dust and sand are highly abrasive. If dust and sand are allowed to remain on threaded or sliding surfaces, moving parts of the theodolite will soon bind and the instrument will become inaccurate or inoperable. The theodolite should be brushed frequently and carefully wiped clean. Be extremely careful not to scratch lens and prism surfaces during cleaning operations. Always protect the instrument from blowing dust and sand. Place a protective cover over theodolite when it is not in use.

2-8. 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. Internal fogging can usually be removed by placing theodolite in a warm, dry place. Corrosion caused by high humidity can be partially eliminated by using warm, dry storage areas and desiccants. After use, dry instrument thoroughly with a soft, lint-free cloth.

2-9. Operation in Salt Water Areas

Salt is highly corrosive to metals. When operating the theodolite in salt water areas, wipe the instrument frequently with a soft, clean cloth. If the theodolite is exposed to direct salt spray, it should be cleaned thoroughly and should be returned to an instrument shop for overhauling as soon as possible. Cleaning intervals should be shortened considerably for theodolites subjected to salt air exposure.

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS

NOTE
No lubrication of this equipment by the operator is authorized.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-1. General

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

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

c. After you operate. Be sure to perform your after (A) PMCS.

d. If your equipment fails to operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms, see TM38-750.

e. The item number column shall be used as a source of item numbers for the TM Number column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

f. To insure that the theodolites are ready for operation at all times, they must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed and described in table 3-1. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the units 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.

3-2. Preventive Maintenance Checks and Services

This paragraph contains a tabulated listing of preventive maintenance checks and services, table 3-1.

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

INTERVAL		B-BEFORE OPERATION		A-AFTER OPERATION	
Item No.	B	A	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available if:
1	●		Theodolite components and accessories	Make certain all components (theodolite, tribrach, tripod, battery box, etc) and accessories (tools, electrical cables, haversack, cases, covers, kits, etc, fig. 3-12 thru 3-16) are present and operational. Test and replace defective batteries and lamps. clean dirty lenses, mirrors, and level vials.	A required component or accessory is nonoperational or missing.
2		●	Theodolite components and accessories	Clean dust or dirt from components, accessories, and cases. Replace desiccant if color is pink.	A component or accessory is defective or missing.

Section III. TROUBLESHOOTING

3-3. General

a. This section contains troubleshooting information for locating and correcting mostofthe operating troubles which may develop in the directional theodolite. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine corrective actions to take.You should perform the tests/inspections and corrective actionsintheorder listed.

b. This manual cannot list all malfunctions that may occur, nor all tests, or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify yoursupervieor.

c. The table lists the common malfunctions which you may find during the operation or maintenance of the directional theodolite or its components. You should perform the test/inspections and corrective actions in the order listed.

NOTE

Before uou use this table be sure you have performed all appllicable operating checks

3-4. Troubleshooting Information

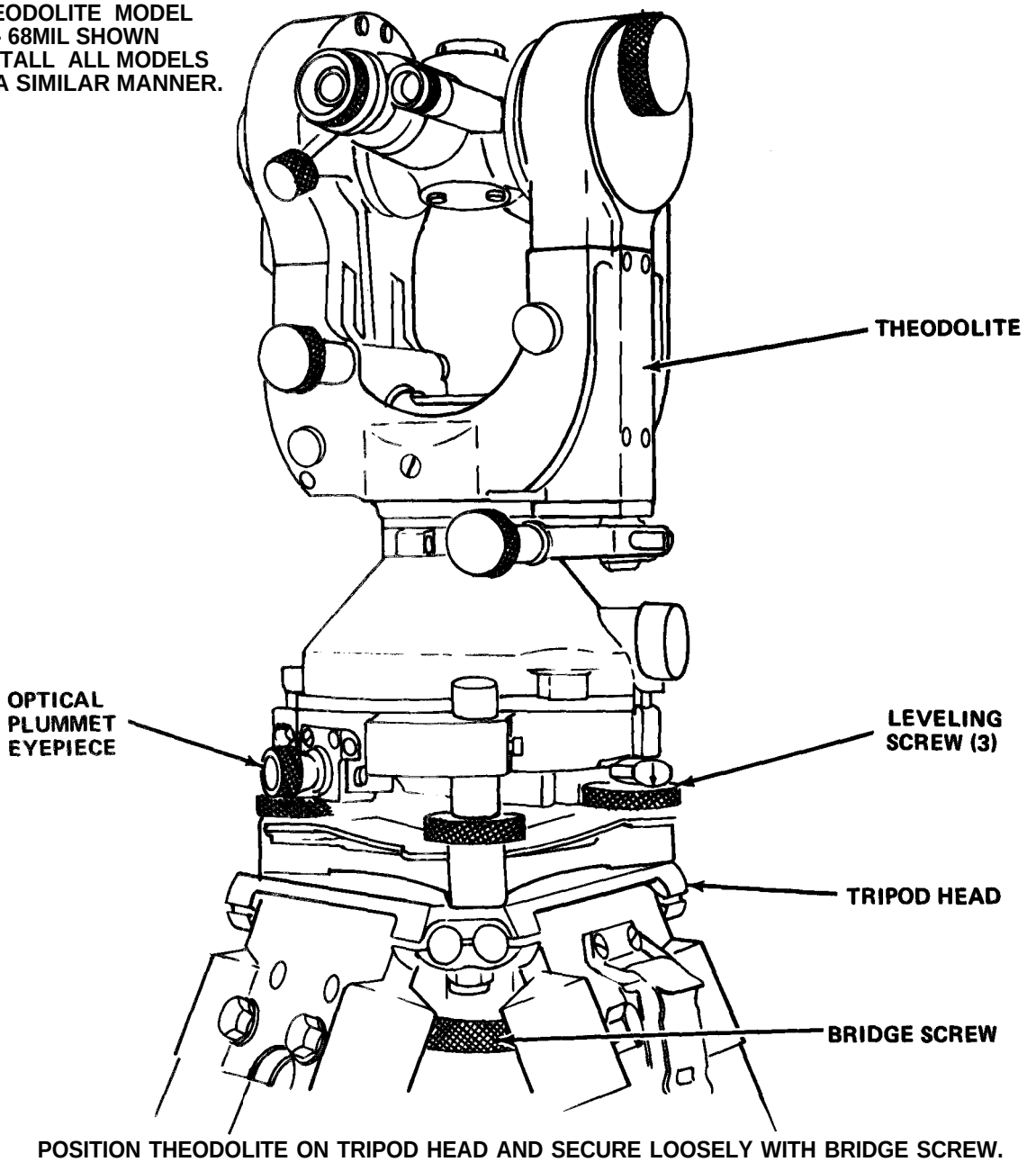
Table 3-2 contains the information for corrective actions to be taken.

Table 3-2. **Troubleshooting**

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. THEODOLITE WILL NOT SEAT PROPERLY ON TRIPOD HEAD
Check if bridge screw is improperly started. **Restart bridge screw (fig. 3-1).**

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

NOTE: THEODOLITE MODEL T2 - 68MIL SHOWN INSTALL ALL MODELS IN A SIMILAR MANNER.



STEP 1. POSITION THEODOLITE ON TRIPOD HEAD AND SECURE LOOSELY WITH BRIDGE SCREW.
STEP 2. CENTER CIRCULAR LEVEL BUBBLE USING LEVELING SCREWS.
STEP 3. SIGHT THROUGH OPTICAL PLUMMET EYEPIECE AND ADJUST EYEPIECE UNTIL THE CIRCULAR MARKS ARE CLEARLY VISIBLE.
STEP 4. CAREFULLY MOVE THEODOLITE ON TRIPOD HEAD UNTIL THE STATION POINT IS CENTERED ON THE EYEPIECE CIRCULAR MARKS.
STEP 5. TIGHTEN BRIDGE SCREW.

TS 6675-296-14/3-1

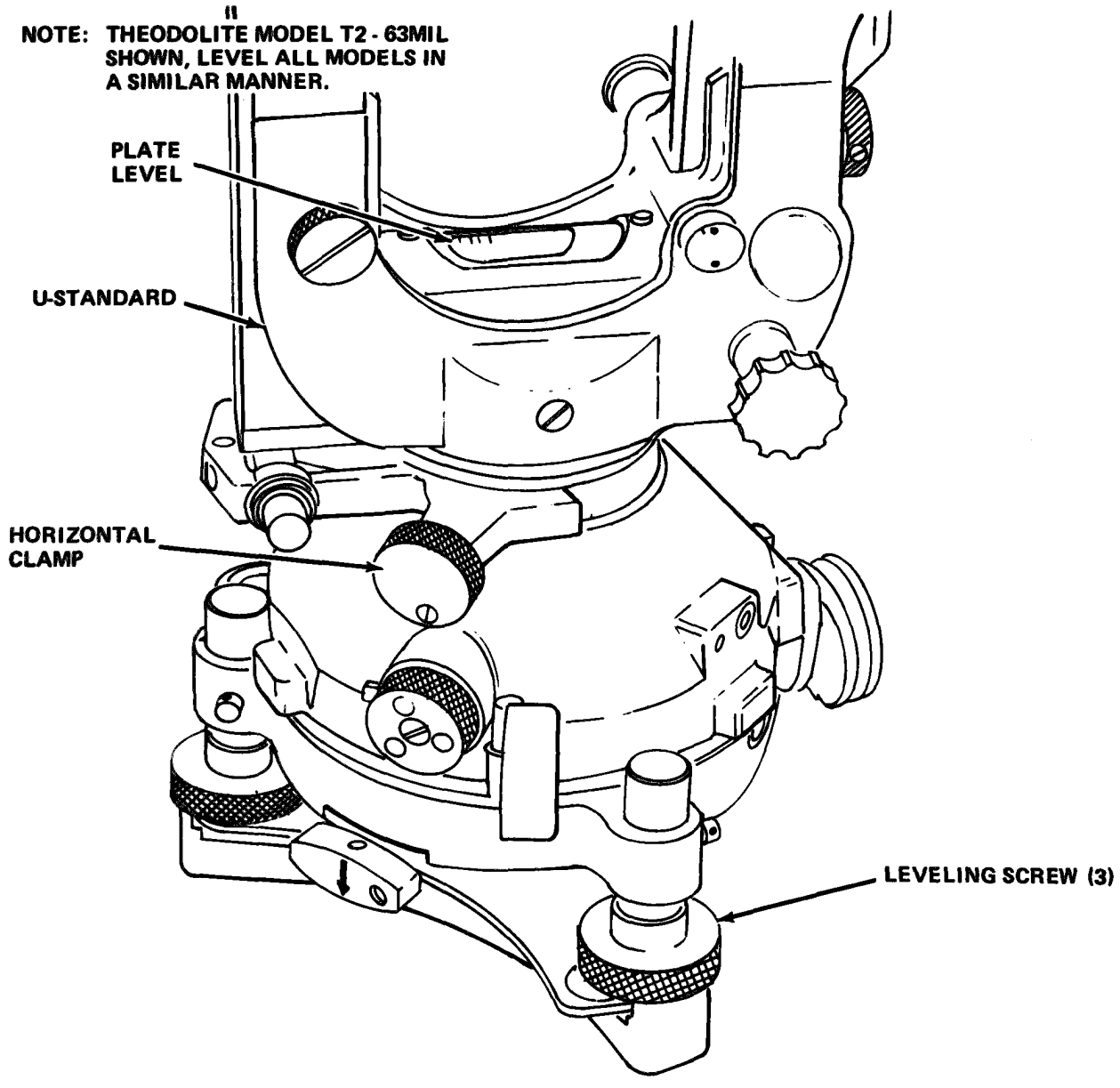
Figure 3-1. Theodolite, removal and installation.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. THEODOLITE WILL NOT STAY ON LINE

Step 1. Check if theodolite is out of level.
Level theodolite (fig. 3-2).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



STEP 1. UNLOCK THE HORIZONTAL CLAMP. ROTATE THE U-STANDARD UNTIL THE PLATE LEVEL IS PARALLEL TO A LiNE JOINING ANY TWO LEVELING SCREWS. LOCK THE CLAMP.

STEP 2. TURN THE TWO LEVELING SCREWS THAT ARE PARALLEL WITH THE PLATE LEVEL. SIMULATANEOUSLY, BUT IN OPPOSITE DIRECTIONS UNTIL THE LEVEL BUBBLE IS CENTERED.

STEP 3. UNLOCK THE HORIZONTAL CLAMP. ROTATE THE U-STANDARD 90° AND LOCK THE CLAMP. TURN THE THIRD LEVELING SCREW UNTIL THE LEVEL BUBBLE CENTERED.

STEP 4. UNLOCK THE HORIZONTAL CLAMP. ROTATE THE U-STANDARD 180° AND LOCK THE CLAMP. TURN THE SAME LEVELING SCREW AS IN STEP 3 AND REMOVE ONE-HALF OF ANY BUBBLE DISPLACEMENT THAT MAY EXIST.

NOTE: IF AFTER STEP 4 THE PLATE LEVEL BUBBLE IS MORE THAN TWO DIVISIONS FROM CENTRALITY, THE CORRECTION IS MADE WITH THE PLATE LEVEL ADJUSTING SCREW.

TS 6675-296-12/3-2

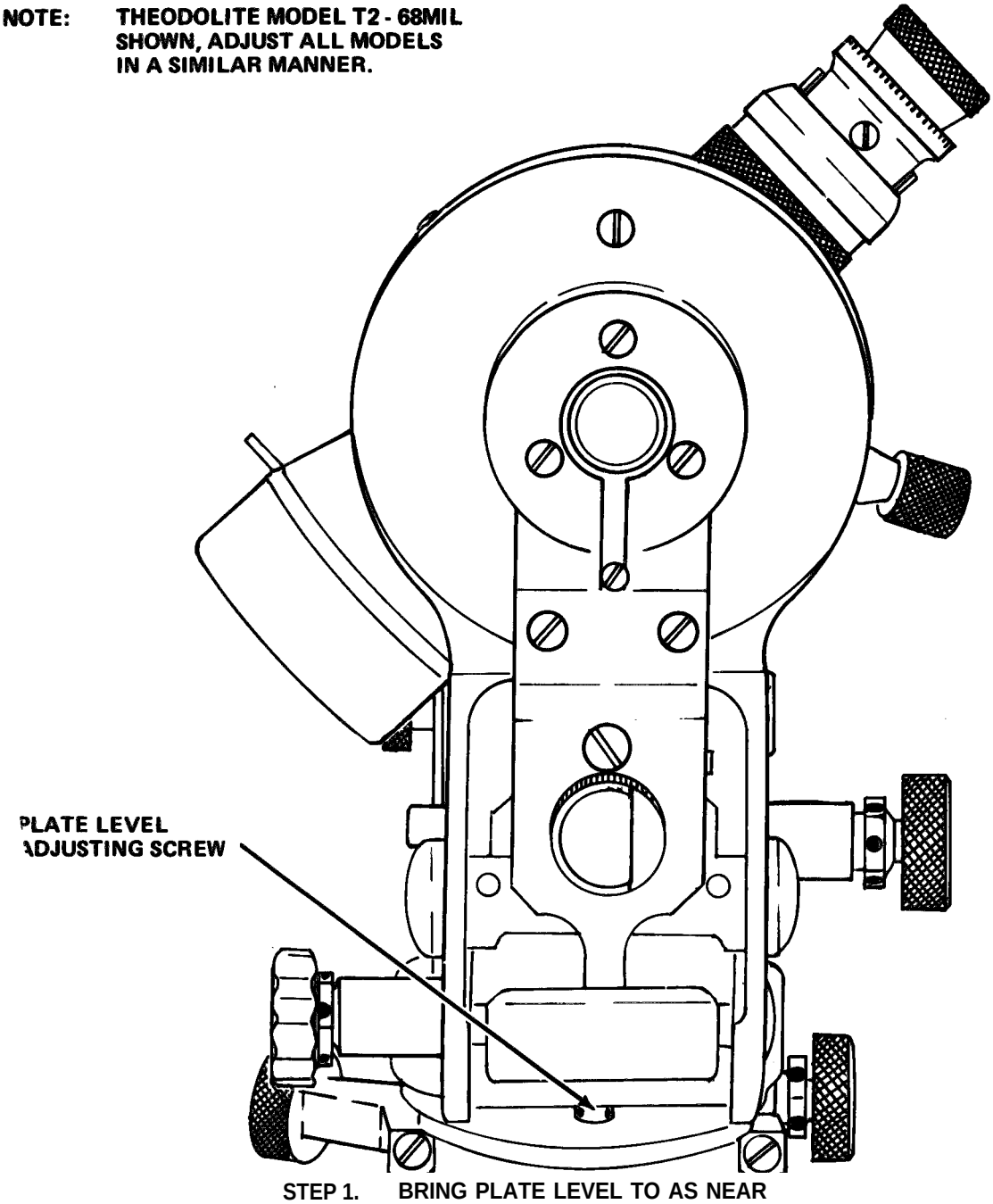
Figure 3-2. Theodolite Leveling.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 2. Check if plate level or collimation level is out of adjustment.
Adjust plate level (fig. 3-3) or collimation level (fig 3-4).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

NOTE: **THEODOLITE MODEL T2 - 68MIL SHOWN, ADJUST ALL MODELS IN A SIMILAR MANNER.**



STEP 1. BRING PLATE LEVEL TO AS NEAR CENTER AS POSSIBLE.

STEP 2 WITH THE THEODOLITE IN THIS POSITION, CORRECT ONE-HALF OF THE BUBBLE ERROR BY TURNING THE LEVELING SCREW.

STEP 3. USING THE ADJUSTING PIN , TURN THE PLATE LEVEL ADJUSTING SCREW TO CORRECT THE OTHER HALF OF THE ERROR.

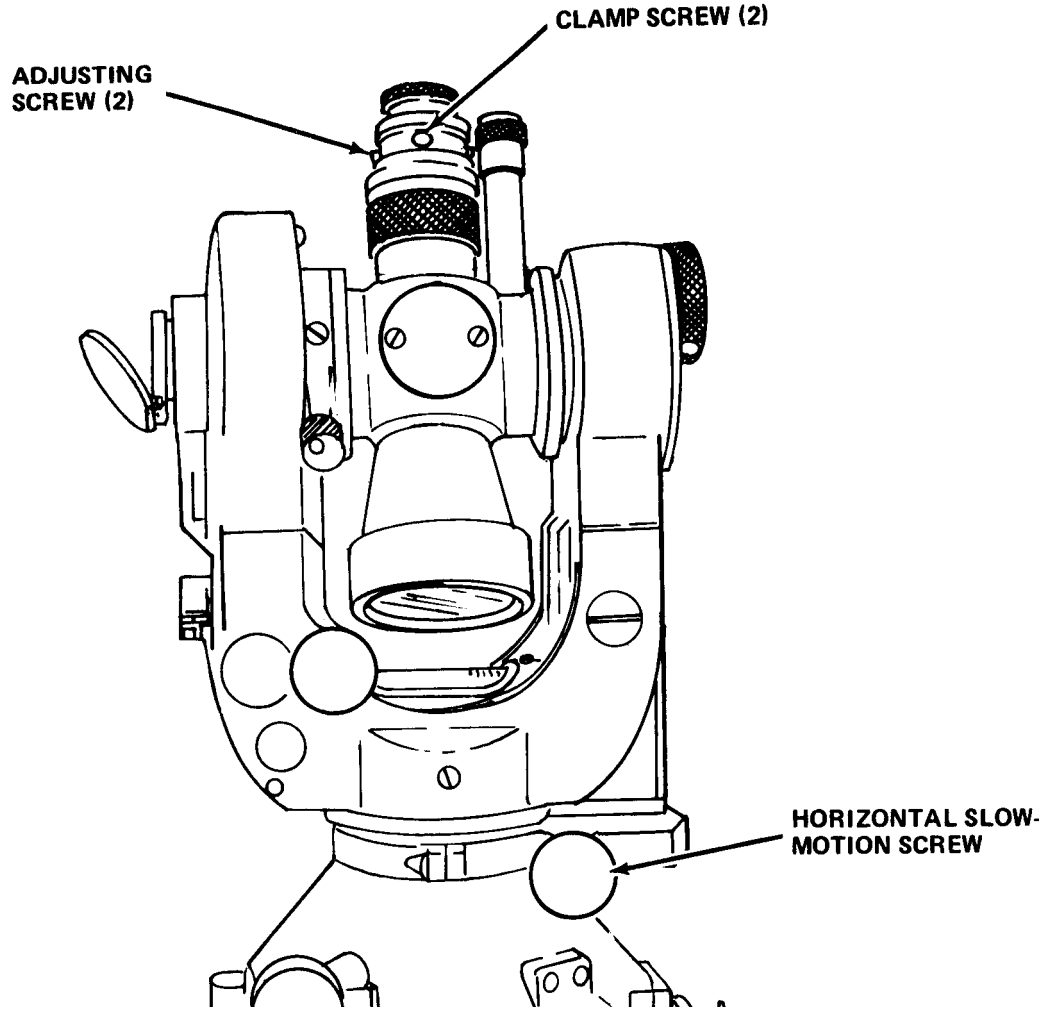
STEP 4. REPEAT THE ABOVE STEPS UNTIL THE BUBBLE REMAINS CENTERED REGARDLESS OF THE POSITION TO WHICH THE THEODOLITE IS TRAVERSED.

TS 6675-296-14/3-3

Figure 3-3. Plate level, adjustment.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

NOTE: THEODOLITE MODEL T2 - 68MIL SHOWN, ADJUST ALL MODELS IN A SIMILAR MANNER.



STEP 1. SIGHT A WELL DEFINED OBJECT WITH THE VERTICAL CROSSLINE. MAKE THE COINCIDENCE OF GRADUATION LINES AND RECORD THE SCALE READINGS.

STEP 2. REVERSE THE TELESCOPE POSITION AND SIGHT THE OBJECT. MAKE THE COINCIDENCE OF THE GRADUATION LINES AND RECORD THE SCALE READINGS.

STEP 3. THE DIFFERENCE BETWEEN THE TWO READINGS, REDUCED BY 3,200 MILS IS TWICE THE COLLIMATION ERROR.

STEP 4. SET THE MICROMETER SCALE AT ONE-HALF THE FIGURE COMPUTED BY STEP 3. MAKE THE COINCIDENCE OF THE GRADUATION LINES BY TURNING THE HORIZONTAL SLOW-MOTION SCREW.

STEP 6. WITH THE TELESCOPE IN THIS POSITION, CENTER THE VERTICAL CROSSLINE ON THE OBJECT AS FOLLOWS:

A. SLIGHTLY LOOSEN THE TWO CLAMP SCREWS .
B. TO MOVE THE CROSSLINE TO THE RIGHT, LOOSEN LEFT ADJUSTING SCREW AND TIGHTEN RIGHT ADJUSTING SCREW BY AN EQUAL DEGREE.
C. TO MOVE CROSSLINE TO THE LEFT, LOOSEN RIGHT ADJUSTING SCREW AND TiGHTEN LEFT ADJUSTING SCREW BY AN EQUAL DEGREE.
D. TIGHTEN THE TWO CLAMP SCREWS.

TS 6675-29614/3-4

Figure 3-4. Horizontal collimation error, adjustment.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. PLATE LEVEL BUBBLE NOT CENTERED

Check if plate level is out of adjustment

Adjust plate level (fig. 3-3).

4. COLLIMATION LEVEL BUBBLE NOT CENTERED

Check if collimation level is out of adjustment.

Adjust collimation level (fig. 3-4).

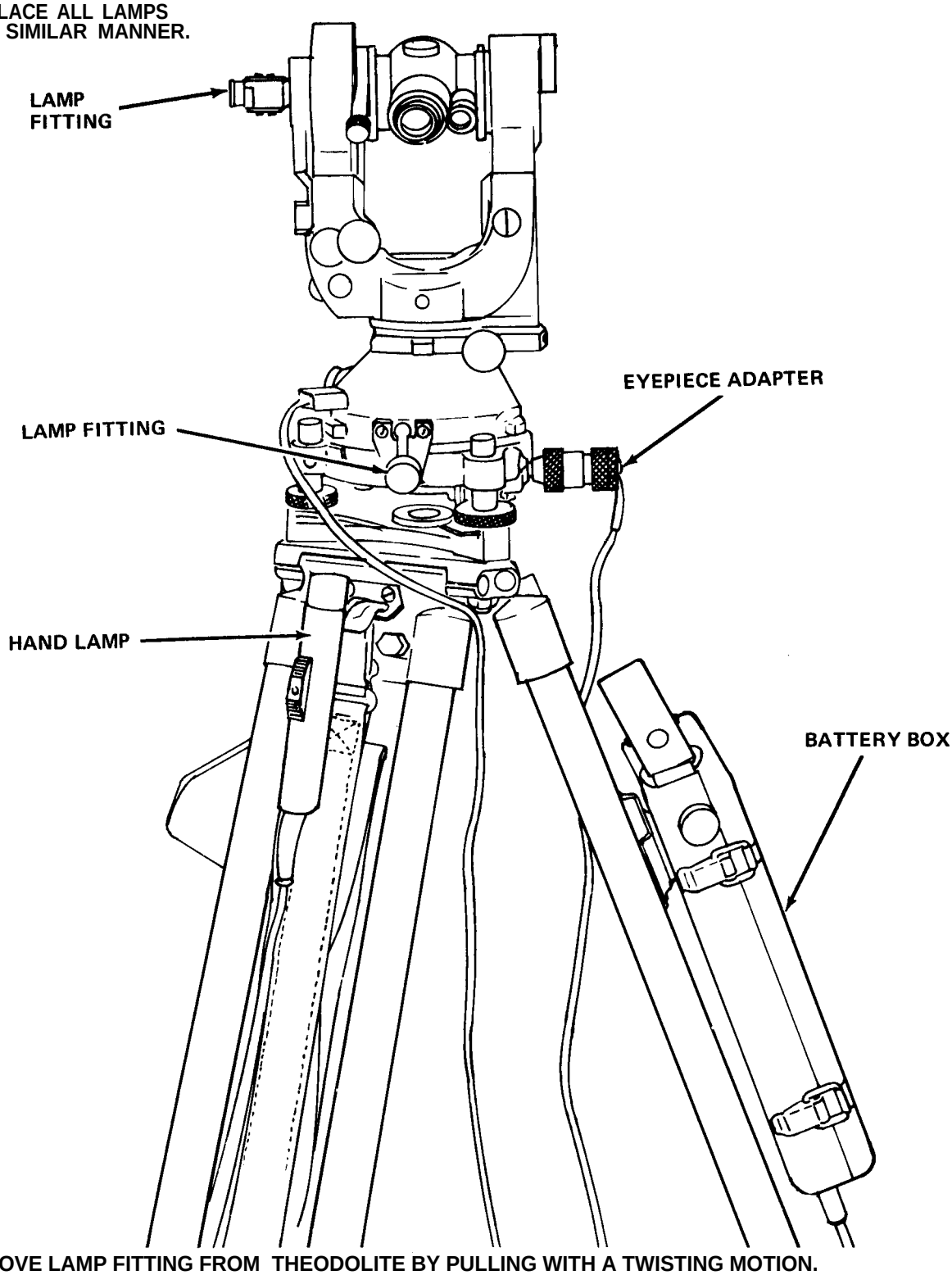
5. LIGHTS ON VERT. AND HORIZ. CIRCLES UNEQUAL OR ABSENT

Step 1. Check if illumination lamp is defective.

Replace lamp (fig. 3-5).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

NOTE: THEODOLITE MODEL T2 - 68MIL SHOWN, REPLACE ALL LAMPS IN A SIMILAR MANNER.



NOTE: REMOVE LAMP FITTING FROM THEODOLITE BY PULLING WITH A TWISTING MOTION. REMOVE LAMP FROM LAMP FITTING. OPEN BATTERY, BOX COVER AND REMOVE BATTERIES.

TS 6675-296-14/3-5

Figure 3-5. Lamps and battery, removal and installation.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 2. Check if illuminating mirror is defective.
Use mirror from the circle not in uee in order to complete the mission.
Step 3. Check if lamp fitting is defective.
Use lamp fitting from the circle not in use in order to continue mission.

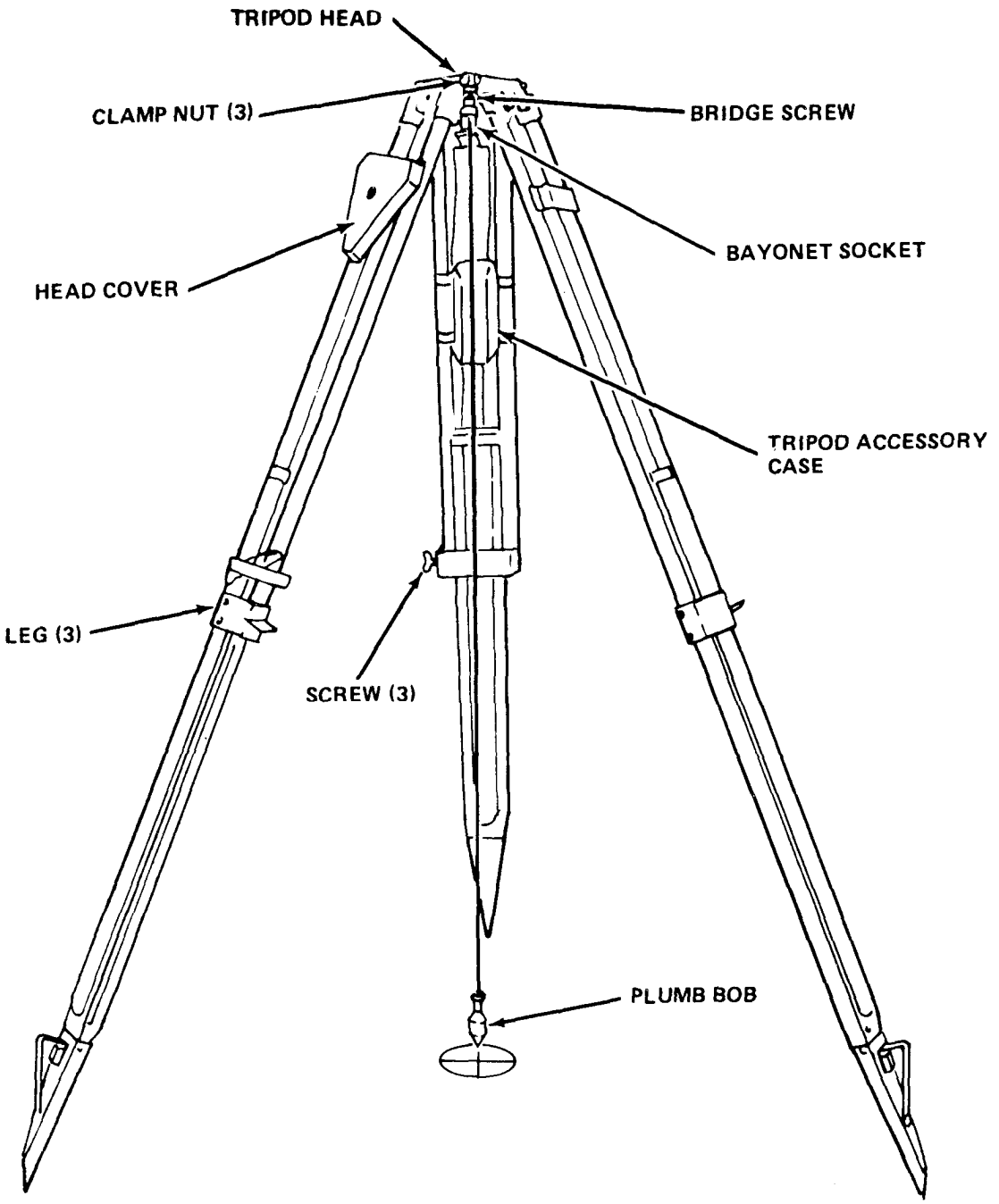
6. ILLUMINATION SYSTEM FAULTY OR FAILS TO FUNCTION

Check if batteries are detective.
Replace batteries (fig. 3-5).

7. TRIPOD LEGS WILL NOT LOCK IN POSITION

Check if leg clamping screws are loose.
Tighten screws (fig. 3-6).

MALFUNCTION
TESTOR INSPECTION
CORRECTIVE ACTION



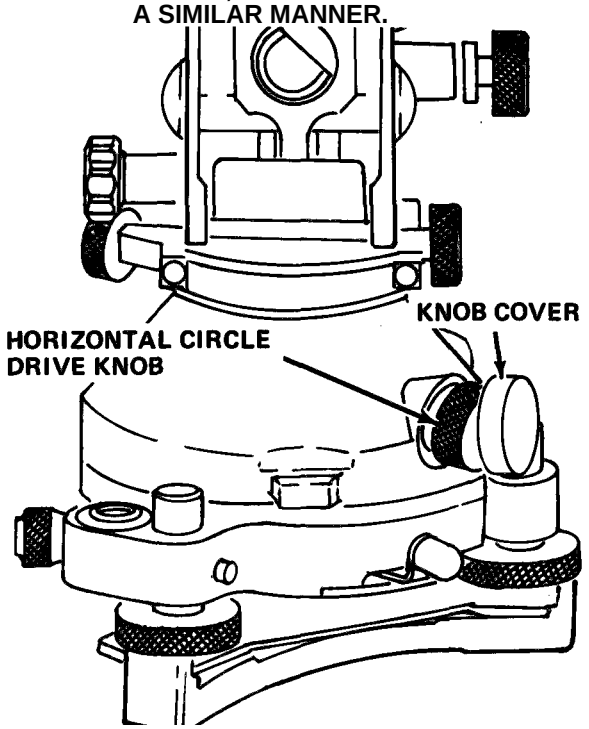
STEP 1. UNFOLD AND EXTEND LEGS TO DESIRED LENGTH, TIGHTEN SCREW (3).
STEP 2. TIGHTEN CLAMP NUT (3).
STEP 3. REMOVE PLUMB BOB FROM TRIPOD ACCESSORY CASE. INSERT BAYONET SOCKET INTO BRIDGE SCREW. SECURE BY TURNING CLOCKWISE 1/4 TURN.
STEP 4. POSITION TRIPOD SO THAT PLUMB BOB IS 1/2-INCH FROM STATION POINT.
STEP 5. SET LEGS FIRMLY IN GROUND WITH FOOT PRESSURE.
STEP 6. REMOVE PLMB BOB ASSEMBLY AND RETURN TO TRIPOD ACCESSORY CASE.
STEP 7. REMOVE HEAD COVER. STOW ON BRACKET.

TS 6675-296-14/3-6

Figure 3-6. Tripod and plumb bob, removal and installation.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
8. HORIZONTAL CIRCLE HARD TO MOVE	Check if circle drive knob is out of adjustment.	Adjust knob (fig. 3-7).

NOTE: THEODOLITE MODEL T2 - 63MIL SHOWN, ADJUST ALL MODELS IN A SIMILAR MANNER.



STEP 1. OPEN THE KNOB COVER.
STEP 2. TURN THE DRIVE KNOB UNTIL THE THREE SCREWS CAN BE SEEN THROUGH THE HOLES IN THE KNOB.
STEP 3. LOOSEN THE THREE SCREWS JUST ENOUGH TO MOVE THE KNOB. MOVE THE KNOB UP OR DOWN UNTIL IT TURNS SMOOTHLY WITHOUT WHIPLASH.
STEP 4. TIGHTEN THE THREE SCREWS AND CLOSE THE KNOB COVER.

TS 6675-296-14/3-7

Figure 3-7. Horizontal circle drive knob, adjustment.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. LEVELING SCREWS TOO TIGHT OR TOO LOOSE	Check if leveling screws are out of adjustment.	Adjust screws (fig 3-8),

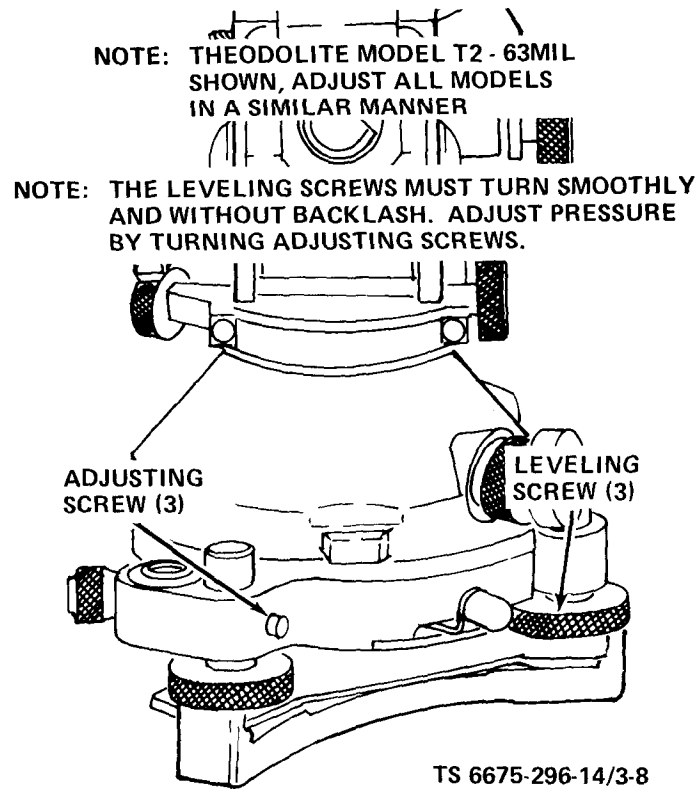


Figure 3-8. Leveling screws. adjustment.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
10. TELESCOPE TURNS TOO HARD OR TOO EASILY	
Check if telescope clamp is improperly set.	
	Loosen or tighten clamp (fig.3-9).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

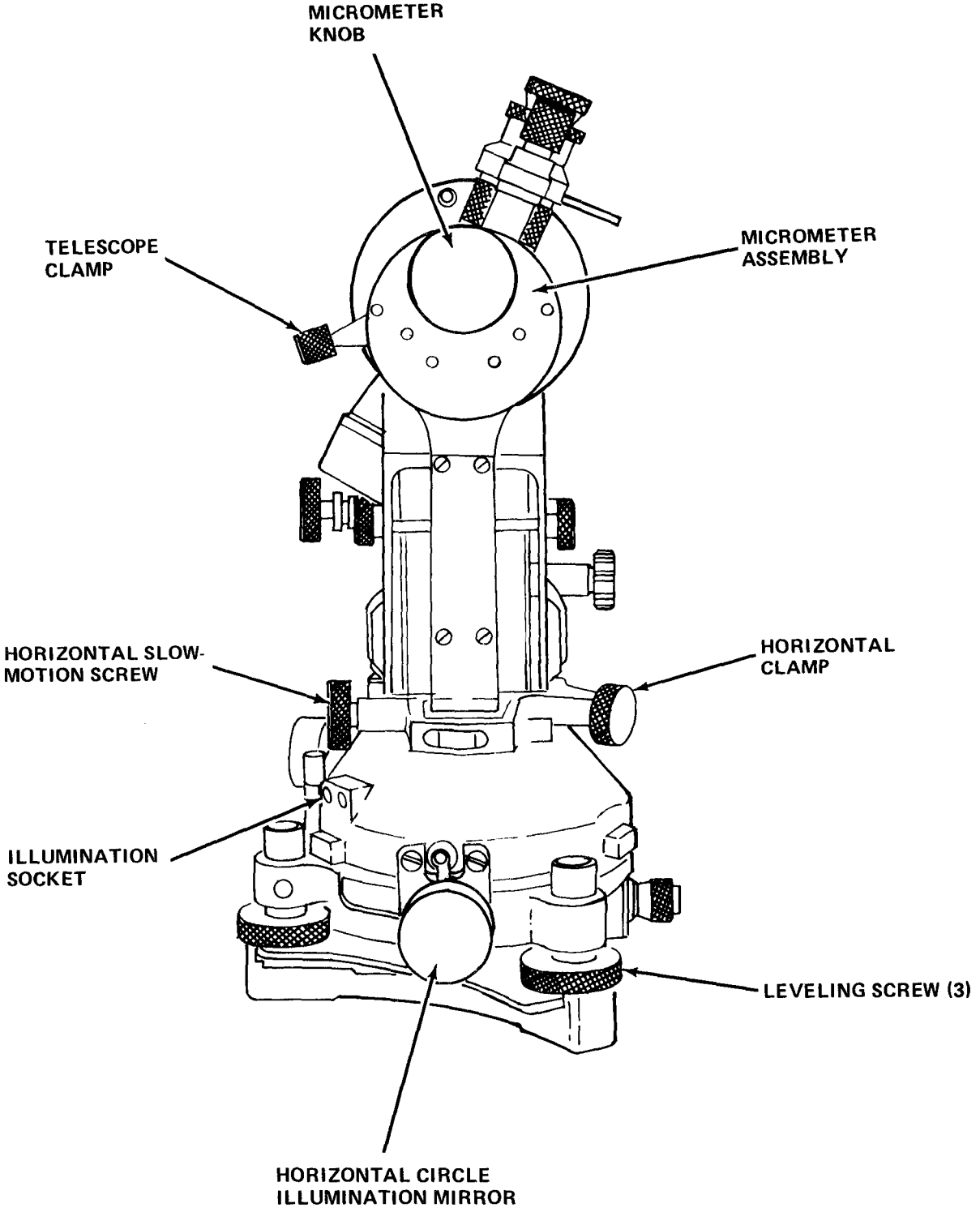
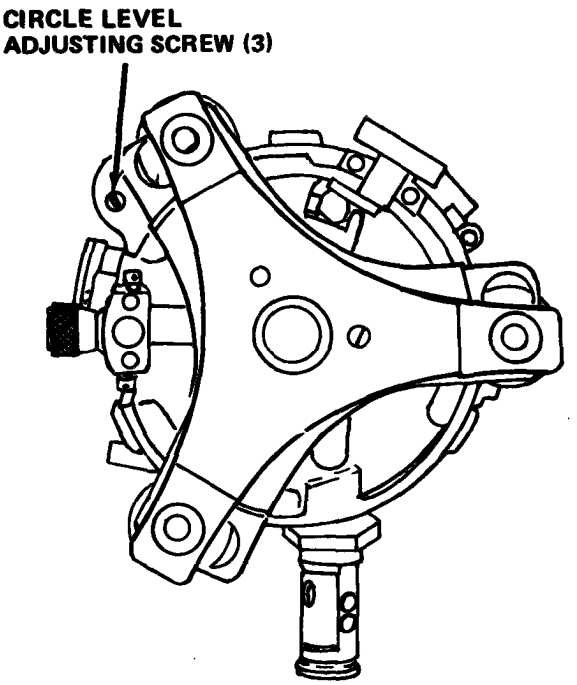


Figure 3-9. Theodolite (Models T2-63MIL, T2-66-C-MIL and T2-67MIL), right side view.

MALFUNCTION
TEST OR INSPECTION
CORRRECTIVE ACTION

11. CIRCULAR LEVEL BUBBLE NOT CENTERED

Check if circular level in out of adjustment.
Adjust circular level (fig. 3-10).



NOTE: THEODOLITE MODEL T2 - 63MIL SHOWN, ADJUST ALL MODELS IN A SIMILAR MANNER.

STEP 1. LEVEL THE THEODOLITE.
STEP 2. IF THE CIRCULAR LEVEL IS NOT CENTERED IN THE VIAL, THE CIRCULAR LEVEL IS OUT OF ADJUSTMENT. TIGHTEN OR LOOSEN THE THREE ADJUSTING SCREWS TO BRING THE LEVEL BUBBLE TO CENTER.

NOTE: NONE OF THE THREE ADJUSTING SCREWS SHOULD BE TIGHTENED ALL THE WAY. THEY SHOULD FLOAT ON THE ADJUSTING SPRINGS.

TS 6675-14/3-10

Figure 3-10. Circular adjustment.

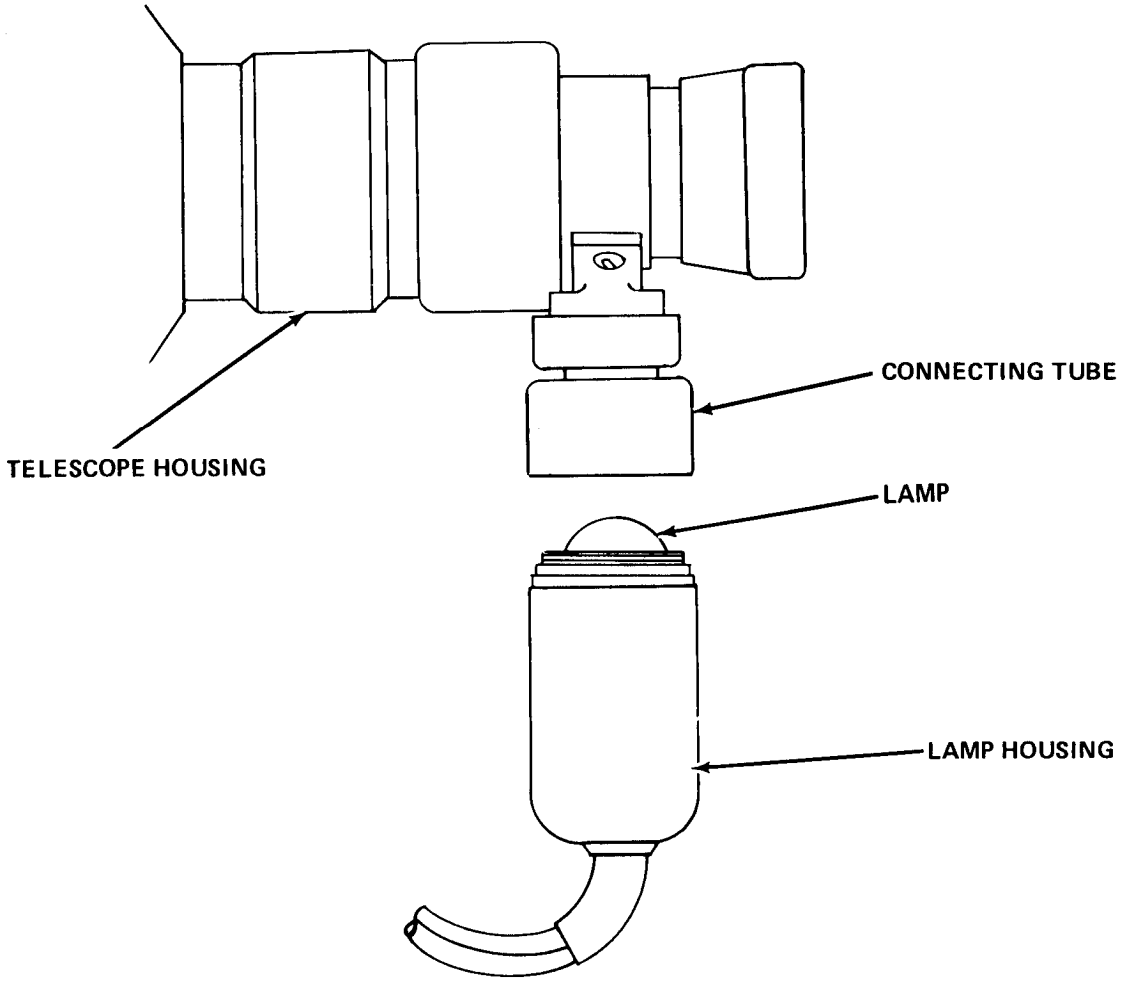
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

12. AUTO COLLIMATION EYEPIECE FAILS TO ILLUMINATE (Model T2-56-C-MIL)

Check if lamp is defective.

Replace lamp (fig. 3-11).

NOTE: THE AUTO COLLIMATION EYEPIECE IS USED ON MODEL T2-56-C-MIL ONLY.



NOTE: HOLD CONNECTING TUBE AND TURN LAMP HOUSING CLOCKWISE TO REMOVE, REMOVE LAMP FROM LAMP HOUSING.

TS 6675-296-14/3-11

Figure 3-11. Auto collimation eyepiece lamp, removal and installation.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
13. TELESCOPE CROSSLINES WILL NOT FOCUS	
Check if telescope eyepiece is defective. Return to organizational maintenance.	
14. CIRCLE AND MICROMETER IMAGES WILL NOT FOCUS	
Check if microscope eyepiece is defective. Return to organizational maintenance.	

Section IV. MAINTENANCE PROCEDURES

3-5. Haversack and Accessory Case

The operator shall service the haversack and the accessory case. He shall make certain that the accessory case contains all the components shown by figure 3-12, and the optical plummet eyepiece adapter.

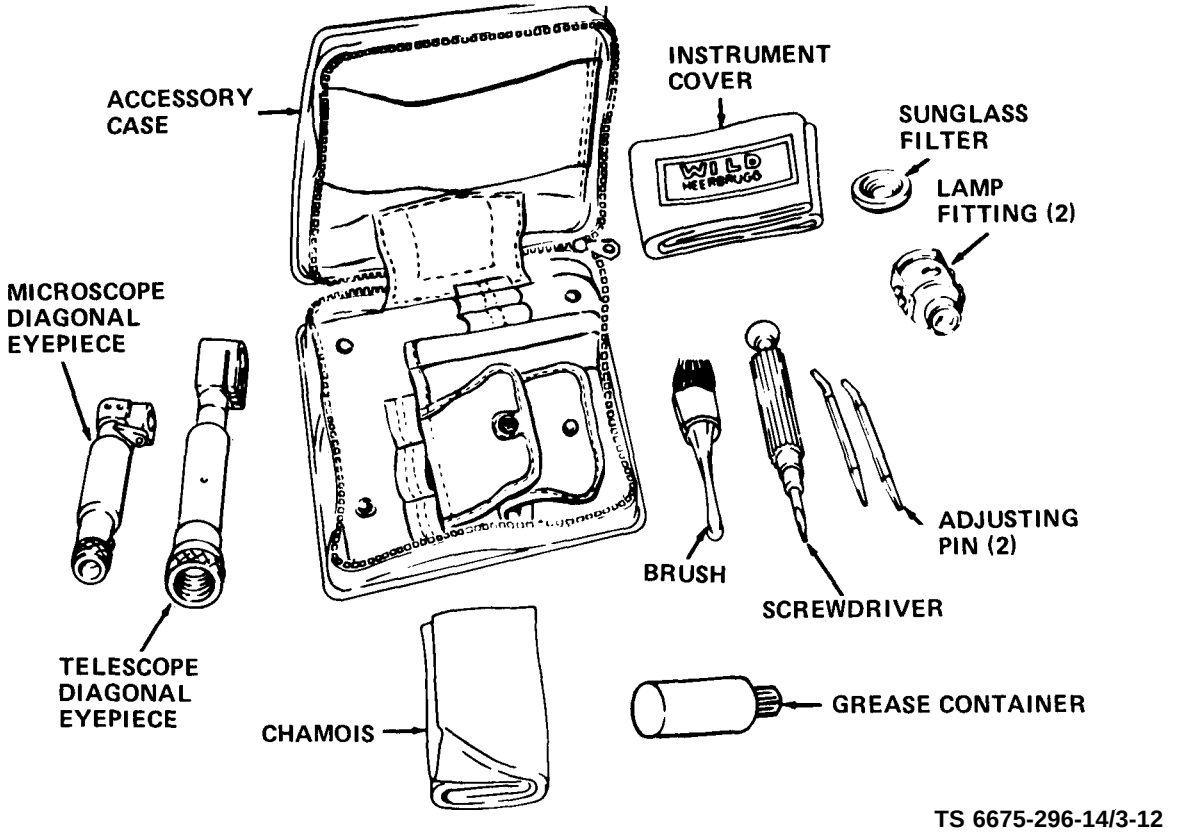
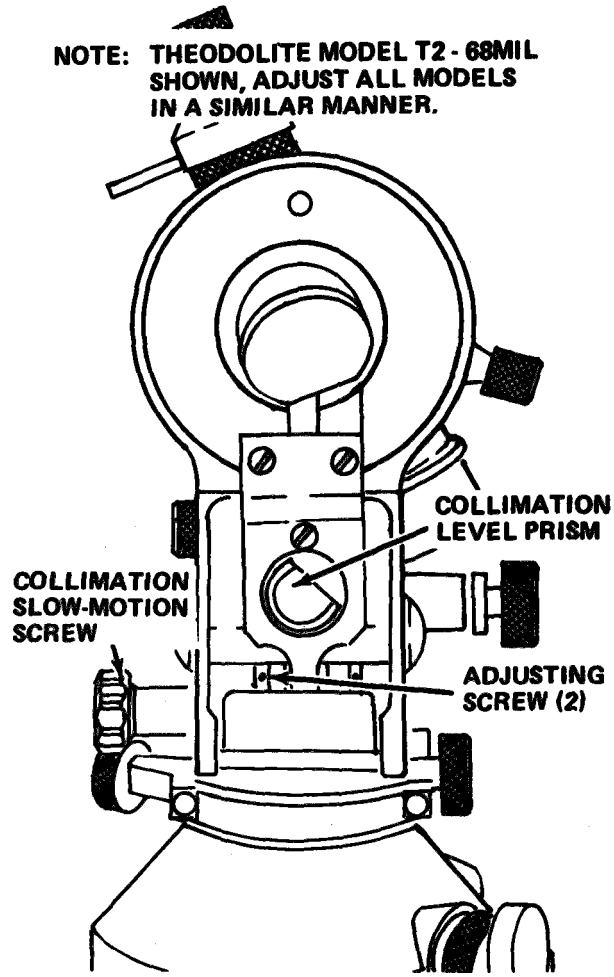


Figure 3-12. Accessory case, unpacked view.

3-6. Vertical Collimation Level

The operator shall refer to figure 3-13 and adjust the theodolite vertical collimation error.



STEP 1. SIGHT A WELL DEFINED OBJECT WITH THE HORIZONTAL CROSSLINE. COINCIDE THE COLLIMATION LEVEL BUBBLE BY TURNING COLLIMATION SLOW-MOTION SCREW. MAKE THE COINCIDENCE OF THE GRADUATION LINES AND RECORD THE SCALE READINGS.

STEP 2. REVERSE THE TELESCOPE POSITION AND SIGHT THE OBJECT. COINCIDE THE COLLIMATION LEVEL BUBBLE, MAKE THE COINCIDENCE OF THE GRADUATION LINES AND RECORD THE SCALE READINGS.

STEP 3. THE TOTAL OF THE TWO READINGS, REDUCED BY 6,400 MILS, IS TWICE THE COLLIMATION ERROR. COMPUTE THE ZENITH DISTANCE AND SET THE MICRO-METER SCALE AT THE CORRECT READING.

STEP 4. MAKE THE COINCIDENCE OF THE GRADUATION LINES.

STEP 5. COINCIDE THE COLLIMATION LEVEL BUBBLE BY LOOSENINGS ONE ADJUSTING SCREW AND TIGHTENIN6 THE OTHER ADJUSTING SCREW BY AN EQUAL DEGREE.

TS 6675-296-14/2-13

Figure 3-13. Vertical collimation error, adjustment.

3-7. Tribrach Assembly

Inspect the tribrach lock lever or lock knob as applicable, for ease of snapping in and out of lock position and for sufficient tension to lock the instrument to the tribrach.

3-8. Battery Box

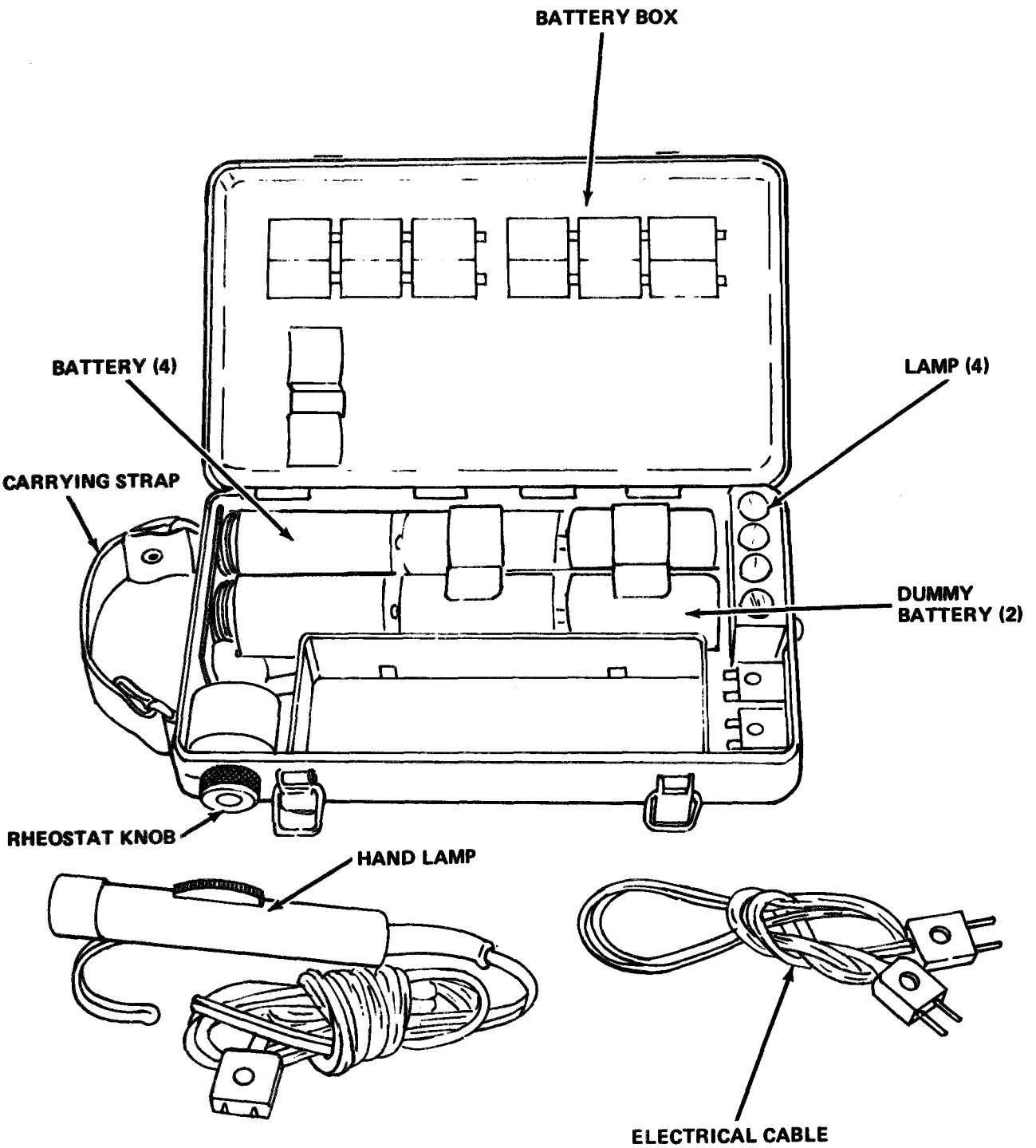
a. Inspect the battery box (fig. 3-14) for damage, rust, and defective clamps and carrying handle. Make certain the box contains all the components shown.

b. Turn the rheostat knob through its full travel. The movement should be smooth and free of binding.

c. Inspect all electrical contacts for loose connections and corrosion.

d. Inspect the hand light for broken casing, defective switch, insecure or damaged plug, and frayed insulation.

e. Inspect the electrical cable for insecure or damaged plugs and frayed or cracked insulation.



TS 6675-296-14/3-14

Figure 3-14. Battery box and contents.

3-9. Tripod Assembly

Inspect the tripod assembly (fig. 3-15) for damaged or missing parts and loose or missing hardware.

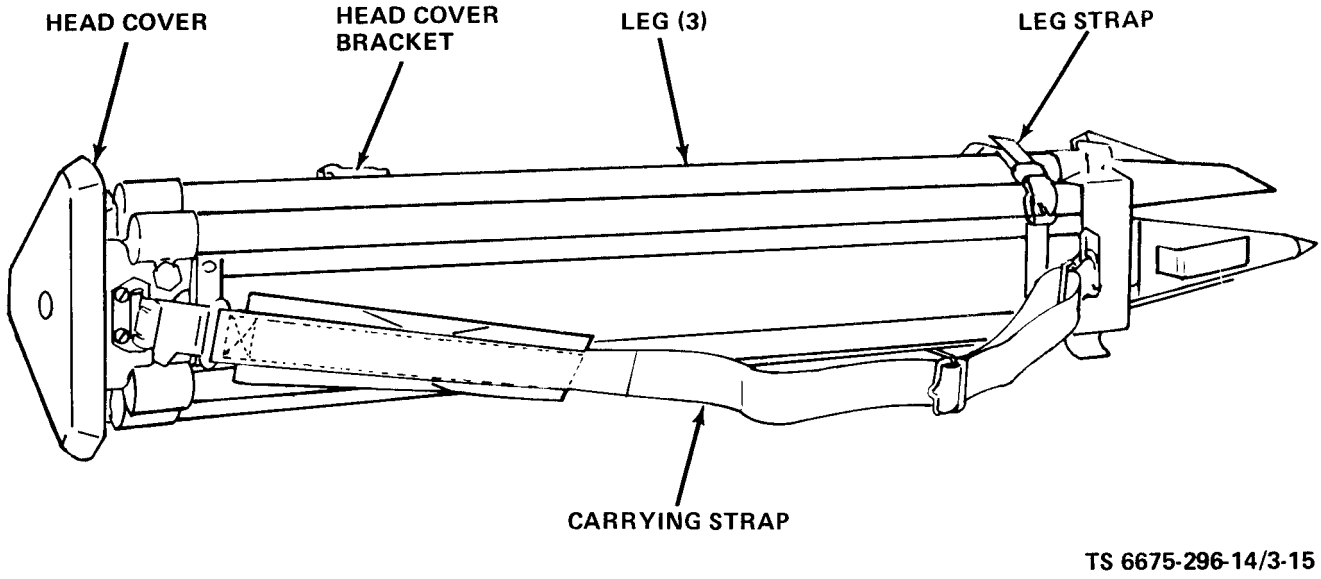


Figure 3-15. Tripod assembly.

3-10. Plumb Bob Assembly

Refer to figure 3-16 and inspect the tripod accessory case for damage. See that the plumb bob assembly and tripod wrench are contained in the case and are in serviceable condition.

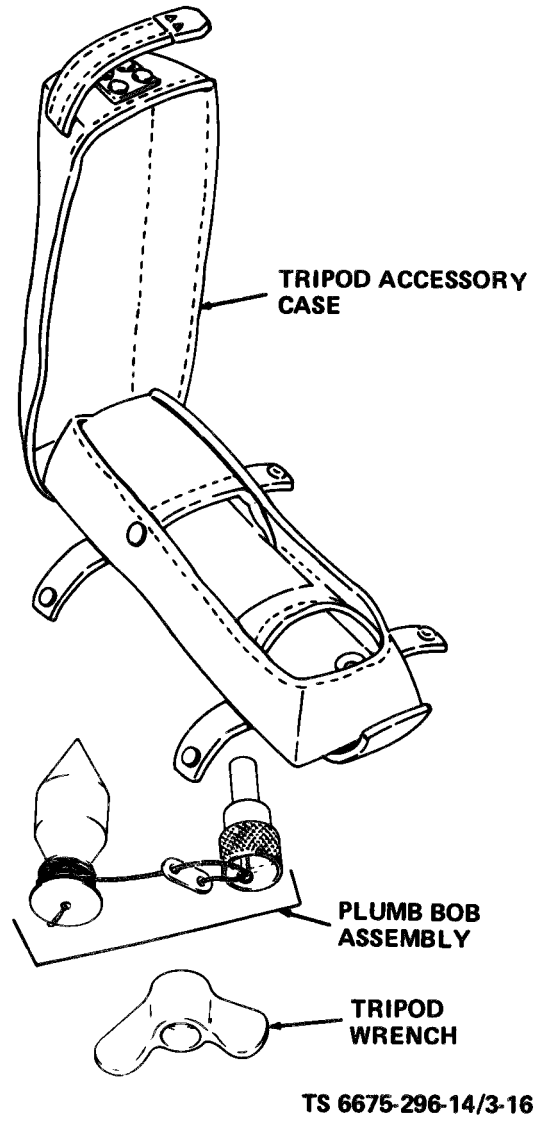


Figure 3-16. Tripod accessory case, unpacked view.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section L SERVICE UPON RECEIPT OF MATERIEL

4-1. Inspecting and Servicing the Equipment

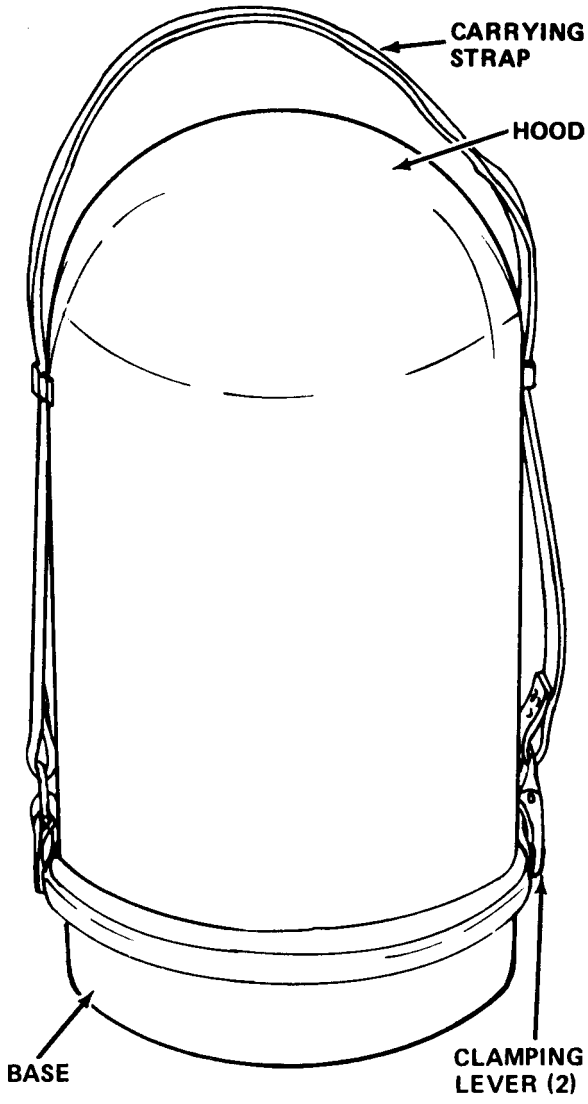
a. General. Perform preventive maintenance checks and services in accordance with table 4-1.

Table 4-1. Operator/Crew Preventive Maintenance Checks and Services

INTERVAL		S-SEMIANNUAL (6 MONTHS)		
Item No.	S	Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment is Not Ready/ Available if:
			NOTE PERFORM OPERATOR/CREW PMCS AND LUBRICATION PRIOR TO OR IN CONJUNCTION WITH ORGANIZATIONAL PMCS. Lubrication instructions section IV (para 4-9 and 4-10)	
1	●	Theodolite components and accessories	Clean and inspect per paragraph 4-1 thru 4-3. Replace or dehydrate desiccant if color is pink.	

b. Carrying Case.

(1) Inspect the carrying case hood and base (figure 4-1) for dents, cracks, and rust. Inspect clamps and carrying strap for defects.



STEP 1. GRASP CARRYING STRAP JUST ABOVE CLAMPING LEVERS AND PULL OUTWARD TO RELEASE CLAMPS.

STEP 2. LIFT THE HOOD FROM THE BASE.

TS 6675-269-14/4-1

Figure 4-1. Theodolite carrying case hooa, removal and installation.

(2) Refer to figure 4-2 and remove theodolite from carrying case base.

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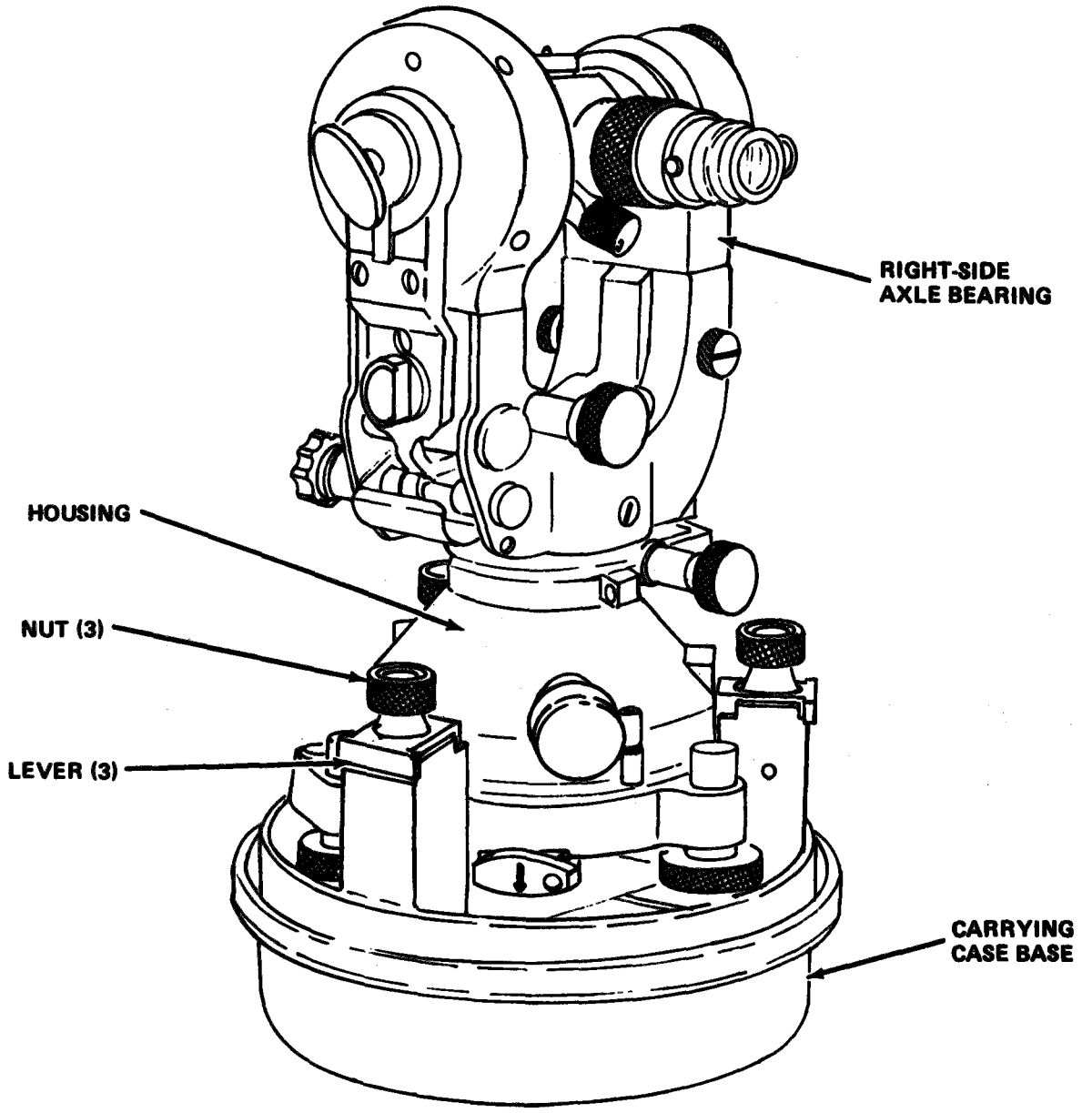
NOTE: THEODOLITE MODEL
T2 - 68MIL SHOWN
REMOVE ALL MODELS
IN A SIMILAR MANNER.



STEP 1. LOOSEN THE THREE NUTS AND PULL LEVERS AWAY FROM CARRYING CASE BASE.
STEP 2. GRASP THE RIGHT-SIDE AXLE BEARING WITH ONE HAND AND PLACE THE OTHER HAND BELOW THE HOUSING; LIFT THE THEODOLITE FROM THE CARRYING CASE BASE.
STEP 3. PLACE THE THEODOLITE ON A FIRM, LEVEL SURFACE.

TS 6675-296-14/4-2

Figure 4-2. Theodolite carrying case *base, removal and installation.*

CAUTION

Do not grasp the left hand axle bearing when lifting the theodolite. This will cause undue pressure on the collimation lever and make readjustment necessary.

(3) Inspect the gasket in the carrying case base (fig. 4-3).

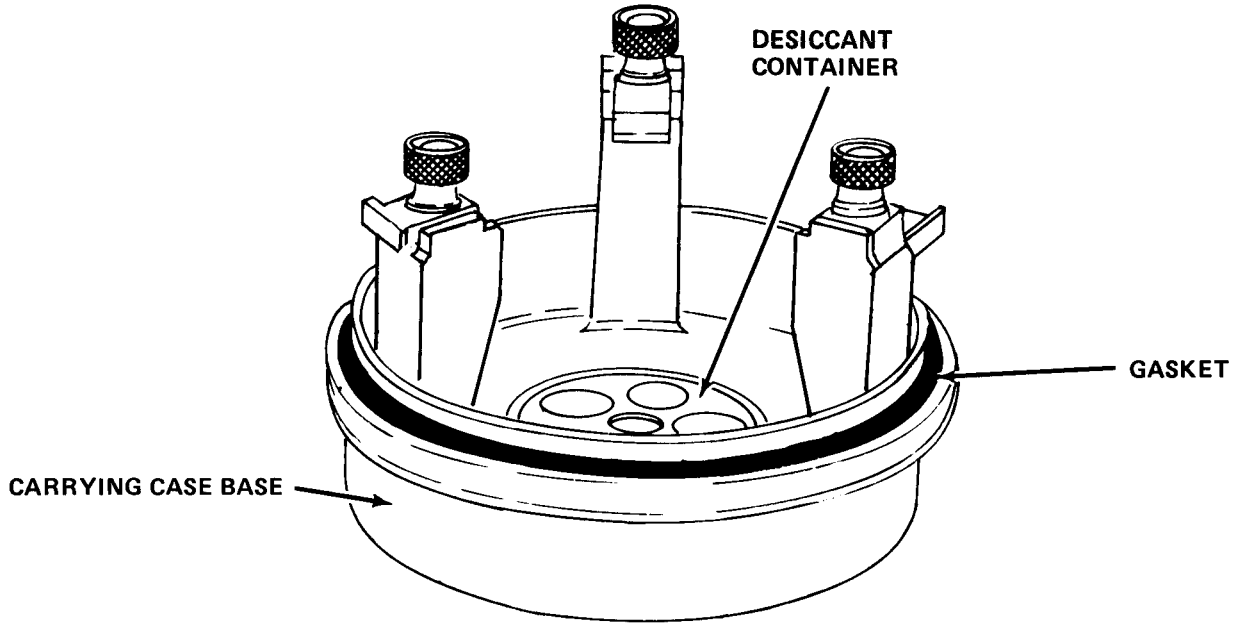


Figure 4-3. Carrying case base.

(4) Inspect the carrying case desiccant for discoloration.

NOTE

Desiccant should be blue in color. Pink desiccant indicates moisture saturation and must be dehydrated or replaced. Instrument should be inspected for moisture damage if desiccant is pink.

c. *Theodolite.*

(1) Visually inspect the theodolite for broken or missing parts, cracked or scratched lens and mirrors, loose or missing hardware, and other indications of damage.

(2) Inspect three leveling screws (figure 4-4) for rough travel and instability throughout their range. The leveling screws must turn easily with thumb and finger pressure, but they must be tight enough to hold the instrument in any position. Leave screws at midpoint of travel.

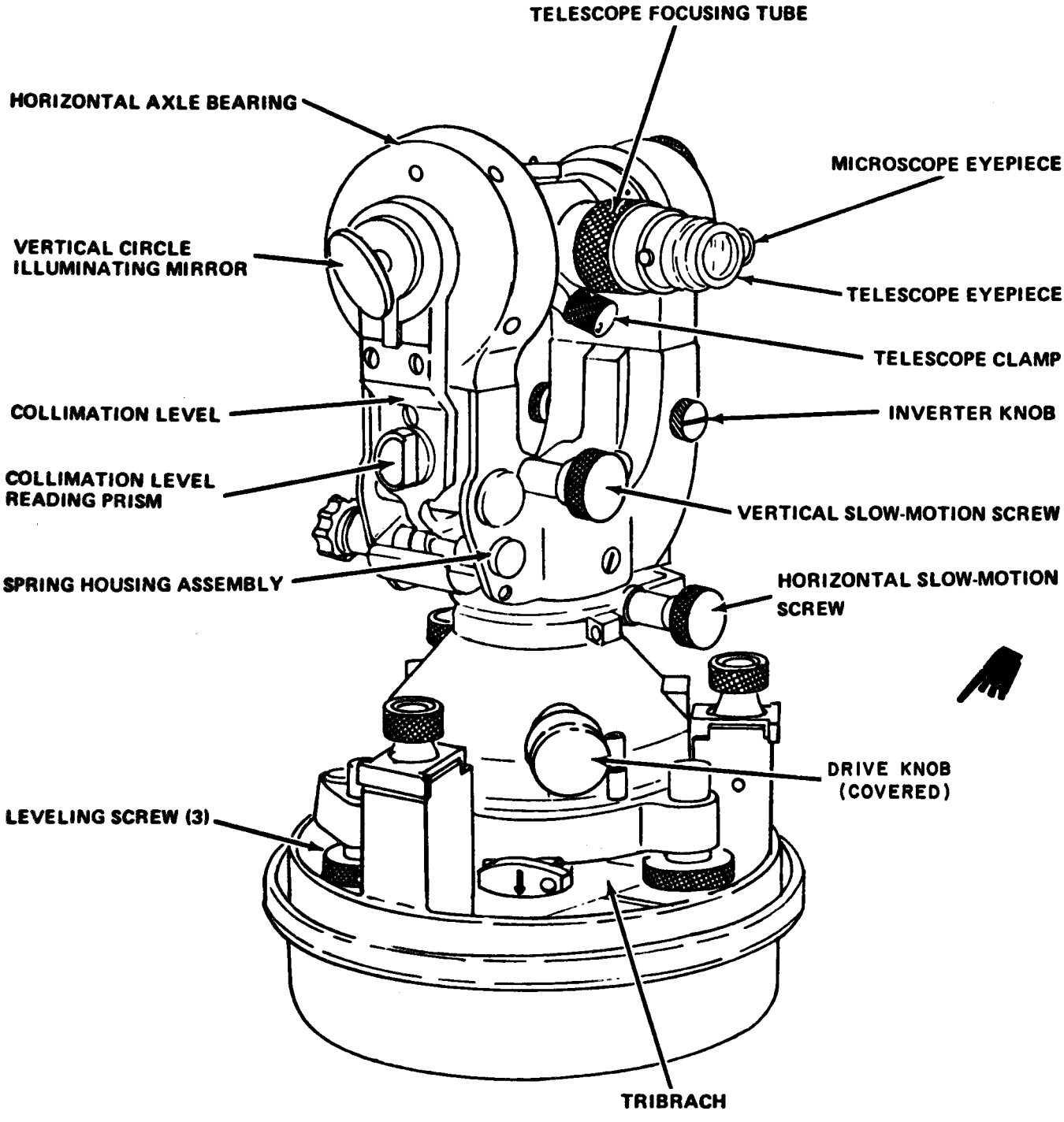


Figure 4-4. Theodolite (Model T2-56-M-MIL), left rear, three-quarter view.

(3) Inspect the telescope and horizontal clamps (fig. 4-5) for proper operation. Clamp should lock instrument position at a given point with only slight pressure. Do not overtighten.

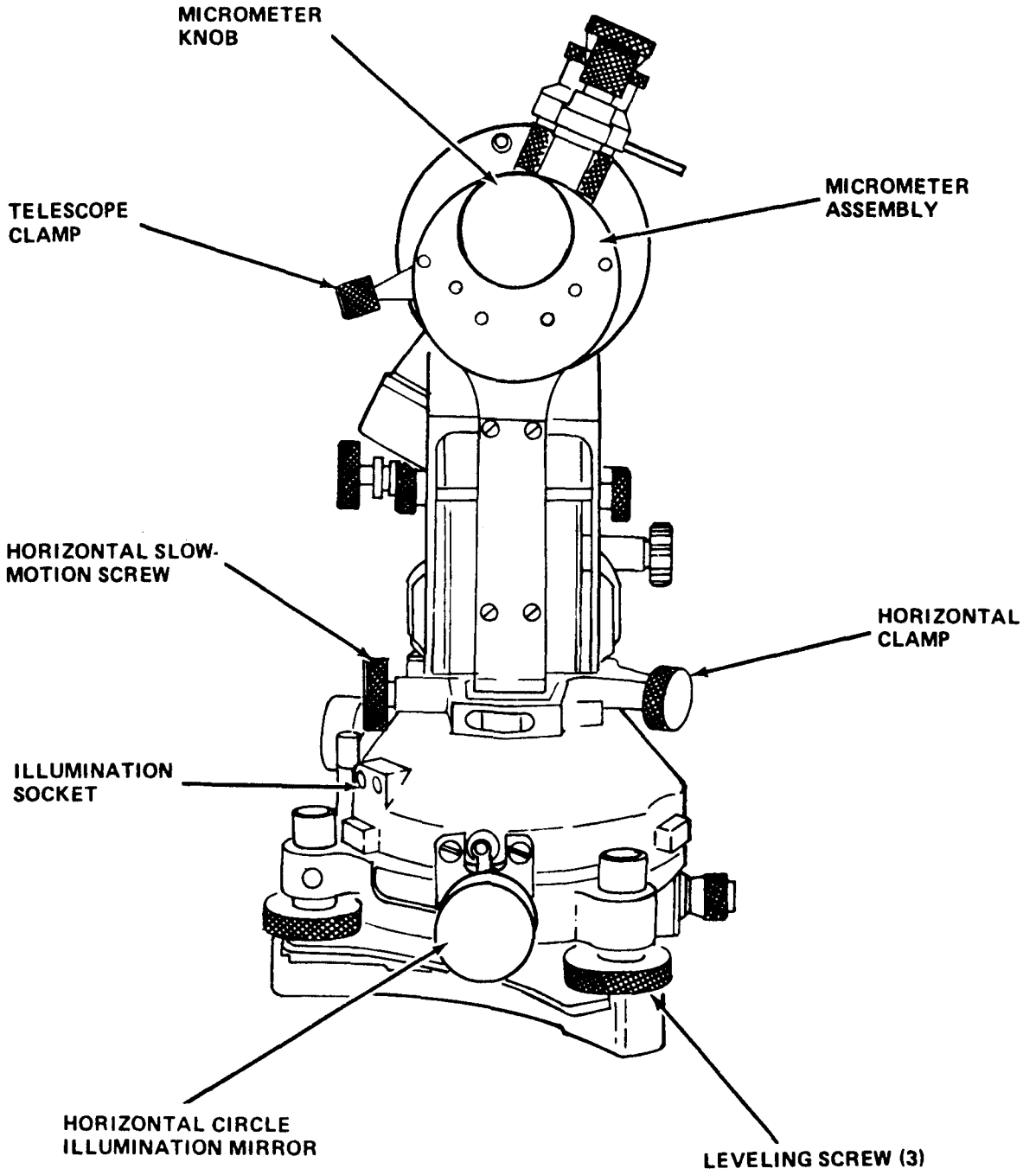
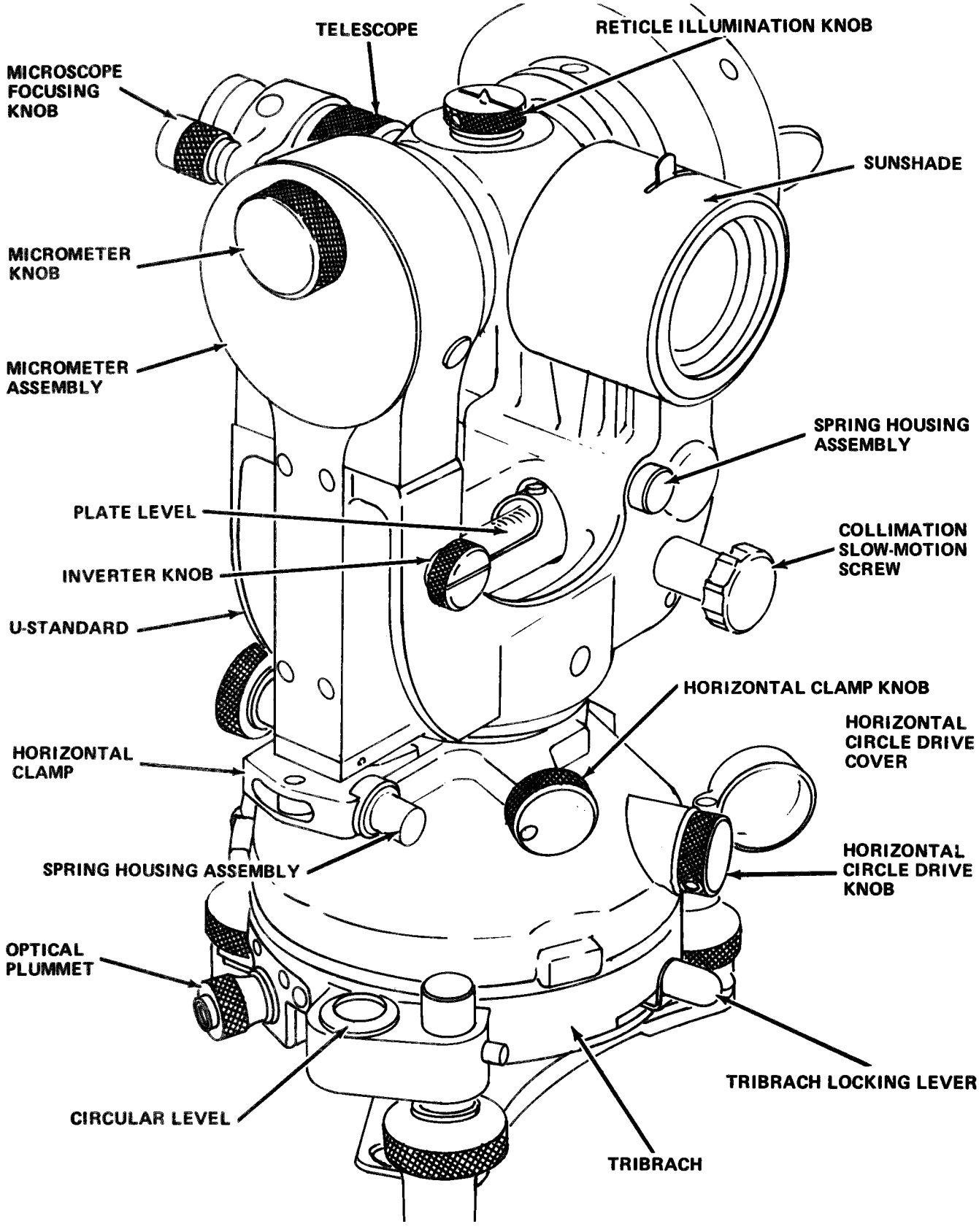


Figure 4-5. Theodolite (Models T2 - 63MIL, T2-66-C-MIL and T2-67MIL), right side view.

(4) Inspect the horizontal slow-motion screw, vertical slow-motion screw (fig. 4-4), and collimation slow-motion screw (fig. 4-6) for improper operation.



TS 6675-296-14/4-6

Figure 4-6. *Theodolite (Model T2-56-M-MIL), right front, three-quarter view.*

(5) Inspect the reticle illumination knob, micrometer knob and inverter knobs (figure 4-4), for smooth operation throughout their full travel.

(6) Inspect the telescope focusing tube (fig. 4-4), telescope eyepiece, and microscope eyepiece for smooth operation throughout their full travel.

(7) Inspect the optical lenses for finger marks, dust, scratches, and etching. Remove dust with the camel's hair brush. Foreign matter may be removed by breathing on the lens and wiping dry with a chamois, or with lens tissue and grain alcohol or acetone.

CAUTION

Do not use acetone on plastic material.

(8) Inspect the tribrach lock lever or lock knob as applicable, for ease of snapping in and out of lock position and for sufficient tension to lock the instrument to the tribach.

(9) Inspect the horizontal circle and vertical circle illumination mirrors (fig. 4-7). These mirrors must snap into position firmly and securely. They must rot ate freely, have a smooth, snug hinge action and remain in the position placed.

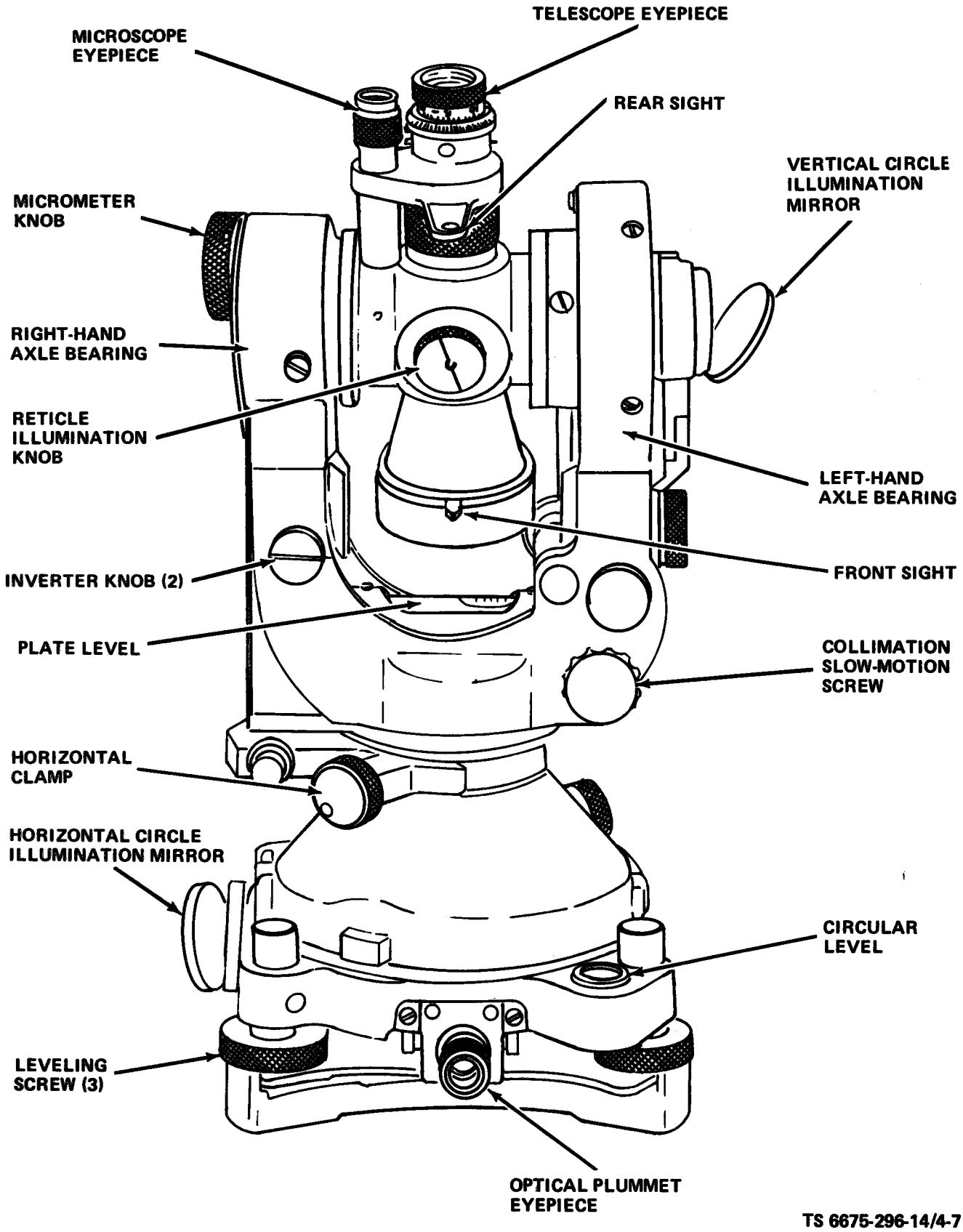


Figure 4-7. Theodolite (Models T2-63MIL, T2-66-C-MIL and T2-67MIL), front view.

(10) Inspect the circular level, plate level, and collimation level mirror for cracks, breakage, and looseness.

d. Tripod Assembly.

(1) Inspect the tripod assembly (fig. 4-8) for damaged or missing parts and loose or missing hardware.

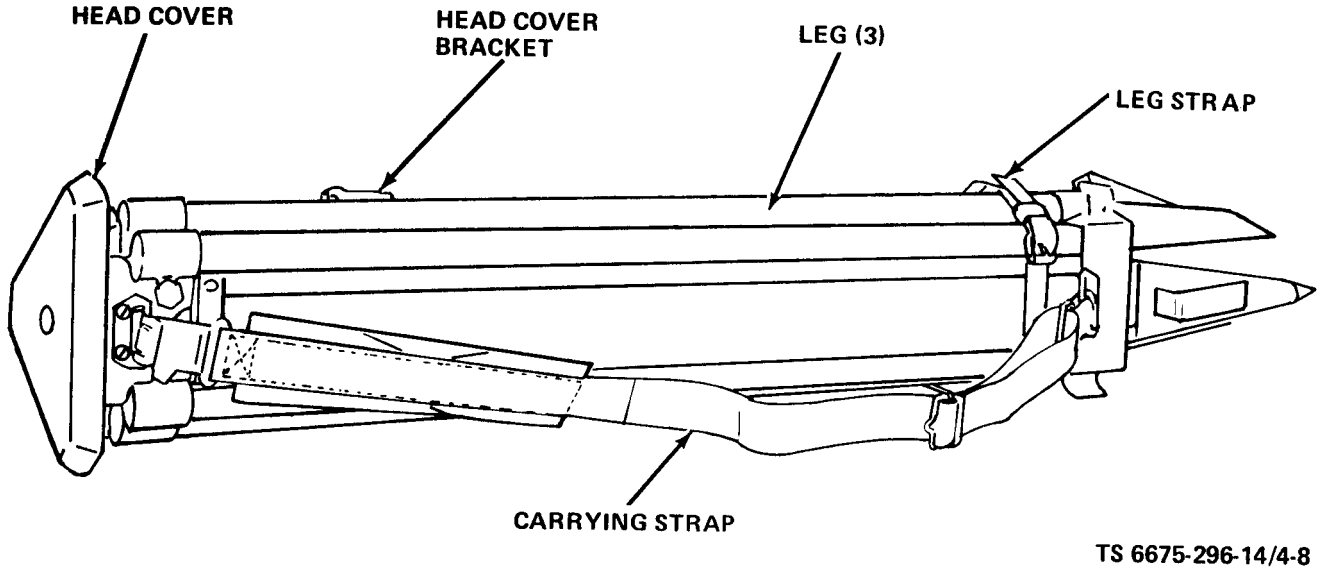


Figure 4-8. Tripod assembly.

(2) Refer to figure 4-9 and inspect the tripod accessory case for darnage. See that the plumb bob assembly and tripod wrench are contained in the case and are in serviceable condition.

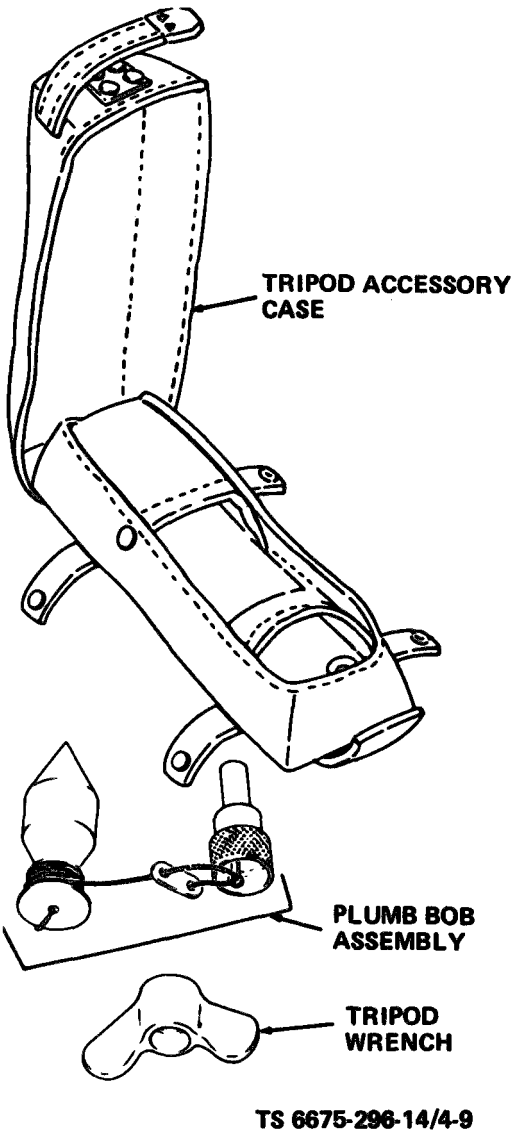


Figure 4-9. Tripod accessory case, unpacked view.

e. Accessory Case.

(1) Inspect the accessory case for damage and defective zipper and snaps. Make certain that the case contains the component shown by figure 4-10, and the optical plummet eyepiece adapter.

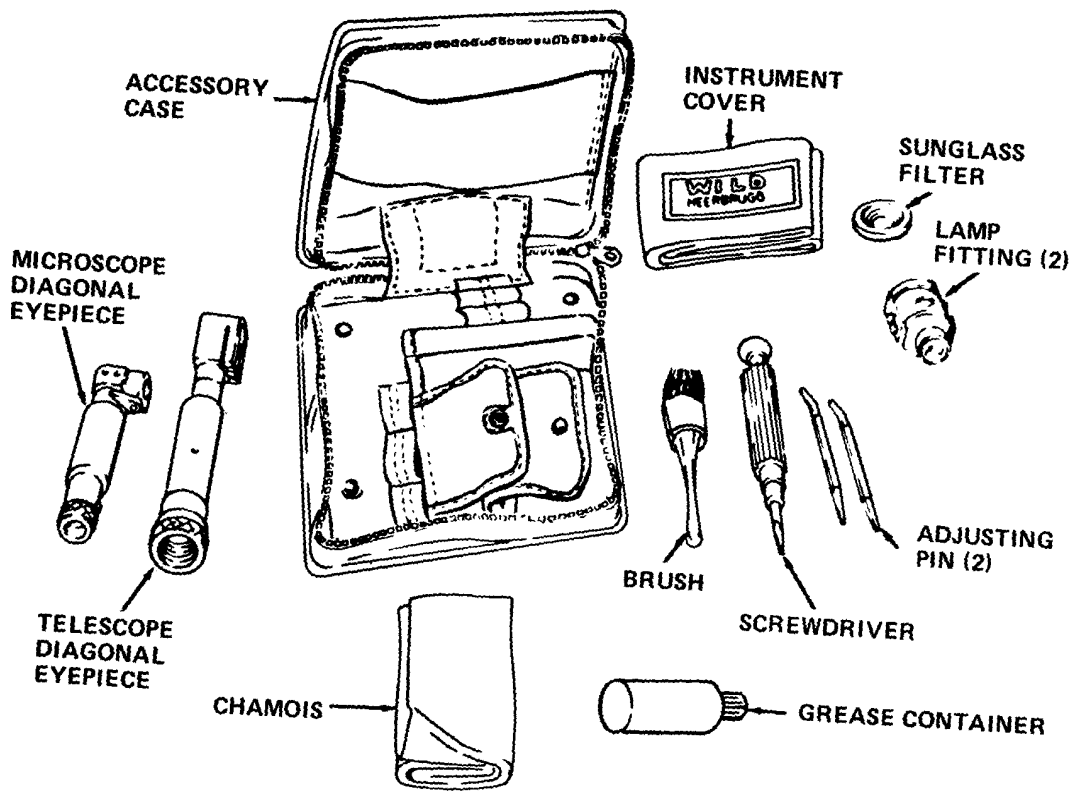


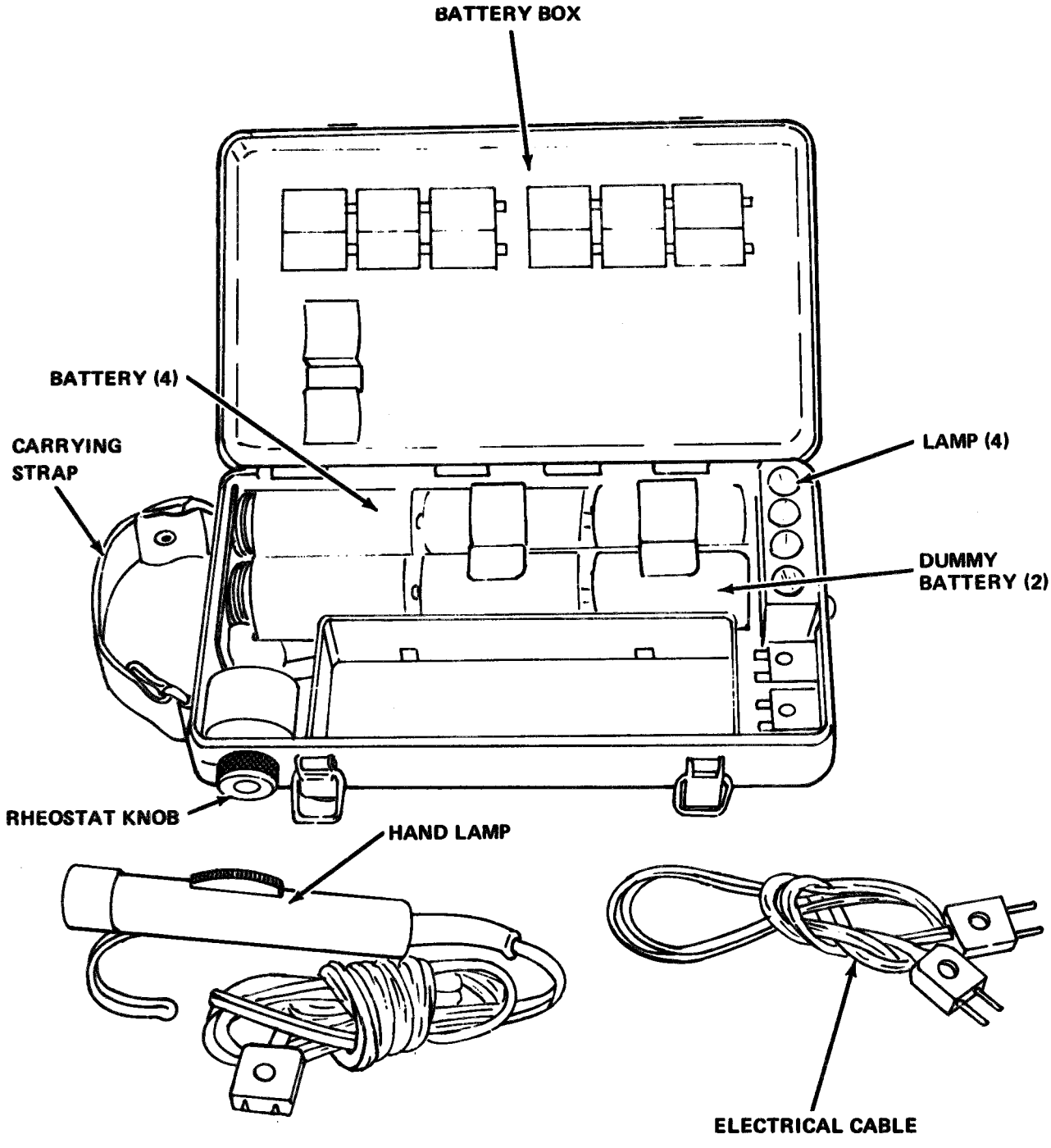
Figure 4-10. Accessory case, unpacked view,

(2) Inspect the telescope and microscope diagonal eyepieces and the telescope sunglass filter for scratches, cracks, and defective mounting.

(3) Inspect the lamp fittings for broken glass and corroded or defective contact.

f. Battery Box.

(1) Inspect the battery box (fig. 4-11) for damage, rust, and defective clamps and Carrying handle. Make certain the box contains all the components shown.



TS 6675-296-14/4-11

Figure 4-11. Battery box and controls.

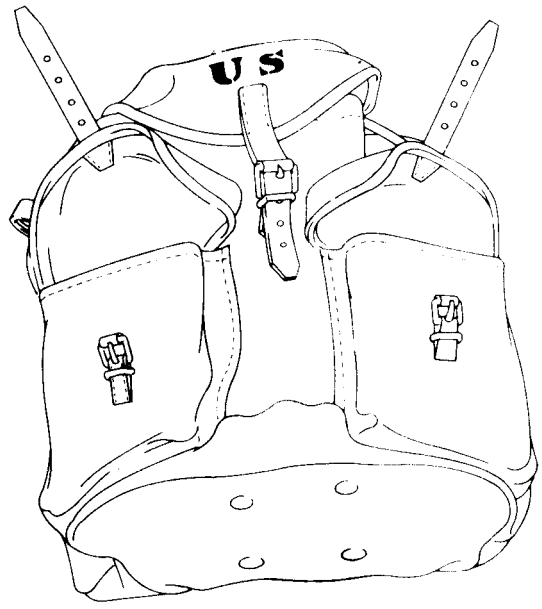
(2) Turn the rheostat knob through its full travel. The movement should be smooth and free of binding.

(3) Inspect all electrical contacts for loose connections and corrosion.

(4) Inspect the hand lamp for broken casing, defective switch, insecure or damaged plug, and frayed insulation.

(5) Inspect the electrical cable for insecure or damaged plugs and frayed or cracked insulation.

g. Haversack. Inspect the haversack (fig. 4-12) for damaged straps, insecure or defective buckles, torn padding, and tears or cuts.



TS 6675-296-14/4-12

Figure 4-12. Haversack.

h. Winterization Kit Case.

(1) Inspect the winterization kit case for damage and defective zipper or snaps. Make certain the case contains the components shown by figure 4-13.

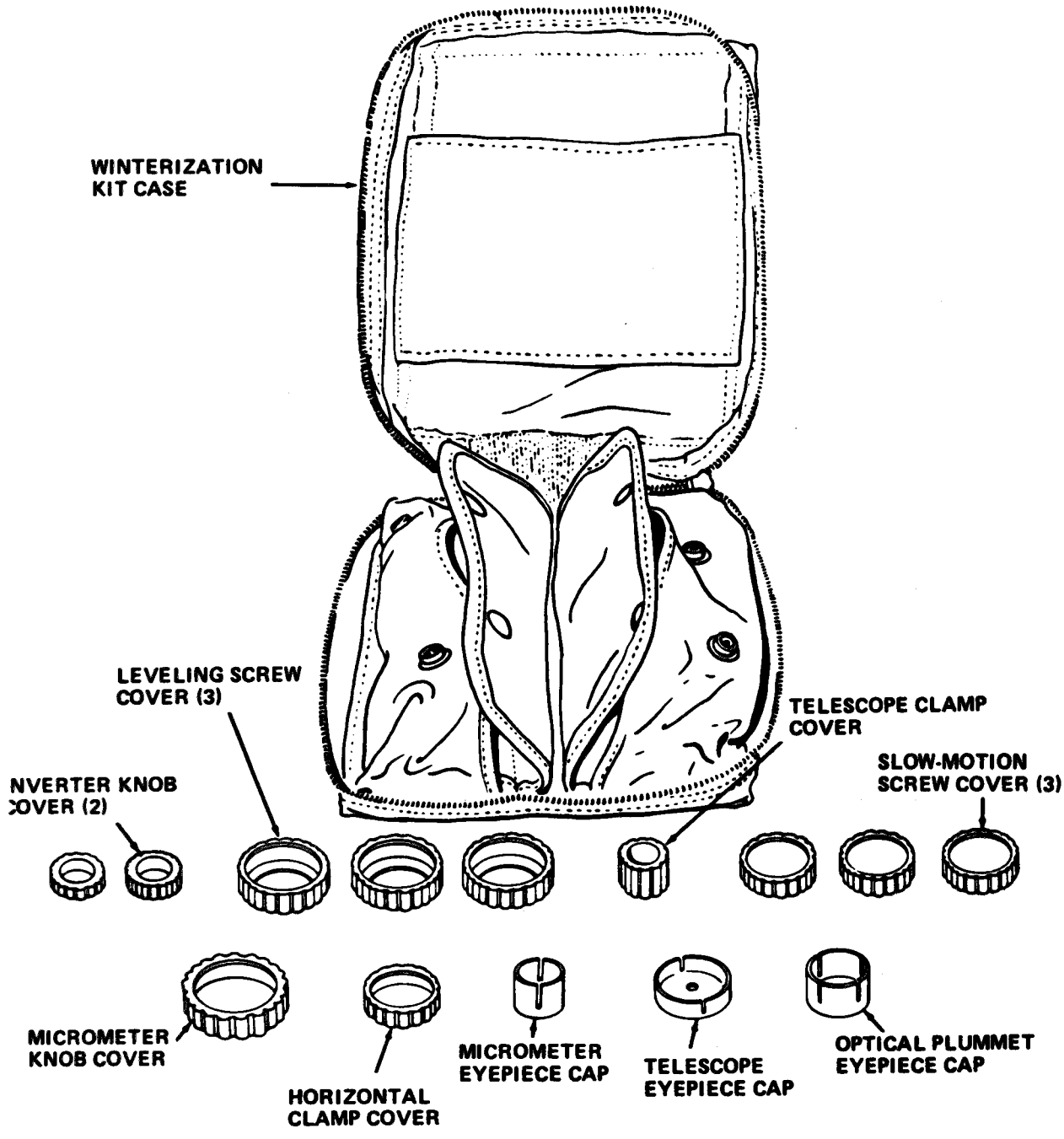
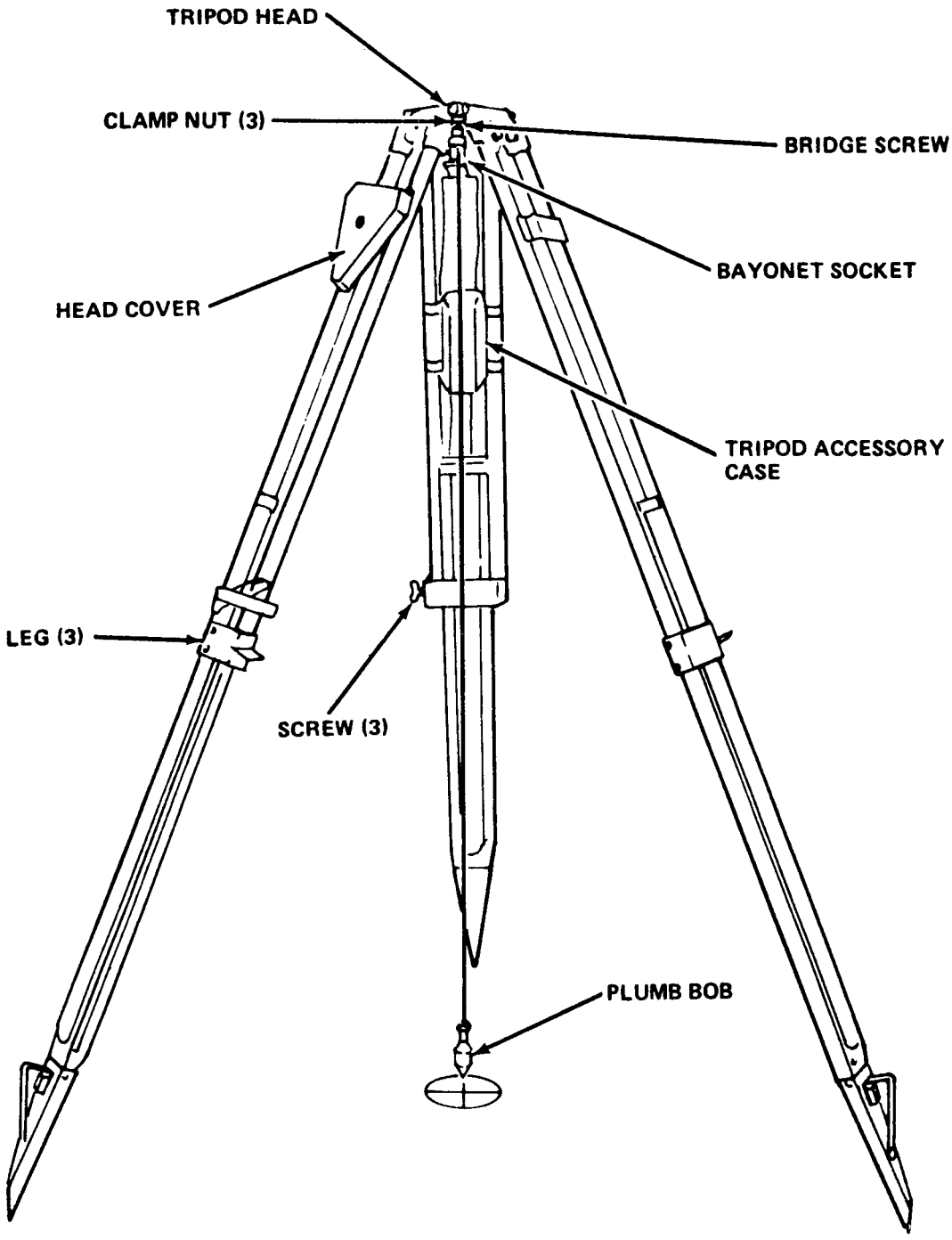


Figure 4-13. Winterization *kit case, unpacked view.*

(2) Inspect all covers and caps for defects.

4-2. Installation

a. Tripod. Refer to figure 4-14 and set up the tripod.



STEP 1. UNFOLD AND EXTEND LEGS TO DESIRED LENGTH, TIGHTEN SCREW (3).
STEP 2. TIGHTEN CLAMP NUT (3).
STEP 3. REMOVE PLUMB BOB FROM TRIPOD ACCESSORY CASE. INSERT BAYONET SOCKET INTO BRIDGE SCREW. SECURE BY TURNING CLOCKWISE 1/4 TURN.
STEP 4. POSITION TRIPOD SO THAT PLUMB BOB IS 1/2-INCH FROM STATION POINT.
STEP 5. SET LEGS FIRMLY IN GROUND WITH FOOT PRESSURE.
STEP 6. REMOVE PLMB BOB ASSEMBLY AND RETURN TO TRIPOD ACCESSORY CASE.
STEP 7. REMOVE HEAD COVER. STOW ON BRACKET.

TS 6675-296-14/4-14

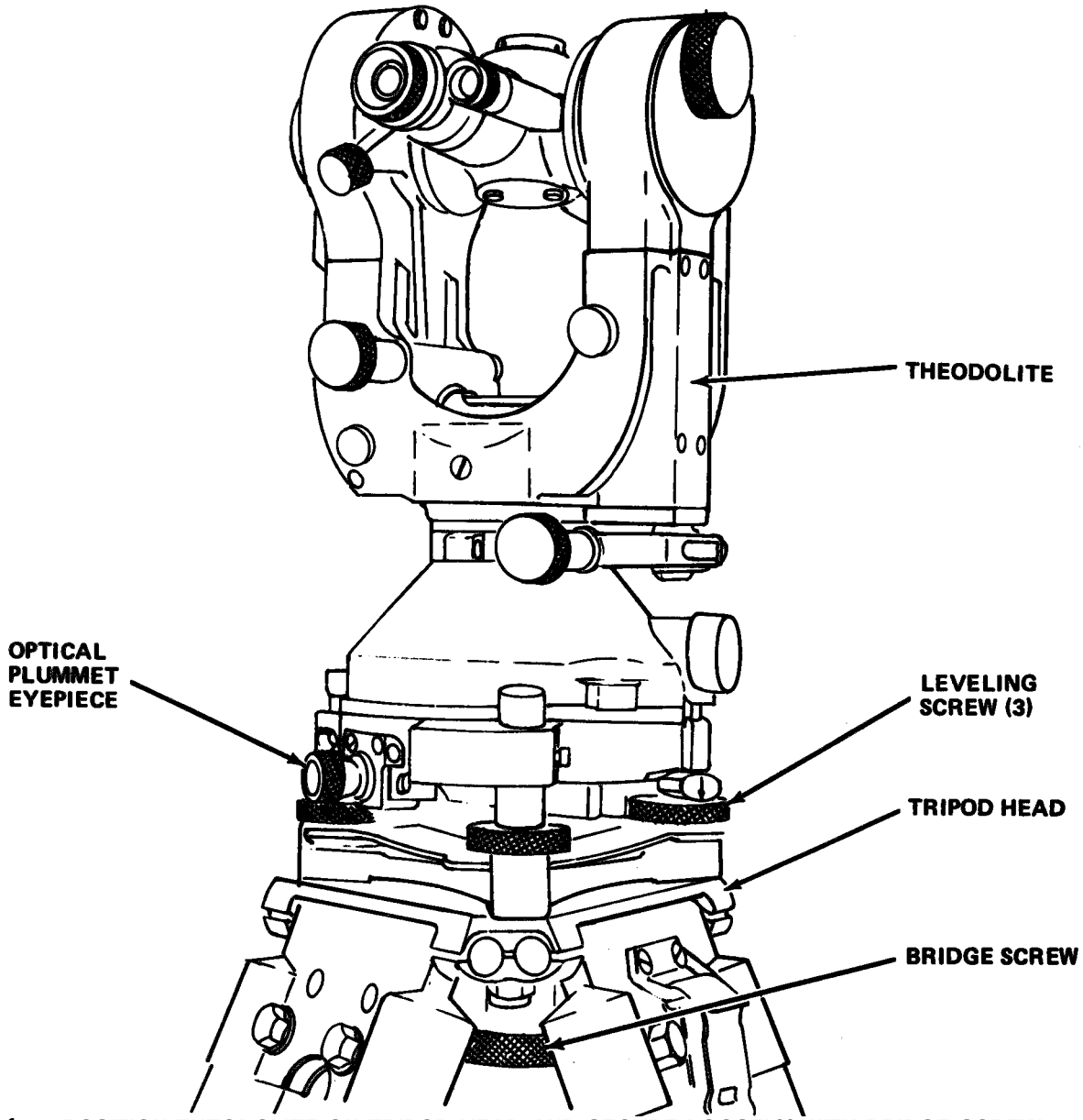
Figure 4-14. Tripod and plumb bob, removal and installation.

b. Theodolite.

(1) Remove the theodolite from the carrying case (fig. 4-2).

(2) Refer to figure 4-15 and install the theodolite on the tripod.

NOTE: THEODOLITE MODEL T2 - 68MIL SHOWN, INSTALL ALL MODELS IN A SIMILAR MANNER.



STEP 1. POSITION THEODOLITE ON TRIPOD HEAD AND SECURE LOOSELY WITH BRIDGE SCREW.
STEP 2. CENTER CIRCULAR LEVEL BUBBLE USING LEVELING SCREWS.
STEP 3. SIGHT THROUGH OPTICAL PLUMMET EYEPIECE AND ADJUST EYEPIECE UNTIL THE CIRCULAR MARKS ARE CLEARLY VISIBLE.
STEP 4. CAREFULLY MOVE THEODOLITE ON TRIPOD HEAD UNTIL THE STATION POINT IS CENTERED ON THE EYEPIECE CIRCULAR MARKS.
STEP 6. TIGHTEN BRIDGE SCREW.

TS 6675-296-14/4-15

Figure 4-15. Theodolite, removal and installation.

4-3. Equipment Conversion

a.. General. During night or dark-day operation, the reading circles are illuminated bv installing the illumination system (fig. 4-16), which is contained in the battery box and the accessory case. An eyepiece adapter, which is connected to the battery box, fits over tne eyepiece and provides illumination for the optical plummet. For high-angle and celestial observations, the diagonal eyepieces contained in the accessory case are installed on the telescope and microscope eyepiece, The sunglass filter can be mounted on either the telescope eyepiece or the telescope diagonal eyepiece to reduce glare. The autocolhimation eyepiece (figure 4-17) and illumination is furnished with the Model T2-56-C-MIL theodolite only and permits proper focusing in ranges of less than 55 inches (1.4m).

NOTE: THEODOLITE MODEL
T2 - 68MIL SHOWN, INSTALL
ALL ILLUMINATION SYSTEMS
IN A SIMILAR MANNER.

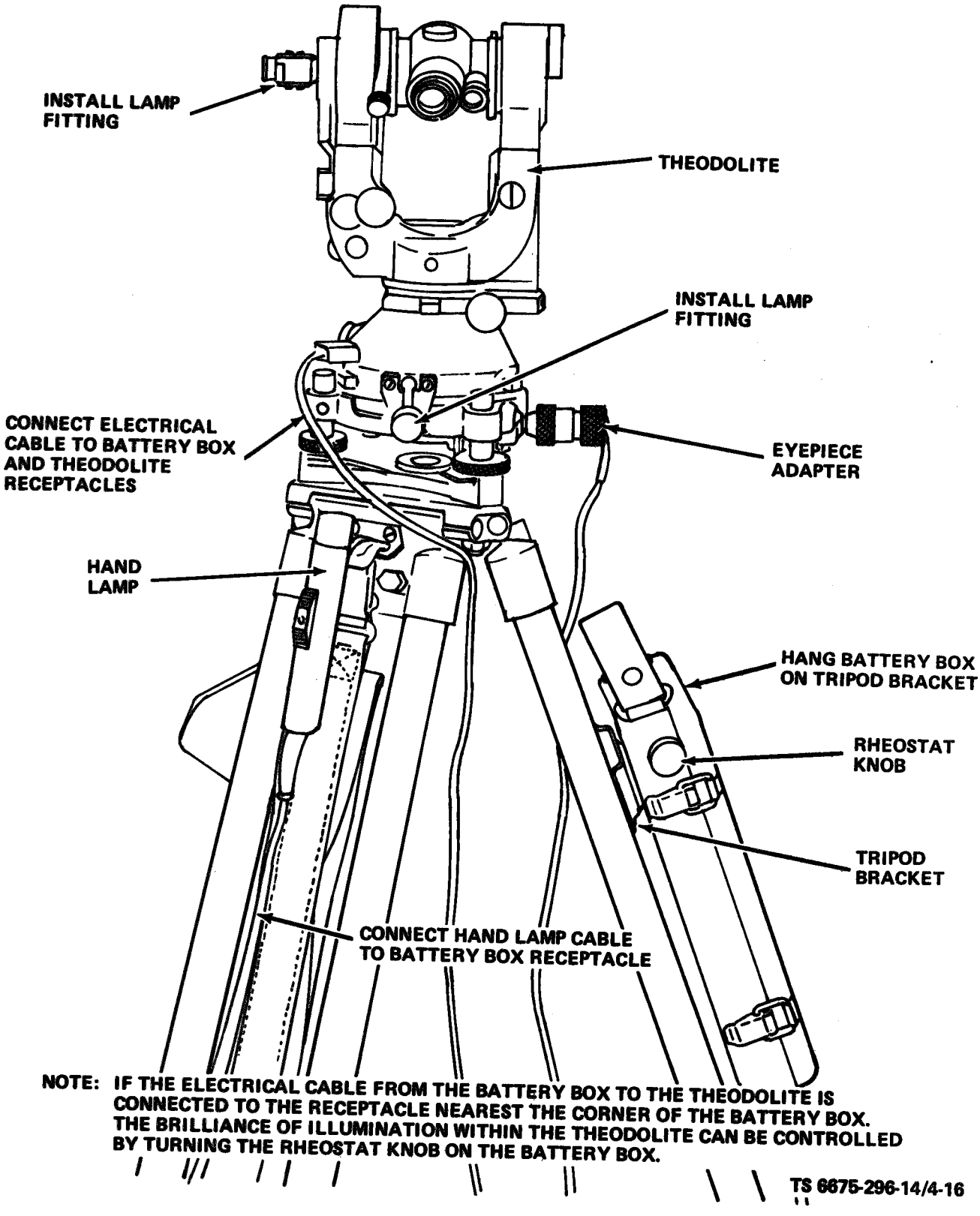


Figure 4-16. Illumination system, removal and installation.

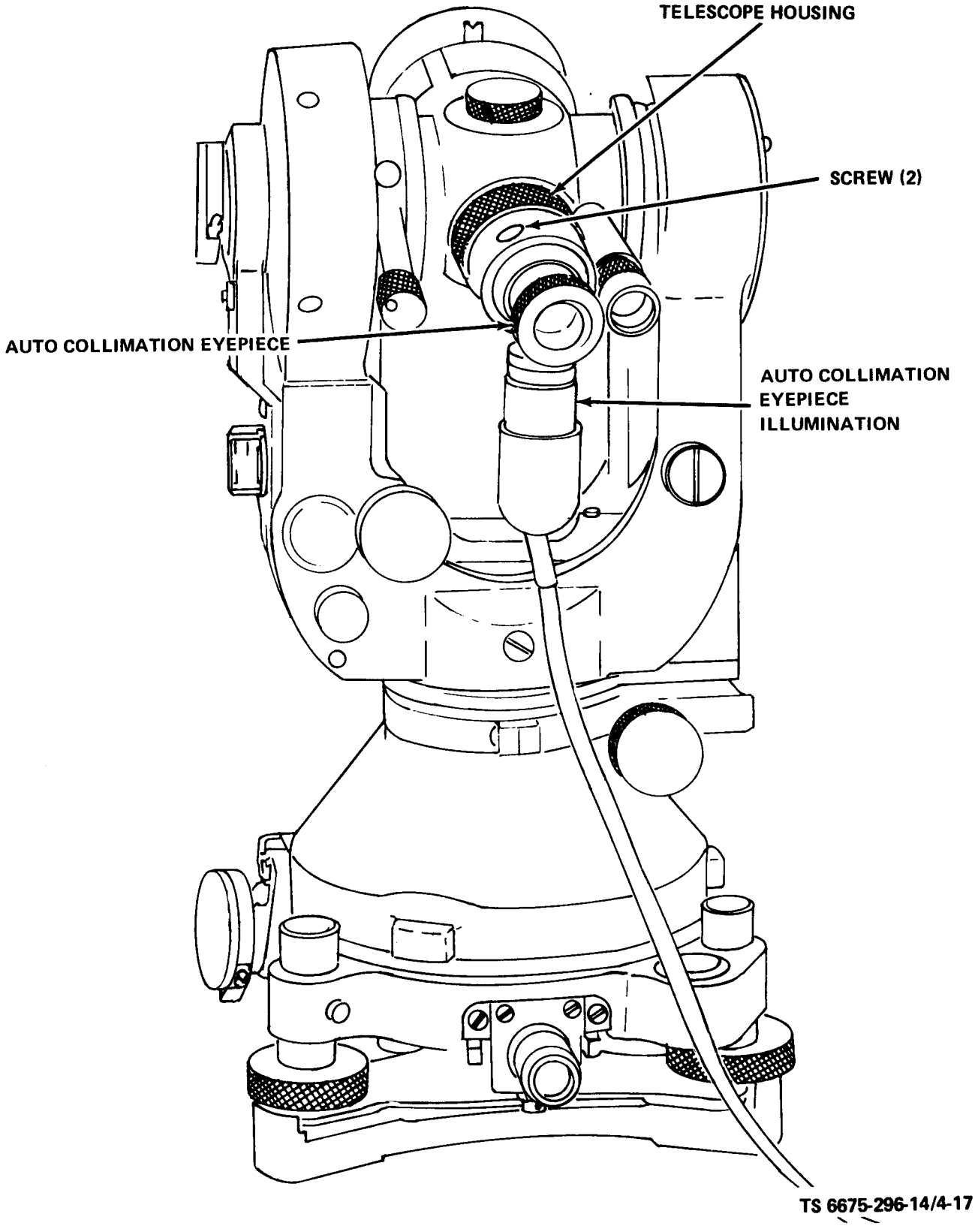


Figure 4-17. Theodolite (Model T2-56-C-MIL), with autocollimation eyepiece installed, front view.

b. Night ro Dark-Day Operations. *Refer to* Figure 4-16 and install the illumination system.

c. High Angle Observations.

(1) Remove the telescope and microscope *diagonal* eyepieces from the accessory case (fig. 4-10) .

(2) Refer to figure 4-18 and install the diagonal eyepieces.

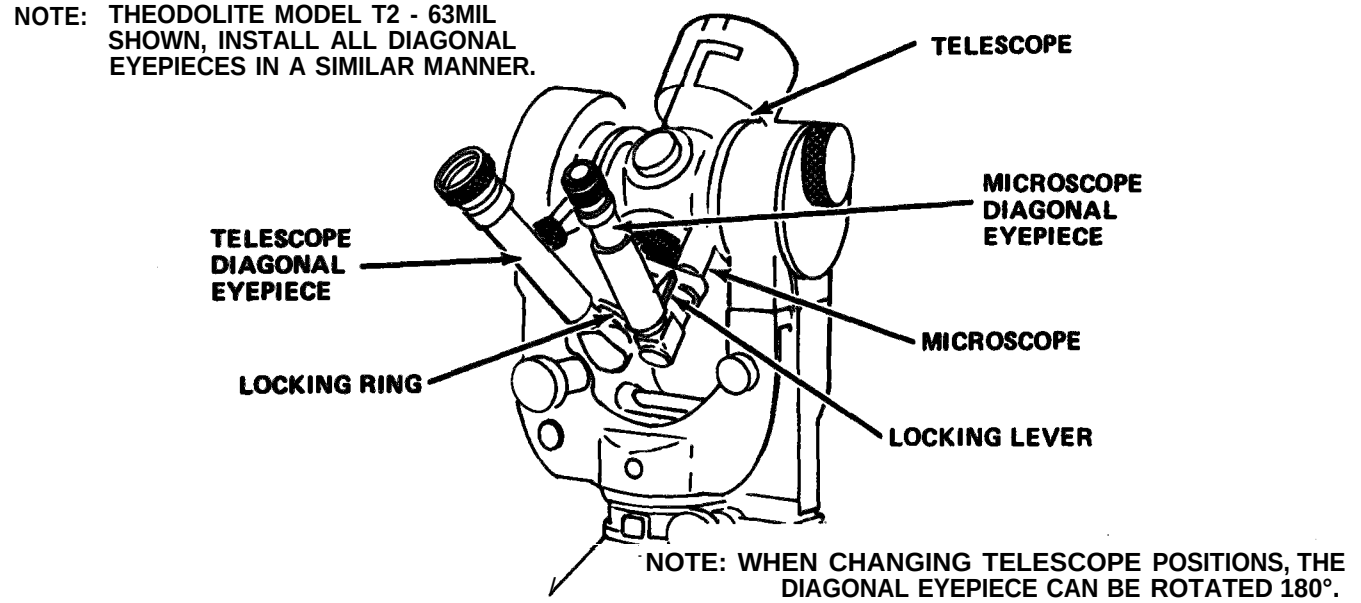


Figure 4-18. Theodolite diagonal eyepiece, installation.

WARNING

Serve eye damage can result from performing observations against direct sunlight without utilizing the sunglasses filter.

d. Autocollimation Eyepiece and Illumination (Model T2-56-C-MIL).

(1) Remove retaining screws (fig. 4-17) and remove the telescope eyepiece and reticle sleeve as an assembly.

(2) Position the autocollimation eyepiece in the telescope eyepiece and secure with retaining screws. Attach the autocollimation eyepiece illumination to the bottom of the eyepiece.

Section II. MOVEMENT TO A NEW WORKSITE

4-4. Dismantling for Movement

a. Short Distances. For short distances in cleared, level areas, the operator may carry the instrument mounted on the tripod. correct carrying position is with tripod head cradled against the instrument in a vertical position.

CAUTION

Always secure the telescope and horizontal and compass circle clamps before moving the instrument. Never carry the instrument over the shoulder.

b. Long Distance.

(1) When moving the theodolite for long

Section III. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

4-6. Special Tools and Equipment.

a. The special tools required to perform organizational maintenance on the theodolite are listed in table 4-2.

b. No special equipment is required by organizational maintenance personnel for performing maintenance on the theodolite.

4-7. Repair Parts

Repair parts are listed and illustrated in the repair parts and special tools list covering organizational maintenance for this equipment, TM 5-6675-296-24P, 5-6675-205-20P and 5-6675-233-20P.

4-8. Fabricated Tools and Eqiupment

There are no fabricated tools and equipment required for organizational maintenance.

Table 4-2. Special Tools

[tern	NSN or Part No.	Use
Pin, adjusting	6675-00-353-4103	Adjust theodolite adjusting screws.
Wrench, tripod	5120-00-378-9520	Tripod leg adjustment, removal, and installation.
Screwdriver	5120-00-961-2761	Adjust horizontal drive.

Section IV. LUBRICATION INSTRUCTIONS

4-9. General

All movable parts of the theodolite, both smooth and threaded surfaces, are fitted within extremely fine tolerances. For this reason, most parts of the theodolite are cleaned prior to lubrication. Any attempt to lubricate the theodolite without first cleaning it, may result in damage to the instrument. Only those lubricants approved for use on the theodolite will be used. No lubrication will be performed in the field unless specifically called for.

4-10. Detailed Lubrication Information

a. Care of Lubricants. Special care should be taken to see that all surveying instrument lubricants are kept absolutely free from contamination by any foreign substance. 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 the theodolite will be stocked. Approved lubricants are noncorrosive and highly refined and must be free from all paint removing ingredients. Ordinary machine oil is not an approved lubricant. The following lubricants are approved for use on this theodolite:

(1) OCW; oil, clock and watch, 1/2 oz. bottle, NSN 9150-00-252-6382.

(2) GIA; grease, aircraft and instrument, 4 oz. tube, NSN 9150-00-985-7244.

c. Lubrication Procedure.

(1) *Collimation lever bearing.* Place 1 drop of oil at the top of the crack between the collimation lever and the left-hand axle bearing. Work the oil

into the crack by alternately pushing and releasing the lower part of the collimation lever against the spring of the collimation slow-motion screw. Wipe off all the excess oil with a clean, lint-free cloth.

(2) *Leveling* screws. Turn one of the leveling screwsoutward to the extreme length of its travel. Clean it thoroughly with a clean, lint-free cloth. lubricate sparingly and run the screw through its travel several times to distribute the lubricant evenly. Wipe off all excess lubricant. Lubricate the other two leveling screws in a similar manner.

(3) Spring plate. The sloped sides of the spring plate, which contact the leveling screws to hold them securely against the base plate, should be lubricated sparingly as required. Remove base plate. Apply grease sparingly to the sloped edges of the openings in the spring plate. Replace base plate.

(4) *Horizontal drive knob cover hinge.* Apply 1 drop of oil to the hinge pin in the hinge of the horizontal drive knob cover. Carefully work the cover forward, backward, up, and down to distribute the oil over the working surfaces. Wipe off all excess oil with a clean, lint-free cloth.

Section V. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

4-11. General

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

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

c. *Afler you operate. Be sure to* perform your after (A) PMCS.

d. If your equipment fails to operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms, see TM 38-750.

e. The item number column shall be used as a source of item numbers for the "TM Number" column on DA Form 2404, Equipment Inspection and Maintain Worksheet, in recording results of PMCS.

f. To insure that the theodolites are ready for operation at all times, they must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance checks and services to be performed are listed and described in table 4-3. The item numbers indicate the sequeuce of minimum inspection requirements. Defects discovered during operation of the units 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.

4-12. Preventive Maintenance Checks and Services

This parsgraph contains a tabulated listiug of preventive maintenance checks and services, table 4-3.

Table 4-3. Preventive Maintenance Checks and Services

NOTE

Within designated interval, these checks are to be performed in the order listed.

B—Before D—During | A—After W—Weekly | M—Monthly C—Combat Operability Check

Item No.	Interval B	D	A	W	M	C	Item to be inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment will be reported Not Ready (Red) if:
1			•	•			Field pack	Clean dirty field pack. Replace defective pack.	
2	•		•	•			Accessory case	Clean accessory case. Replace missing or defective components.	
3	•		•	•			Tripod accessory case	Replace missing or defective components. Clean dirty case.	
4	•			•			Battery box	Replace defective batteries or missing spare lamps. Check hand light operation; replace if defective.	

B—Before
D—During

A—After
W—Weekly

M—Monthly
C—Combat Operability Check

Item No.	Interval B	D	A	W	M	C	Item to be inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment will be reported Not Ready (Red) if:
5			•				Tripod	Clean dirty tripod. Repair or replace a defective tripod.	
6	•	•					Carrying case	Check desiccant; dehydrate or replace if color is pink Replace a defective case.	
7	•		•				Theodolite	Clean dirty lenses, mirrors, and level vials. Check eyepiece, adjusting and clamping knobs, and leveling screws for freedom of movement. Replace defective or damaged theodolite.	
8	•						Winterization Kit	Check for missing components. Replace if missing or defective.	

Section VI. TROUBLESHOOTING

4-13. General

a. This section contains troubleshooting information for locating and correcting most of the operating troubles which may develop in the directional theodolite. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you to determine corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

c. The table lists the common malfunctions which you may find during the operation or maintenance of the directional theodolite or its components. You should perform the tests/inspections and corrective actions in the order listed.

NOTE

Before you use this table be sure you have performed all applicable operating checks.

4-14. Troubleshooting Information

Table 4-4 contains the information for corrective actions to be taken.

Table 4-4. Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. THEODOLITE WILL NOT SEAT PROPERLY ON TRIPOD HEAD

Step 1. Tribrach defective.
Replace tribrach.
Step 2. Tripod head defective
Remove tripod cover, pins, screws end head. Replace head with screws, pins and cover.

2. TELESCOPE CROSSLINES WILL NOT FOCUS

Telescope eyepiece defective.
Remove eyepiece by turning locking ring counterclockwise.
Replace eyepiece.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. CIRCLE AND MICROMETER IMAGES WILL NOT FOCUS

Microscope eyepiece defective.
Remove eyepiece by turning counterclockwise. Replete eyepiece.

4. LIGHTS ON VERTICAL AND HORIZONTAL CIRCLES UNEQUAL OR ABSENT

Step 1. Horizontal circle or verticle illuminating mirror defective.
Remove mirrors by pulling output with a twisting motion.
Replace mirrors.
Step 2. Lamp fitting defective.
Replace fitting.

5. TRIPOD LEGS WILL NOT LOCK IN POSITION

Leg clamping Screws defective or missing.
Replace screws.

6. LEVELING SCREWS TOO TIGHT OR TOO LOOSE

Leveling screws dirty or worn.
Clean and lubricate the screws.

7. AUTOCOLLIMATING EYEPIECE FAILS TO ILLUMINATE (Model T2-46-C-MIL)

Step 1. Connections loose.
Tighten connections.
Step 2. Eyepiece defective.
Replace eyepiece.

Section VII. RADIO INTERFERENCE SUPPRESSION

This section is not applicable to this equipment.

Section VIII. MAINTENANCE OF CARRYING CASE, HAVERSACK AND ACCESSORY CASE

4-15. General

This section covers the maintenance of the carrying case, haversack and accessory case.

4-16. Carrying Case

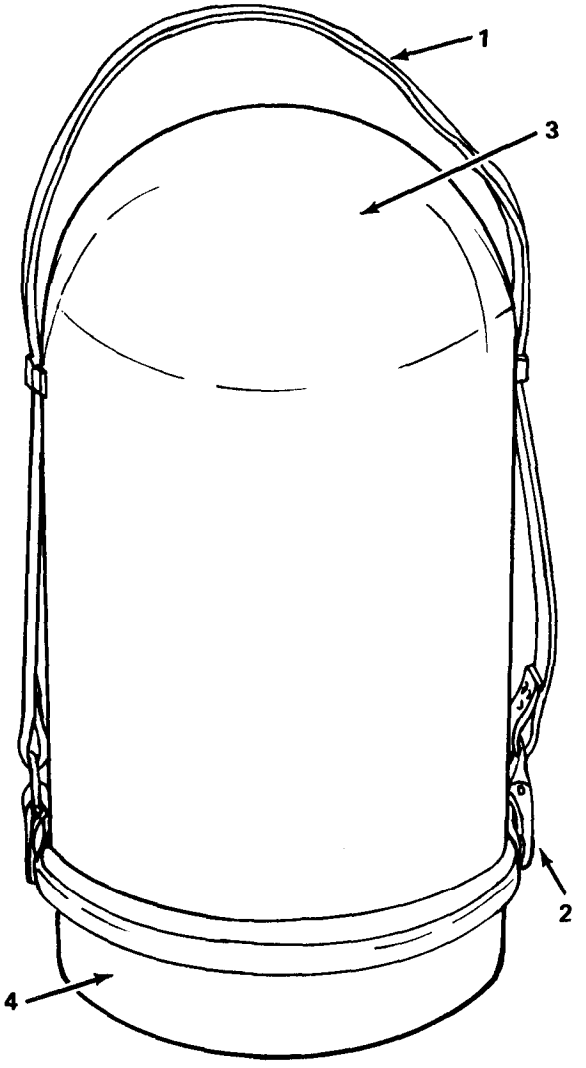
a. The carrying case for the theodolite is composed of a metal hood and base. The carrying case rpovides a convenient means of carrying the theodolite in the field and serves as a dustproof and moistureproof container for the instrument when it ie in storage, The base has a recess in the bottom which houses the desiccant container. The haversack is used to carry the theodolite when the uee of the carrying caee alone is impractical.

b. Hood.

(1) *Removal.*

(a) Grasp carrying strap (1, fig. 4-19) just above clamping levers (2) and pull outward to release clamps.

(b) Lift the hood (3) from the base (4).



1. CARRYING STRAP
2. CLAMPING LEVER (2)
3. HOOD
4. BASE

TS 6675-296-14/4-19

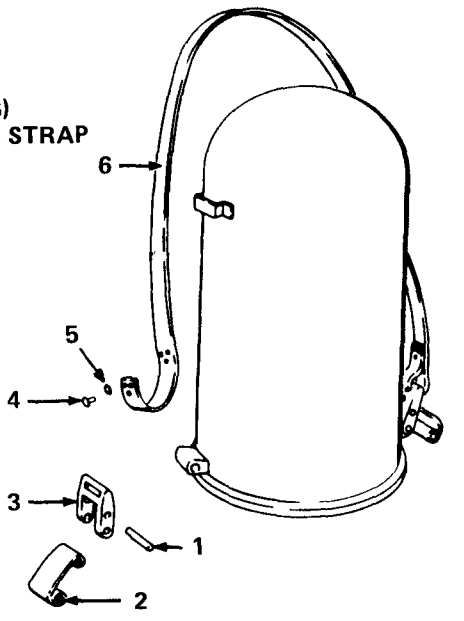
Figure 4-19. Theodolite carrying case hood, removal and installation.

(2) Disassembly.

(a) Remove pins (1, fig. 4-20) and clamps (2) from levers (3).

(b) Remove rivets (4) and washers (5) from carrying strap (6).

1. PIN (4)
2. CLAMP (2)
3. LEVER (2)
4. RIVET (6)
5. WASHER (6)
6. CARRYING STRAP



TS 6675-296-14/4-20

Figure 4-20. Theodolite carrying case hood.

(3) *Cleaning, Inspection, and Repair.*

(a) Clean all metal parts with soap and water and dry thoroughly.

(b) Clean the carrying strap with saddle soap.

(c) Inspect the strap for cracks, breaks, and cuts. Inspect for worn mounting holes and deterioration due to age.

(d) Inspect the lever pins for burrs and wear. Inspect the locking levers and lever clamps for burrs, bends, and cracks. Inspect for enlarged mounting holes.

(e) Inspect the hood for dents, cracks, and holes. Inspect the bottom rim for out-of-round.

(f) Remove all burrs from the lever pins, locking levers, and lever clamps. Straighten minor dents. Remove all traces of rust and repaint where necessary.

(g) Straighten minor dents or bends in the hood. Seal all cuts or holes in the hood. Repaint where necessary.

(h) Replace all defective parts that cannot be repaired.

(4) *Assembly.*

(a) Attach carrying strap (6, fig. 4-20) to levers (3) with rivets (4) and washere (5).

(b) Attach clamps (2) to levers with pins (1).

(5) Installation.

(a) Place hood (3, fig. 4-19) on base (4).

(b) Engage clamping levers (2) over edge of base and press levers inward toward hood Until they snap tight.

c. Base and Desiccant.

(1) *Removal from theodolite.*

(a) Loosen nuts (1, fig. 4-21) and slide levers (2) outward.

(b) Grasp the right-side axle bearing (3) with one hand and place the other hand below the housing (4).

(c) Lift the theodolite from the carrying case base (5).

NOTE: THEODOLITE MODEL T2 - 68MIL SHOWN, REMOVE ALL MODELS IN A SIMILAR MANNER.

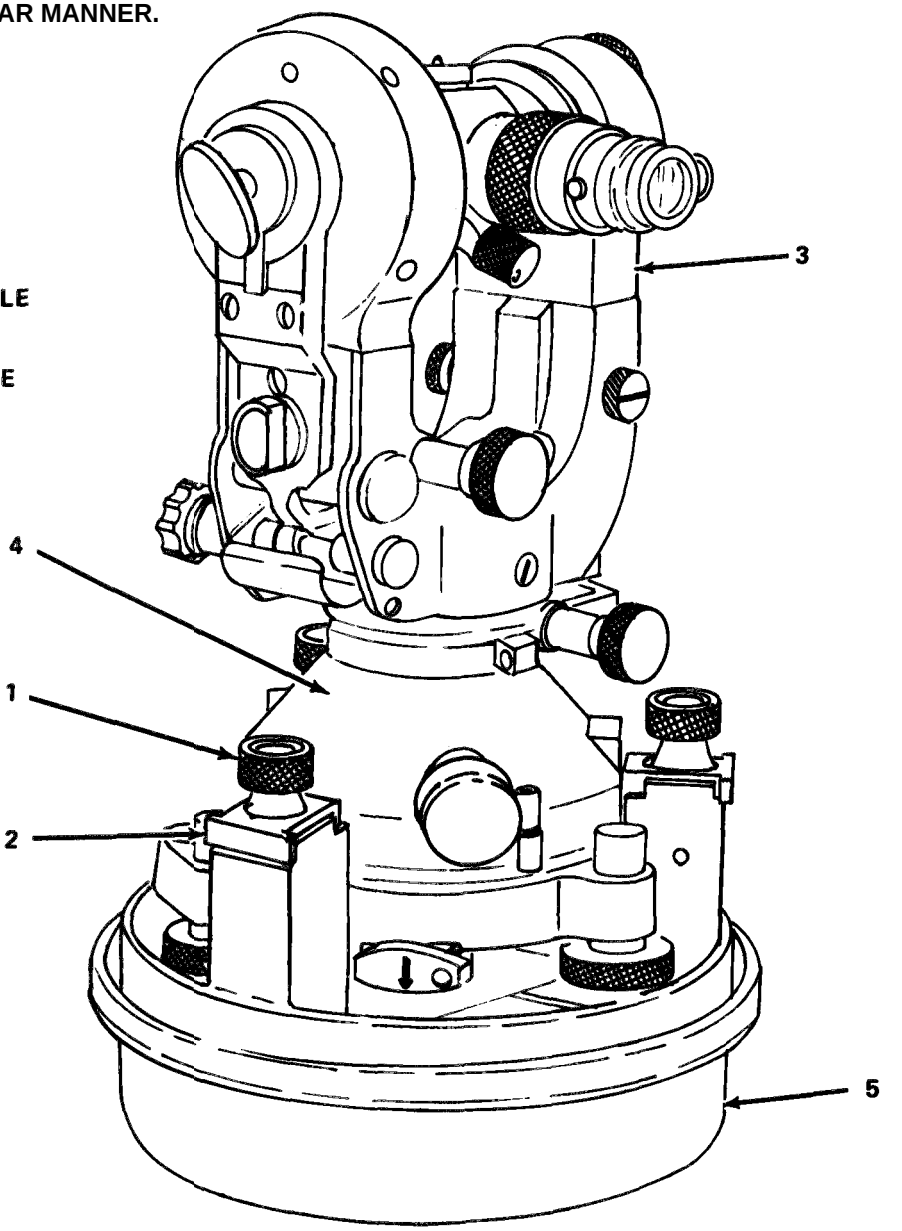


Figure 4-21. Theodolite carry case base, removal and installation.

(2) *Disassembly.*

(a) Remove screws (1, fig. 4-22), collar (2) and gasket (3).

(b) Remove L. H. thread screws (4), nuts (5), beveled washers (6), plain washers (7) and levers (8).

(c) Remove pins (9) and studs (10).

(d) Remove upper container (11), screen (12), window (13), inner container (14), desiccant (15) and lower container (16).

1. SCREW (6)
2. COLLAR
3. GASKET
4. SCREW (3)
5. NUTS (3)
6. BEVELED WASHERS (3)
7. WASHER (3)
8. LEVER (3)
9. PIN (3)
10. STUD (3)
11. UPPER CONTAINER
12. SCREEN
13. WINDOW
14. INNER CONTAINER (3)
15. DESICCANT
16. LOWER CONTAINER

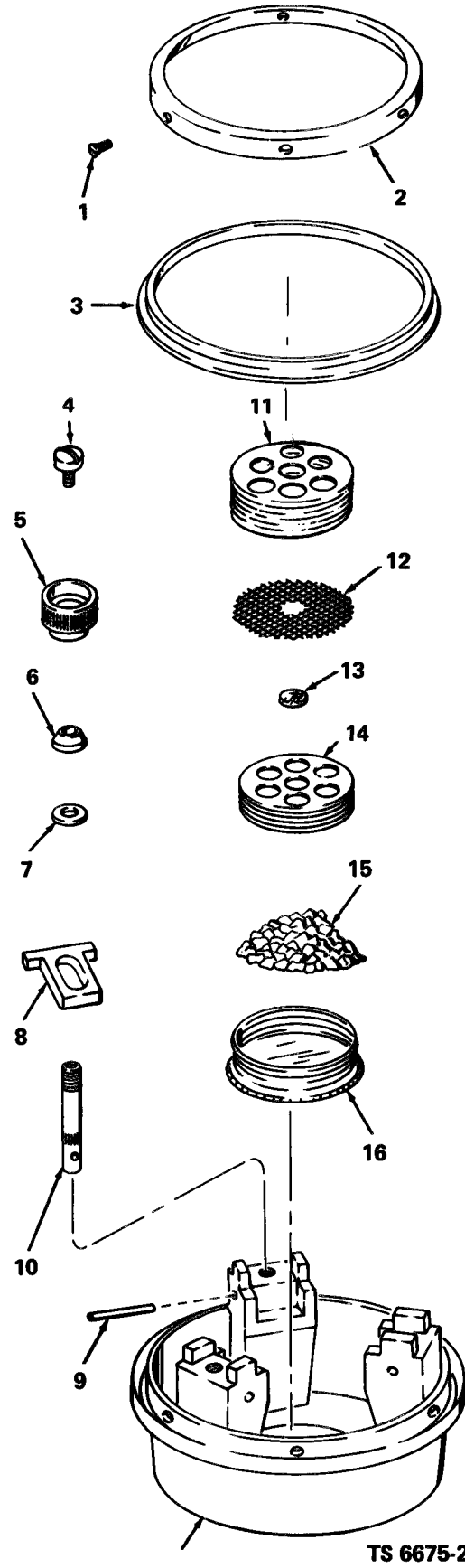


Figure 4-22. Theodolite carrying case base and desiccant.

(3) *Cleaning, Inspection, and Repair.*

(a) Clean all metal parts with soap and water and dry thoroughly. Brush threaded surfaces free of any foreign matter. Wipe the rubber gasket clean with a soft cloth.

(b) Inspect all threaded surfaces for worn or damaged threads. Inspect the lever nuts, slide levers, and washers for burrs and worn surfaces.

(c) Inspect the base for cracks and a broken casting. Inspect the collar for bends, breaks, and out -of -round.

(d) Inspect the rubber gasket for damage or hardening because of age or excessive heat.

(e) Remove all burrs from the base, slide levers, lever nuts, and collar. Straighten minor bends in the collar and washers. Replace all defective parts.

(f) Inspect the sections of the desiccant container for bends, breaks, and damaged threads.

(g) Inspect the desiccant for color. Serviceable desiccant is blue in color. Pink desiccant indicates moisture saturation, and the desiccant must be dehydrated or replaced. Instrument should be inspected for moisture damage if desiccant is pink.

(h) Replace the desiccant or container as necessary.

(4) *Assembly.*

(a) Assemble lower container (16, fig. 4-22), desiccant (15), inner container (14), window (13), screen (12) and upper container (11).

(b) Attach studs (10) to base with pins (9).

(c) Assemble on studs the levers (8), plain washers (7), beveled washers (6), nuts (5) and L.H. thread screws (4).

(d) Attach gasket (3) and collar (2) to base with screws (1).

(5) *Installation.*

(a) Install the desiccant container in the base.

(b) Place the theodolite in the carrying case base (5, fig. 4-21).

(c) Slide levers (2) toward theodolite and tighten nuts (1).

4-17. Haversack

a. General. The haversack is used for carying the theodolite when it is impractical to carry the unit using the carrying case. The theodolite in its carrying case is strapped in the haversack, which in turn, is carried on the operator's back.

b. Cleaning and Inspection.

(1) Brush the haversack free of dust and dirt. Clean the straps with saddle soap.

(2) Inspect the haversack for damage and defects that would render it unserviceable. Repair or replace a defective haversack.

4-18. Accessory Case

a. Inspection.

(1) Inspect the accessory case for damage and defective zipper and snaps. Make certain that the case contains the components shown by figure 4-23, and the optical plummet eyepiece adapter.

(2) Inspect the telescope and microscope diagonal eyepieces and the telescope sunglass filter for scratches, cracks, and defective mounting.

(3) Inspect the lamp fittings for broken glass and corroded or defective contacts.

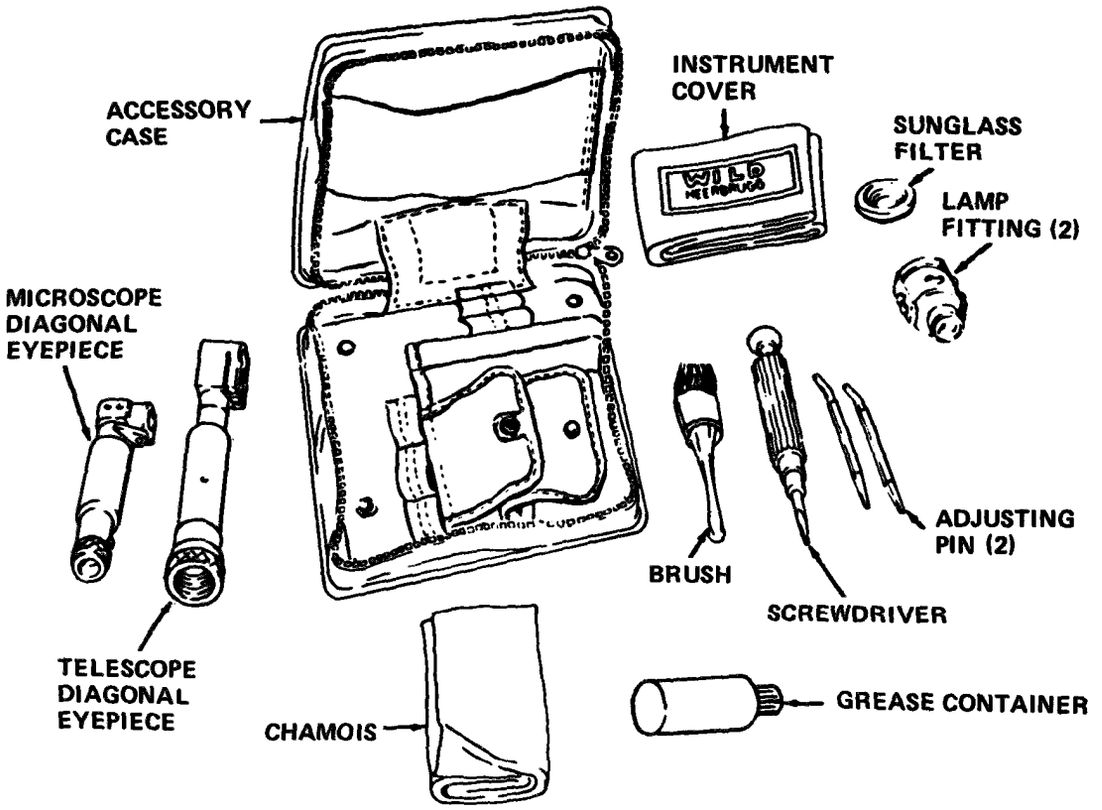


Figure 4-23. Accessory case, unpacked view.

b. Cleaning

(1) *Accessory Case.* Brush case free of dust and dirt. Repair or replace as necessary.

(2) Telescope and Microscope Eyepieces.

(a) Carefully clean the metal parts of the telescope and microscope eyepieces with a clean, dry cloth.

CAUTION

Do not use acetone on plastic material

(6) Remove dust or dirt from the lenses with a soft brush, lens tissue, grain alcohol or acetone.

(3) *Diagonal Eyepieces.*

(a) Clean all parts except the lenses with a Clean, dampened cloth.

(b) Clean the lenses with a soft brush, lens tissue, grain alcohol or acetone. See caution note above.

(4) Sunglass Filter.

(a) Clean the metal part of the sunglass filter with soap and water.

CAUTION

Do not use acetone on plastic material.

(b) Clean the lens with a soft brush, lens tissue, grain alcohol or acetone.

Section IX. MAINTENANCE OF EYEPIECES

4-19. General

This section covers the maintenance of the telescope and microscope eyepieces, diagonal eyepieces, sunglass filter, sunshade and autocollimation eyepiece with illumination.

4-20 Telescope and Microscope Eyepieces

a. General. The telescope eyepiece is used to focus the crosslines and the objective point. The microscope eyepiece is used to bring the circle images into focus.

b. Removal.

(1) Remove microscope eyepiece (fig. 4-24) by turning counterclockwise,

(2) Remove telescope eyepiece by turning locking ring counterclockwise.

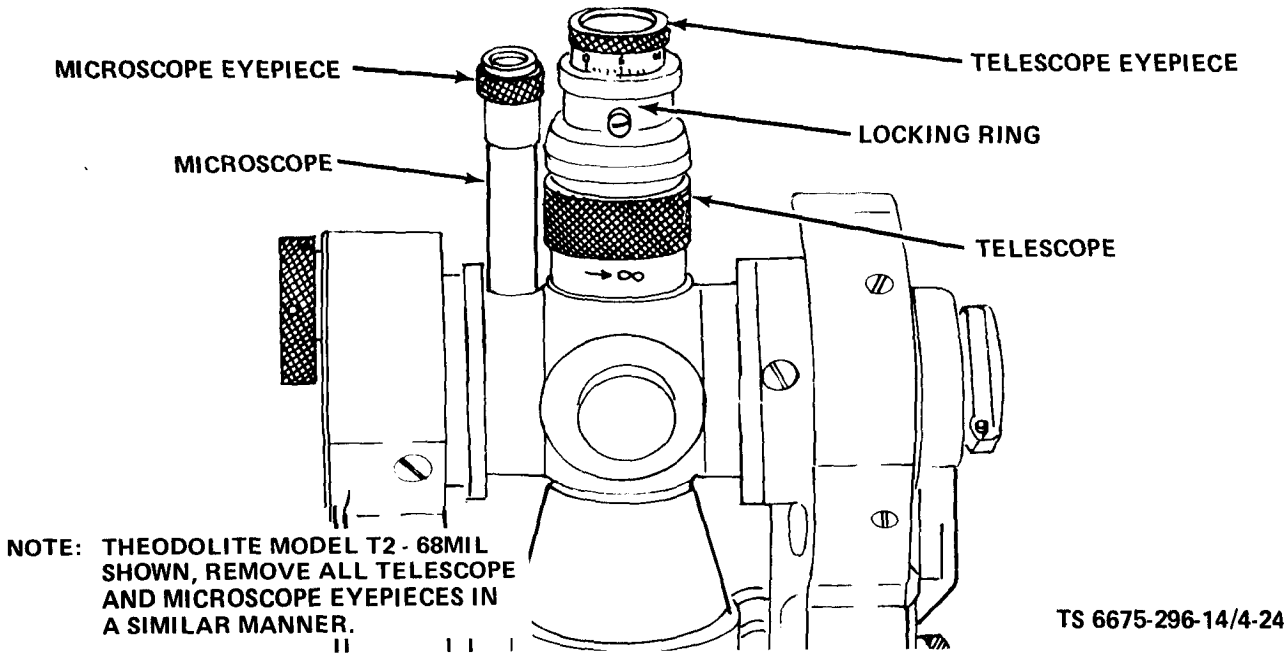


Figure 4-24. Telescope and microscope eyepieces, removal and installation.

c. Cleaning and Inspection.

(1) Carefully clean the metal parts of the telescope and microscope eyepieces with a clean, dry cloth.

(2) Remove dust or dirt from the lenses with a soft brush, lens tissue, grain alcohol or acetone.

CAUTION

Do not use acetone on plastic material.

(3) Inspect the eyepieces for worn or darnaged threads, bent or broken metal parts, and chipped, cracked, or etched lenses.

(4) Replace defective eyepieces.

d. Installation.

(1) Install microscope eyepiece (fig. 4-24) by turning clockwise.

(2) Install telescope eyepiece by turning locking ring clockwise.

4-21. Diagonal Eyepieces

a. General. The microscope diagonal eyepiece and the telescope diagonal eyepiece perform the function of the conventional eyepieces listed in *a.* above. In addition, they enable the instrument man to take sightings and readings up to the zenith.

b. Removal.

(1) Remove telescope diagonal eyepiece (fig. 4-25) by turning locking ring counterclockwise.

(2) Release locking lever and remove microscope diagonal eyepiece.

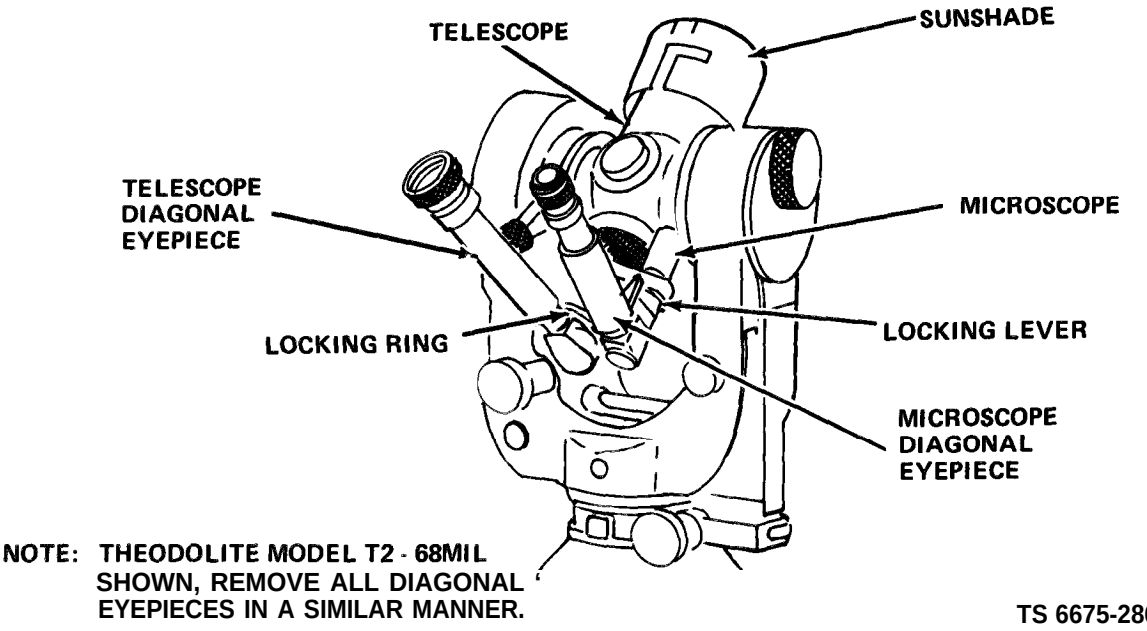


Figure 4-25. Diagonal eyepieces, removal and installation.

c. Cleaning and Inspection.

(1) Clean all parts except the lenses with a clean, dampened cloth.

(2) Clean the lenses with a soft brush, lens tissue, grain alcohol or acetone.

CAUTION

Do not use acetone on plastic material.

(3) Inspect the lenses for chips, cracks, and fungus etching. inspect the metal parts for bends, breaks, and worn or damaged threads.

(4) Replace all defective parts.

d. Installation.

(1) Install telescope diagonal eyepiece (fig. 4-25) by turning locking ring clockwise.

(2) Install microscope diagonal eyepiece and lock lever.

4-22. Sunglass Filter

a. General. The sunglass filter is a push-fit on the telescope eyepiece. It is held in place by spring action exerted by the filter body. The sunglass filter is used to reduce glare so that direct sightings can be made of the sun. It can be mounted on either the telescope eyepiece or the telescope diagonal eyepiece.

b. Removal. The sunglass filter is a push-fit on the telescope. Slide it off.

c. Cleaning and Inspection.

(1) Clean the metal part of the sunglass filter with soap and water.

(2) Clean the lens with a soft brush, lens tissue, grain alcohol or acetone.

CAUTION

Do not use acetone on plastic material.

(3) Inspect the eyepiece for bent or cracked metal parts.

(4) Replace a defective sunglass filter.

4-23. Sunshade

a. General The sunshade is of the push-fit type and can be easily installed or removed by hand from the objective end of the telescope. It is used to reduce glare when making sightings on bright, sunny days.

b. Cleaning and Inspection.

(1) Clean the sunshade with soap and water and wipe dry.

(2) Inspect the sunshade for cracks, breaks, and defects.

(3) Replace a defective sunshade.

4-24. Autocollimation Eyepiece with Illumination (Model T2-56-C-MIL)

a. General. The autocollimation eyepiece is issued with the Theodolite Model T2-56-C-MIL only. It permits focusing at a distance of 55 inches or less. The hand lamp, battery cable assembly, and autocollimation eyepiece with illumination cannot be operated at the same time because the power source has only two female plugs. Any two of the above can be operated simultaneously.

b. Removal.

(1) Disconnect the autocollimation eyepiece illumination (fig. 4-26) from the bottom of the autocollimation eyepiece.

(2) Remove the two screws that secure the autocollimation eyepiece to the telescope housing and remove the autocollimation eyepiece.

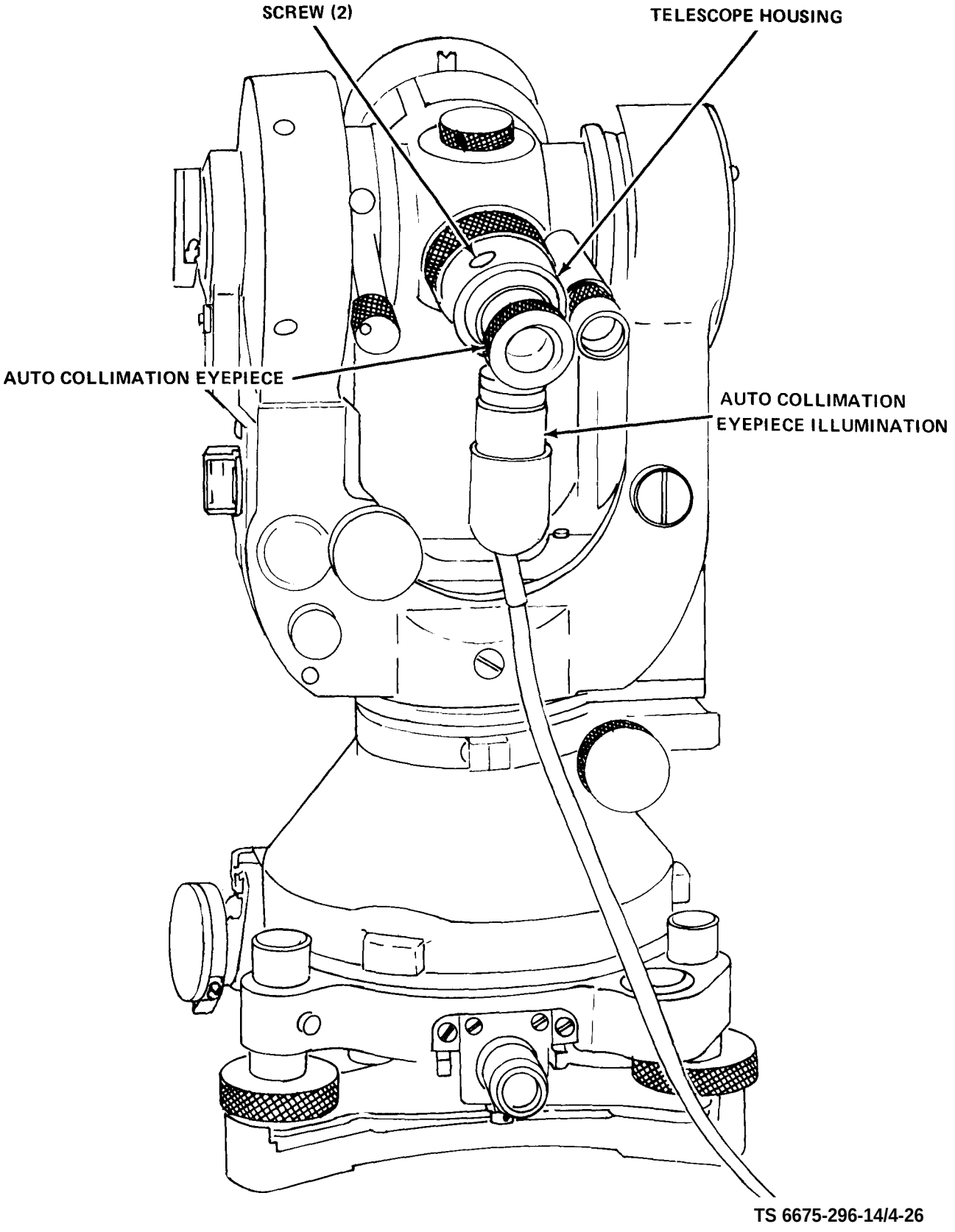


Figure 4-26. Theodolite (Model T2-5-C-MIL), with autocollimation eyepiece installed, front view.

c. Cleaning and Inspection.

(1) Clean the autocollimation eyepiece and illumination with a soft, dry cloth.

(2) Clean the external part of the lens with a camel's-hair brush or lens tissue or by breathing on the lens and wiping dry the the chamois.

(3) Inspect the lens for chips, cracks, and fungus etching.

(4) Inspect the lamp and the cable assembly for defects.

(5) Replace all defective parts.

d. Installation.

(1) Position the autocollimation eyepiece (fig. 4-26) in the telescope housing and secure with retaining screws.

(2) Attach the autocollimation eyepiece illumination to the bottom of the eyepiece.

Section X. MAINTENANCE OF TRIBRACH ASSEMBLY

4-25. Tribrach Assembly

a. General. The tribrach assembly consists of the tribrach, leveling, screw, optical plummet, circular level, and base plate assemblies. Together they enable the operator to quickly and accurately secure the theodolite to, and remove it from the preleveled base which remains attached to the tripod head. By using it the operator can shift the instrument back and forth between established stations, as when closing a traverse, without having to level or realign the theodolite each time it is moved.

b. Removal. (Models T2-56-C-MIL, T2-56-M-MIL, T2-63MIL, T2-66-C-MIL and T2-67MIL).

(1) Push the tribrach lock lever (fig. 4-27) downward and to the right to disengage locking lever.

(2) Lift the theodolite from the tribrach assembly.

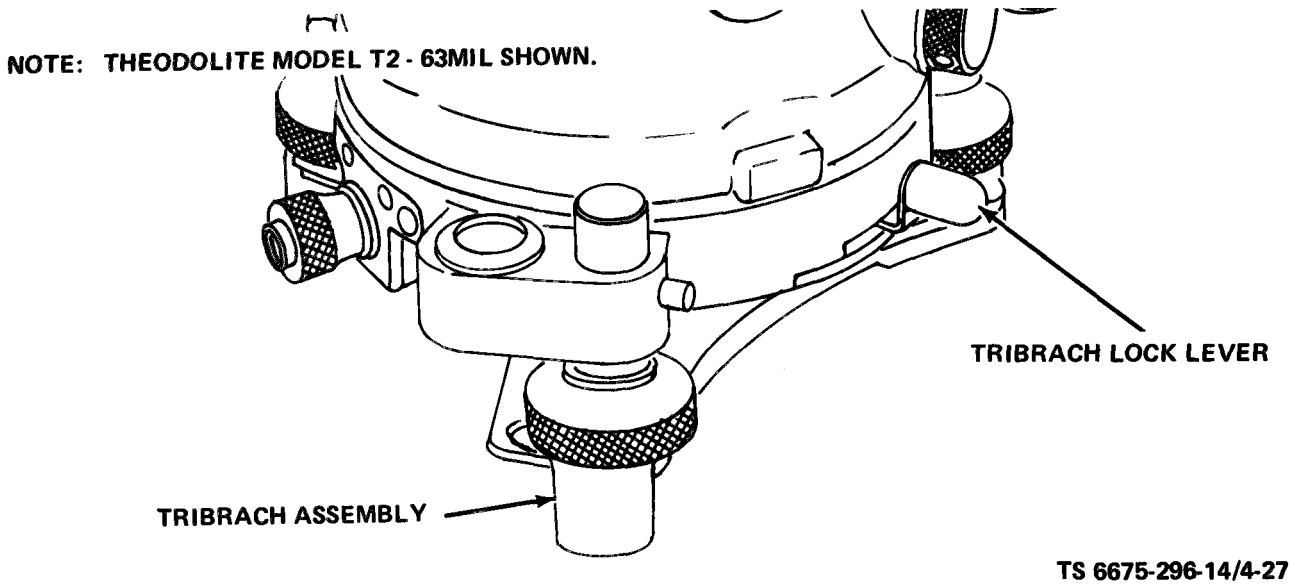


Figure 4-27. Tribroch assembly, removal and installation.

c. Removal. (Model T2-68MIL)

(1) Loosen the locking screw (fig. 4-28) and rotate the tribrach lock knob counterclockwise.

(2) Lift the theodolite from the tribrach assembly.

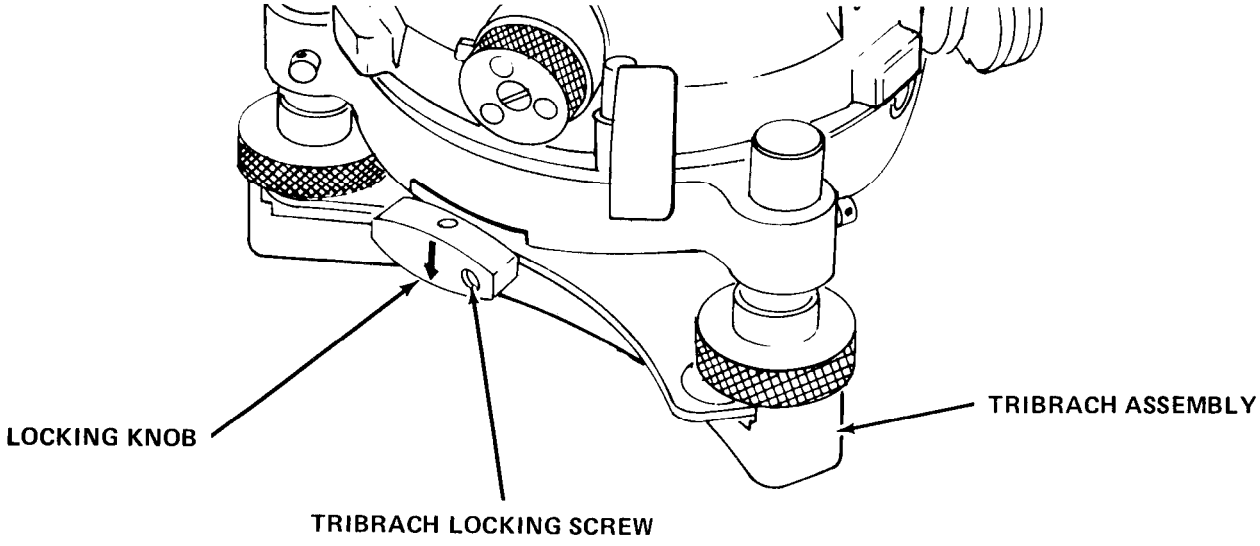


Figure 4-28. Tribrach assembly T2-68MIL, removal and installation.

d. Cleaning and Inspection. Brush all dirt, dust, and foreign matter from the tribrach components. Wipe all surfaces clean with a soft, lint-free, moistened cloth. Thoroughly clean all bearing surfaces on which the tapered locking wedges ride. Inspect the tribrach, base plate, and spring plate for cracks, and breaks. Inspect the three leveling screws for proper operation. They should turn smoothly and evenly, yet require a moderate amount of force exerted by thumb and forefinger to turn without backlash. Lubricate bearing surfaces sparingly before reassembling the tribrach assembly to the theodolite. Replace a defective tribrach assembly.

e. *installation.* (Models T2-56-C-MIL, T2-56-M-MIL, T2-63MIL, T2-66-C-MIL and T2-67MIL).

(1) Place the theodolite on the tribrach assembly (fig. 4-27).

(2) Push the lock lever upward and to the left to engage locking lever.

f. Installation. (Model T2-68MIL).

(1) Place the theodolite on the tribrach assembly (fig. 4-28).

(2) Turn tribrach lock knob clockwise and tighten locking screw.

Section XI. MAINTENANCE OF ILLUMINATION MIRRORS

4-26. General

The rotable illumination mirrors are used to reflect available natural light through the illuminating prisms within the theodolites and onto the reading circles. At night and on dark days they are replaceable by the illumination lamps.

4-27. Illumination Mirrors

a. Removal. Refer to figure 4-29 and remove the illumination mirrors.

b. Cleaning and Inspection. Clean the metal parts with soap and water. Clean the mirror with a camel's hair brush it dusty, and with a chamois it foggy. Inspect the hinge action for too-stiff or too-loose movement. It should remain in the position where placed. Inspect the push-fit mirror mounting for too-tight or too-loose fit, distortion, and other damage. Oil the hinge sparingly if needed and wipe off all excess oil. Inspect for a lost, cracked, or broken mirror. Replace a defective illumination mirror.

c. Installation. Refer to figure 4-29 and install the illumination mirrors.

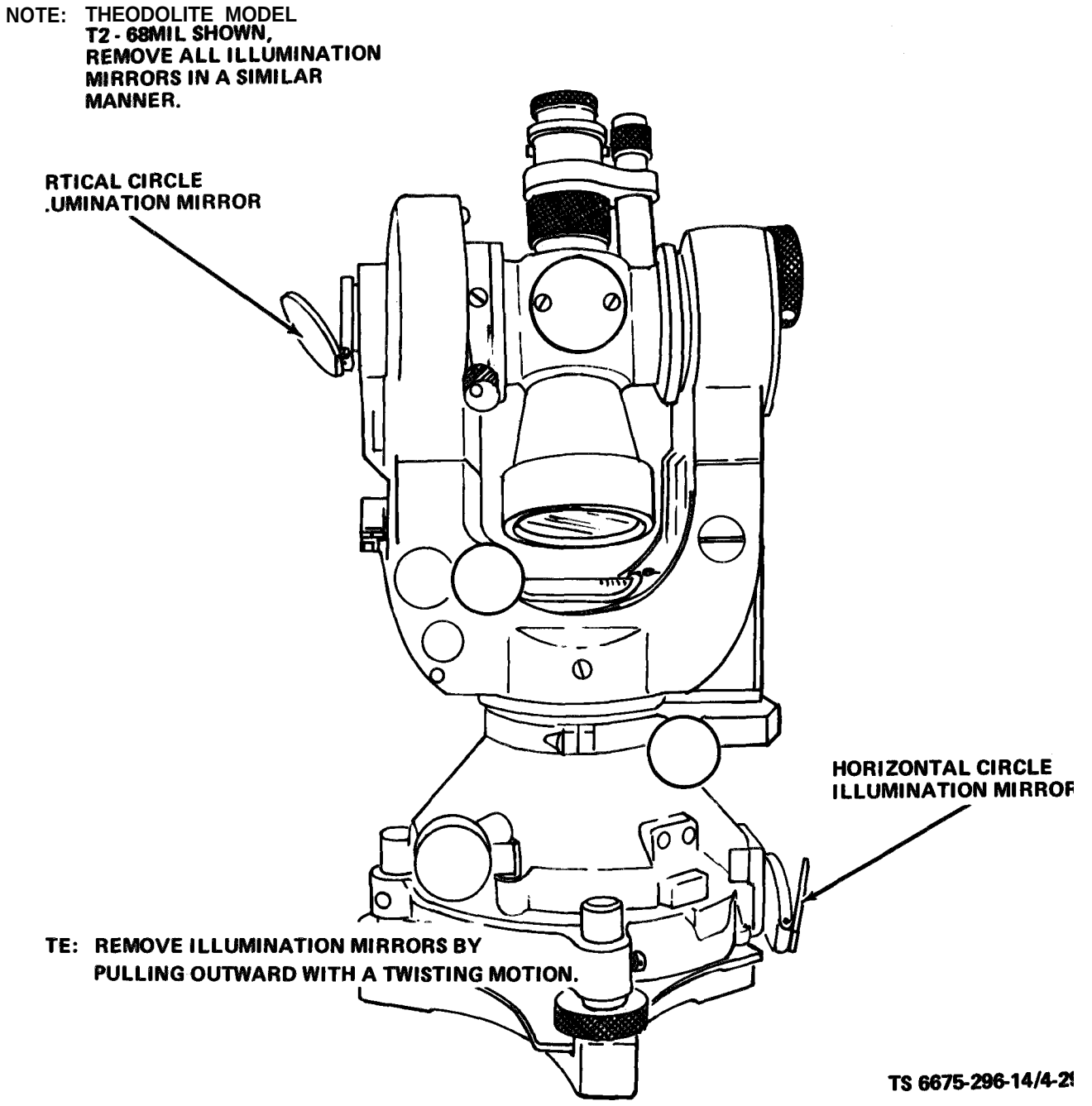


Figure 4-29. Illumination mirrors, removal and installation.

Section XII. MAINTENANCE OF TRIPOD ASSEMBLY, PLUMB BOB AND TRIPOD WRENCH

4-28. Tripod Assembly

a. General. The tripod sssembly is of the extension leg which consists of the tripod head, tripod leg assemblies, and the cover plate. When the theodolite is being used for surveying work and other precision measuring, it is mounted on the tripod head.

b. Disassembly.

(1) Remove cover (1, fig. 4-30), pins (2), screws (3), head (4) and clamps (5).

(2) Remove housing (6), head screws (7), bolts (8), bracket (9) and screws (10).

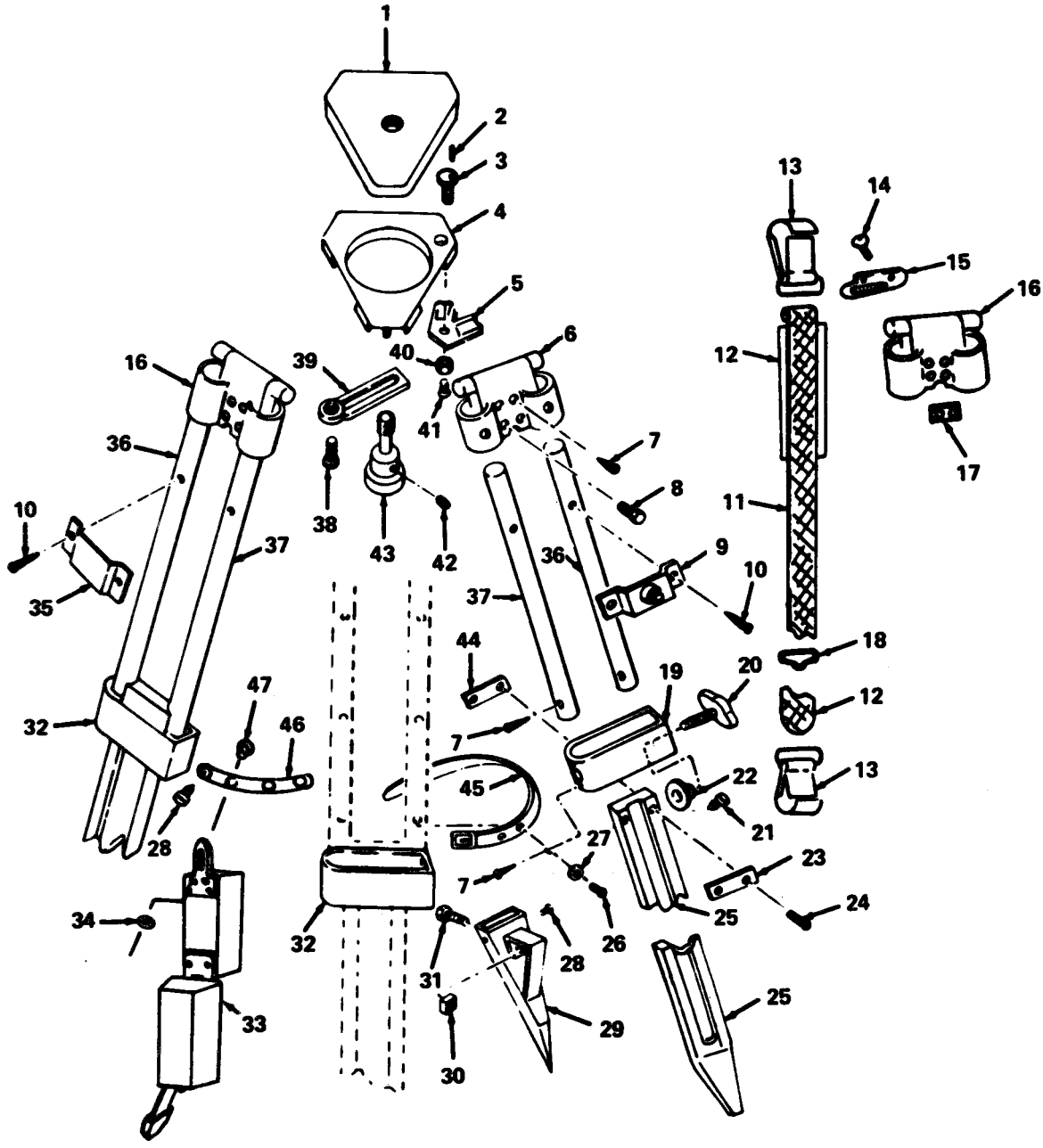
(3) Remove sling (11), sling (12), hooks (13), screws (14), belt loop (15), leg clamps (16), lock plate (17) and buckle (18).

(4) Remove clamp (19), thumbscrew (20), screws (21), clamp plate (22), plates (23), screws (24) and legs (25).

(5) Remove screws (26), washers (27), screws (28), shoes (29), nuts (30), screws (31) and clamps (32).

(6) Remove accessory case (33), washers (34), bracket (35), L.H. legs (36), R.H. legs (37), screws (38), bridge (39), nuts (40) and leveling screws (41).

(7) Remove screws (42), bridge screw (43), plates (44), strap (45), brackets (46) and rivets (47).



1. COVER
2. PIN (3)
3. SCREW (3)
4. HEAD
5. CLAMP (3)
6. HOUSING
7. HEAD SCREW (6)
8. BOLT (6)
9. BRACKET
10. SCREW (2)
11. SLING
12. SLING
13. HOOK (2)
14. SCREW (2)
15. BELT LOOP
16. LEG CLAMP (2)
17. LOCK PLATE
18. BUCKLE
19. CLAMP
20. THUMBSCREW
21. SCREW (6)
22. CLAMP PLATE
23. PLATE (3)
24. SCREW (6)
25. LEG (3)
26. SCREW (2)
27. WASHER (2)
28. SCREW (6)
29. SHOE (3)
30. NUT (3)
31. SCREW (3)
32. CLAMP (2)
33. ACCESSORY CASE
34. WASHER (4)
35. BRACKET
36. LEG, L.H. (3)
37. LEG, R.H. (3)
38. SCREW
39. BRIDGE
40. NUT (3)
41. LEVELING CREW (3)
42. SCREW
43. BRIDGE SCREW
44. PLATE (3)
45. STRAP
46. BRACKET (2)
47. RIVET (4)

TS 6675-296-14/4-30

Figure 4-30. Tripod assembly.

c. Cleaning and Inspection.

(1) Clean all parts with an approved cleaning solvent and dry thorouqhly. Clean the wooden parts with a soft cloth moistened with water and dry thoroughly. Clean the strap with saddle soap.

(2) Inspect the tripod leg housings and cover for burrs, cracks, and wear. Inspect the head and cover for burrs, scratches, cracks, and breaks. Inspect the bridge for bends, burrs, wear, and damage. Inspect the clamps, shoes, and battery box bracket for cracks, breaks, and wear.

(3) Inspect the strap for cuts, wear, and damaged seams. Inspect' the wooden legs for cracks, splits, wear, and warping.

(4) Remove all burrs and minor scratches. Straighten minor dents and bends. Varnish or paint OD the wooden legs if the protective coating is worn or damaged. Paint all exposed metal surfaces.

(5) Replace all defective parts that cannot be repaired.

d. Assembly.

(1) Assemble rivets (47, fig. 4-30), brackets (46), strap (45), plates (44), bridge screw (43) and screws (42).

(2) Attach leveling screws (41), nuts (40), bridge (39), screws (38), R.H. legs (37), L.H. legs (36), bracket (35), washers (34) and accessory case (33).

(3) Attach clamps (32) screws (31), nuts (30), shoes (29), screws (28), washers (27) and screws (26).

(4) Assemble legs (25), screws (24), plates (23), clamp plate (22), screws (21), thumbscrew (20) and clamp (19).

(5) Attach buckle (18), lock plate (17), leg clamps (16), belt loop (15), screws (14), hooks (13), sling (12) and sling (11).

(6) Attach screws (10), bracket (9), bolts (8), head screws (7) and housing (6).

(7) Attach clamps (5), head (4), screws (3), pins (2) and cover (l).

4-29. Plumb Bob

a. General. When installed on the tripod, the plumb bob makes it possible to center the instrument exactly over the station point.

1. BAYONET TUBE
2. RING
3. SLIDE
4. CORD
5. PLUMB BOB

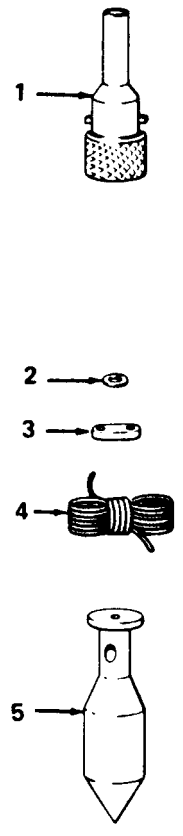


Figure 4-31. Plumb bob, disassembly and assembly.

b. Disassembly. Remove bayonet tube (1, fig. 4-31), ring (2), slide (3), cord (4) and plumb bob (5).

c. Cleaning, *Inspection and Repair.*

(1) Clean all metal parts with soap and water and dry thoroughly.

(2) Inspect the bayonet tube, ring, slide, and plumb bob for signs of wear, cracks, or breaks. Inspect the lugs on the bayonet tube for burrs. Inspect the cord for wear.

(3) Remove all burrs and replace damaged or defective parts. Use new cord when reassembling the plumb bob.

d. Assembly. Assemble bayonet tube (1, fig. 4-31), ring (2), slide (3), cord (4) and plumb bob (5).

4-30. Tripod Wrench

a. General. The tripod wrench is used to tighten or loosen the clamping

screws under the tripod head to hold the tripod legs in position.

b. Removal. Remove the tripod wrench from the tripod accessory case.

c. Clean and *Inspect.* Clean the wrench with soap and water and dry thoroughly. Inspect the wrench for wear, burrs, cracks, or breaks. Remove minor burrs from the wrench. Check to see whether the wrench engages the bolts on the tripod head in a satisfactory manner. Replace a damaged or defective tripod wrench.

d. Stow the wrench in the tripod accessory case.

4-31 INSTALLATION OF WINTERIZATION KIT LEVELING SCREW COVERS (ALL MODELS)

a. Remove tribrach assembly in accordance with paragraph 4-25c.

b. Loosen the machine screw (figure 4-32) on the base of the tribrach.

c. Rotate the tribrach spring plate to allow the larger side of the spring plate slot to release the leveling screws.

d. Install the leveling screw covers. Insure that the lips of the covers are positioned on the top of the leveling screws.

e. Position lower tribrach on upper tribrach assembly. The leveling screw feet, large side of spring plate slot, and leveling screw bearing must be in line.

f. Rotate the spring plate to allow smaller slot of spring plate to catch the leveling screw. Pressure downwards (toward the leveling screws) on the spring plate may be required to rotate spring plate onto the leveling screws.

g. Tighten the machine screw.

h. Install tribrach on theodolite and insure leveling screws operate correctly.

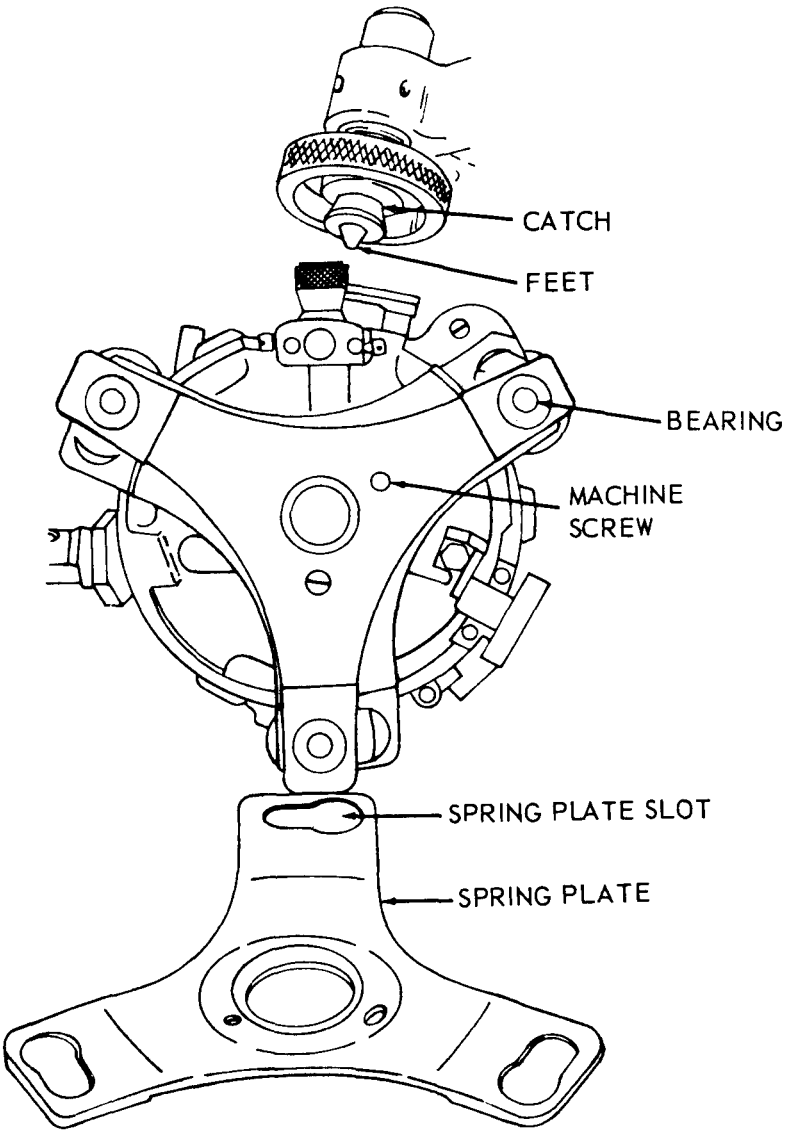


Figure 4-32. Winterization kit leveling screw covers, installation.

CHAPTER 5

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS AND EQUIPMENT

5-1. Special Tools and Equipment

No special tools and equipment are required for Direct Support and General Support personnel for performing maintenance on the theodolites.

5-2. Repair Parts

Repair Parts are listed and illustrated in TM 5-6675-296-24P, 5-6675-205-35P and 5-6675-233-35P.

6-3. Fabricated Tools and Equipment

No fabricated tools and equipment are required for Direct Support and General Support personnel for performing maintenance on the theodolites.

Section II. TROUBLESHOOTING

NOTE

There are no troubleshooting items applicable to Direct Support and General Support Maintenance.

Section III. GENERAL MAINTENANCE

5-4. Hand Lamp.

a. Disassembly.

(1) Remove cover (1, fig 5-1), lamp (2), housing (3), switch slide (4), screw (5), insulator (6) and *screws* (7).

(2) Remove lampholder (8), switch (9), cable assembly (10), cover (11), plug connector (12) and hook (13).

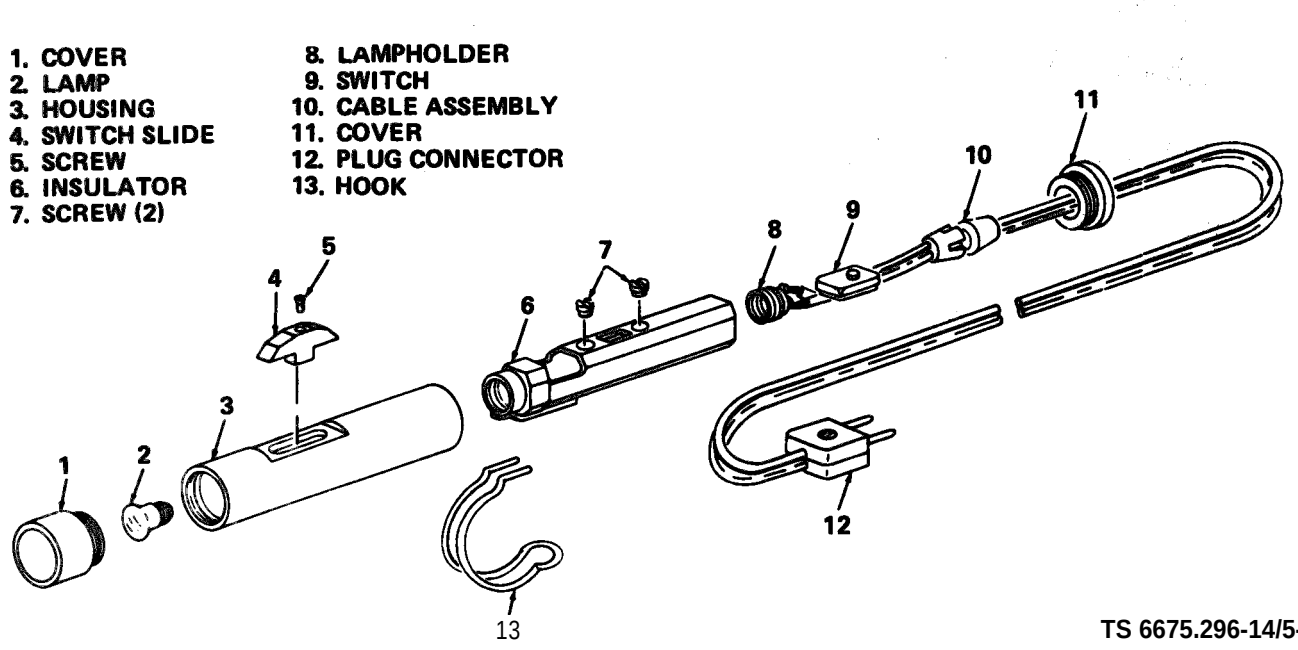


Figure 5-1. Hand light, disassembly and assembly

b. Repair.

(1) Remove all burrs and straighten minor dents.

(2) Replace all defective parts that cannot be repaired.

c. Assembly.

(1) Attach hook (13, fig. 5-1), plug connector (12). cover (11), cable assembly (10), switch (9) and lampholder (8).

(2) Assemble screws (7), insulator (6), screw (5). switch slide (4), housing (3), lamp (2) and cover (1).

5-5. Battery Box.

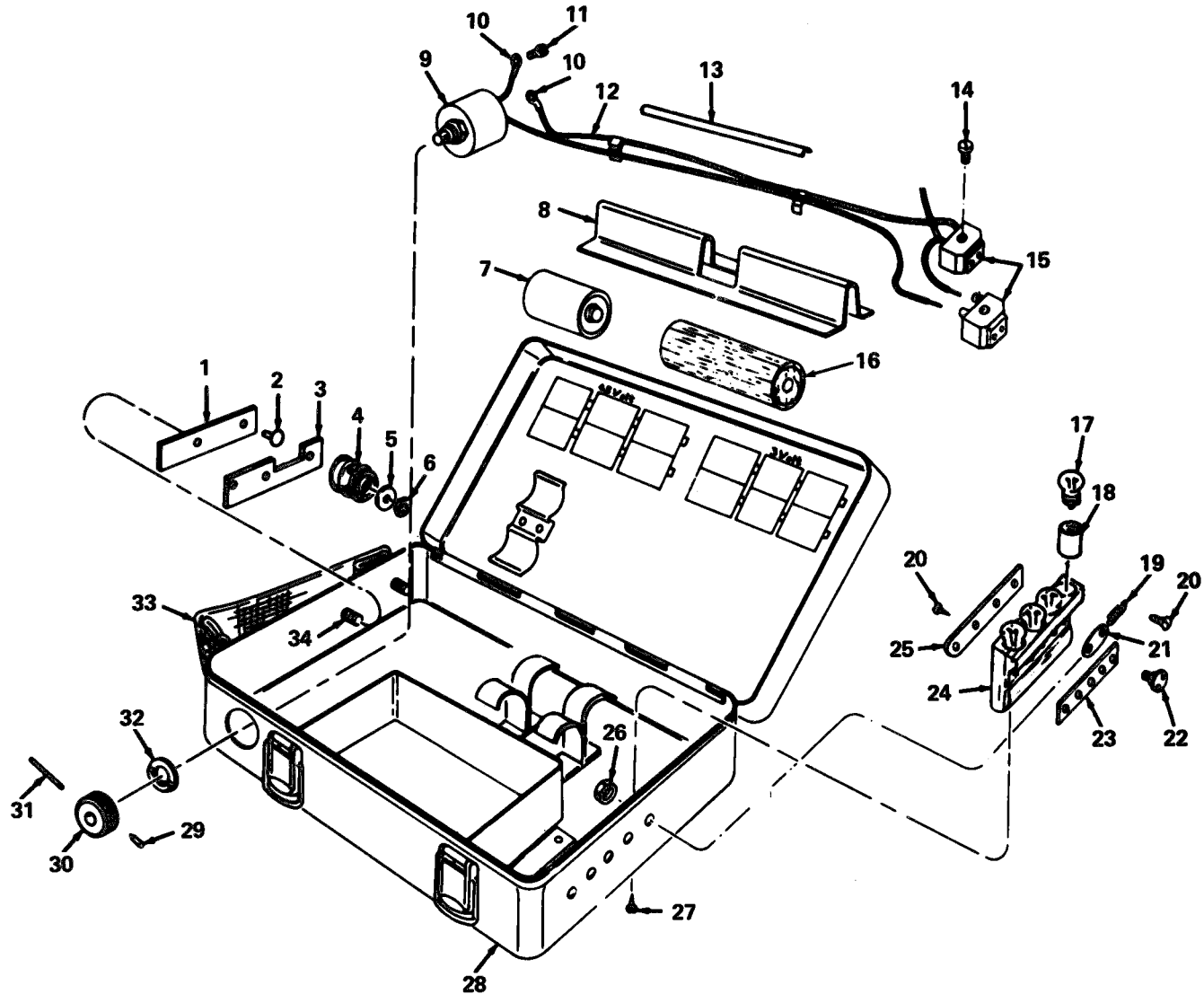
a. Disassembly.

(1) Remove insulation (1, fig. 5-2), rivets (2), contact (3), springs (4), washers (b) and nuts (6).

(2) Remove batteries (7), insulation (8), rheostat (9), terminal lugs (10), screws (11), cable (12), insulation (13), screws (14) and sockets (15).

(3) Remove dummy battery assembly (16), lamps (17), lamp housings (18), spring (19), screws (20), contact (21), knob (22), slide lever (23), lamp trunk (24) and contact (25).

(4) Remove nut (26), screws (27), battery box (28), setscrew (29), knob (30), pin (31), washer (32), carrying strap (33) and screws (34).



1. INSULATION
2. RIVET (2)
3. CONTACT
4. SPRING (2)
5. WASHER (2)
6. NUT (2)
7. BATTERY (4)
8. INSULATION
9. RHEOSTAT
10. TERMINAL LUG (2)
11. SCREW
12. CABLE
13. INSULATION
14. SCREW (2)
15. SOCKET (2)
16. DUMMY BATTERY ASSEMBLY
17. LAMP (4)
18. LAMP HOUSING (4)
19. SPRING
20. SCREW (4)
21. CONTACT
22. KNOB
23. SLIDE LEVER
24. LAMP TRUNK
25. CONTACT
26. NUT
27. SCREW (2)
28. BATTERY BOX
29. SETSCREW
30. KNOB
31. PIN
32. WASHER
33. CARRYING STRAP
34. SCREW (2)

TS 6675-296-14/5-2

Figure 5-2. Battery box, disassembly and assembly.

b. Repair.

(1) Remove all burrs and straighten minor dents.

(2) Replace all defective parts that cannot be repaired.

c. Assembly.

(1) Assemble screws (34, fig. 5-2), carrying strap (33), washer (32), pin (31), knob (30), set-screw (29), battery box (28), screws (27) and nut (26) .

(2) Assemble contact (25), lamp trunk (24), slide lever (23), knob (22), contact (21), screws (20), spring (19), lamp housings (18), lamps (17) and dummy battery assembly (16).

(3) Assemble sockets (15), screws (14), insulation (13), cable (12), screws (11), terminal lugs (10), rheostat (9), insulation (8) and batteries (7).

(4) Assemble nuts (6), washers (5), springs (4), contact (3), rivets (2) and insulation (1).

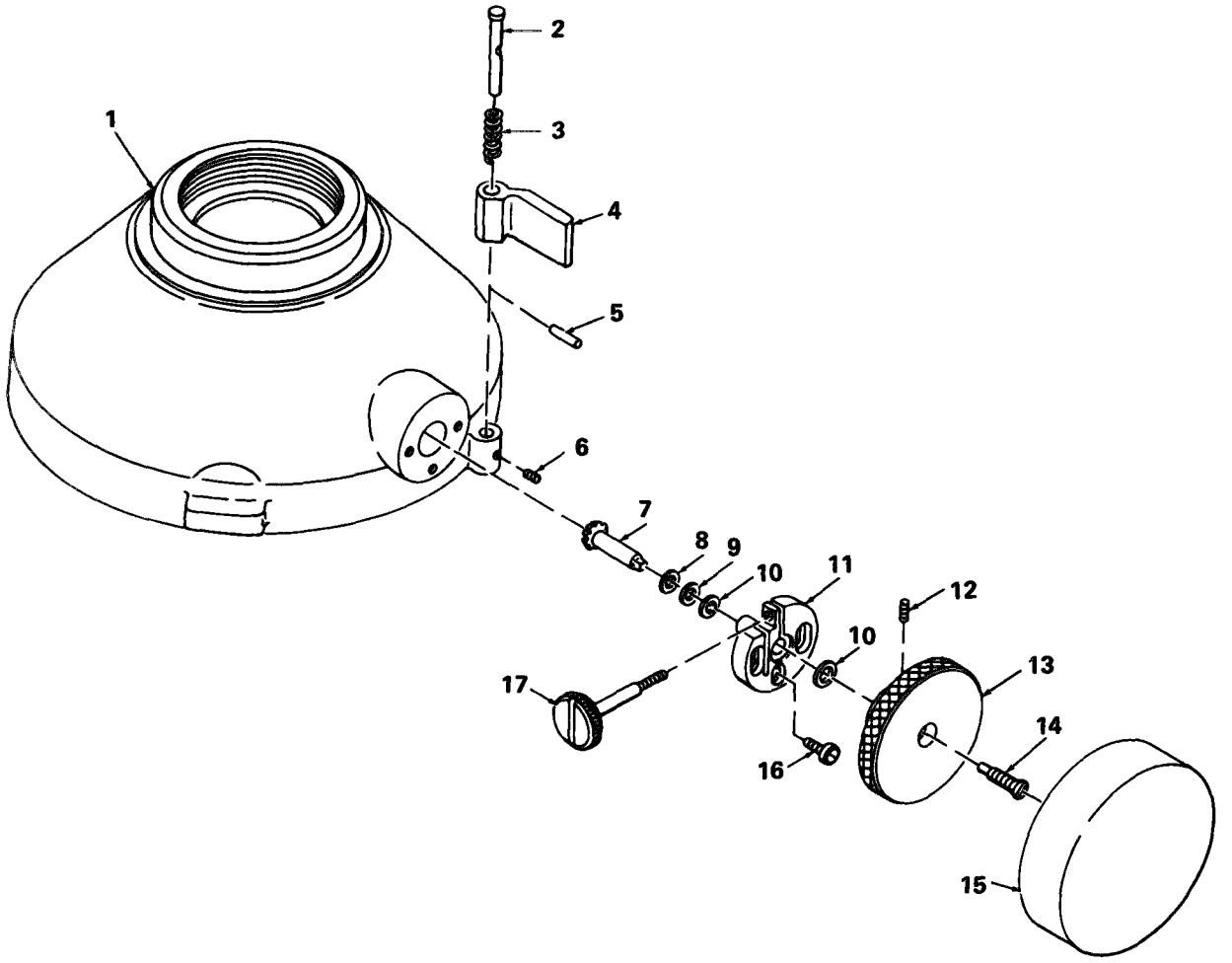
5-6. Retrofit Kit

a. Disassembly.

(1) Remove screw (6, fig. 5-3), pin (5), hinge (4), spring (3), and circle drive axis (2) from horizontal base (1).

(2) Remove cover (15), knob screw (14), knob (13), setscrew (12), teflon washers (10), screws (16), thumb screw (17), adjusting knob (11), spring washer (9), washer (8), and drive (7).

NOTE: USED FOR MISSILE APPLICATION ONLY.



1. HORIZONTAL BASE
2. CIRCLE DRIVE AXIS
3. SPRING
4. HINGE
5. PIN
6. SCREW
7. DRIVE
8. WASHER
9. SPRINGWASHER
10. TEFLON WASHER (2)
11. ADJUSTING KNOB
12. SETSCREW
13. KNOB
14. KNOB SCREW
15. COVER
16. SCREW (3)
17. THUMBSCREW

TS 6675-296-14/5-3

Figure 5-3. Horizontal circle drive *rerofit kit, disassembly and assembly.*

b. Repair.

(1) Remove rust and bum.

(2) Replace all defective parts that cannot be repaired.

c. Assembly.

(1) Assemble drive (7. fig. 5-3), washer (8), spring washer (9), adjusting knob (11), thumb screw (17), screws (16), teflon washer (10), knob (13) setscrew (12), knob screw (14) and cover (15).

(2) Assembly circle drive axis (2). spring (3), hinge (4). pin (5) and screw (6) to horizontal base (l).

APPENDIX A

REFERENCES

A-1. Painting

TM 9-213	Painting Instruction for Field Use

A-2. Maintenance

TB 750-97-66	Maintenance Expenditure Limits for FSC Group 66
TM 38-750	The Army Maintenance Management System
TM5-6675-205-20P	Organizational maintenance repair parts and special tools list: Theodolite, directional, 0.002-mil graduation, 5.9-inch long telescope, detachable tribrach, w/accessories and tripod (Wild Heerbrugg model T-2-56-C-MIL) NSN 6675-00-82-4635 (Wild Hewbrugg model T-2-S6-M-MIL) NSN 6675-00-796-9439 (Wild Heerbrugg model T-2-56-M-MIL, reference) (Wild Heerbrugg model T-2-664-MIL, reference) NSN 6676-00-988-5225
TM5-6675-205-35P	DS, GS and depot maintenance repair parta and special tools list: Theodolite, directional, 0.002-mil graduation, 5.9-inch long telescope, detachable tribrach, w/accessories and tripod (Wild Heerbrugg model T-2-56-C-MIL) NSN 6675-00-682-4635 (Wild Heerbrugg model T-2-56-M-MIL) NSN 6675-00-796-9439 (Wild Heerbrugg model T-2-56-M-MIL, reference) (Wild Heerbrugg model T-2-56-C-MIL, reference) NSN 6675-00-988-5225
TM5-6675-233-20P	Organizational maintenance repair parts and special tool lists: Theodolite, directional, 0.002 mil graduation, 5.9 in. long telescope, detachable tribrach, w/accessories and tripod (Wild Heerbrugg model T2-63 mil) NSN 6675-00-983-8027 (Wild Heerbrugg model T2-63 mil, serial no. range 100656, 100934 through 100963, 10184 through 10112) NSN 6675-00-988-5225
TM5-6675-233-35P	DS, GS, and depot maintenance repair parts and special tool lists: Theodolite, directional, 0.002 mil graduation, 5.9 in. long telescope, detachable tribrach, w/accessories and tripod (Wild Heerbrugg model T2-63 mil) NSN 6675-00-983-8027 (Wild Heerbrugg model T2-63 mil, serial no. range 100656, 100934 through 100963, 10184 through 10112) NSN 6675-00-988-5225
TM5-6675-296-24P	Organizational, DS, GS and depot maintenance repair parts and special tools list: Theodolite, directional, 0.002 mil graduation, 5.9 in. long telescope, detachable tribrach, w/accessories and tripod (Wild Heerbrugg model T2-68 mil) NSN 6675-00-089-8885, theodolite (reference) model T2-68 mil NSN6675-00-988-5225

A-3. Shipment and Storage

TM 740-90-1	Administrative Storage of Equipment
TB 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage

APPENDIX B

COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists integral components of and basic issue items for the theodolite to help you inventory items required for safe and efficient operation.

B-2. General

This 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 theodolite and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the theodolite in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the theodolite 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 TOE/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.

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

b. National Stock Number. Indicates the national stock number assigned to the item and which will be ueed for requisitioning.

c. Part Number. 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*
CSM	Model T2-56-C-MIL
CSN	Model T2-56-M-MIL
AZX	Model T2-63MIL
AZZ	Model T2-66-C-MIL
CRR	Model T2-66-MIL
CRS	Model Reference

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 an inventory. Under the Rcv'd column, list the quantity you actually receive on your major item. The Date columns are for your 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 Number	(3) Part No & FSCM	(4) Description	(5) Location	(6) Usable On Code	(7) Qty Reqd.	(8) Quantity Rcv'd	Date	Date
B 1			T21 2A59M IL (89905)	Tribrach Assy		CSN CSM	1			
B 2			GDF2 000000 (89905)	Tribach Assy		AZX AZZ	1 1			
B 3			GDF2 000000 68 (89905)	Tribach Assy		CRR CRS	1 1			
			NT2 427A (89905)	Sunshade		CSN CSM	1 1			
			GSB2 (89905)	Sunshade		AZX AZZ CRR CRS	1 1 1 1			
B 4			NT2 58 A59B60 (89905)	Illumination Mirror Assy		CSN CSM	2 2			
B 5			T1A2900158 (89905)	Illumination Mirror Assy		AZX AZZ CRR CRS	2 2 2 2			
				Case Assy, Carrying Consisting of:						
B 6			GVP4 04000 (89905)	Hood Assy		CSN CSM AZX AZZ CRR CRS	1 1 1 1 1 1			
B 7			XT21 108MIL (89905)	Base Assy		CSN CSM AZX AZZ CRR CRS	1 1 1 1 1 1			
B 7			NT1 893 894 895 (89905)	Desiccant Container		CSN CSM AZX AZZ CRR CRS	1 1 1 1 1 1			
			316128 (89905)	Case, Shipping		CSN CSM AZX AZZ CRR CRS	1 1 1 1 1 1			
B 8				Case, Accessory Containing the following:						
B 8			T21 251AG (89905)	Case Accessory		CSN CSM AZX AZZ CRR CRS	1 1 1 1 1 1			
B 8			NT2 549 (89905)	Cover, Instrument		CSN CSM AZX AZZ CRR CRS	1 1 1 1 1 1			

(1) Illustration (a) Figure No.	(b) Item No.	(2) National Stock Number	(3) Part No. & FSCM	(4) Description	(5) Location	(6) Usable On Code	(7) Qty Reqd.	Quantity Rcv'd	Date	Date	Date
B-8			XT21-111 (89905)	Eyepiece, Diagonal		CSN	1				
				Microscope		CSM	1				
B-8			GZOM2-00000 (89905)	Eyepiece, Diagonal		AZX	1				
				Microscope		AZZ	1				
B-8			GZOM2-00001-68 (89905)	Eyepiece, Diagonal		CRR	1				
				Microscope		CRS	1				
B-8			XT21-110 (89905)	Eyepiece, Diagonal		CSN	1				
				Telescope		CSM	1				
B-8			GZOF00000 (89905)	Eyepiece, Diagonal		AZX	1				
				Telescope		AZZ	1				
B-8			GZOF00000-68 (89905)	Eyepiece, Diagonal		CRR	1				
				Telescope		CRS	1				
B-8			XT2-92 (89905)	Sunglass Filter		CSN	1				
						CSM	1				
B-8			GOF4-00000 (89905)	Sunglass Filter		AZX	1				
						AZZ	1				
B-8			GOF4-00001 (89905)	Sunglass Filter		CRR	1				
						CRS	1				
B-8			T21-4W (89905)	Lamp Fittings		CSN	2				
						CSM	2				
						AZX	2				
						AZZ	2				
						CRR	2				
						CRS	2				
				Battery Box Assy Containing the following:							
B-9			GEB8-000000-66 (89905)	Box Assy, Battery		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-9			XT2-73 (89905)	Lamp, Hand		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-1			XT2-72 (89905)	Cable Assy, Electrica		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
B-1			GEB11-000000-66 (89905)	Cable Assy, Electrica		CRR	1				
						CRS	1				
B-			GEB10-000000 (89905)	Battery, Dummy		CSN	2				
						CSM	2				
						AZZ	2				
						CRR	2				
						CRS	2				
			10102202 (09786)	Adapter, Optical		CSN	1				
				Plummet Eyepiece		CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-1			HDS1-2A (89905)	Haversack		CSN	1				
						M	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				

(1) Illustration (a) Figure No.	(1) Illustration (b) Item No.	(2) National Stock Number	(3) Part No. & FSCM	Description	Location	(6) Usable On Code	(7) Qty Reqd.	(8) Quantity Rcv'd	Date	Date	Date
B 11				Tripod Assy Extension Leg consisting of:		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B 11			21A00800066 (89905)	Tripod Assy		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-11			3A63A (89905)	Cover, Tripod		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B 12			21A007000 66 (89905)	Tripod Accessory Case		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B 12			166494 (89905)	Wrench, Tripod		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-12			2A001000 (89905)	Plumb Bob Assy		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				

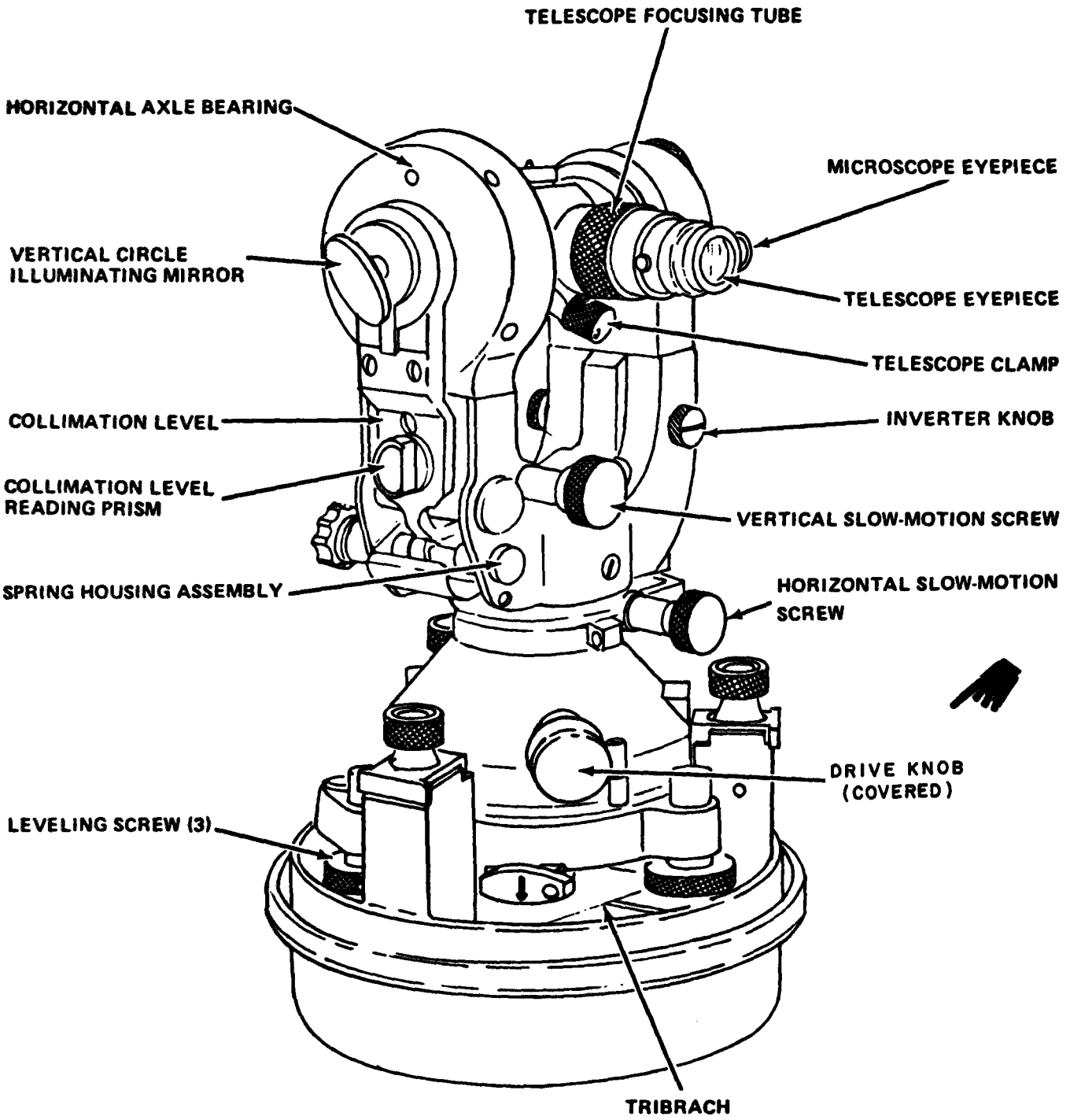


Figure B-1. Theodolite (Model T2-56-M-MIL), left rear, three-quarter view.

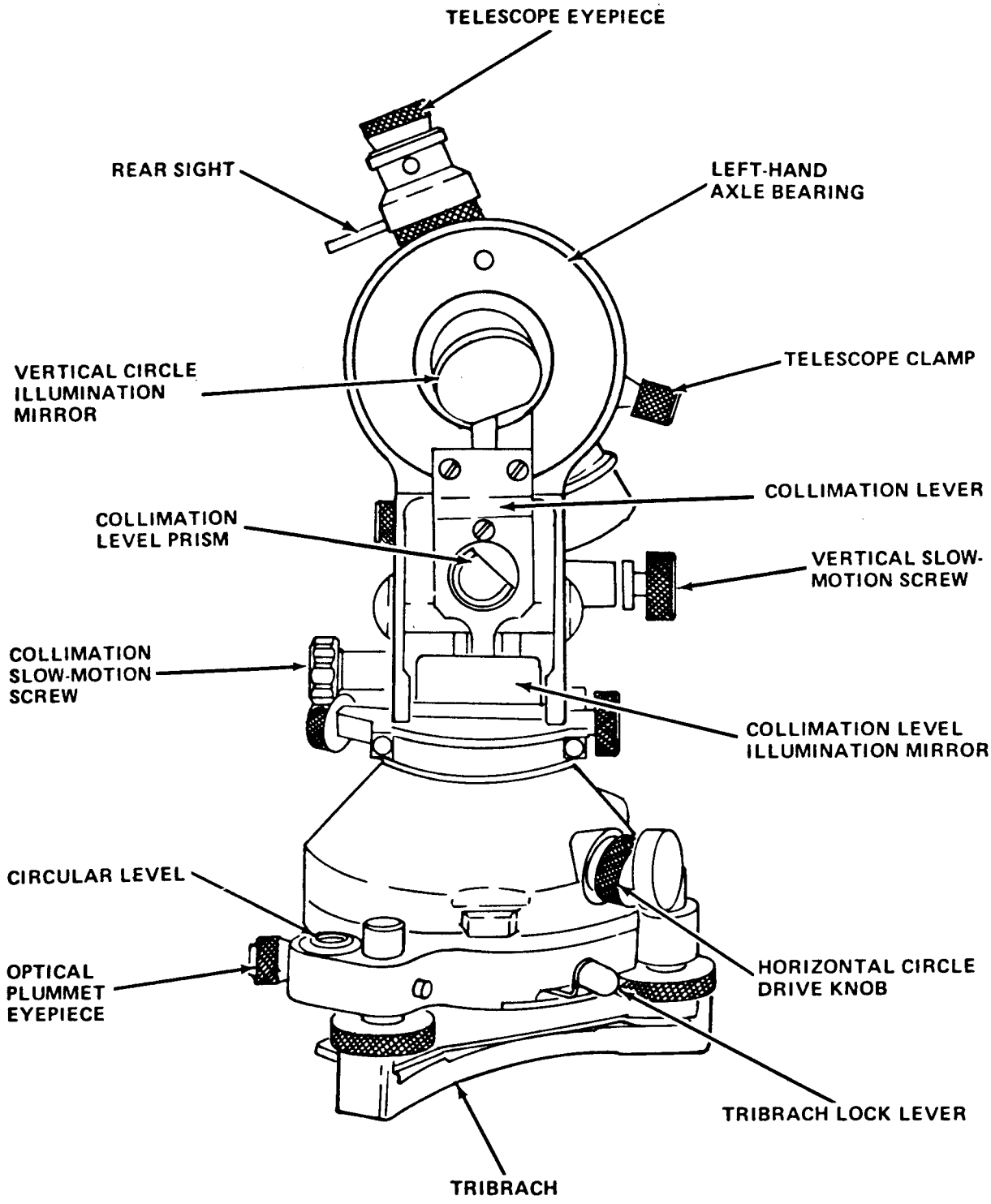


Figure B-2. Theodolite (Models T2-63MIL, T2-66-C-MIL and T2-67MIL), left side view.

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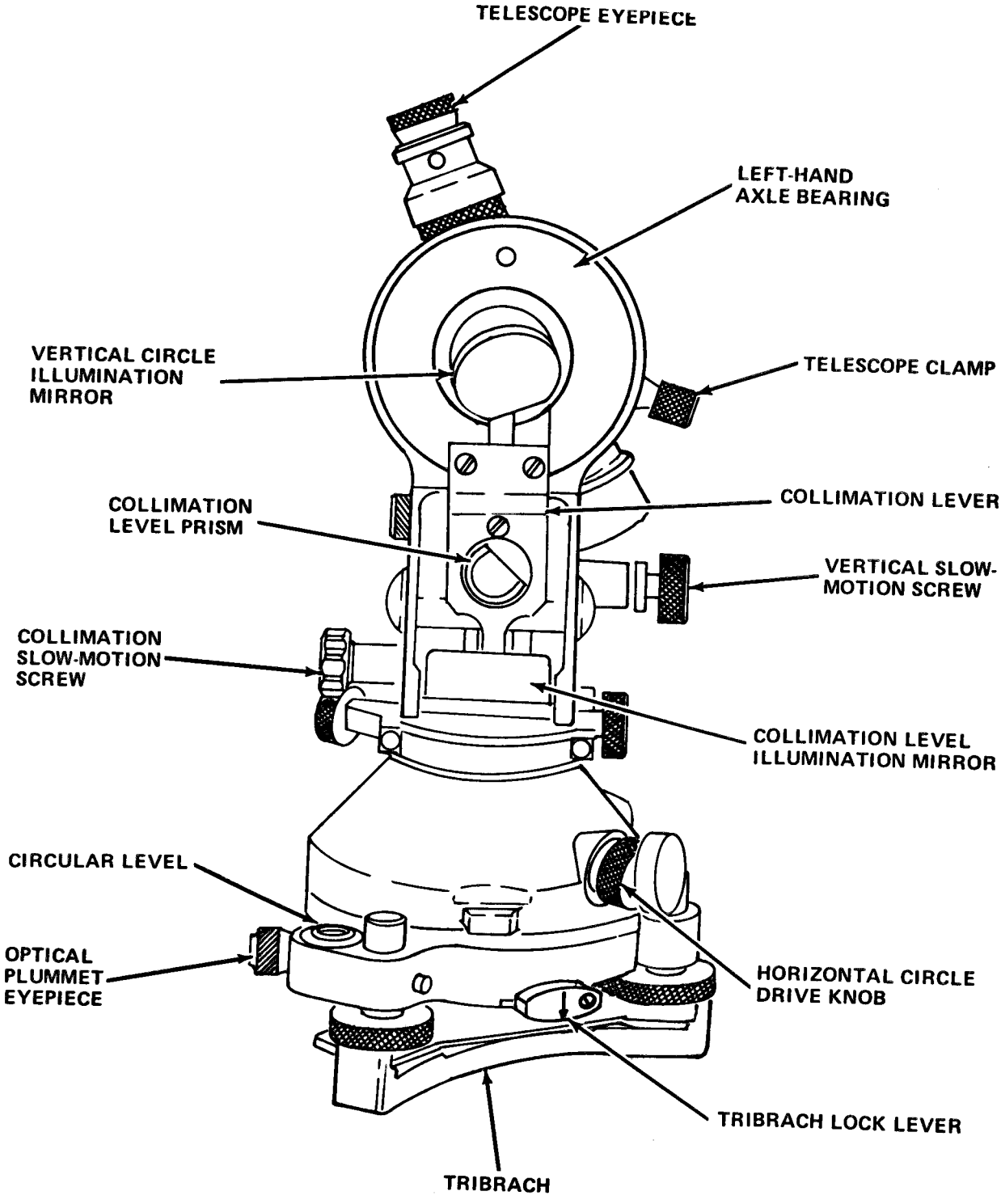


Figure B-3. Theodolite (Model T2-68MIL), left side view.

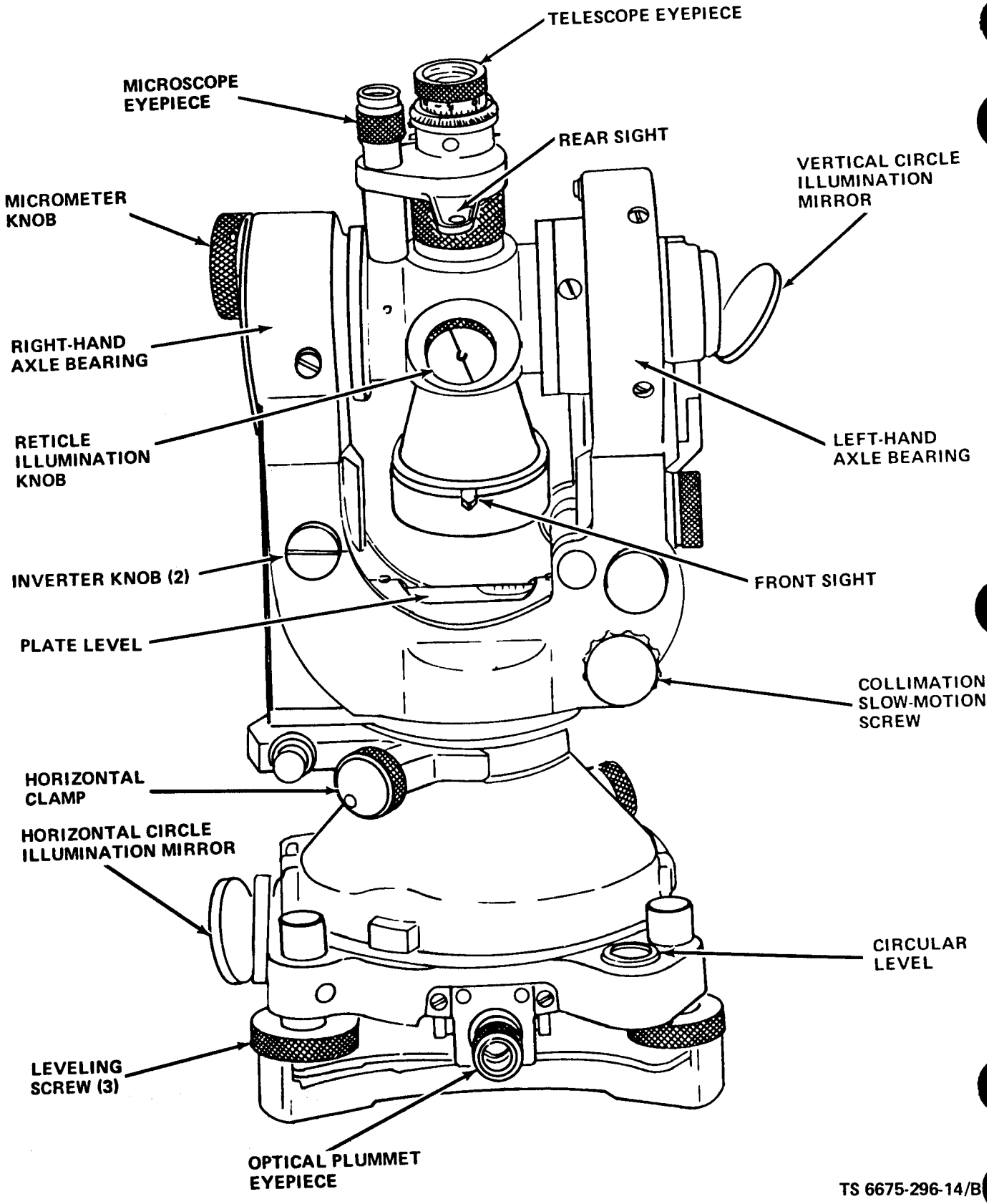


Figure B-4. Theodolite (Models T2-63MIL, T2-66-C-MIL and T2-67MIL), front view.

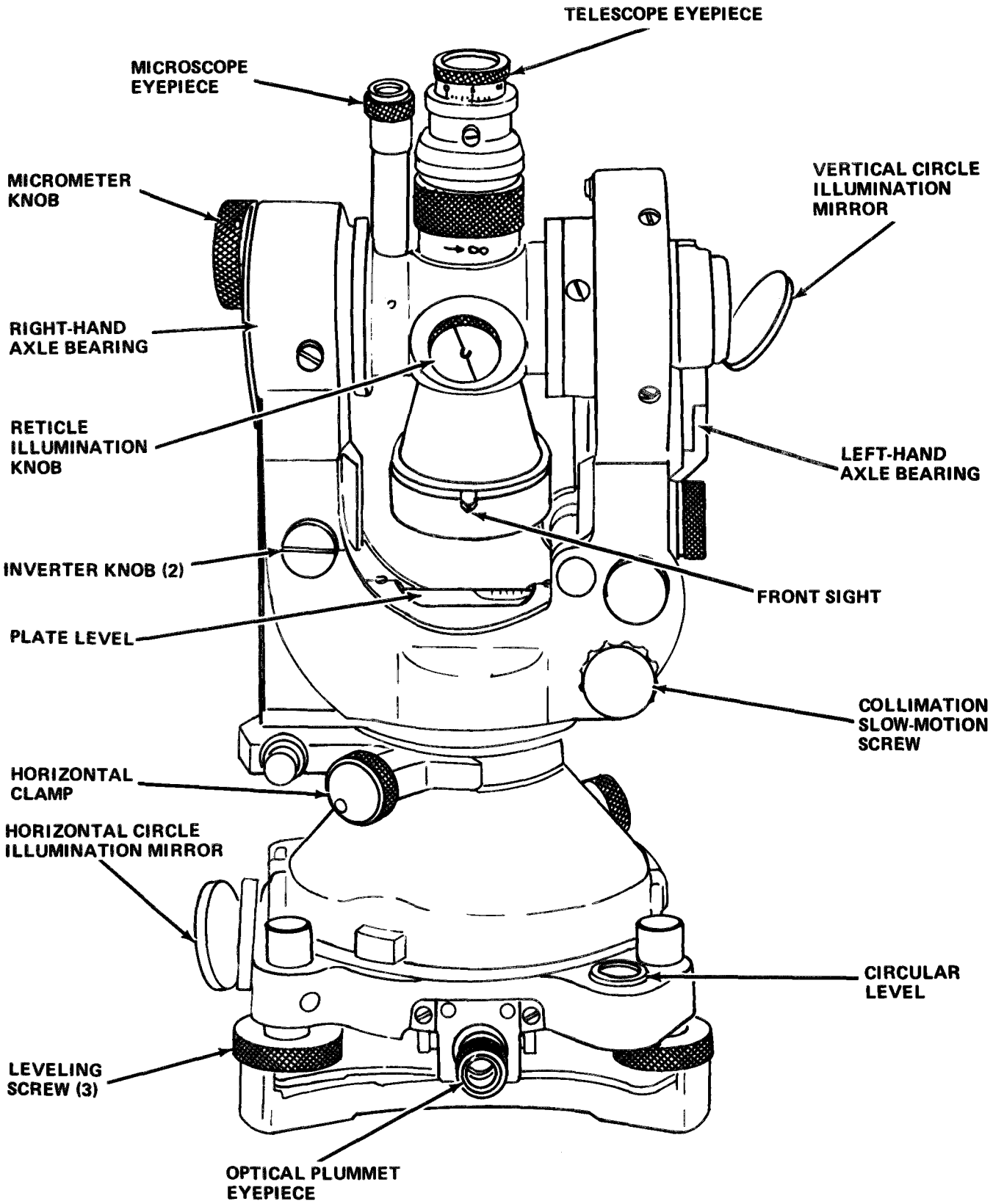


Figure B-5. Theodolite Model T2-68MIL), front view.

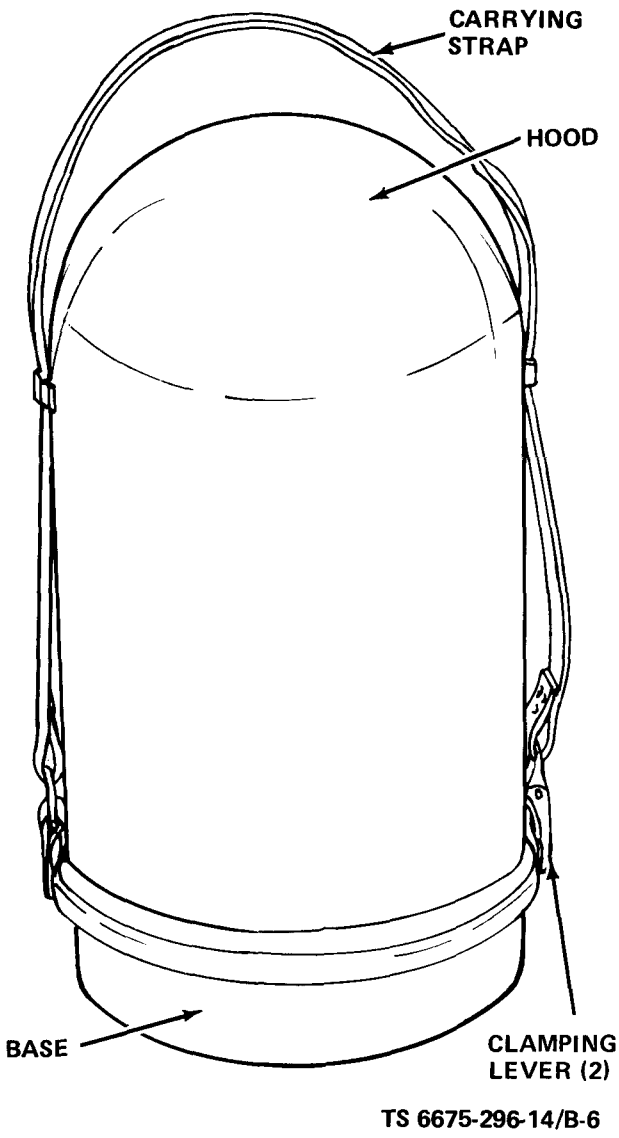


Figure B-6. Theodolite carrying case hood.

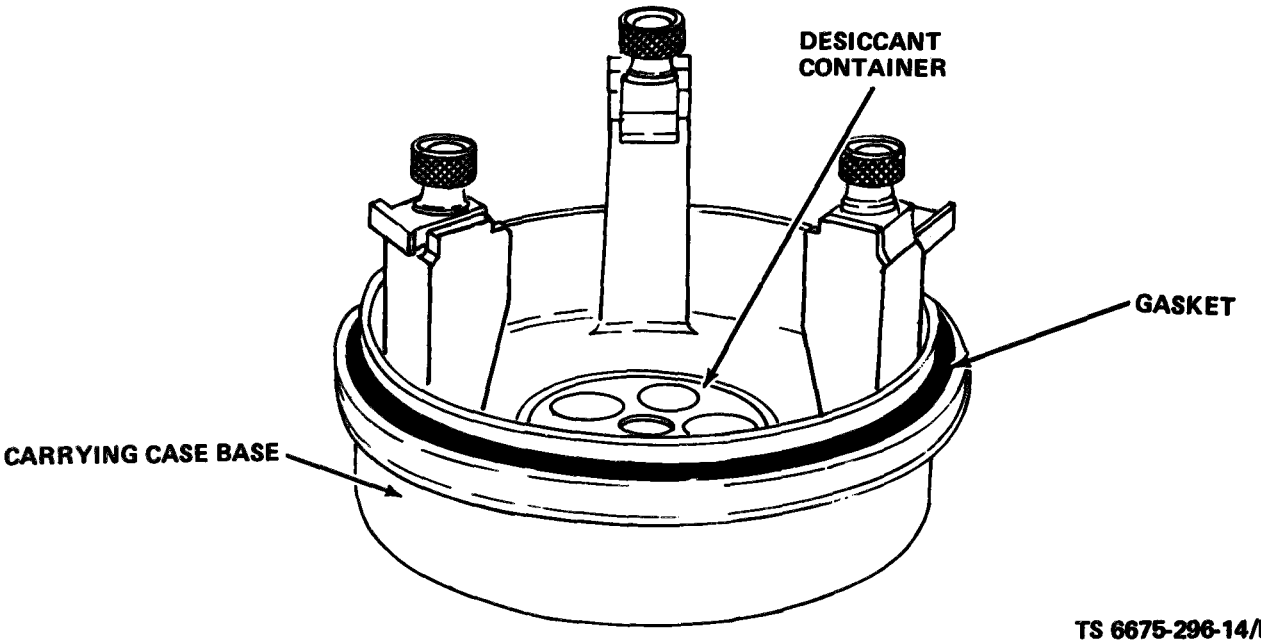


Figure B-7. Carrying case base.

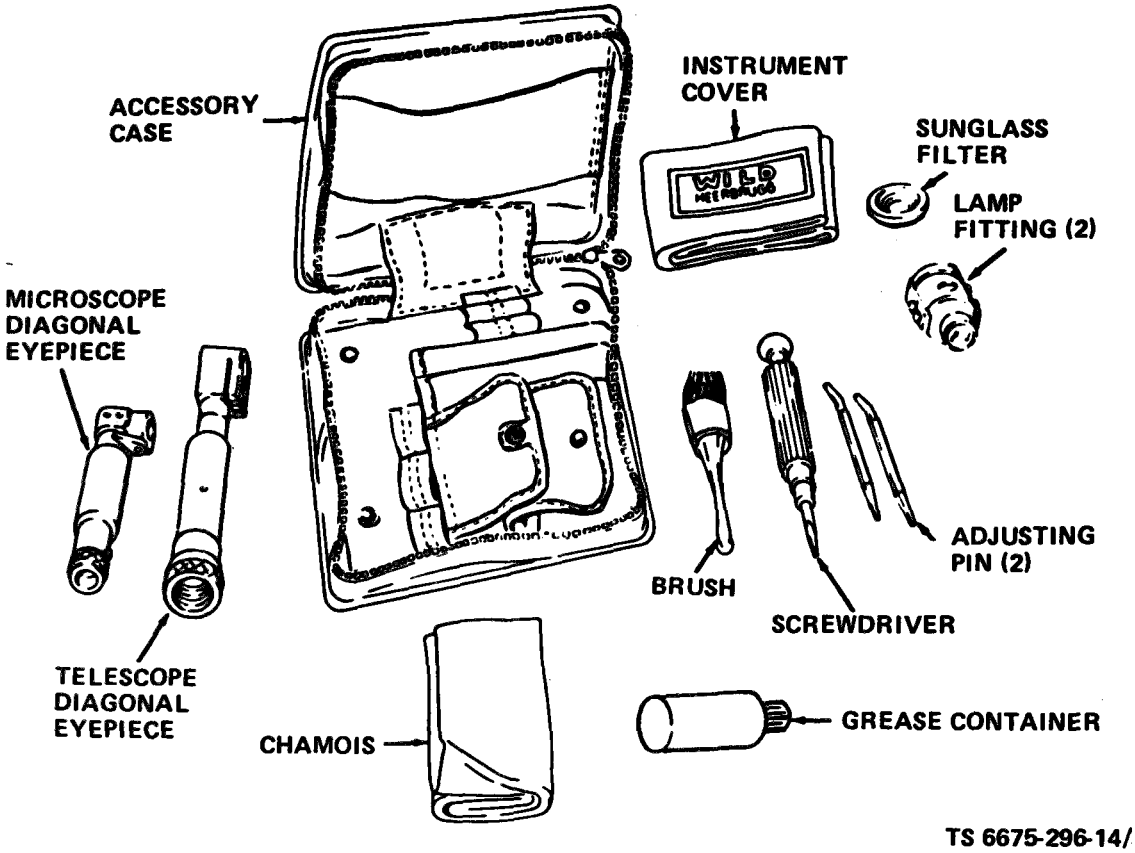


Figure B-8. Accessory case, unpacked view.

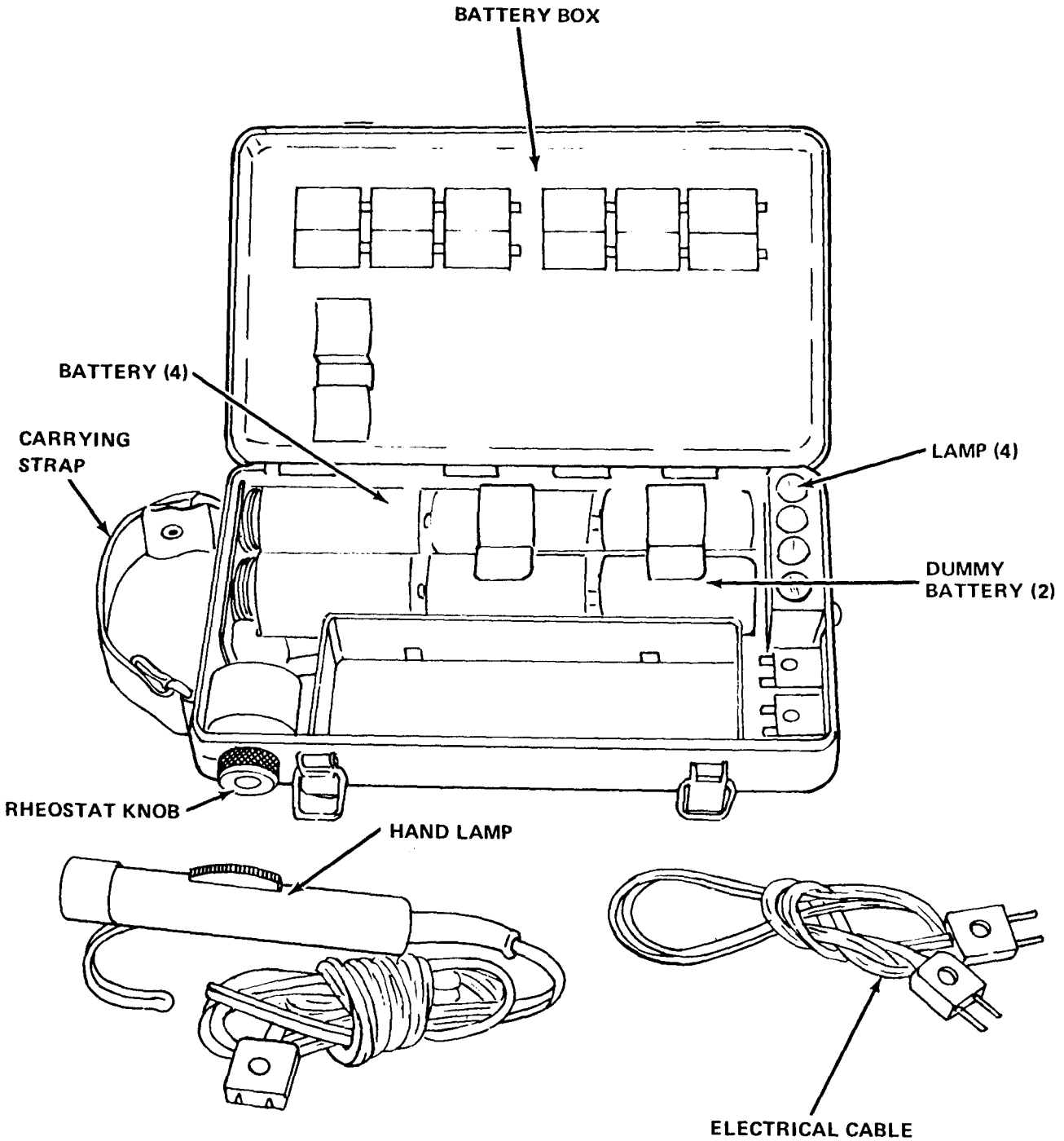
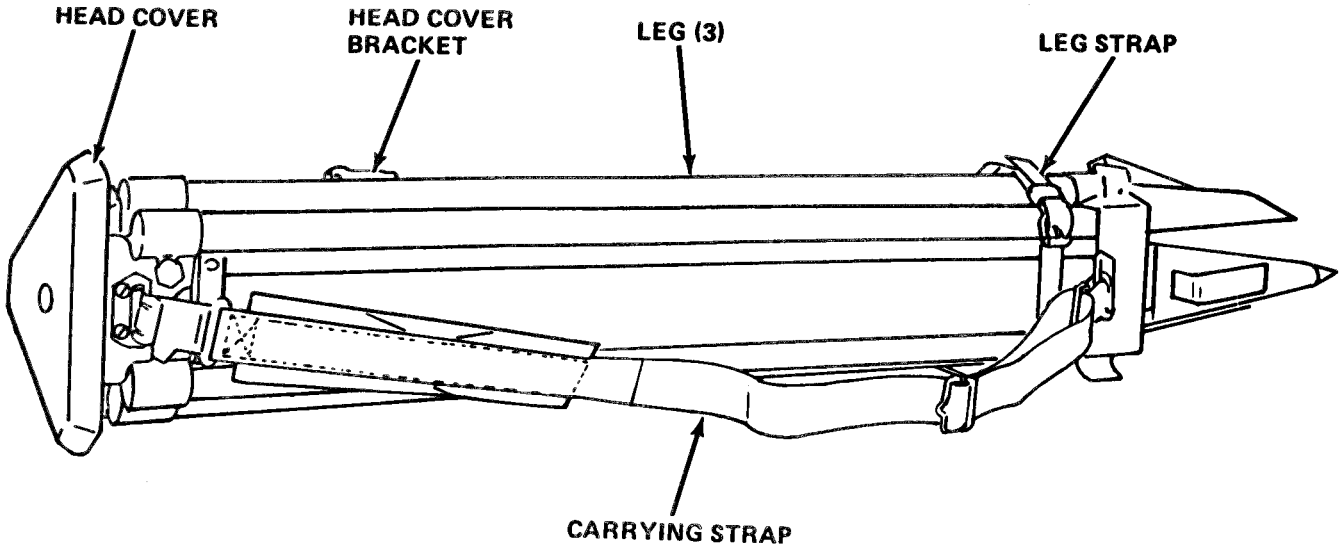


Figure B-9. Battery box and contents.

TS 6675-296-14/B-10

Figure B-10. Haversack.



TS 6675-296-14/B-11

Figure B-11. Tripod assembly.

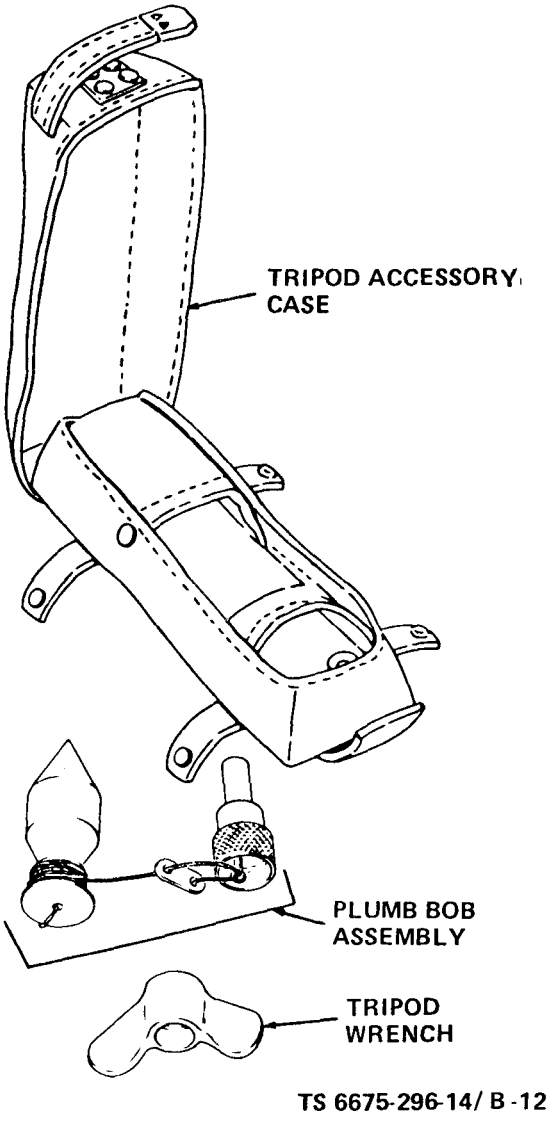


Figure B-12. Tripod accessoy case.

Section III. BASIC ISSUE ITEMS

(1) Illustration (a) Figur No.	(1) Illustration (b) tem No.	(2) National Stock Number	(3) Part No. & FSCM	(4) Description	(5) ocation	(6) Usable On Code	(7) Qty teqd.	(8) Quantity Rcv'(	Dat	Dat	Date
				TM 5-6675-296-14		CSN	1				
				Operator, Organizational		CSM	1				
				Direct Support an		AZX	1				
				General		AZZ	1				
				Support Maintenance		CRR	1				
				Manual		CRS	1				
B-8			3A55 (89905)	Pin, Adjusting		CSN	2				
						CSM	2				
						AZX	2				
						AZZ	2				
						CRR	2				
						CRS	2				
B-8			HDW1-2 (89905)	Screwdriver, jewelers		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-8			KKC300 (89905)	Chamois		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-8			3A59 (89905)	Brush, Dust		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-9			HEG3-64 (89905)	Lamps		CSN	3				
						CSM	3				
						AZX	3				
						AZZ	3				
						CRR	3				
						CRS	3				
B-9			MS15611-5 (96906)	Lamp		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				
B-8			HDF3-4 (89905)	Container Lubricant		CSN	1				
						CSM	1				
						AZX	1				
						AZZ	1				
						CRR	1				
						CRS	1				

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists additional item you are authorized for the support of the theodolite.

C-2. General

This list identifies items that do not have to accompany the theodolites and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. Explanation of Listing

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. If item required differs for different models of this equipment, the model is shown under the Usable on heading in the description column. These codes on identified as:

Code	Used on
CSM	Model T2-56-C-MIL
CSN	Model T2-56-M-MIL
AZX	Model T2-63MIL
AZZ	Model T2-66-C-MIL
CRR	Model T2-68-MIL
CRS	Model Reference

Section II. ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description Part Number & FSCM		Usable On Code	(2) U/M	(4) Qty Auth
	BA30 (81349)	Battery Dry 1.5 Volts	CSN CSM AZX AZZ CRR CRS	ea	8
	WK2 ASSY (89905)	Winterization Kit	CSN CSM AZX AZZ CRR CRS	ea	1

APPENDIX D

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions on explanatory notes for a particular maintenance function.

D-2. Maintenance Functions

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

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

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

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

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

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement.. Consists of comparisons of **two instruments,** one of which is a certified **standard of known** accuracy, to detect and adjust **any discrepancy in** the accuracy of the instrument

g. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services or other maintenance actions to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

j. Overhaul. That maintenance effort (services/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR.) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

h. Refold. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurement (hours/miles, etc.) considered in classifying Army equipment /components.

D-3. Column Entries Used in the MAC

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

b. Column (2), *Component/Assembly. Column* (2) contains the names of component, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column (3), *Maintenance Functions.* Column (3) lists the functions to be performed on the item listed in column (2). (For detailed explanation of these functions, see pare D-2.)

d. Column (4), *Maintenance Level. Column* (4) specifies, by the listing of a work time figure in the

appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column (3). This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The number of man-hours specified by the work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This item includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C	Operator or crew.
O	Organization maintenance.
F	Direct support maintenance.
H	General support maintenance.
D	Depot maintenance.

e. Column (5), *Tools and Equipment.* Column (5) specifies, by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column (6), *Remarks.* This column contains a letter code in alphabetic order which is keyed to the remarks contained in Section IV.

D-4. Column Entries Used in Tool and Test Equipment Requirements

a. Column (1), *Tool or Test Equipment Reference Code.* The tool and test equipment reference code correlates with a maintenance function on the identified end item or component.

b. Column (2), *Maintenance Level.* The lowest level of maintenance authorized to use the tool or test equipment.

c. Column (3), *Nomenclature. Name* or identification of the tool or test equipment.

d. Column (4), *National/NATO Stock Number.* The National or NATO stock number of the tool or test equipment.

e. Column (5), *Tool Number.* The manufacture's part number.

D-5. Explanation of Columns in Section IV

a. Reference Code. The code scheme recorded in column (6), Section II.

b. Remarks. This column lists information pertinent to the maintenance function being performed as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1)	(2)	(3)	(4) Maintenance Category					(5)	(6)
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
01	Haversack; Shipping, Carrying and Accessory Case								
	Haversack	Inspect		0.1					
		Replace		0.1					
		Service	0.2						
	Shipping Case	Inspect		0.1					
		Replace		0.1					
		Repair		0.2					
	Carrying Case	Inspect		0.1					
		Replace		0.1					
		Repair		0.1					
	Accessory Case	Inspect		0.1					
		Replace		0.1					
		Service	0.2						
02	Telescope Axis, Focusing Tube, Eyepiece and Telescope Objective Assembly								
	Telescope Axis Assembly	Inspect	...	...	...	...	0.1		
		Replace	...	...	...	...	0.5		
		Repair	...	...	...	...	0.3		
		Overhaul	...	...	...	...	0.5		
		Adjust	...	...	...	...	0.2	1,2	
	Focusing Tube	Inspect	...	...	...	...	0.1		

(1) Group Number	(2) Component/	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
02 (Cont.)		Replace					0.1		
	Eyepiece and Telescope Objective Assembly								
		Inspect				...	0.1		
		Replace					0.2		
		Repair		...			0.3		
		Overhaul		...			0.5		
03	Optical Plummet Eyepiece Assembly								
	Optical Plummet Eyepiece Assembly								
		Inspect		0.1					
		Replace			...		0.3		
		Repair			...		0.2		
		Overhaul					0.3		
		Adjust		0.1				1,2	
04	Reading Microscope and Mirror Assembly								
	Miscroscope, Reading Assembly								
		Inspect		0.1					
		Replace					0.2		
		Repair		...			0.2		
	Illumination Mirror Assembly								
		Inspect		0.1					
		Replace		0.1					
05		Repair		0.1					
	Vertical Circle Illumination, Horizontal Axis and Vertical Reading Assemblies								
	Vertical Circle Illumination Assembly								
		Inspect					0.1		
		Replace					0.3		
		Repair					0.5		
		Adjust					0.2	2	
	Horizontal Circle Axis Assembly								
		Inspect					0.1		
		Replace					0.3		
		Repair			...		0.5		
		Adjust					0.2	2	
	Vertical Circle Reading Assembly								
		Inspect	...				0.1		
		Replace		...	..		0.3		
		Repair					0.3		
		Adjust					0.2		
06	Base Cover Assembly								
	Base Cover Assembly								
		Inspect			..		0.1		
		Replace					0.2		
		Repair					0.2		
07	Vertical Collimation Level, Reading Micrometer, and U-Standard Assembly								
	Vertical Collimation								
		Inspect		0.1					
		Replace					0.3		
		Repair	...				0.2		
		Adjust	0.1					1,2	
	Reading Micrometer Assembl	Inspect					0.1		
		Replace					0.2		
		Repair					0.2	2	
		Adjust					0.1		
		Overhaul					0.3		

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
07 (Cont.)	U-Standard Assembly	Inspect					0.1		
		Replace	...		...		0.2		
		Repair	...			...	0.3		
		Adjust					0.1	1,2	
		Overhaul					0.5		
08	Tribrach Assembly Horizontal Clamp, Horizontal Circle Base Plate and Motion Screw Assemblies								
	Tribrach Assembly	Inspect	0.1						
		Replace		0.2					
		Repair	...	..			0.5		
	Leveling Screw Assembly	Inspect		0.1					
		Service		0.1					
		Replace					0.1		
		Adjust		0.1.		...		1	
	Tribrach Base Assembly	Inspect		0.1					
		Replace					0.1		
		Repair					0.1		
	Base Plate Assembly	Inspect		0.1					
		Replace		0.1					
		Repair		...			0.1		
	Horizontal Clamp Assembly	Inspect	...				0.1		
		Replace					0.2		
		Repair					0.1		
	Horizontal Circle Drive Assembly	Inspect	...	...	.	...	0.1		
		Replace					0.1		
		Repair					0.1		
	Slow Motion Tangent Screws	Inspect		0.1					
		Service		0.1					
		Replace		.	...	.	0.2		
09	Handlamp, Eyepiece Adapter Assemblies								
	Handlamp	Inspect		0.1					
		Replace		0.1					
		Repair		..	0.2				
	Eyepiece Adapter Assembly	Inspect		0.1					
		Replace	..	0.1					
		Repair	..	0.2					
10	Battery Box and Tripod Assembly								
	Battery Box	Inspect	0.1						
		Replace		0.1					
		Repair	..		0.2				
	Tripod Assembly	Inspect	0.1						
		Service	0.1	..				3	
		Replace		0.1					
		Repair	..	0.3					
	Plumb Bob Assembly	Inspect	0.1						
		Replace		0.1					
11	Retrofit Kit, (Clamp Assembly, Horizontal Circle Drive and Housing Lens and Light) Retrofit Kit	Inspect		0.1					
		Replace			0.2				
		Repair			0.3				

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) Reference Code	(2) Maintenance Category	(3) Nomenclature	(4) National Stock Number (NSN)	(5) Tool Number
1	C, O, F	Pin, Adjusting	6675-00-353-4103	3A55(89905)
2	C, O, F	Screwdriver	5120-00-961-2761	HDW1-2(89905)
3	C, O, F	Wrench, Tripod	5120-00-378-9520	3A29(89905)

Section IV. REMARKS

This section is not applicable

APPENDIX E

REPAIR PARTS AND SPECIAL TOOLS LIST

For repair parts and special tools list see TM's 5-6675-296-24P, 5-6675-205-20P, 5-6675-205-35P, 5-6675-233-20P and 5-6675-233-35P.

APPENDIX F

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

F-1. Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the theodolite. These items are authorized to you by CTA 50-970. Expendable Items (except Medical, Class V, Repair Parts, and Heraldic Items).

F-2. Explanation of Columns

a. Column (1)-Item *Number.* This number is assigned to the entry in tbe listing.

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

C–Operator
O–Organizational Maintenance
F–Direct Support Maintenance
H–General Support Maintenance

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

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

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

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	C,O	6850-00-680-2233	Desiccant Activated 1.5 lb	lb
2	C,O	7920-00-401-8034	Cloth, Lint-free, Non-abrasive, General Purpose Part No. 1001	bx
3	C,O	9150-00-985-7244	Grease, Instrument and Aircraft (GIA) MI-G-23827	tu
4	C,O	9150-00-252-6382	Oil, Clock and Watch (OCW) 5cc	bt
5	C,O	6810-00-223-2739	Acetone, Technical, 1 pt can; Spec MMM-A-185	pt
6	C,O	6850-00-664-5685	Cleaning Solvent Spec P-D-680	qt
7	C,O	.....	Lens Tissue NNNP40TYPEI CLASSI (81349)	pk
8	C,O	.....	Orange Sticks 13218E3063 (97403)	pk

INDEX

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

PAUL T. SMITH
Major General, United States Army
The Adjutant General

Distribution:

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

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
CoA, 3d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE 16 DEC 74

PUBLICATION NUMBER	DATE	TITLE
TM5-6115-200-20 AND P	1 APR 72	GENERATOR SET 10 KW NSN 6115-00-231-7286

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
6	2-1 a		
81		4-3	
125	line 20		

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

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders

Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe

DA FORM 1 AUG 74 2028-2 (TEST)

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG DOTTED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

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DATE

PUBLICATION NUMBER	DATE	TITLE

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

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

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

DA FORM 1 AUG 74 2028-2 *(TEST)*

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FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 lf ounces
1 liter = 10 deciliters = 33.82 fl ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*
inches	centimeters	2.540
feet	meters	.305
years	meters	.914
miles	kilometers	1.609
square inches	Square centimeters	6.451
square feet	Square meters	.093
square yards	square meters	.836
square miles	square kilometers	2.590
acres	square hectometers	.405
cubic feet	cubic meters	.028
cubic yards	cubic meters	.765
fluid ounces	milliliters	29.573
pints	liters	.473
quarts	liters	.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	.454
short tons	metric tons	.907
pound-feet	newton-meters	1.365
pound-inches	newton-meters	.11375
ounce-inches	newton-meters	.007062

To change	*To*	*Multiply by*
centimeters	inches	.394
meters	feet	3.280
meters	yards	1.094
kilometers	miles	.621
square centimeters	square inches	.155
square meters	square feet	10.764
square meters	square yards	1.196
square kilometers	square miles	.386
square hectometers	acres	2.471
cubic meters	cubic feet	35.315
cubic meters	cubic yards	1.308
milliliters	fluid ounces	.034
liters	pints	2.113
liters	quarts	1.057
liters	gallons	.264
grams	ounces	.035
kilograms	pounds	2.205
metric tons	short tons	1.102

Temperature (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 032195-002