

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

---

OPERATOR AND ORGANIZATIONAL

MAINTENANCE MANUAL

SCORSBY TABLE ASSEMBLY

(FSN 4920-696-7186)



HEADQUARTERS, DEPARTMENT OF THE ARMY  
JULY 1962

CHANGE

No.1

}

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D. C., 2 February 1972

Operator and Organizational Maintenance Manual

SCORSBY TABLE ASSEMBLY

(FSN 4920-696-7186)

TM 55-4920-229-12, 2 July 1962, is changed as follows:

*Pages 26 and 27.* Paragraphs 67 through 73 are deleted in their entirety. The following sentence is added after "Section V. Demolition of Material to Prevent Enemy Use": (Refer to TM 750-244-1-4 for demolition instructions).

By Order of the Secretary of the Army:

Official:

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

W. C. WESTMORELAND,  
*General, United States Army,  
Chief of Staff.*

DISTRIBUTION:

To be distributed in accordance with DA Form 12-31 (qty rqr block no. 94) requirements for Organizational Maintenance Instructions for all Fixed and Rotor Wing Aircraft.

TECHNICAL MANUAL

No. 55-4920-229-12



HEADQUARTERS,  
DEPARTMENT OF THE ARMY  
WASHINGTON 25, D.C., 2 July 1962

## Operator and Organizational Maintenance Manual

### SCORSBY TABLE ASSEMBLY

(FSN 4920-696-7186)

	Paragraph	Page
CHAPTER 1. INTRODUCTION		
Section I. General .....	1 - 3	2
II. Description and data .....	4, 5	2
CHAPTER 2. OPERATING INSTRUCTIONS		
Section I. Service upon receipt of equipment .....	6 - 10	7
II. Controls .....	11 - 19	9
III. Operation under usual conditions .....	20 - 29	11
IV. Operation under unusual conditions .....	30 - 33	13
CHAPTER 3. MAINTENANCE INSTRUCTIONS		
Section I. Special organizational tools and equipment.....	34, 35	14
II. Lubrication .....	36, 37	14
III. Preventive maintenance services.....	38, 39	16
IV. Troubleshooting .....	40, 41	17
V. Scorsby table assembly.....	42 - 53	18
CHAPTER 4. SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE		
Section I. General .....	54, 55	25
II. Storage .....	56 - 58	25
III. Shipment within continental United States.....	59 - 62	25
IV. Shipment outside continental United States .....	63 - 66	26
V. Demolition of material to prevent enemy use .....	67 - 73	26
APPENDIX I. REFERENCES .....		28
II. MAINTENANCE ALLOCATION.....		29
III. REPAIR PARTS AND SPECIAL TOOL LISTS .....		30
INDEX .....		34

# CHAPTER 1 INTRODUCTION

## Section I. GENERAL

### 1. Scope

These instructions are published for the operating and maintenance personnel to whom the Scorsby table assembly is assigned. They contain information on the operation, lubrication, detailed preventive maintenance services, and maintenance of this assembly, its accessories and auxiliaries; also packing, preservation, storing, and shipping procedures and methods of demolition to prevent enemy use.

### 2. References

Reference information applicable to the Scorsby table assembly is contained in the following:

- a. Appendix I provides a listing of available current references.
- b. Appendix II contains the maintenance allocation chart.
- c. Appendix III contains a listing of all repair parts and special tools and equipment authorized and required for second echelon maintenance.

### 3. Applicable Forms

The maintenance records and other applicable forms listed below will be used in conjunction with the maintenance and operation of the Scorsby Table Assembly by authorized first and second echelon personnel.

DA Form 1598	Records of Comments on Publications.
DA Form 1747	Command Maintenance Inspection-recapitulation of Transportation Corps: equipment inspected.
DA Form 1749	Command Maintenance Inspection-repair parts-supply operation check list.
DA Form 2258	Depreservation Guide of Engineer Equipment.
DA Form 460	Preventive Maintenance Roster.
DA Form 464	Worksheet for preventive Maintenance and Technical Inspection of Engineer Equipment.
DA Form 468	Unsatisfactory Equipment Report.
DA Form 478	Organizational Equipment File.
DA Form 5-22	Unserviceable Part Identification Tag.
DA Form 5-76	Inspection of Equipment in Storage.
DA Form 811	Work Request and Job Order
DA Form 9-111	Unserviceable Test Instrument or Standard.
DA Form 988	Visual Inspection Sheet Serviceability of Material.
DA Form 1085	Domestic Freight Routing Request and Order.
DD Form 6	Report of Damage or Improper Shipment.
DD Form 858	Material Transfer Record

*Note.* Comments and/or suggestions for improvements to this manual are to be forwarded to the Commanding General, U.S. Army Transportation Materiel Command, P.O. Box 209, Main Station, St. Louis 66, Mo.

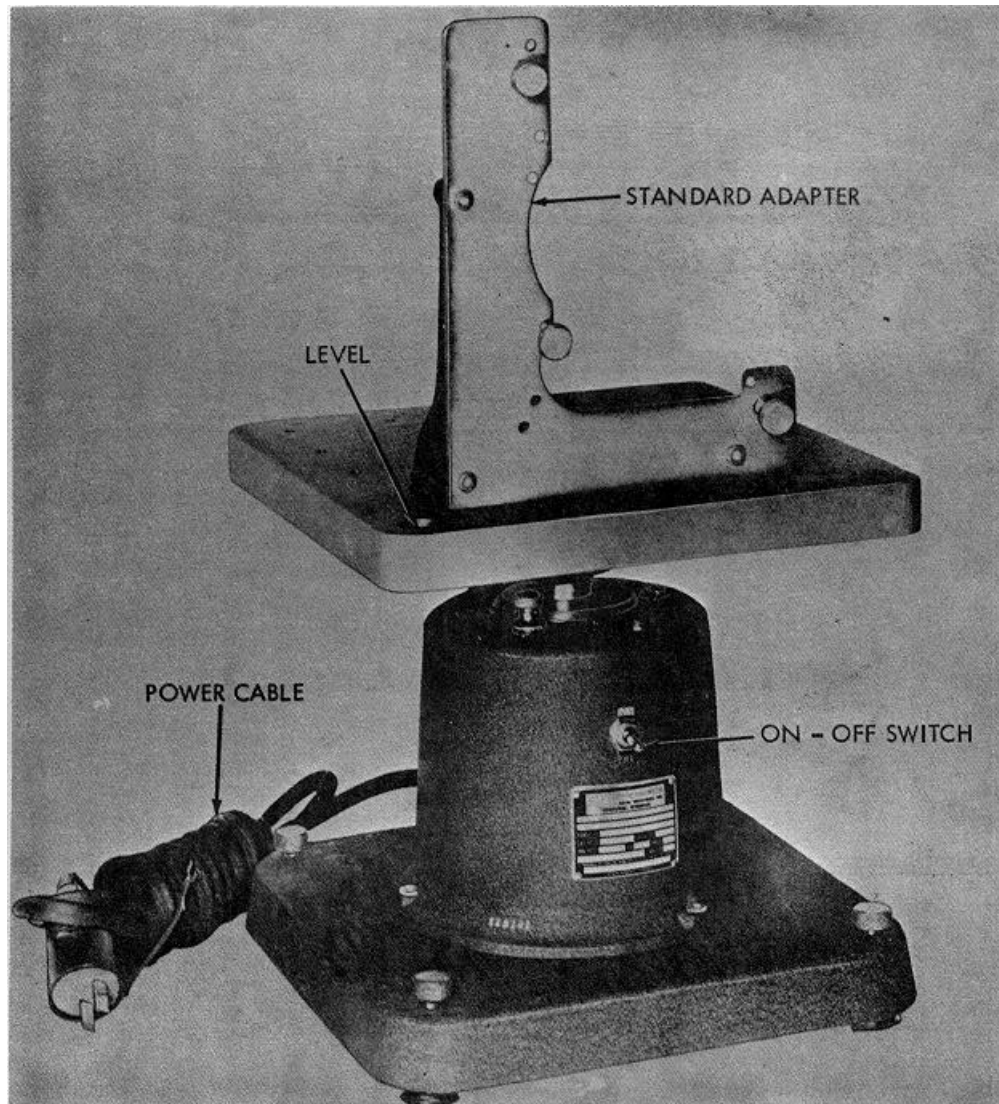
## Section II. DESCRIPTION AND DATA

### 4. Description

a. *General Description* (fig. 1). The Scorsby table assembly (hereafter referred to as table assembly) consists of a Scorsby table part No.1406R manufactured by the Ideal Aerosmith Division of Royal Industries Inc., Cheyenne, Wyo. with a standard adapter. The table assembly is a self contained unit, complete with all operating controls, switches and indicators necessary for

normal operation. All component parts of the table assembly are readily accessible with a minimum amount of disassembly.

- (1) *The Scorsby table* (fig. 1). The Scorsby table consists essentially of a motor which drives the table through a linkage that will either rotate the table or move it in a Scorsby motion (whichever is desired), an ON-OFF power switch for



**Figure 1. Scorsby table assembly with standard adapter.**

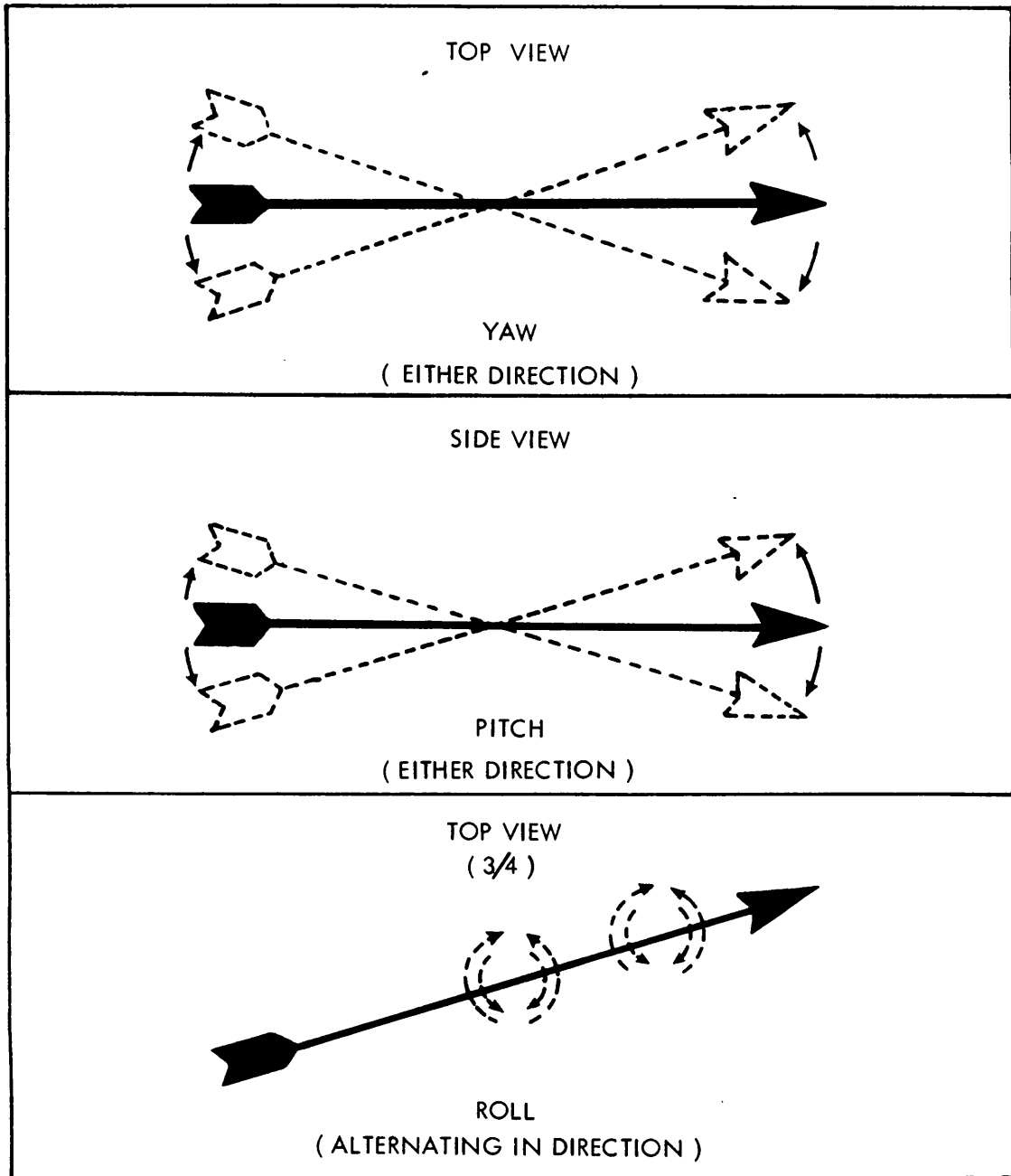
energizing or deenergizing the motor, and a reversing switch which provides automatic or manual control of the direction of motor shaft rotation.

- (2) The Scorsby adapter (fig. 1) is an L-shaped adapter that can be attached directly to the Scorsby table to provide the means for mounting and testing a gyroscopic instrument in a vertical position.

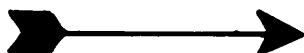
b. *Purpose of Table Assembly.* The table assembly has two functions: It can impart Scorsby motion (fig. 2) to the equipment mounted on it, or can function as a turntable. When it functions to develop Scorsby motion,

it oscillates in known amounts of roll, (to sway or rock from side to side) pitch (to plunge with alternate rise or fall of bow or stern, as a ship) and yaw (to turn or deviate from the line of flight by angular motion about the normal or vertical axis of an airplane). Under these conditions, the extent of the effect of static friction inherent in gyroscope assemblies can be determined. Thus the Scorsby table assembly can be used to test gyroscopic instruments which measure motions of roll, pitch, and yaw.

When the table assembly functions as a turntable it rotates at an approximate speed of six rpm. The table assembly is so designed that its



INFLUENCE OF YAW , PITCH , AND ROLL  
ON GENERALLY PREVAILING DIRECTION  
OF FLIGHT ( MOVEMENT )



INDICATES DIRECTION OF FLIGHT  
( GENERALLY PREVAILING MOVEMENT )

### DIAGRAM OF ELEMENTS OF SCORSBY MOTION

Figure 2. Diagram of elements of Scorsby motion.

direction of rotation can be automatically reversed every six cycles (approximately every minute) or manually reversed if so desired.

c. *Identification.* The table assembly has two identification plates. The table assembly identification plate (A, fig. 3) located on the front of the housing below the ON-OFF switch gives the range, catalog no., and electrical specifications. The motor identification plate (B) gives the data on the electrical synchronous induction motor of the unit. This identification plate is located under the table assembly on the motor which is installed in the table frame housing.

d. *Deviations in Models.* This manual contains the operating and maintenance instructions for the Scorsby Table Assembly. part No. 1406R, FSN 4920-696-7186 manufactured by Ideal Aerosmith, Inc. of Cheyenne, Wyo.

## 5. Tabulated Data

### a. General.

Manufacturer----- Ideal-Aerosmith, Inc. Div. Of  
Royal Industries, Cheyenne,  
Wyo.  
Model -----1406R  
Weight-----28 lbs.  
Length, over all (fig.4)-----10 in.  
Width, overall -----10 in.  
Height, overall-----18 1/2 in.  
including adapter.

### b. Classification and Ratings.

Range (tilt angle) -----0-15°  
Rated load capacity -----25 lbs  
Turntable speed-----6 rpm  
Drive -----Indirect, gear driven  
Motor:  
Manufacturer -----General Electric  
Type -----Synchronous induction.  
Voltage -----115  
Cycles -----60  
Phase -----Single  
Torque -----75 oz in.  
rpm -----75  
Temperature rise -----40°C. (104°F.)  
Time rating-----Continuous

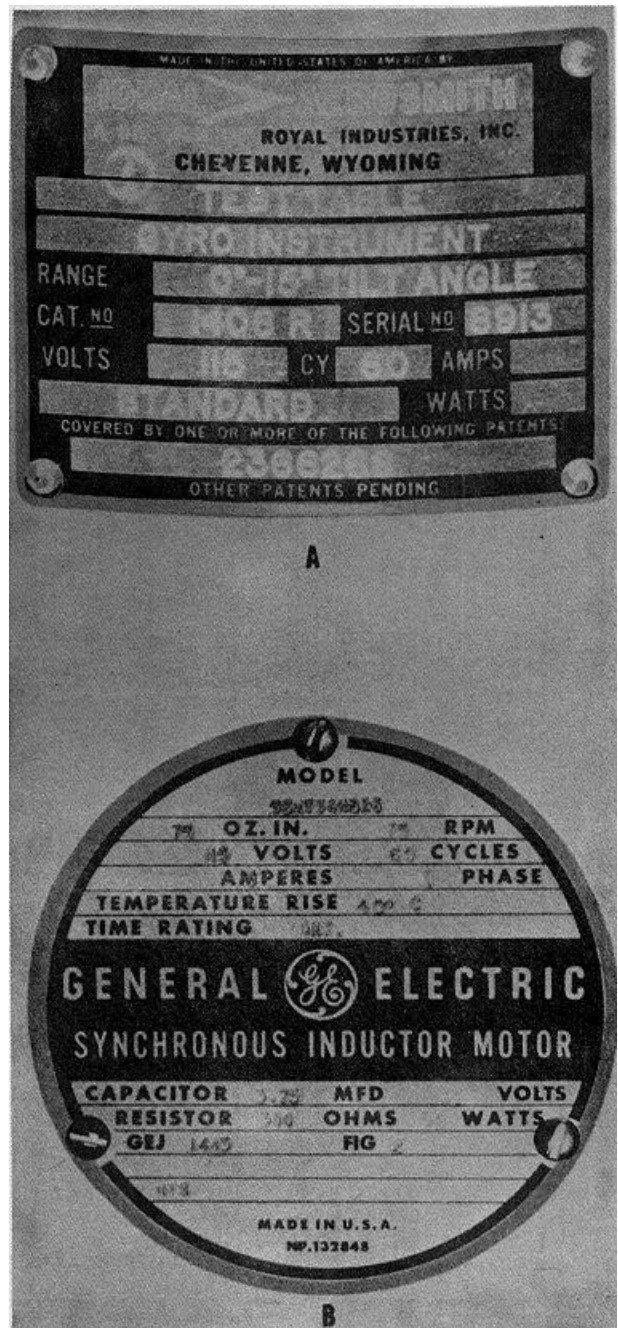


Figure 3. Identification plates.

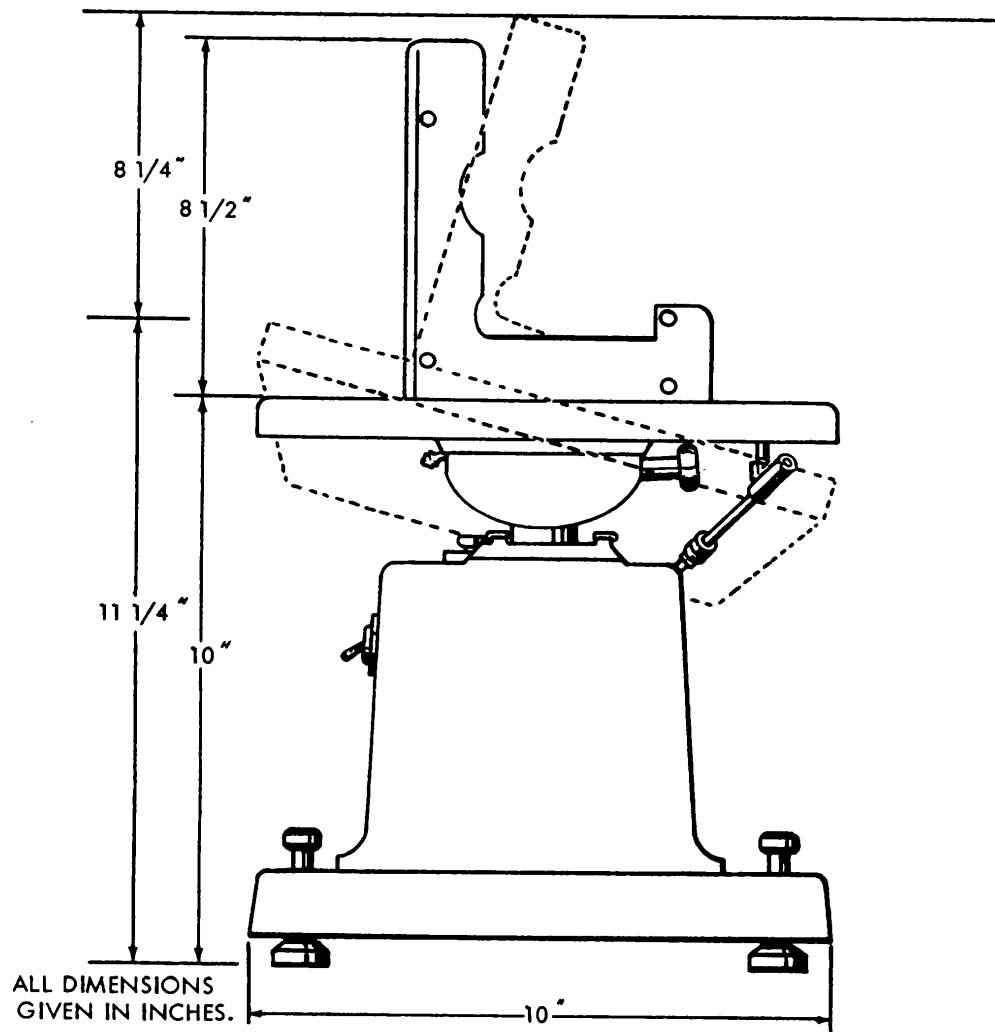


Figure 4. Overall dimensions.



## CHAPTER 2 OPERATING INSTRUCTIONS

---

### Section I. SERVICE UPON RECEIPT OF EQUIPMENT

#### 6. Unloading and Uncratering Equipment

*a. Unloading.* Since the table assembly, including accessories, is light in weight and easily handled, few special unloading instructions are required. However, since the table assembly is precision mounted, it should be shipped, unloaded, and stored in its normal upright position and handled with care. The upright position is indicated by an arrow and the word "UP" on the outside of the crate (fig. 5).

*b. Uncratering.* See figure 5 for the unpackaging sequence. Exercise care in unpacking the table assembly using the following procedure:

- (1) Visually inspect the crate for evidence of damage. If the crate is received in a damaged condition, DD Form 6 should be filled out by authorized personnel.
- (2) Cut the steel bands securing the crate and pull nails out from top of crate. Remove top.
- (3) Pull nails from one side of crate and remove side.
- (4) Remove packed unit from crate and open water vapor-proof barrier bag.
- (5) Open cardboard carton and remove padding, and wrapped adapter from top of carton.
- (6) Remove table assembly from carton.
- (7) Conserve shipping crate, carton, and packaging materials for future use in storage and shipping.

#### 7. Inspection of New Equipment

Perform a complete inspection of the table assembly and adapter, visually inspecting for loss or damage which may have occurred during shipment. Check for the following:

- a.* Evidence of rust, corrosion or fungus.
- b.* Loose or missing nuts, screws, and washers.
- c.* Damaged insulation, broken wires, loose connections, and damaged connector on power cable (fig. 1).
- d.* Damaged or broken ON-OFF switch.
- e.* Indication of oil leakage.
- f.* Dented, bent, broken or missing adapter, table, motor, housing or base.
- g.* Broken or defective level.
- h.* Report damage or improper shipment using DD Form 6.
- i.* Perform before operation preventive maintenance services given in table I.
- j.* Upon completion of inspection DA Form 988 should be filled out by authorized personnel.

#### 8. Servicing New Equipment

- a. Lubrication.* Perform lubrication procedures as required in paragraphs 36 and 37.
- b. Cleaning.* Using a soft lint-free cloth or soft bristle brush, remove all dirt and dust from external surfaces of table assembly.

#### 9. Inspection of Used Equipment

Perform the procedures outlined in paragraph 7. Replace, repair, or report to the responsible authority any damaged, worn or malfunctioning part or assembly.

#### 10. Servicing Used Equipment

Perform the procedures outlined in paragraph 8. Replace, repair, or report to the responsible authority any damaged, worn or malfunctioning part or assembly.

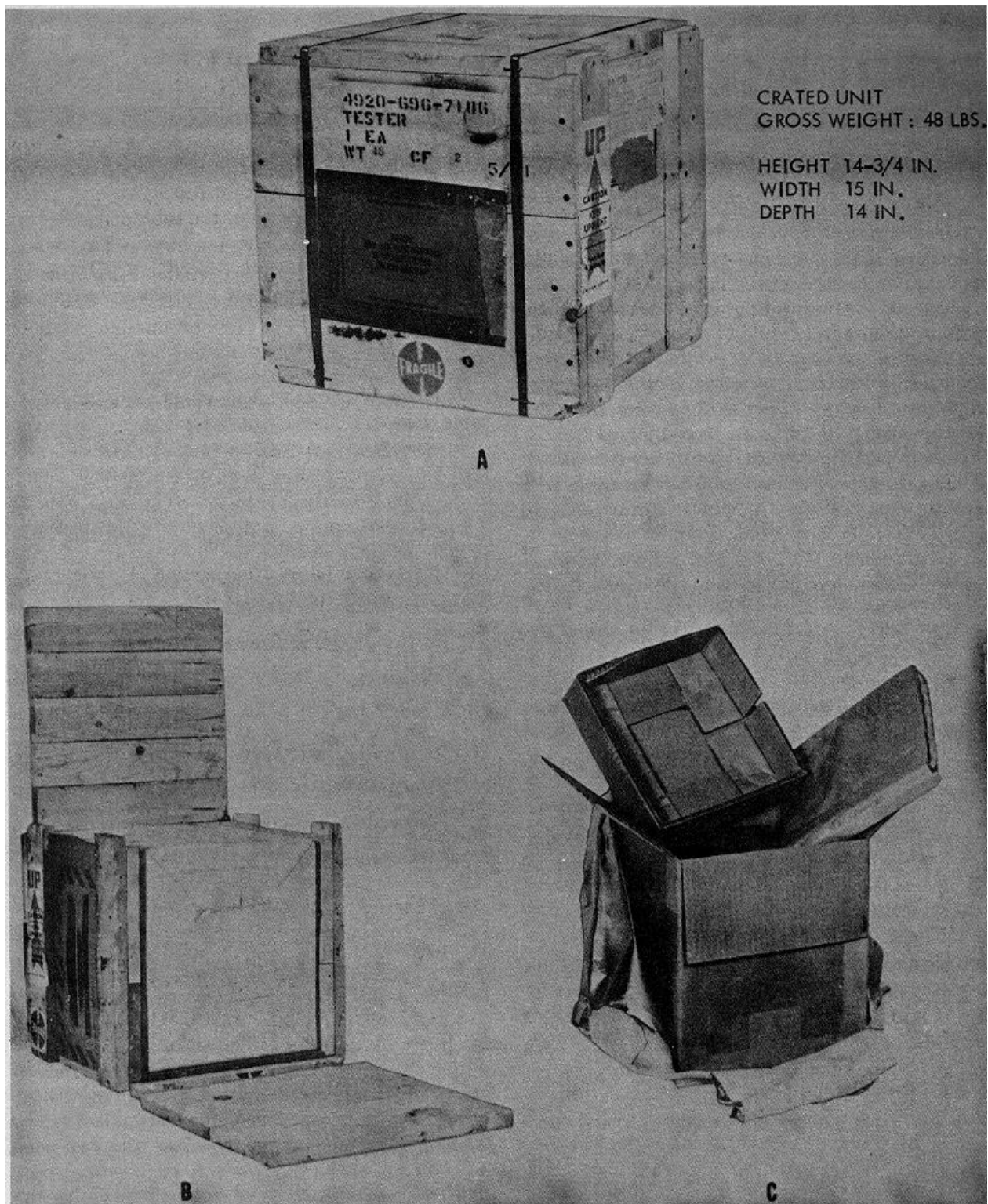


Figure 5. Unpackaging sequence.

## Section II. CONTROLS

### 11. General

This section describes, locates, illustrates and furnishes the operator with sufficient information pertaining to the various controls provided for the proper operation of the Scorsby table assembly.

### 12. Tie Rod

The tie rod (fig. 6) is located under the table at the right side and connects from the table to the table frame housing by means of ball joints. The tie rod prevents the table from rotating, when in the level (non-tilted) position, while the motor is running. If the table is tilted and the motor is running, Scorsby motion (oscillation) of the table will result. Disconnecting the tie rod from the table results in complete rotation of the table, along with the head, either with the table tilted or level, in its horizontal plane.

### 13. Table Leveling Screws and Level

The four table leveling screws (fig. 6) are located in the base of the table assembly, one in each corner. The circular level is located on the front of the table in the left hand corner. By adjustment of the four table leveling screws and observation of the level, the table can be leveled in its horizontal plane.

### 14. On-Off Switch

The ON-OFF switch (fig. 6), located on the front of the table frame housing above the unit identification plate, controls application of electrical power to the motor for rotation of the head assembly of the Scorsby table.

### 15. Reverse Control Knob

The reverse control knob (fig. 6) is located on the top of the table frame housing on the left and to the front directly below the table. The reverse control knob is provided to allow use of either the automatic or manual reversing feature of the table assembly. The head of the table assembly can be set to reverse its direction of rotation automatically every six cycles (approximately once each minute) by lifting up on the reverse control knob. In addition, the direction of rotation of the head of the table may be reversed at any time by moving the knob to the lower position and turning it manually in the direction of desired rotation.

### 16. Table Tilt and Stop Screw

The stop screw (fig. 6) is located on the table assembly directly below the table and to the left of the scale. The stop screw is provided to set the angle of tilt of the table (up to 15°). By pushing on the edge of the table at the stop screw end, after the clamp screw is released, the table can be set to the desired angle and the stop screw turned inward. Thereafter, if the table is leveled it can be returned to the original setting held by the stop screw by pressing on the edge of the table.

### 17. Lock Screw

The lock screw (fig. 6) is located on the table assembly directly below the table and to the right of the scale. It serves to hold the table in the position at which it is tilted.

#### **Caution**

**Do not change table tilt position while lock screw is engaged. A force of eight pounds or more exerted on the edge of the table will cause the table to tilt against lock screw pressure with possible damage to head of table assembly.**

### 18. Scale

The scale (fig. 6) is located directly below the table on the center block of the table assembly near the stop screw. The scale is calibrated with graduation marks at 0, 1 1/2 5, 7 1/2, 10, and 15° to indicate the angle at which the table is tilted.

### 19. Reversing Switch

The reversing switch (fig. 7) is located inside the table frame housing with its toggle lever positioned in between the curves of the reverse control arm. It functions to reverse rotation of the head of the table assembly alternately (once every six cycles) automatically. A finger on the reversing switch knob drive engages a slot in the star wheel of the switch drive. The star wheel is rigidly attached to the knurled collar just below the reversing switch knob. The automatic reversing mechanism can be disconnected by pressing down on the reversing switch knob so that it snaps into its lower position. The rotation of the head of the table assembly can then be reversed by controlling the switch manually as explained in paragraph 15.

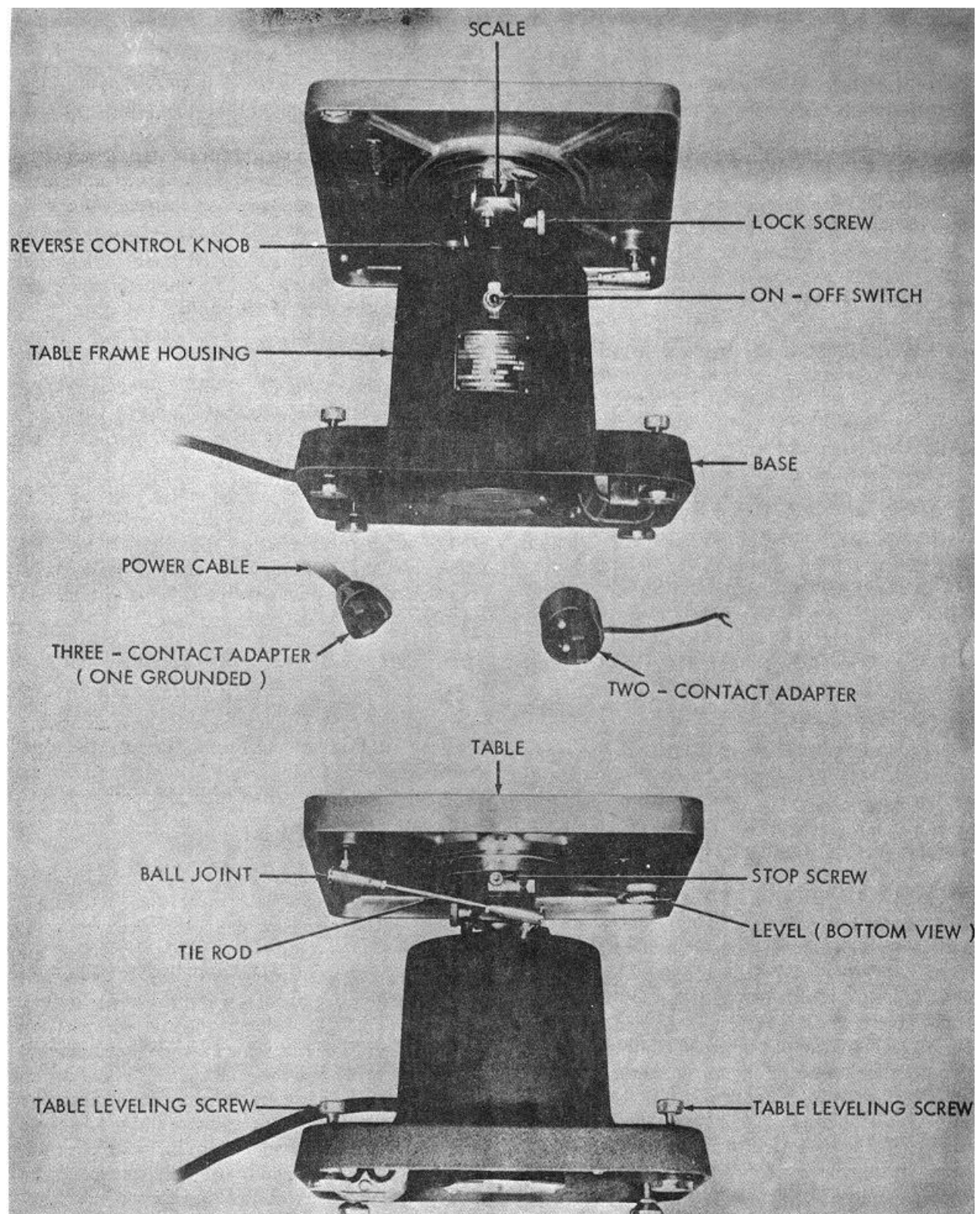


Figure 6. Controls.

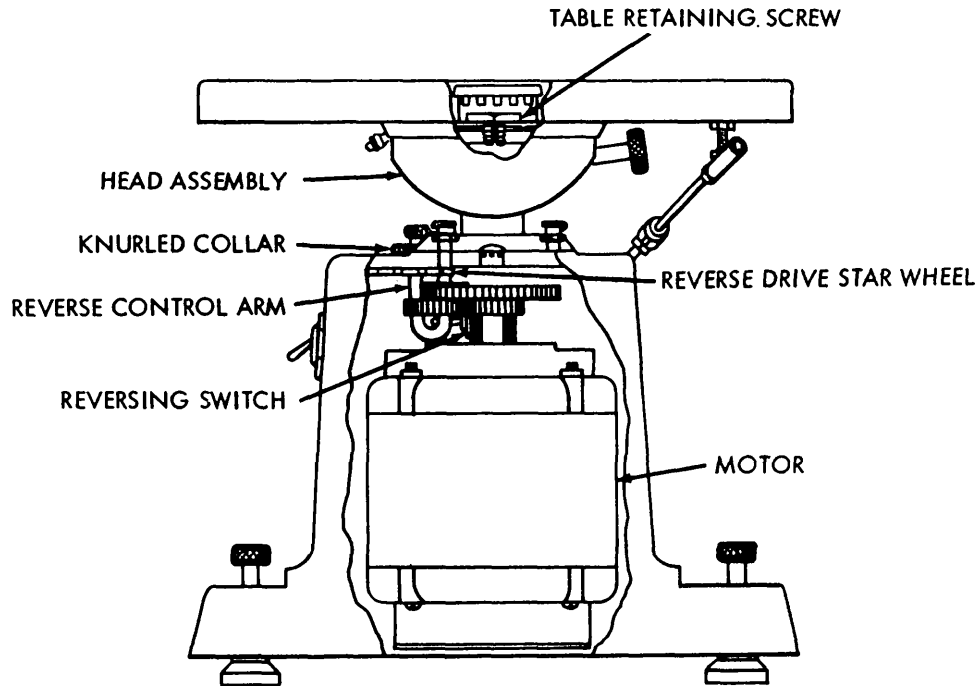


Figure 7. Cross-sectional view of Scorsby table.

### Section III. OPERATION UNDER USUAL CONDITIONS

#### 20. General

Instructions in this section are published for the personnel responsible for the operation of this equipment. It is essential that the operator know how to perform every operation of which the equipment is capable. This section gives instructions on starting and stopping the table assembly, on how to obtain the basic motions of the unit, and on how to use the basic motions to perform the tests for which the unit is designed.

#### 21. Starting and Stopping

##### a. Starting.

- (1) Refer to paragraph 39 and perform the before operation services given in table I.
- (2) Make certain ON-OFF switch (fig. 6) is in OFF position, and connect power cable to a 110-volt ac 60-cycle electrical power source.
- (3) Proceed with tests as outlined in the applicable handbook for the gyroscopic instrument being tested. Place ON-OFF switch in ON (up) position to apply power to table assembly.

**Caution:** If the motor emits a loud hum when the power is applied and/or the head assembly does not rotate, place the ON-OFF switch in OFF position immediately. Refer to paragraph 41 on troubleshooting

##### b. Stopping.

- (1) Stop the operation of the table assembly by placing the ON-OFF switch in OFF (down) position.
- (2) Refer to paragraph 39 and perform the after operation services given in table I.

#### 22. Preliminary Adjustment

Make certain lock screw (fig. 6) is loose and set table in its horizontal position by bearing down on edge of table opposite stop screw side. Adjust the four table leveling screws in the base of the table assembly and level table by centering bubble in level (fig. 1) mounted in table.

#### 23. Preliminary Warm-Up

Prior to checking any instruments on the table assembly, run the table unit for from 10 to 15 minutes. In addition, refer to the instructions in the applicable equipment handbook or manual for such warmup time as may be required for the gyroscopic instrument to be tested.

## 24. Methods of Mounting Instruments

There are two methods for mounting instruments to be tested on the table assembly.

a. The instrument to be tested can be mounted in a vertical position on the standard adapter (fig. 1) (installed on the table) using the thumb screws and nuts provided.

b. The instrument to be tested can be mounted in a horizontal position directly on the surface of the table (after removal of standard adapter) using suitable threaded holes provided therein and the thumb screws and nuts provided.

## 25. Operational Connections

The table assembly must be set up as follows in order to use the two basic motions in testing gyroscopic instruments.

a. *Scorsby Motion* (fig. 2). To obtain Scorsby motion, the table must be tilted and held in a stationary position. To accomplish this, tilt the table as described in paragraph 27. Also, table-to-table frame housing linkage (tie rod and ball joints fig. 6) must be connected to prevent table from rotating. If detached, secure at ball joints to table and table housing frame. Under these conditions, when power is applied to the motor, the head assembly (fig. 7) will rotate, but the table will remain stationary and Scorsby motion will be developed.

b. *Turntable Motion*. To obtain the turntable motion, the table may be tilted or set in the horizontal position; however, it must be free to rotate. To accomplish this, unscrew ball joint (fig. 6) from table to detach table-to-table frame housing linkage. With this arrangement, when power is applied to the motor, the head assembly will rotate carrying the table with it.

## 26. Reversing the Table

The direction in which the head assembly rotates may be either automatically or manually reversed. The direction of head rotation, in turn, determines the direction of rotation of the table in turntable motion and the directional pattern of oscillation in Scorsby motion. This reversal of rotation can be accomplished as follows:

a. *Automatic Reversal*. Automatic reversal is set by placing the reverse control knob (fig. 6) in its upper position. The reverse control arm (fig. 7), which is attached to the shaft of the reverse control knob, thereby, meshes with the reverse drive star wheel. The star wheel which is rigidly attached to the knurled collar (fig. 7) at the base of the control knob is driven by a series of gears attached to the motor shaft. Since the reverse control arm operates the reverse switch, lifting the reverse control knob to its upper position allows the motor to actuate the reverse switch to automatically

reverse the direction in which the head assembly rotates every six cycles.

b. *Manual Reversal*. Manual reversal is accomplished by placing the reverse control knob in its lower position and turning it in the direction of desired rotation. Since in this lower position, the reverse control arm (fig. 7) does not mesh with the star wheel, it is disconnected from the motor shaft and automatic reversing cannot occur. However, manually turning the reverse control knob, to which the control arm is attached, will activate the reversing switch to reverse the direction of head assembly rotation and, in turn, table rotation or Scorsby motion oscillation as the case may be.

### Note

**The reverse control knob is held in either its upper (automatic) or lower (manual) position by a ball and spring device**

## 27. Adjustment of Table Tilt

The table (fig. 6) can be tilted to any preset angle, as determined by the setting of the stop screw, up to the 150 limit set by the design of the head assembly. Since the center block of the head assembly is provided with a slot rather than a hole for accommodation of the lock screw which holds the top plate and table in position, the table can be tilted by proceeding as follows:

- Turn the stop screw out (counterclockwise).
- Loosen the lock screw and press down on the edge of the table at the stop screw end to position the table at the desired angle of tilt as indicated on the scale (fig. 6).
- Turn the stop screw in (clockwise) to set the angle of tilt.
- Tighten the lock screw to hold the table in tilted position.

### Note

By placing the table at the desired angle and then turning the stop screw in, the table if subsequently placed in level position, may then be returned to its original preset angle without resetting by virtue of the stop screw setting.

## 28. Test Gyroscopic Instruments

The Scorsby table which coordinates the combined motions of roll, pitch, and yaw (Scorsby motion) applies the fundamental principle involved in testing gyroscopically stabilized instruments. By subjecting gyro stabilized instruments to tests on the Scorsby table every bearing pivot in the instrument is set in motion, permitting ready detection of any troubles caused by rough, binding,

improperly adjusted, or otherwise defective bearings. After the operator becomes thoroughly familiar with the operating details, as outlined in paragraphs 20 through 28 he should, upon undertaking the testing of gyroscopically stabilized instruments, refer to the latest applicable handbook or manual on the prime equipments and the step-by-step test procedures given.

### **29. Movement of Equipment**

Movement of the Scorsby table requires few special instructions when relocation is limited to from one work area to another within the same general proximity. However, after-operation services should be followed as

indicated in paragraph 39 and normal precautions should be followed to protect the table assembly. Instructions pertaining to shipment to other locales within the Continental United States and oversea shipment are covered in sections III and IV of chapter 4.

#### **Caution**

**The Scorsby table should always be transported in its upright position. When carried manually, it should be handled at the base and not at the table.**

## **Section IV. OPERATION UNDER UNUSUAL CONDITIONS**

### **30. General**

This section contains special operating instructions which are necessary for the proper functioning of the table assembly under unusual conditions.

### **31. Extremes of Heat and Cold**

No special operating instructions are required for operation of the table assembly under extreme conditions of heat and cold.

### **32. Dust Conditions**

Every effort should be made to protect the table assembly when its operation is necessary in a dusty

environment. Particles of dirt, especially on the motor bearings and head assembly, can cause undue wear of the motor bearings and head assembly and malfunction of the unit. Refer to paragraphs 36 through 39 and reduce intervals of service and maintenance to compensate for operation in a dusty environment.

### **33. Other Extreme Conditions**

Operation of the table assembly under other extreme conditions such as in snow, rain, high humidity, and salt water areas will not adversely affect the table assembly within limitations. Refer to paragraphs 36 through 39 and reduce intervals of service and maintenance to compensate for abnormal operations and conditions.



## CHAPTER 3 MAINTENANCE INSTRUCTIONS

### Section I. SPECIAL ORGANIZATIONAL TOOLS AND EQUIPMENT

#### 34. Special Tools and Equipment

No special tools or equipment are required or supplied for maintenance of the Scorsby table assembly.

#### 35. Repair Parts

Repair parts are listed in appendix III.

### Section II. LUBRICATION

#### 36. General

This section contains a reproduction of the official lubrication order and lubrication instructions which are supplemental to, and are not covered in the lubrication order (fig. 8). For current lubrication order, always refer to DA Pam 310-4.

#### 37. Detailed Lubrication Information

a. *Care of Lubricants.* Keep all lubricants (grease and oil) in closed containers and store in a clean dry place away from heat. Allow no dirt, dust, water, or foreign materials to mix with the lubricant at any time. Keep all lubrication equipment clean and ready for use.

b. *Points of Lubrication.* Points of lubrication and fittings are readily located by reference to lubrication order LO 55-4920-229-12.

c. *Cleaning.* Use an approved cleaning solvent such as MIL-C-16553 to clean points of application, the fittings, and surrounding surfaces before lubricating. After lubricating, remove any excess lubricant from point of application.

d. *Intervals.* The unit should be lubricated at one month intervals. Every two years the unit should be disassembled and lubricated internally.

e. *One Month Intervals.* At the end of each month of normal operation, or more frequently to compensate for abnormal or severe operating conditions, the following lubrication operations should be accomplished without disassembly of the unit.

- (1) Apply the equivalent of approximately Y inch ball of high quality bearing grease, such as MIL-G-27343, at the grease fitting on the head assembly. Remove the access cap on the top right portion of the table frame housing (fig. 6) and apply the same amount of grease on the teeth of the gears which are accessible through the hole. Replace cap.

#### Note

**The portions of the two gears which are accessible through the hole, mesh with the only other two gears in the unit enabling even distribution of grease to the gearing.**

- (2) Lubricate the head bearing plate by applying four to ten drops (enough to saturate the felt wick pad) to the oil cup nearest the table tie rod. Use a very light, acid free mineral oil that will not gum.

#### Note

**Gyroscope lubricating oil, such as MIL-L-16958A, is satisfactory for all oiling operations on this unit.**

- (3) Lubricate the shaft of the compound gear assembly by applying two drops of oil to the oil cup nearest the reverse control knob (fig. 6).
- (4) Apply a drop of oil to shaft of the reverse control knob.
- (5) Apply a drop of oil on the grooves at each end of the trunnion block which slides when the table is tilted. Work block several times through full travel.
- (6) Apply a drop of oil on the ball of each ball joint of the table tie rod (fig. 6).
- (7) Apply a drop of oil to the shaft of each of the four leveling screws. Work screws in and out.

f. *Two Year Intervals.* At the end of each two year interval of normal operation, or more frequently to compensate for abnormal or severe operating conditions, disassemble the unit as in paragraphs 48 through 50 and perform the following lubrication.

- (1) While the motor is still out of the base



TABLE, SCORSBY ASSEMBLY  
(IDEAL-AEROSMITH MODEL NO.1406-R)

REFERENCE: TM55-4920-229-12

Intervals are based on normal operation. Reduce to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing.

Clean parts with SOLVENT, dry-cleaning or with OIL, fuel diesel. Dry before lubricating.

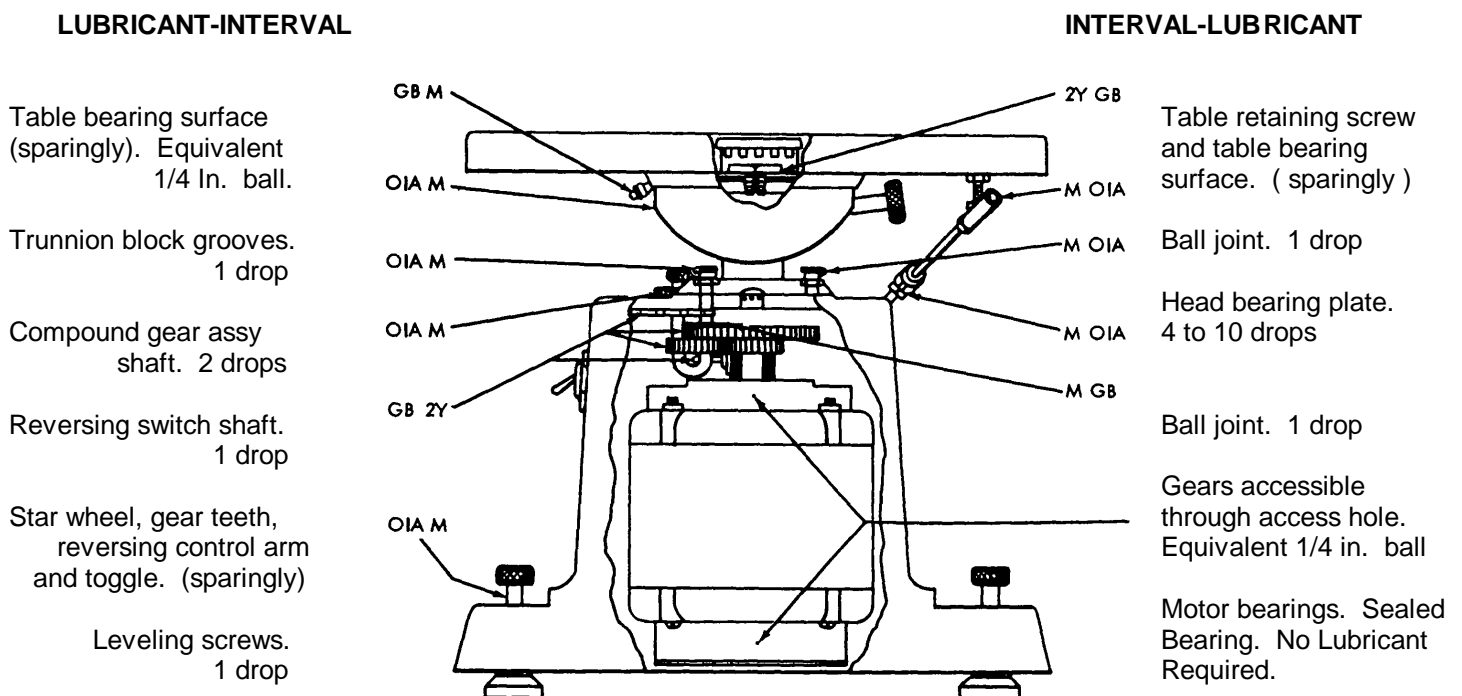


Figure 8. Lubrication order.

## KEY

LUBRICANTS	EXPECTED TEMPERATURES	INTERVALS
<b>O I A</b> - OIL, INSTRUMENT AIRCRAFT (MIL L 16958)	All Temperatures	M - Monthly 2Y - 2 Years
<b>G B</b> - GREASE , BEARING (MIL G 27343 )	All Temperatures	

### NOTES:

1. The Scorsby table assembly should be lubricated at one month intervals, or more frequently if conditions warrant.
2. Every two years the unit should be disassembled and lubricated.
3. Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

By Order Of:

### Figure 8-Continued.

housing, coat the reverse control arm (fig. 7), reversing switch toggle, reverse drive star wheel, and teeth of all gears with MIL-G-27343 grease.

- (2) Coat the table bearing surface of the head (fig. 7), and the table retaining screw on the bearing surface with MIL-G27343 grease. Reassemble the unit.

*Note.* Motor is provided with sealed lifetime lubricated bearings.

## Section III. PREVENTIVE MAINTENANCE SERVICES

### 38. General

To insure that the table assembly is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure.

- a. Perform the necessary preventive maintenance services before operation.
- b. Defects discovered during operation should be noted for future correction to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed during operation which would damage the equipment if operation were continued.
- c. Perform after-operation services at intervals based on the normal operation of the table assembly. Reduce intervals to compensate for abnormal conditions.

### 39. Operator Daily Service

Daily services are listed in table I in the appropriate column of interval or intervals in terms of before operation, during operation, and after operation.

Table I

Interval			Check
Before operation	During operation	After operation	
X	X	X	<i>Publications.</i> See that a copy of this manual, TM 55-4920-22912, and the current lubrication order are with the equipment and in serviceable condition. <i>Visual inspection.</i> Make a visual inspection of the table assembly. Check for loose, missing, or damaged parts.
X			

AGO5033A

Table I--Continued

Intervals			Check
Before operation	During operation	After operation	
			Correct deficiencies noticed or report the condition to the proper authority.
X			<i>Tampering.</i> Check to see if the table assembly has been tampered with. Check to see if unit is properly assembled. Do not operate the unit until all deficiencies noticed are repaired or corrected. Report uncorrected deficiencies to the proper authority.
X			<i>Starting precautions.</i> See that the table assembly, the power cable, and the work area are free of water, sand, grit, metal chips and such.

Table I--Continued

Intervals			Check
Before operation	During operation	After operation	
X	.		<i>Power supply.</i> Assure that power supply is proper 115 volt AC, 60 cycle, single phase source.
X			<i>Lubricate.</i> Apply oil and grease to the oil cups and grease fitting and internal surfaces as necessary. Refer to paragraph 37.
	X		<i>Unusual noises or operation.</i> Check for unusual noises or operation such as squeal, excessive vibration, and overheating. Stop operation and check motor. Do not resume operation until the deficiency is corrected.
		X	<i>Stowing unit.</i> See that unit is properly stowed.

## Section IV. TROUBLESHOOTING

### 40. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the table assembly and its components. Each trouble symptom stated is followed by a list of probable causes of the trouble.

The possible remedy recommended is described opposite the probable cause.

### 41. Troubleshooting

Troubleshooting procedures are given in table II.

Table II. Troubleshooting

Trouble	Probable cause	Possible remedy
a. Motor runs but head assembly fails to rotate or motor chatters.	Table retaining screw too tight----- Improper or insufficient lubrication at head assembly and/or motor bearings. Weight of instrument under test in excess of 25 pounds.	Adjust screw to hold but not bind. Check lubrication and lubricate as necessary (par. 37) or replace motor (par 50). Remove load in excess of 25 pounds.
b. Motor fails to run-----	Power cable not properly connected--- ON-OFF switch defective ----- Power cable or other wiring in unit has open, short, or loose connection Defective motor ----- Defective capacitor and/or resistor	Plug power cable into proper outlet. Replace switch (pars. 50 and 53). Check and replace defective wiring or tighten connection. Replace motor (par. 50). Replace as required (pars. 50 and 53). Replace motor (par. 50).
c. Motor overheats and/or makes unusual noises or excessive vibration.	Refer to causes and remedies in a above. Defective motor-----	Replace motor (par. 50).
d. Head and/or table fails to reverse in automatic phase of operation.	Reverse control knob not in its raised position. Reverse mechanism out of adjustment or defective.	Place control knob in its automatic (raised) position. Operate in manual position by use of reverse control knob in its down position. If reversing occurs indicating reverse switch is all right, check adjustment and conditions of reverse drive star wheel and spring (par. 51). Replace a defective reversing switch or drive mechanism part.

**Table II. Troubleshooting-Continued**

Trouble	Probable cause	Possible remedy
e. Head and/or table fails to reverse in manual phase of operation	Defective reversing switch or wiring -	Replace switch and/or wiring (pars. 50 and 53).
f. Head and/or table continues to reverse erratically.	Short in reversing switch and/or wiring	Replace switch and check wiring between reversing switch and motor. Replace wiring as necessary.

**Section V. Scorsby Table Assembly****42. Functional Description**

The Scorsby table assembly incorporates an ac synchronous electrical motor with the components of a resistor-capacitor starting and reversing circuit mounted in the table base. This motor (fig. 7) is the prime source of mechanical power to bring about rotation of the table through a series of four gears and the head assembly upon which the table is mounted. Two different basic movements can be imparted to the table, when the assembly is in operation depending upon whether or not the tie rod linkage is connected between the table frame housing and table. The table can be rotated in level or tilted position in a simple turntable action with the tie rod disconnected. This turntable motion lacks the yaw, pitch, and roll movements which, in combination, constitute Scorsby motion (fig. 2). On the other hand, with the table tilted (up to 150 from the horizontal, with an included angle of 30°) and the tie rod connected, Scorsby motion is imparted to the table.

The direction of turntable rotation and the phase of Scorsby motion (oscillation) can be reversed by means of the reversing switch and the reverse mechanism composed of the reverse drive star wheel, (fig. 7) reverse control arm, and reverse control knob. The reversing action can be brought about automatically by raising the control knob so that the head revolves in one direction (clockwise or counterclockwise) for six revolutions, plus or minus one-half revolution, for one minute after which it reverses to revolve in the opposite direction in like manner. This cycle of revolutions will alternate continuously as the notched star wheel meshes with the reverse control arm to control the revolutions mechanically and actuate the reverse switch after the required six cycles. The reversing action can also be controlled manually when desired by placing the reverse control knob in its lower position and actuating the reversing switch by turning the knob in the desired

direction of revolution. In the manual phase of head rotation, revolution in the direction selected by the operator will be continuous until manual rotation of the reverse control

knob to the opposite direction, since the reverse drive star wheel becomes engaged only during automatic operation. The basic Scorsby motion, which the table imparts to gyroscopically stabilized instruments which are mounted on it, is essential for the testing of such instruments.

**43. Inspection of Table Assembly**

The following monthly inspection of the Scorsby table should be carried out with the interval of inspection shortened according to necessity as indicated by adverse conditions of environment in work area and the work load to which the equipment is subjected.

a. Operate the unit until the scale (fig. 6) faces toward the front of the table assembly. Test to see that the table can be tilted. Check that stop screw can be turned in and out, and then turn it in to hold angle of tilt. Tighten lock screw and see that it holds angle of tilt of table.

b. Check that the reverse control knob (fig. 6) can be raised and lowered.

c. Operate the unit and raise the reverse control knob (fig. 6). Observe that the head assembly reverses in direction of rotation every six rpm. Place the reverse control knob in the lower position and turn it clockwise and observe that the head assembly rotates in one direction (clockwise) only, that is, without reversal. Rotate the knob manually counterclockwise and observe that the head assembly reverses direction of rotation to counterclockwise and continues in that direction.

**44. Alignment and Adjustment**

Alignment and adjustment of the table assembly prior to operation is accomplished by first setting the assembly on a flat, secure surface in

upright position. Make certain table is not tilted (scale (fig. 6), should read 0°). Adjust the four table leveling screws (fig. 6) as required and level the table assembly as indicated by the centering of the bubble in the circular level (fig. 1).

*Note.* Prior to testing of gyroscopic instruments on the table assembly, operate the table unit and allow it to warm up for from 10 to 15 minutes. Refer to applicable prime equipment manual or handbook to determine any warm up time which may be required for the gyroscopic instrument to be tested.

#### 45. Calibration

Monthly, or more often if conditions require, the Scorsby table assembly should be calibrated using the procedures following. These calibration procedures are primarily a check of the reliability of the Scorsby table indications and operating characteristics.

a. Using a stop watch or a watch with a second hand, check the number of revolutions the head assembly makes in a minute during automatic reverse operation. The head assembly should complete  $6 \pm \frac{1}{2}$  rpm per minute.

b. Operate the unit in the automatic reversing phase and observe its reversing action. The head assembly should complete  $6 \pm \frac{1}{2}$  rpm, reverse direction, and repeat this sequence.

c. Adjust the table assembly for levelness (par. 44). After the table has been leveled as indicated by the level (fig. 1) on the table, use a standard level to check the levelness of the table.

This will indicate any discrepancy, if any, between the table circular level and the standard level.

d. Tilt the table to the 15° mark. Secure this position by turning in the stop screw (fig. 6) and lock screw. Check the degree of tilt as indicated by the scale on the head assembly against that indicated by a protractor. Make a similar check at several other points as indicated on the scale.

e. If the above checks indicate a discrepancy in any of the readings or operating characteristics and they cannot be readily adjusted, refer to the troubleshooting chart and repair and replacement instructions.

#### 46. Repair of Table Assembly

Repair of the Scorsby table assembly consists basically of the replacement of worn, damaged, and malfunctioning parts as outlined in the paragraphs 48 through 53. The paragraphs are written in sequence of actual removal and disassembly of parts and the procedure in each par-

agraph, in most cases, must be undertaken first in order to carry out the procedures outlined in subsequent paragraphs.

#### 47. Replacement of Table Assembly

Replacement of the table assembly as a unit should be made only in cases where a multiplicity of malfunctions, worn, and damaged parts makes it difficult impracticable, or impossible to bring the unit up to operating specifications and to within calibration by replacing parts.

#### 48. Table-To-Table Frame Housing Linkage

##### a. *Removal.*

(1) Remove ball joints (2, fig. 9) by loosening nuts (1) and unscrewing ball joints at table (12) and table frame housing.

(2) Remove ball joints with tie rod (3).

##### b. *Cleaning, Inspecting, and Repairing.*

(1) Clean tie rod and ball joints using an approved cleaning compound such as MIL-C-16553 and dry thoroughly.

(2) Inspect tie rod for a bent condition, stripped or worn threads. Check ball joints and fasteners for damaged or worn condition. Straighten a bent tie rod.

(3) Replace any parts found to be defective.

c. *Installation.* Install tie rod (3, fig. 9) and ball joints (2) on table (12) and table frame housing (59, fig. 10) by securing at ball joints and tightening down nuts (1, fig.9).

*Note.* Make certain tie rod is in correct position relative to table and table frame housing at installation.

#### 49. Adapter, Table, and Head Assembly

##### a. *Removal and Disassembly.*

(1) Remove screws (4, fig. 9) and washers (5) securing adapter (6) to table. Remove adapter.

(2) Remove four socket head screws (11) securing table (12) to head. Remove table.

(3) Remove and disassemble head assembly and table using index number sequence as given in figure 9 for guidance.

**Caution: Be certain to remove set screw (19) before attempting to remove table retaining screw (20).**

##### b. *Cleaning, Inspecting, and Repairing.*

(1) Clean table, adapter, and head assembly parts using an approved cleaning solvent such as MIL-C-16553 and dry thoroughly.

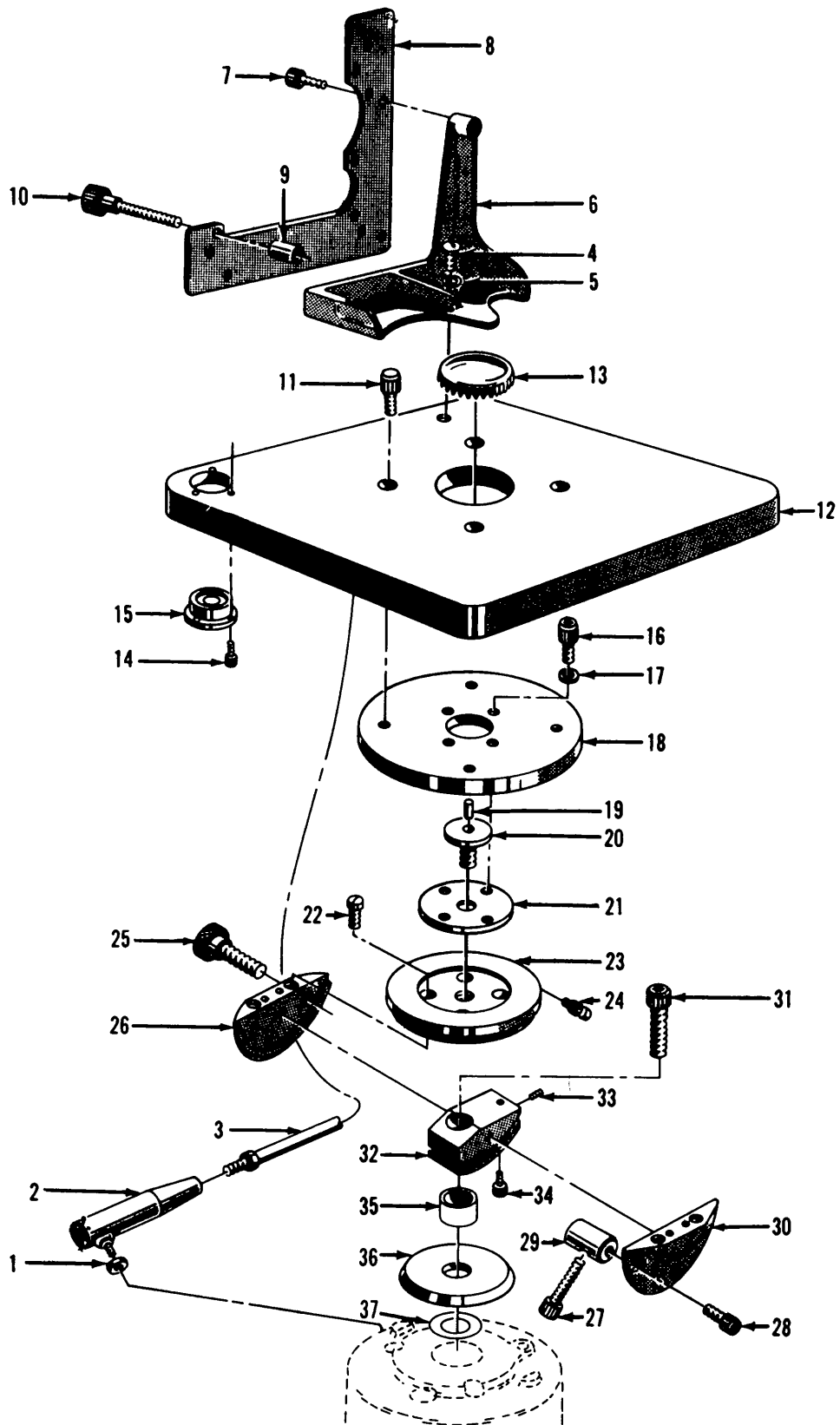


Figure 9. Exploded view of table and head assembly .

1	Nut, plain hex, 10-32	20	Table retaining screw
2	Ball joint	21	Table centering washer
3	Tie rod	22	Screw, modified
4	Screw, machine, round head, 10-32 X 3/	23	Top plate
5	Washer, tooth lock, No. 10	24	Grease fitting
6	Adapter	25	Head Tilt lock screw
7	Screw, cap, socket, head, hex 10-32 X V	26	Tilt scale side plate
8	Panel	27	Screw, cap, socket head, hex 1/4-28 X 1
9	Allen nut, 10-32	28	Screw, cap, socket, head, hex 1/4-28 X
10	Screw, instrument mounting	29	Stop post
11	Screw cap, socket head, hex 10-32 X M8	30	Stop post side plate
12	Table	31	Screw, cap, socket head, hex, 5/16-24 X M4
13	Plug	32	Center block
14	Screw, fillister head 2-56 X V3	33	Set screw, headless, Hex, 6-32 X V
15	Level	34	Screw, cap, socket head, hex, 1/4-28 X M8
16	Screw, cap, socket head, hex, 10-32 X Ys	35	Spacer
17	Washer, tooth lock, No. 10	36	Head bearing plate
18	Mounting plate	37	Shim washer
19	Set screw, headless, Hex, 10-32 X Y		

**Figure 9-Continued.**

(2) Inspect the table and adapter for distortion, condition of mounting threads, and scores on table surface.

(3) Check the head assembly for worn and damaged parts, condition of threads, scores on surfaces, and distorted plates.

(4) Replace any part which is excessively worn or defective.

*c. Reassembly and Installation.*

(1) Reassemble and install head assembly in reverse order of disassembly and removal.

(2) During reassembly refer to paragraph 37 and lubricate as outlined for the parts of head assembly and table.

**Caution: Take care in assembling table retaining screw (20, fig. 9) not to secure it down too tightly. If secured too tightly binding of the head and table will result during operation.**

(3) Install table and adapter in reverse order of removal.

## **50. Motor Assembly**

*a. Removal.*

(1) Remove screws (1, fig. 10) securing mounting plate (2), with resistor attached, to bottom of base (13). Remove resistor insulator (3) and resistor (6) with plate.

(2) Remove screw (7) securing bracket (8), and capacitor (11) to bottom of base (13). Remove bracket. Remove screw (9), washer (10), and capacitor (11).

(3) Remove screws (12) securing base (13) to table frame housing (59). Remove base.

(4) Remove locknut of switch (22) and remove ON-OFF switch plate (18).

(5) Scribe mark housing of motor (20) and bottom of table frame housing (59) to indicate their relative positions in order to aid in repositioning motor at installation.

(6) Remove screws (19) securing motor (20) inside table frame housing (59). Carefully remove motor from inside frame housing and support it to prevent damage to attached wiring and connections.

(7) Loosen locknut securing reversing switch (21) to bracket (28) at inside of table frame housing (59).

(8) Carefully remove motor, capacitor, resistor, switches, and power cable, and attached wiring together.

(9) Remove screws securing end cover of motor and remove cover to expose connections at terminal board of motor (fig. 11). Remove nuts and screw securing external connections to motor.

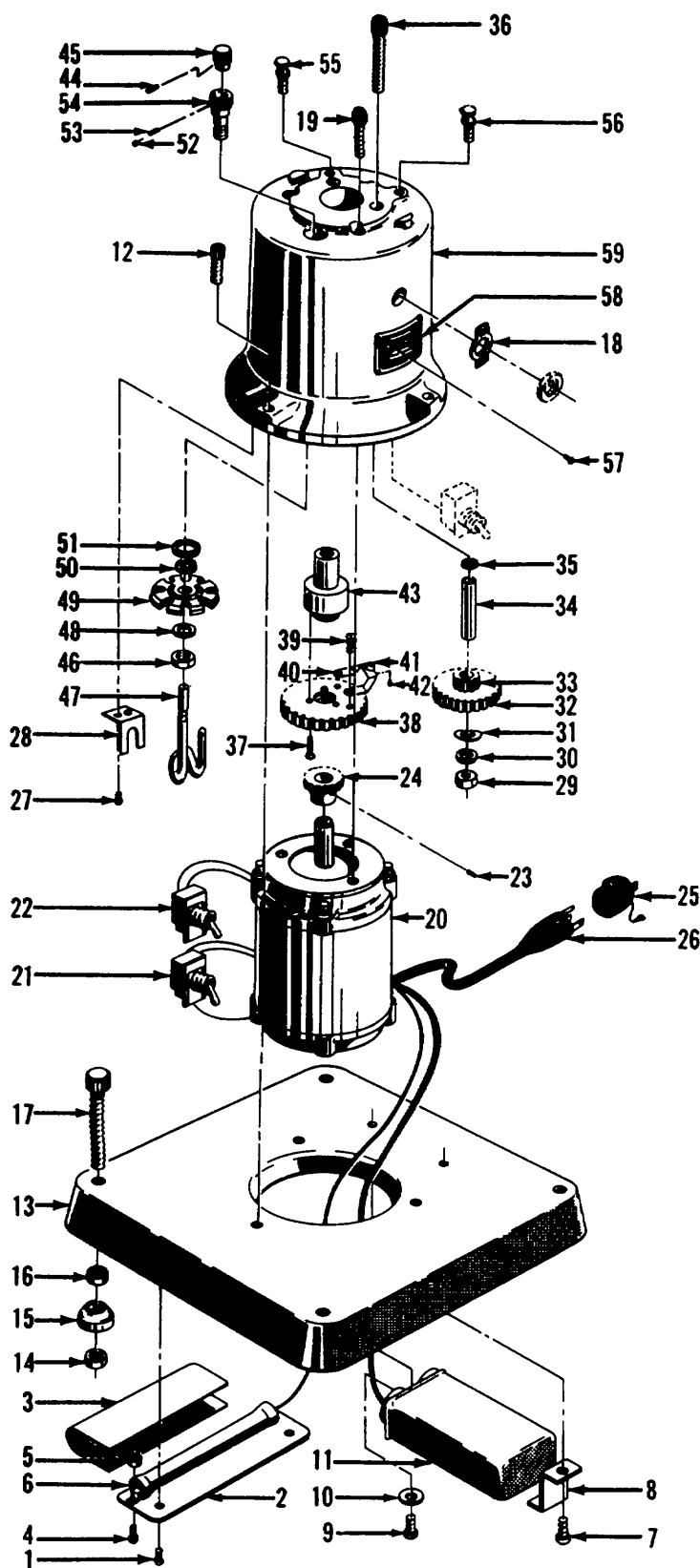
*b. Cleaning, Inspecting and Replacement.*

(1) Refer to paragraph 53 regarding disassembly, inspection, and replacement of the capacitor, resistor, switches, power cable, and wiring.

(2) Clean external surfaces of motor using an approved cleaning solution such as MILC-16553 and dry thoroughly.

(3) Inspect motor for bent shaft and excessive end play in shaft. Replace a defective motor.

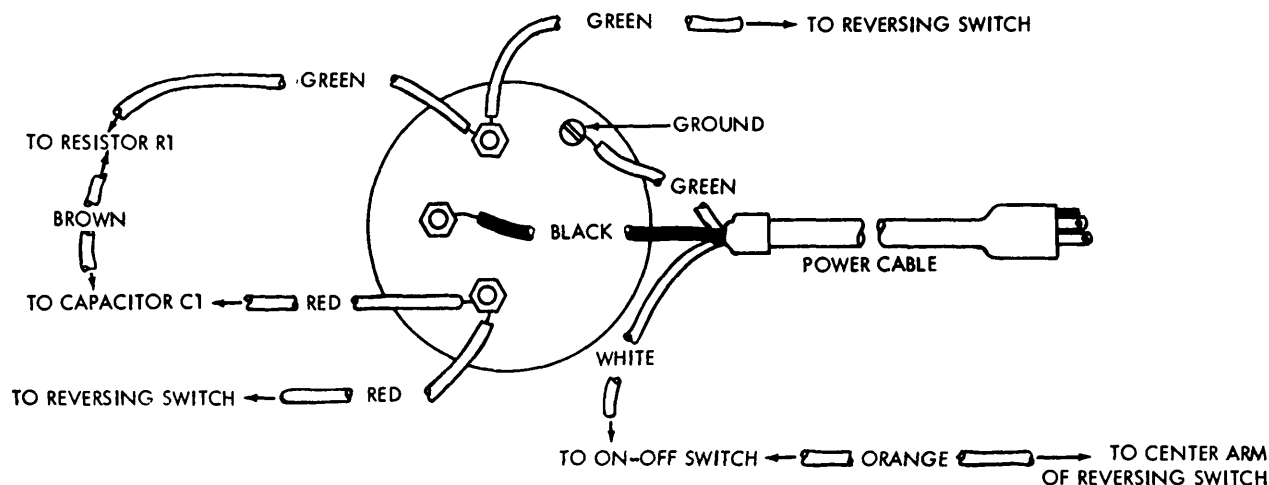
(4) Examine gear (24, fig. 10) for worn, bent, or broken teeth. Replace a defective gear.



- 1 Screw, machine, round Head, 8-32  
X  $\frac{1}{8}$
- 2 Resistor mounting plate
- 3 Resistor insulator
- 4 Screw, machine, round head, 6-32  
X  $\frac{1}{4}$
- 5 Nut, plain hex, 6-32
- 6 Resistor, porcelain w/clamps, 300  
ohm, 50w
- 7 Screw, machine, round head, 10-32  
X  $\frac{1}{4}$
- 8 Screw, machine, round head, 10-32  
X  $\frac{1}{4}$
- 10 Washer, flat, 3/16 X 1/16
- 11 Capacitor, 3.75  $\mu$ f, 330 volts
- 12 Screw, cap, socket head, hex,  $\frac{1}{4}$ -20  
X  $\frac{3}{4}$
- 13 Base
- 14 Nut, plain hex, jam,  $\frac{1}{4}$ -28
- 15 Foot
- 16 Foot bearing nut
- 17 Leveling screw
- 18 ON-OFF switch plate
- 19 Screw, cap, socket head, hex 10-32  
X  $1\frac{1}{2}$
- 20 Motor
- 21 Reversing switch
- 22 ON-OFF switch
- 23 Setscrew, headless Hex, 10-32 X  $3/16$
- 24 Gear, 18T-24P
- 25 Electrical adapter
- 26 Cable and plug assembly
- 27 Screw, machine, round head, 10-32  
X  $5/16$
- 28 Reversing switch bracket
- 29 Nut, self locking 10-32
- 30 Washer, flat 10 X  $7/16$  X 0.063
- 31 Washer, special
- 32 Gear, 48T-24P
- 33 Gear, 12T-24P
- 34 Gear shaft
- 35 Shim washer
- 36 Screw, cap, socket head hex, 10-32  
X  $1\frac{1}{4}$
- 37 Screw, machine, flat head, 10-32  
X  $\frac{1}{2}$
- 38 Head drive gear
- 39 Screw, machine, round head, 6-32  $\frac{1}{4}$
- 40 Reverse drive spring
- 41 Reverse spring button
- 42 Button rivet
- 43 Head bearing shaft
- 44 Setscrew, headless, hex, 6-32 X  $\frac{1}{8}$
- 45 Reverse control knob
- 46 Nut, light, jam, 5/16-24
- 47 Reverse control arm
- 48 Washer, flat, 5/16 X  $9/16$  X 0.062
- 49 Reverse drive star wheel
- 50 Shim washer
- 51 Shim washer
- 52 Steel ball
- 53 Spring
- 54 Reverse control bushing
- 55 Oiler
- 56 Oiler
- 57 Drive screw
- 58 Nameplate
- 59 Table frame housing

Figure 10. Exploded view of housing, base, gear, and electrical assemblies.





**Figure 11. Electrical connections to motor terminal board.**

*c. Installation.*

*Note.* Before and during installation, as applicable, refer to paragraph 37 and lubricate as outlined for reversing switch and other accessible parts as required.

- (1) Install motor, capacitor, resistor, switches and power cable in reverse of removal procedure as outlined in a above.
- (2) Use scribe marks made during removal to aid in lining up holes in motor housing and (19, fig. 10). table frame housing for installation of screws

## 51. Gear Assembly and Reverse Drive Mechanism

*a. Removal and Disassembly.*

- (1) To gain access to the gear assembly and reverse drive mechanism, remove the table and the motor assembly as outlined in paragraphs 49 and 50.
- (2) Remove and disassemble the gear assembly and reverse drive mechanism using index number sequence as given in figure 10 for guidance.

*b. Cleaning, Inspecting, and Repairing.*

- (1) Clean parts of gear assembly and reverse drive mechanism using an approved cleaning solvent such as MILC-16553 and dry thoroughly.
- (2) Inspect gears for worn and broken teeth. Check shafts for bends, cracks, and distortion.
- (3) Examine screws, reverse control bushing (54, fig. 10) and nuts for worn and damaged threads.
- (4) Check reverse drive spring (40) for bends and breaks and a worn or defective reversing spring button (41).

- (5) Examine the reverse drive star wheel (49) for worn or broken slots.

- (6) Replace any worn or damaged

parts.

*c. Reassembly and Installation.*

*Note.* During reassembly and installation, refer to paragraph 37 and lubricate, accessible parts as required.

- (1) Reassemble gear assembly and reverse drive mechanism using the reverse of index number sequence as given in figure 10 for guidance.

*Note.* Make certain reverse control-arm (47) and reverse drive spring (40) are properly positioned relative to reversing switch (21) and reverse drive star wheel (49) respectively during reassembly.

- (2) Install motor assembly and table as outlined on paragraphs 50 and 49.

## 52. Base and Table Frame Housing

*a. Removal.*

- (1) Refer to paragraph 50a(1) through (3) in order to remove base (13, fig. 10) only.
- (2) In order to replace table frame housing (59), the other subassemblies of the Scorsby table must be removed (pars. 48 through 51).

*b. Cleaning, Inspecting, and Replacement.*

- (1) Clean base and table frame housing using an approved cleaning solvent such as MIL-C-16553 and dry thoroughly.
- (2) Examine base and table frame housing for cracks, scores, distortions, and worn or damaged thread.

- (3) Replace damaged or worn oilers (55, fig. 10) and (56), table leveling assembly (14) through (17) or a defective base or table frame housing.

*c. Installation.*

- (1) To install a table frame housing, reassemble and install subassemblies of Scorsby table assembly (pars. 48 through 51).
- (2) To install base (13, fig. 10) only, use procedure in paragraph 50a(1) through (3) in reverse order.

### 53. Electrical System

A power source of 110 volts, 60 cycles ac is required to operate the Scorsby table assembly. See figure 12 for schematic wiring diagram. A separate power source is required for operation of electrically driven gyro instruments which are tested with the unit.

*a. Disassembly.* Allow wiring connections to remain intact and carefully remove the resistor and shield assembly, capacitor, motor assembly, ON-OFF switch, and reversing switch from the base housing of the unit as described in paragraph 50. Remove the end cover of the motor assembly.

*b. Inspection.*

- (1) Check all solder connections for condition and security.
- (2) Check solderless connections on the phenolic terminal board located in the base of the motor assembly for security and condition and security of the crimp-on terminal lugs.
- (3) Check power cable for condition of the insulation and condition and security of terminals.
- (4) Inspect the plug adapter on the end of the power cable for general condition, security and condition of the ground wire and terminals.
- (5) Check all wires generally for condition.
- (6) Inspect the other components such as the switches, capacitor, and resistor for condition and evidence of overheating.
- (7) Use a suitable instrument such as an ohmmeter and check continuity of circuitry in accordance with the schematic wiring diagram (fig. 12).

*c. Replacement.* Replace any component parts or wiring found to be deficient or defective.

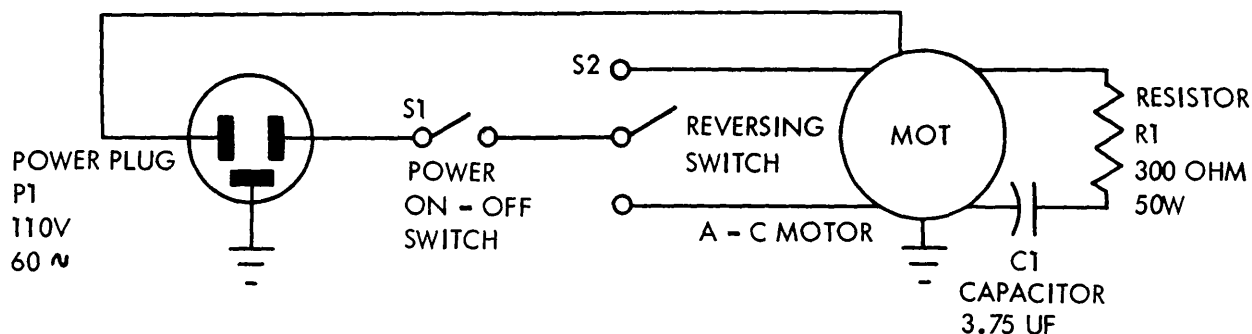


Figure 12. Schematic wiring diagram for Scorsby table assembly.

**CHAPTER 4**  
**SHIPMENT, LIMITED STORAGE, AND DEMOLITION OF MATERIAL TO PREVENT**  
**ENEMY USE**

---

**Section I. GENERAL**

**54. Scope**

This chapter covers methods and instructions pertaining to the preparation of material for shipment and storage. Also covered are methods of destroying the equipment when in danger of imminent capture to prevent enemy use.

**55. Safety Precautions**

The Scorsby table assembly must be transported and stored in its normal upright position at all times. In addition normal safety precautions shall be taken for the protection of the equipment during intransit movement and while in storage.

**Section II. STORAGE**

**56. Indefinite Storage**

*a. Inspection.* Prior to indefinite storage, inspect the table assembly including standard adapter as outlined in paragraphs 43 and 48 through 53 as applicable.

*b. Preventive Maintenance Services.* Perform preventive maintenance services as outlined in paragraphs 38 and 39 and assure that the table assembly is in proper working condition.

*c. Type of Container.* Use the original shipping cartons and packaging materials. Refer to paragraph 6 and package unit in reverse order shown in Figure 5.

*d. Packaging.* If original shipping cartons and packaging materials are unavailable, refer to Military Specification MIL-P-3571 for packaging and Military Specifications MIL-B-131 for use of water vapor barrier material.

*e. Indefinite Storage Inspection.* No further inspection of the unit is required until ready for use.

**57. Limited Storage**

*a.* Limited storage is defined as periods up to 6 months.

*b.* Prior to limited storage, inspect the table assembly including standard adapter as outlined in paragraphs 43 and 48 through 53, as applicable.

*c.* Perform preventive maintenance services as outlined in paragraphs 38 and 39 and assure that the table assembly is in proper working condition.

*d.* Use the original shipping carton or other suitable container to provide some protection for the unit during limited storage.

*e.* Inasmuch as there is no requirements for weather proofing of the unit during limited storage, care should be exercised in selection of a storage area. The package should be stored in a dry, sheltered location.

**58. Inspection and Maintenance of Table Assembly While in Limited Storage**

*a.* Interval of inspection and maintenance of table assembly while in limited storage shall be 30 days after initial storage and at the end of each 30 day period thereafter.

*b.* Inspection shall include scrutiny for and rectification of damage, deterioration, rusting, corrosion, accumulation of water, and pilferage.

*c.* Remove all accumulation of dust and dirt prior to re-storing.

**Section III. SHIPMENT WITHIN CONTINENTAL UNITED STATES**

**59. General**

This section provides instructions pertaining to shipment, storage, and mode of securing the unit package during intransit shipment within the Continental United States.

**60. Safety Precautions**

The Scorsby table assembly must be maintained in its normal upright position at all times during

**AGO 5033A**

shipment. In addition, refer to and carry out, special snipping precautions outlined in paragraph 62.

#### **61. Type of Container**

Refer to Military Specification MIL-P-3571 for instructions relative to type of container to be used and method of packaging.

#### **62. Shipment**

Domestic shipment normally will be handled by such carriers as aircraft, freight car, or truck.

a. No special tie-down or blocking instructions are required; however, precautions will be taken to secure the unit package by means of ropes or straps to prevent shifting.

b. If stacking is required, larger, heavier equipment should be placed on the bottom. Parallel separators such as wooden slats shall be used between equipments stacked.

c. Covers such as canvas or other suitable waterproof material shall be provided to prevent weather damage.

### **Section IV. SHIPMENT OUTSIDE CONTINENTAL UNITED STATES**

#### **63. General**

This section gives instructions pertaining to shipment, storage, and mode of securing the unit package during intransit shipment outside the Continental United States.

#### **64. Safety Precautions**

The Scorsby table assembly must be maintained in its normal upright position at all times during shipment. In addition, refer to, and carry out, special shipping precautions outlined in paragraph 66.

#### **65. Type of Container**

Refer to Military Specification MIL-P-3571 for instructions relative to type of container to be

used and method of packaging.

#### **66. Shipment**

Oversea shipment will normally be handled by such carriers as aircraft and ocean surface vessels.

a. No special tie-down or blocking instructions are required; however, precautions will be taken to secure the unit package by means of ropes or straps to prevent shifting,

b. If stacking is required, larger, heavier equipment should be placed on the bottom. Parallel separators such as wooden slats shall be used between equipments stacked.

c. On shipboard, protective covers such as canvas or other suitable waterproof material shall be provided for protection against salt water spray.

### **Section V. DEMOLITION OF MATERIAL TO PREVENT ENEMY USE**

#### **67. General**

This section covers methods of destroying the Scorsby table when in danger of imminent capture to prevent enemy use.

#### **68. Decision to Demolish**

Usually, based on time element, the unit commander makes the decision either to destroy the equipment or render it inoperative.

Note. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all Scorsby table assemblies and all corresponding repair parts.

#### **69. Demolition by Mechanical Means**

Use sledge hammers, crowbars, picks, axes, or any other heavy tools which may be available to destroy the following:

- a. Circular level indicator.

**AGO 5033A**

- b. Tie rod.
- c. Reverse control knob.
- d. ON-OFF switch.
- e. Tilt scale lock screw.
- f. Table tilt stop screw.
- g. Leveling screws.
- h. Lubrication fittings.
- i. Power cable.

#### **70. Demolition by Misuse**

Pour sand, dirt, metal chips, or other gritty material into lubrication fittings and gearing access port and operate the Scorsby table.

#### **71. Demolition by Scattering and Concealment**

Remove all easily accessible parts such as the tie rod, ball joints, level, leveling screws, table dust cap, table, and power cable. These and the base assembly should then be widely scattered in dense

foliage, buried in dirt, sand, or thrown in lake, stream, well, or other body of water.

## **72. Demolition by Burning**

Pack rags, clothing, or canvas around unit. Saturate this package with gasoline, oil, or diesel fuel and ignite.

**Caution: Use extreme care when handling flammable liquids. After saturating package with**

**fuel, move fuel container at least 50 feet from demolition area. Assure that demolition area is clear of personnel and ignite package from a safe distance.**

## **73. Demolition by Submersion**

Totally submerge the unit in a body of water to provide some water damage and concealment. Salt water will do the greatest damage to metal parts.

**AGO 5033A**

## APPENDIX I REFERENCES

---

### 1. Related Equipment and Instructions

- a.* LO 55-4920-229-12 Lubrication Order, Table, Scorsby Assembly Ideal Aerosmith (Model No. 1406-R).
- b.* MIL-B-131 Barrier Material, Water Vapor-Proofed, Flexible.
- c.* MIL-C-16553 Cleaning Solution and Rinsing Solution, Watch, Waterless.
- d.* MIL-G-27343 Grease, Ball and Roller Bearing, for Temperatures Ranging from Minus 100°F. to Plus 400°F.
- e.* MIL-L-16958 Lubricating Oil, Mineral Oil Composition, For Torpedo gyroscope.
- f.* MIL-P-3571 Packaging of Laboratory Apparatus Accessories and Supplies, Overseas Shipment.
- g.* MIL-STD-129 Marking for Shipment and Storage

### 2. Dictionaries of Terms and Abbreviations

- a.* AR 320-50 Authorized Abbreviations and Brevity Codes.
- b.* FM 21-30 Military Symbols
- c.* FM 21-6 Techniques of Military Instruction.
- d.* AR 320-5 Dictionary of United States Army Terms.

### 3. Publication Indexes

- a.* DA Pam 310-1 Index of Administrative Publications.
- b.* DA Pam 310-2 Index of Blank Forms
- c.* DA Pam 310-22 Index of Supply Manuals, Transportation Corps.
- d.* DA Pam 310-3 Index of Training Publications.
- e.* DA Pam 310-4 Index of Training Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.

## APPENDIX II MAINTENANCE ALLOCATION

### 1. General

The maintenance allocation chart is the authority for allocating maintenance responsibilities in accordance with the Transportation Corps Allocation System. All maintenance and operating procedures that are the responsibility of the operator are described in chapters 2 and 3.

### 2. Purpose

This appendix provides all activities with maintenance functions to be performed at each echelon of maintenance.

### 3. Definitions

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

*B Adjust.* To regulate periodically to prevent malfunction.

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

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

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

*f. Repair.* To restore to a serviceable condition by replacing unserviceable parts or by any other action required utilizing tools, equipment and skills available, to include welding, grinding, riveting straightening, adjusting and such.

*g. Align.* To adjust two or more components of an electrical (or mechanical) system so that there functions are properly synchronized.

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

*i. Symbol "X".* The symbol "X" placed in the appropriate column indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked "X" are authorized to perform the indicated operation.

### 4. Maintenance Functions

Maintenance functions are determined as shown on the maintenance allocation chart following:

**Maintenance Allocation Chart**

(1) Group No.	(2) Component and related operations	(3) 1st	(4) 2d	(5) 3d	(6) 4th	(7) 5th	(8) Tools req'd	(9) Remarks
1.0	Table Scorsby Assembly							
	Service -----		X					
	Adjust -----		X					
	Align -----		X					
	Calibrate -----		X					
	Inspect -----		X					
	Test -----		X					
	Replace -----		X					
	Repair -----		X					
2.0	Adapter Assembly:							
	Adjust -----		X					
	Align -----		X					
	Replace -----		X					
3.0	Motor:							
	Replace -----		X					
4.0	Electrical Switch and Wiring							
	Inspect -----		X					
	Replace -----		X					





Code				Federal stock No.	Description	Unit of issue	Expand-ability	Quantity authorized	List	
Tech serv	Source	Maint level	Re-cover-ability						Fig No.	Item No.
A	b	c	d	e		g	h	i	j	k
					Gear Assy, Compound p/n. 210119-1	ONE				
					Gear, 12T-24P p/n 210117	1 ea			10	33
					Gear, 48T-24P p/n 52448.	1 ea			10	32
					Gear, Head Drive p/n 210129	1 ea			10	38
					Gear, 18T-24Pp/n210152	1 ea			10	24
					Housing, Table Frame p/n 210101-1	1 ea			10	59
					Knob, Reversing Control p/n 210137.	1 ea			10	45
					Nameplate p/n 210345 --	1 ea			10	58
					Nut, Light, Jam MS35691 522.	1 ea			10	46
					Nut, Self Locking AN365-A1032.	1 ea			10	29
					Oiler, 10-32Thd p/n 202 (24981).	2 ea			10	55,56
					Plate, ON-OFF Switch p/n 1329 (72653).	1 ea			10	18
					Plug, Hole p/n 1712). (72653)	1 ea				
					Screw, Cap, Socket Head, Hex MS35458-16.	1 ea			10	36
					Screw, Cap, Socket Head, Hex MS35458-17.	3 ea			10	19
					Screw, Cap, Socket Head, Hex MS35459-35.	3 ea			10	12
					Screw, Drive AN535-0-3--	4 ea			10	57
					Screw, Machine, Flat Head MS35250-72.	3 ea			10	37
					Screw, Machine, Round Head AN515-6-4	2 ea			10	39
					Screw, Machine, Round Head AN520-10-5.	2 ea			10	27
					Setscrew, Headless, Hex Socket MS51034-17.	1 ea			10	44
					Setscrew, Headless, Hex Socket MS51035-34	1 ea			10	23
					Shaft, Gear p/n 210150--	1 ea			10	34
					Shaft, Head Bearing p/n 210124	1 ea			10	43
					Spring Assy, Reverse Drive p/n 210158-1.	ONE				
					Button, Reverse Spring p/n 210134	1 ea			10	41
					Rivet, Button p/n 210136.	1 ea			10	42
					Spring, Reverse Drive p/n 210157.	1 ea			10	40
					Spring, Compression p/n 211188.	1 ea			10	53
					Switch, DPDT, Reversing 1 ea p/n 210163.				10	21

AGO 5033A

Code				Federal stock No.	Description	Unit of issue	Expand-ability	Quantity authorized i	List	
Tech serv	Source	Maint level	Re-cover-ability						Fig No.	Item No.
A	b	c	d	e	f	g	h	i	j	k
					Switch, SPST, ON-OFF 1 ea p/n 8381-K8 (15605).	1 ea			10	22
					Washer, Flat AN960-10	1 ea			10	30
					Washer, Flat AN960-516				10	48
					Washer, Shim p/n 210151	A/R			10	35
					Washer, Shim p/n 210154	A/R			10	51
					Washer, Shim p/n 210155	A/R			10	50
					Washer, Special p/n 214921	1 ea			10	31
					Wheel, Reverse Drive, Star p/n 210138.	1 ea			10	49
					Electrical Adapter p/n AC1402 (03512).	1 ea			10	25
	X2	H	U		Motor p/n 5SMY54HB26 (03512)	1 ea			10	20
					Cable and Plug Assy p/n 316SJBL (03512).	1 ea			10	26
					Plate, Head Bearing p/n 216519.	1 ea			9	36
					Spacer p/n 210035-----	1 ea			9	35
					Washer, Shim p/n 210122 ----	A/R			9	37
	X1				Head Assy p/n 210113-1 ----	ONE				
					Block, Centerp/n210107	1 ea			9	32
					Fitting, Grease p/n 1729 (70270).	1 ea			9	24
					Plate, Mounting p/n 217852	1 ea			9	18
					Plate, Stop Post Side p/n 210110.	1 ea			9	30
					Plate, Tilt Scale Side p/n 210109.	1 ea			9	26
					Plate, Top p/n 210135 --	1 ea			9	23
					Post, Stop p/n 210114 -	1 ea			9	29
					Screw, Cap, Socket Head, Hex MS35458-10.	4 ea			9	16
					Screw, Cap, Socket Head, Hex MS35458-20.	2 ea			9	28, 34
					Screw, Cap, Socket Head, Hex MS35458-25.	1 ea			9	27
					Screw, Cap, Socket Head, Hex MS35458-33.	1 ea			9	31
					Screw, Head Tilt p/n 213043.	1 ea			9	25
					Screw, Modified p/n 210121.	4 ea			9	22
					Screw, Table Retaining p/n 210142.	1 ea			9	20
					Setscrew, Headless, Hex Socket MS51034-17.	1 ea			9	33
					Setscrew, Headless, Hex Socket MS51035-35.	1 ea			9	19
					Washer, Table Centering p/n 210149.	1 ea			9	21
					Washer, Tooth Lock AN936-A10.	6 ea			9	5, 17
					Joint, Ball p/n 316 (78643)---	2 ea			9	2
					Level, Circular p/n 10 (82084)	1 ea			9	15
					Nut, Plain Hex MS35649-102 -	4 ea			9	1

AGO 5033A

Code				Federal stock No.	Description	Unit of issue	Expand-ability	Quantity authorized	List	
Tech serv	Source	Maint level	Re-cover-ability						Fig No.	Item No.
A	b	c	d	e	f	g	h	i	j	k
					Plug, Hole p/n 17156 (72653)	1 ea			9	13
					Rod, Tie p/n 210143 -----	1 ea			9	3
					Screw, Cap, Socket, Hex MS35458-11.	1 ea			9	11
					Screw, Fillister Head AN50C 2-6	3 ea			9	14
					Table p/n213259-----	1 ea			9	12
					Adapter, Standard p/n 210083.-1.	ONE				
					Adapter, p/n 210561 ----	1 ea			9	6
					Nut, Allen, 10-32 -----	3 ea			9	9
					Panel p/n 210118-----	1 ea			9	8
					Screw, Cap, Socket Head, Hex MS35458-10.	3 ea			9	7
					Screw, Instrument Mounting p/n 210133	3 ea			9	10.
					Screw, Machine, Round 2 ea Head AN520-10-6.				9	4

AGO 5033A

## INDEX

	Paragraph	Page
Adjustment of table tilt .....	27	12
Alignment and adjustment .....	44	18
Applicable forms.....	3	2
Automatic direction reversing .....	26a	12
Calibration .....	45	19
Classification and ratings .....	5b	5
Cleaning:		
Adapter, table and head assembly ---49b		19
Base and table frame housing.....	52b	23
Gear assembly and reverse drive		
mechanism.....	51b	23
Motor assembly -.....	50b	12
Table -table frame housing linkage -48b		19
Connection .or Scorsby motion .....	25a	12
Container for shipment outside		
Continental United States .....	65	26
Container for shipment within Continental		
United States.....	61	26
Controls .....	11	9
Definition of limited storage .....	57a	25
Demolition .....	67	26
Demolition:		
Burning .....	72	27
Mechanical means.....	69	26
Misuse .....	70	26
Scattering and concealment.....	71	26
Submersion.....	73	27
Demolition decision -----68.....	26	
Description of Scorsby table assembly .....	4a	2
Detailed lubrication information .....	37	14
Deviation in models .....	4d	4
Disassembly:		
Adapter, table and head assembly .....	-49a	19
Electrical system .....	53a	24
Gear assembly and reverse drive		
mechanism -.....	51a	23
Dust condition operation.....		13
Electrical system .....	53	24
Extremes of heat and cold operation .....	31	13
Functional description of Scorsby table .....	-42	18
Identification data .....	4c	5
Indefinite storage .....	-56	25
Inspection prior to indefinite storage .....	-56a	25
Inspection prior to limited storage .....	57b	25
Inspection:		
Adapter, table, and head assembly .....	-49b	19
Base and table frame housing, .....	52b	23
Electrical system .....	53b	24
Gear assembly and reverse drive		
mechanism .....	51b	23
Motor assembly .....	-50b	21
New equipment .....	-7	7
Scorsby table assembly .....	-43	18
Table-to-table frame housing linkage -.	48b	19
Unit while in indefinite storage .....	56e	25
Unit while in limited storage .....	58	25
Used equipment .....	9	7

	Paragraph	Page
Installation:		
Adapter, table, and head assembly .....	49c	21
Base and table frame housing .....	52c	24
Gear assembly and reverse drive mechanism	51c	23
Motor assembly .....	50c	23
Table-to-table frame housing linkage .....	48c	19
Leveling screws and level .....	13	9
Limited storage .....	57	25
Lock screw for tilt .....	17	9
Lubrication .....	36	14
Manual direction reversing .....	26b	12
Manufacturer .....	5a	5
Methods of mounting instruments .....	24	12
Movement of equipment .....	29	13
ON-OFF switch .....	14	9
Operation under unusual conditions .....	30	13
Operation under usual conditions .....	20	11
Operations connection .....	25	12
Operator daily service .....	39	16
Overall dimensions .....	5a	5
Packaging: .....		
Domestic shipment .....	61	26
Indefinite storage .....	56d	25
Overseas shipment .....	65	26
Preliminary adjustments .....	22	11
Preventive maintenance services .....	38	16
Purpose of Scorsby table assembly .....	4b	3
Reassembly:		
Adapter, table, and head assembly .....	49c	21
Gear assembly and reverse		
drive mechanism .....	51c	23
References .....	2	2
Removal:		
Adapter, table and head assembly .....	49a	19
Base and table frame housing .....	52a	23
Gear assembly and reverse		
drive mechanism .....	51a	23
Motor assembly .....	50a	23
Table-to-table frame housing linkage -.	48a.	19
Repair of Scorsby table assembly .....	46	19
Repair parts .....	35	14
Repairing:		
Adapter, table, and head assembly .....	49b	19
Gear assembly and reverse		
drive mechanism .....	51b	21
Table-to-table frame housing linkage -- ..	48b	19
Replacement:		
Base and table frame housing .....	-52b	23
Electrical system .....	53c	24

	Paragraph	Page
Replacement-Continued		
Motor assembly .....	50b	21
Scorsby table assembly .....	47	19
Reverse control knob .....	15	9
Reversing direction of table .....	26	12
Reversing switch .....	19	9
Safety precautions .....	55	25
Safety precautions for shipment outside		
Continental United States .....	64	26
Safety precautions for shipment within		
Continental United States .....	60	25
Scale for tilt .....	18	9
Scope of instructions .....	1	2
Scorsby motion .....	4b	3
Servicing new equipment .....	8	7
Servicing used equipment .....	10	7

	Paragraph	Page
Shipment outside Continental United States ....	66	26
Shipment within Continental United States .....	62	26
Special tools and equipment .....	34	14
Standard adapter assembly .....	4a	2
Starting and stopping .....	21	11
Table tilt and stop screw .....	16	9
Table leveling .....	13	9
Tabulated data .....	5	5
Testing gyroscopic instruments .....	28	12
Tie rod .....	12	9
Tilt angle scale .....	18	9
Trouble shooting .....	41	17
Turntable motion .....	25b	12
Unloading and uncrating equipment .....	6	7
Unpackaging procedure .....	6b	7
Warm up .....	23	11

BY ORDER OF THE SECRETARY OF THE ARMY:

**G. H. DECKER,**  
*General, United States Army,*  
*Chief of Staff.*

Official:


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

Distribution:

To be distributed in accordance with DA Form 12-31 requirements for other literature of a general nature.

\* U. S. GOVERNMENT PRINTING OFFICE: 1962---650501

**AGO 5033A**

<h2>SOMETHING WRONG WITH PUBLICATION</h2>				
 <p><i>THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.</i></p>		FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)		
		DATE SENT		
PUBLICATION NUMBER		PUBLICATION DATE		PUBLICATION TITLE
<b>BE EXACT PIN-POINT WHERE IT IS</b>		<b>IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.</b>		
PAGE NO.	PARA-GRAPH			
PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER		SIGN HERE		

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS  
ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

## 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 decagram = 10 grams = .35 ounce  
 1 hectogram = 10 decagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

### Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

### Square Measure

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

### Cubic Measure

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

## Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

## Temperature (Exact)

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

**PIN: 009586-000**



This fine document...

Was brought to you by me:



### [Liberated Manuals -- free army and government manuals](#)

Why do I do it? I am tired of sleazy CD-ROM sellers, who take publicly available information, slap “watermarks” and other junk on it, and sell it. Those masters of search engine manipulation make sure that their sites that sell free information, come up first in search engines. They did not create it... They did not even scan it... Why should they get your money? Why are not letting you give those free manuals to your friends?

I am setting this document FREE. This document was made by the US Government and is NOT protected by Copyright. Feel free to share, republish, sell and so on.

I am not asking you for donations, fees or handouts. If you can, please provide a link to [liberatedmanuals.com](http://liberatedmanuals.com), so that free manuals come up first in search engines:

<A HREF=<http://www.liberatedmanuals.com/>>Free Military and Government Manuals</A>

- Sincerely  
Igor Chudov  
<http://igor.chudov.com/>
- [Chicago Machinery Movers](#)