TM 11-6625-1838-15

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DS, GS, AND DEPOT MAINTENANCE MANUAL

TEST SET GROUP OPTICAL ALIGNMENT OQ-62/APS-94D

HEADQUARTERS, DEPARTMENT OF THE ARMY

DECEMBER 1970

WARNING

Be careful when working on the 120 -volt ac line connections to the CRT simulator, image plane light, and telescope light. Serious injury or death may result from contact with these connections.

WARNING

The fumes of tricholoroethane are toxic. Provide ventilation whenever used. DO NOT use near an open flame. Tricholoroethane is not flammable, but exposure of the fumes to an open flame converts to highly toxic dangerous gases.

TM 11-6625-1838-13
C3

CHANGE
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 17 August 1976

Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual
TEST SET GROUP, OPTICAL ALIGNMENT OQ-62/APS-94D

TM 11-6625-1338-15, 31 December 1970, is changed as follows:

1. Remove and insert as indicated below:

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B-1 through B-4	B-l through B-4

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TM 11-6628-1838-15
C 2

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Washington, DC, 3 May 1976

Operator's, Organizational, Direct Support
General Support, and Depot Maintenance Manual
TEST SET GROUP, OPTICAL ALIGNMENT OQ-62/APS-94D

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Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual
TEST SET GROUP, OPTICAL ALIGNMENT 0Q-62/APS-94D

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Remove pages	Invert pages
Delete. Warning (page 2 of cover)	A
l-l through l-4	l-l through l-4
1-9. 1-10	l-9 through l-l@
1-13 through 1-15	l-13 through 1- 15
2-1 through 28	2-l through 2-8
3-3	3-3
.5-1i through .5-5	5-1 through 5-5
7- 3, 7-4	7-3. 7-4
8-1,8-2	8-l. 8-2
B-3 through B-6	B-3 and B-4

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TECHNICAL
No. 11-6625-1838-15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON DC, 31 December 1970

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

TEST SET GROUP, OPTICAL ALIGNMENT OQ-62/APS-94D

LIST OF ILLUSTRATIONS

LIST OF TABLES

CHAPTER 1
INTRODUCTION

Section I. General

1-1. Scope

Test Set Group, Optical Alignment OQ-62/APS-94D (optical alignment test set) described in this manual is special test equipment for Radar Surveillance Set AN/APS-94D issued for depot only. The optical alignment test set is comprised of Test Fixture, Optical Alignment TS-2965/APS94D (mirror alignment test fixture) and Test Fixture, Optical Align ment TS-2966/APS-94D (Lens focus fixture). Operation, organizational maintenance, and depot maintenance for the aforementioned equipment items are covered in the eight chapters and two appendices that comprise this manual. Common names have been substituted for nomenclatured items. Refer to table 1-2. Direct Support and General Support maintenance is not applicable.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA PAM 310-4 to determine whether there are ***new*** editions, changes, or additional publications pertaining to the equipment.

b. ***DA PAM*** 310-7. Refer to the latest issue of DA PAM 310-7 to determine whether there are Modification Work Orders for the equipment.

1-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-581 NAVSUPINST 4030.29/AFR 71-13MCO P4030.29A, and DSAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33A/AFR 75-181MCO P4610.19B and DSAR 4500.15.

1-3.1. Reporting of Errors

The reporting of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded to Commander, U.S. Army Electronics Command, ATTN: DRSEL-MA-Q, Fort Monmouth, NJ 07703.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

The optical alignment test set optically aligns Recorder-Processor-Viewer, Radar Mapping RO-352/APS-94D Test Fixture. The mirror alignment fixture adjusts RO-352/APS-94D mirror angles and sets optical path length at its maximum. The lens focus fixture reduces the optical path length in the RO-352/APS-94D until focus has been achieved and positions lenses along the optical path to obtain the correct object magnification ratio.

1-5. Technical Characteristics

a. Optical Alignment Test Set.

Alignment and focus accuracy.	A resolution of 30 line pairs (minimum) per milliter, covering the distance from the cathode-ray tube (CRT) phosphor surface to the emulsion surface of the recording film

b. *Mirror* Alignment Fixture.

(1) Telescope alignment mirror.

Type of mirror	Front surface
Mirror flatness	Flat to 3 fringes per inch at 5893 Angstroms

(2) Lens plane mirror

Type of mirror	Front surface
Mirror flatness	Flat to 3 fringes per inch at 5893 Angstroms

(3) Image plane mask.

Type of mask	Front Surface
Mirror flatness	Flat to 9 fringes per inch at 5893 Angstroms
Type of mask	Line

(4) Lens plane reticule.

Type of reticle	Circular
Window flatness	Flat to 9 fringes per inch at 5893 Angstroms

(5) Image plane light.

Type of diffuser	Sand blasted surface
Color of filter	Blue
Type of lamp	No. 4505 sealed beam
Lamp power requirements	28 vdc at 1.8 amperes

(6) Telescope light power cable.

Transformer input ..... 115 vac, 60 Hz at 1 ampere
Transformer output ..... 3.5 vac, 60 Hz at 0.3 ampere

(7) Telescope light.

Type of lamp ..... No. 13 incandescent
Lamp power requirements ..... 3.5 vac, 60 Hz at 0.3 ampere

(8) Telescope.

Type of optics ..... Erecting
Magnification power ..... 30 X
Focal length ..... Adjustable, 2 inches to infinity

c. Lens Focus Fixture.

(1) CRT simulator.

Type of lamp 6S6
Lamp power requirements ..... 6 watts at 120 volts.

(2) Image plane mask (MT or FT).

Type of reticle ..... Standard Target U.S.A.F. 1951 Group Numbers 4 through 7
Mask flatness ..... Flat to 9 fringes per inch at 589 Angstroms

(3) Object plane mask.

Type of reticle ..... Rectangular
Focus pattern ..... 15 lines per millimeter and 30 lines per millimeter
Mask flatness ..... Surfaces parallel within 0.001 inch across the longest dimension and 0.0005 inch across the width

(4) Microscope.

Magnification power ..... 100 X
Depth of field ..... Less than 0.001 inch
Field of view ..... 0.04 inch diameter
Optical working distance ..... 0.25 inch

1-6. Components and Dimensions

a. Components. The components of the Optical Alignment test set are listed in table 1-1.

b. Dimensions of Major Components. The dimensions of major components comprising basic issue items are listed in table 1-1.

1-7. Common Names

A list of equipment items that comprise the mirror alignment fixture and the Lens focus fixture is provided in table 1-2. The equipment items are listed under the test fixture with which they are associated. A common name is indicated for each item listed in the table.

Table 1-1. *Dimensions of Major Components*

FSN	Item	QtY	Overall dimensions (in.) Height	weight	Depth	Weight (lb) with case	References
6625-762-4883	Test Fixture, Optical Alignment TS-2965/APS-94D	1	27.35	30.35	28.35	170	(Fig. 1-1 through 1-5.)
6625-762-4880	Test Fixture, Optical Alignment TS-2966/APS-94D	1	27.35	30.35	28.35	211	(Fig. 1-6 through 1-12)
6625-493-7478	Cable Assembly Power, Electrical CX-12241/U (6 ft)	1					

Table 1-2. Common Names

Item	Common name
Test Set Group, Optical Alignment OQ-62/APS-94D	Optical alignment test set
Test Fixture, Optical Alignment TS-2965/APS-94D	Mirror alignment fixture
Caps, Test Set	Case
Fixture, Mirror Alignment	Mirror alignment fixture housing
Telescope, Straight SU-20/APM 214	Telescope
Light, Telescope MX-6556/0APM-214	Telescope light
Cable Assembly, Power, Electrical CX-9974/APM-214	Telescope light power cable
Mirror Assembly, Collimator	Telescope alignment mirror
Mirror Assembly, Lens	Lens plane mirror
Tool, Alignment Mask	Image plane mask
Transport, Mirror Lower	Lower transport
Transport, Mirror Upper	Upper transport
Assembly, Light	Image plane light
Cable Assembly, Power, Electrical CX-12241/U (6 FT)	Image plane light power cable
Reticle Assembly, Lens	Lens plane reticle
Tool, Lens Removal	Lens tool
Test Fixture, Optical Alignment TS-2966/APS-94D	Lens focus fixture
Case, Test Set	case
Housing, Focus Fixture	Lens focus fixture housing
Microscope, Optical	Microscope
Slide, Compound	Compound slide
Tool, Lens, Removal	Lens tool
Tool, Mask Alignment	Image plane mask
Mask Optical Alignment	Object plane mask
Holder, Optical Element	Mask bracket
ADAS Cathode Ray Tube simulator	CRT simulator
ADAS Image Plane Mask Assembly	ADAS image plane mask
Wrench, Collet	Collet wrench

1-8. Description of Equipment

The components of the optical alignment test set are assembled in two portable cases that are identical. A case description is provided in paragraph 1-9. Component descriptions are provided in paragraphs 1-10 through 1-17.

1-9. Description of Case

(fig. 1-1)

The case consists of two pieces, a cover and a bottom. The cover, when assembled on the bottom, is secured with six latches. When the latches are secured, the case is airtight and watertight. A relief valve mounted in the cover equalizes air pressure inside and outside the case.

1-10. Description of Mirror Alignment Fixture

The mirror alignment fixture consists of a case, mirror alignment fixture housing, telescope, and ten minor components. The case is described in paragraph 1-9. The mirror alignment fixture housing is described in paragraph 1-11; the telescope, in paragraph 1-12. The minor components and a special tool supplied with the mirror alignment fixture are described in paragraph 1-13 and 1-14, respectively.

1-11. Description of Mirror Alignment Fixture Housing

(figs. 1-2,1-3)

Front and rear views of the mirror alignment fixture housing are shown in figures 1-2 and 1-3, respectively. The housing is comprised of a base plate, front (vertical) plate, and two side plates made of cast aluminum.

a. The base plate (fig. 1-2) is secured to the bottom of the case (fig. 1-1) with four shock mounts. The vertical plate and side plates are assembled on the base plate in a manner that permits mounting of the optical housing of the RO-352APS-94D on the vertical plate for mirror alignment and initial positioning.

b. The vertical plate is machined to provide two circular openings (windows) and a rectangular opening. The windows pass light to, and from, the optical housing of the RO-352/APS-94D during mirror alignment and initial positioning in the moving target (MT) and fixed target (FT) optical systems. The rectangular opening permits adjustment of the upper mirrors in the RO-352/APS-94D optical housing and access to the lenses in the optical housing interior.

c. Four precision vee blocks, two with thumbscrew adjustments, are assembled on the base plate. Two of the vee blocks are mounted in line with each of the windows in the vertical plate. The vee blocks provide support for the telescope during mirror angular alignment and initial optical path length adjustment.

cl. Three dowel pins (fig. 1-3) in the vertical plate, equally spaced around each window, establish the position of the object plane for RO-352/APS-94D optical alignment in the mirror alignment fixture housing. Three pads pressed into the vertical plate position the optical housing of the RO-352/APS-94D in the object plane when the optical housing is mounted on the mirror alignment fixture housing.

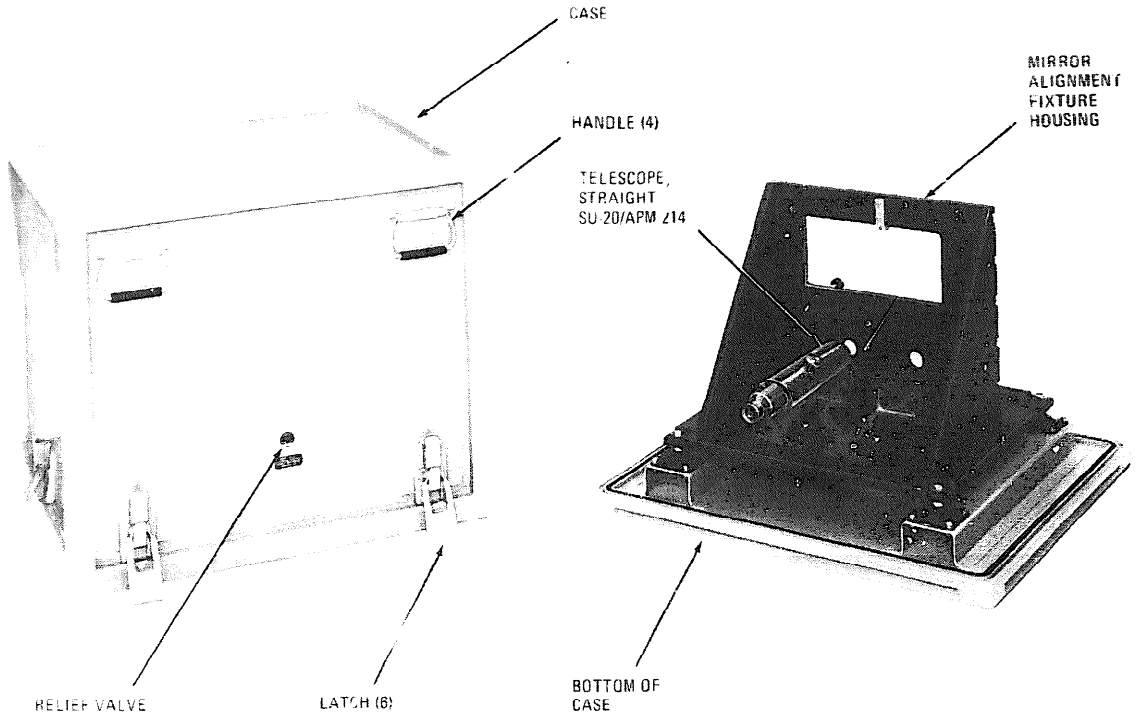

Figure 1-1. Test Fixture Optical Alignment TS-2965/APS-94D, less minor components.

e. A sleeve and yoke on the vertical plate position the FT and MT optical planes in the RO-352/APS-94D perpendicular to the object plane in the mirror alignment fixture housing. Three pawl fasteners secure the optical housing of the RO-352/APS-94D to the fixture housing, following mounting.

1-12. Description of Telescope

(fig. 1-4)

The telescope is a precision light projection instrument used for mirror angle and initial optical path length adjustment in the optical systems of the RO-352/APS-94D. The telescope is 14.12 inches long and 2.25 inches in diameter. Magnification power is 30 X and focal range is 2 inches to infinity. A target (object) is incorporated in the telescope barrel at the end farthest from the eyepiece and a crosshair reticle is positioned in the barrel near the eyepiece. Object focus is controlled by turning the object focus control at the top of the telescope barrel. Eyepiece focus is controlled by turning the eyepiece focus ring. A lamp housing coupling on the telescope mates with the lamp housing of the telescope light (para 1-13).

1-13. Description of Mirror Alignment Fixture Minor Components

(fig. l-5)

a. Light, Telescope MX-6556/APM-214. The telescope light is an assembly that furnishes light required for optical mirror angular and positional adjustments. The assembly consists of a lamp, lamp housing, switch, connector, and cable. The overall length of the assembly is 72 inches. The coupling on the telescope (para l-12) and the cable connector mates with the telescope light power cable (b below). The switch turns the lamp in the lamp housing on and off.

b. Telescope Light Power Cable. The telescope light power cable is an assembly that furnishes the power required to illuminate the lamp in the telescope light (*a* above). The assembly

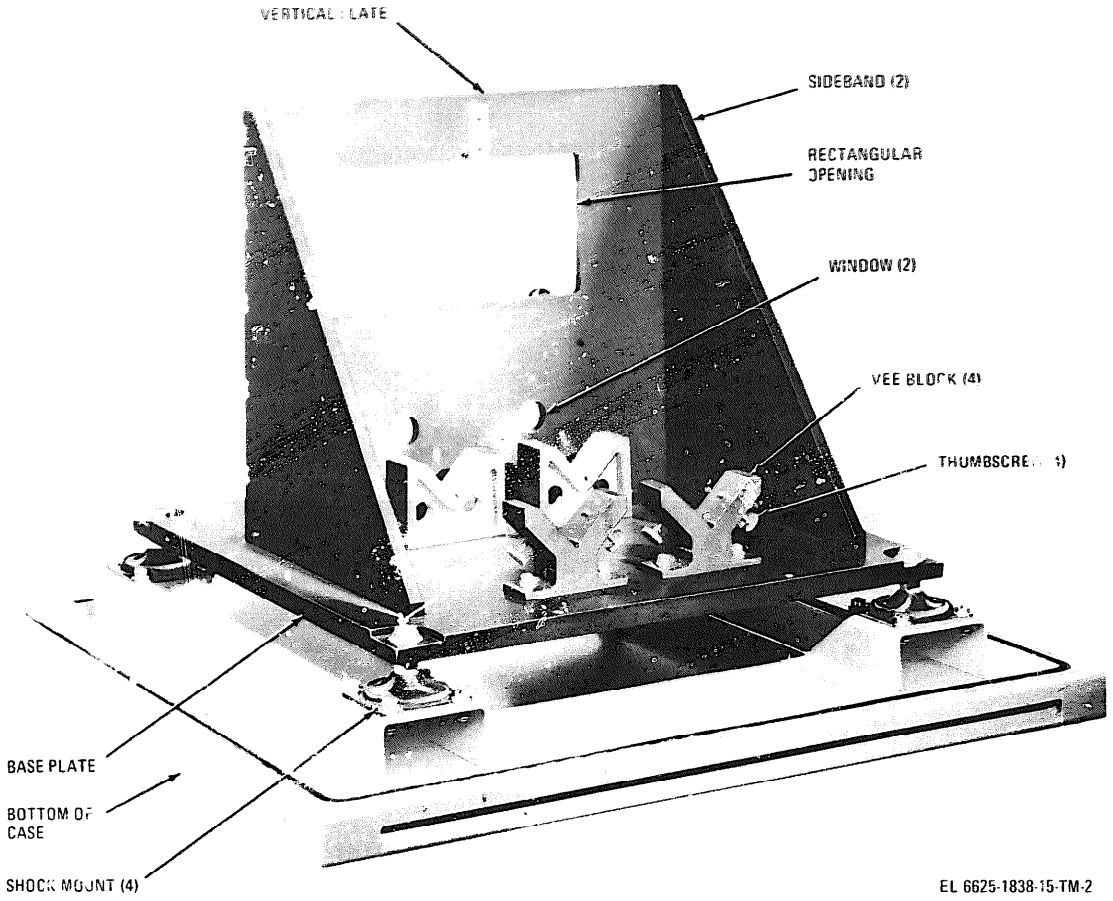

Figure 1-2. Mirror Alignment Fixture Housing, front oblique view.

consists of a power cord with a transformer plug at one end and a connector that mates with the telescope light at the other end. The overall length of the assembly is 14.5 inches. The transformer plug on the power cord steps 115 volts, 60 Hz down to 3.5 volts for application to the lamp in the telescope light.

c. Telescope Alignment Mirror. The telescope alignment mirror is an assembly used to establish the position of the telescope (para 1-12) with regard to the object plane in the mirror alignment fixture. The assembly consists of a circular mirror assembled in an aluminum frame 3.5 inches in diameter. The mirror is made of optical glass coated on the front surface with nickel and overcoated with magnesium fluoride to protect the reflective surface. Three thumbscrews in the mirror assembly secure it to the vertical plate (fig. l-3) of the mirror alignment fixture.

d. Lens Plane Mirror. The lens plane mirror is an assembly used in conjunction with the telescope (para 1-12) to adjust the reflection angle of the lower mirrors in the optical housing of the RO-352-APS-94D. The assembly consists of a circular mirror assembled in a steel housing 2.437 inches in diameter. The mirror is identical to the telescope alignment mirror (c above).

e. Image Plane Mask The image plane mask is a tool used in conjunction with the telescope (para 1-12) to adjust the reflection angle of the upper mirrors in the optical housing of the RO-352-APS-94D and for initial mirror positioning. The tool consists of a rectangular mirror assembled in an aluminum support. The mirror is made of optical glass coated on the front surface with nickel and overcoated with silicon monoxide to protect the reflective surface. A clear 0.001 inch line extends horizontally across the mirror near the center.

f. Lower and Upper Mirror Transports. The lower and upper mirror transports are assemblies used to adjust the reflection angle and position

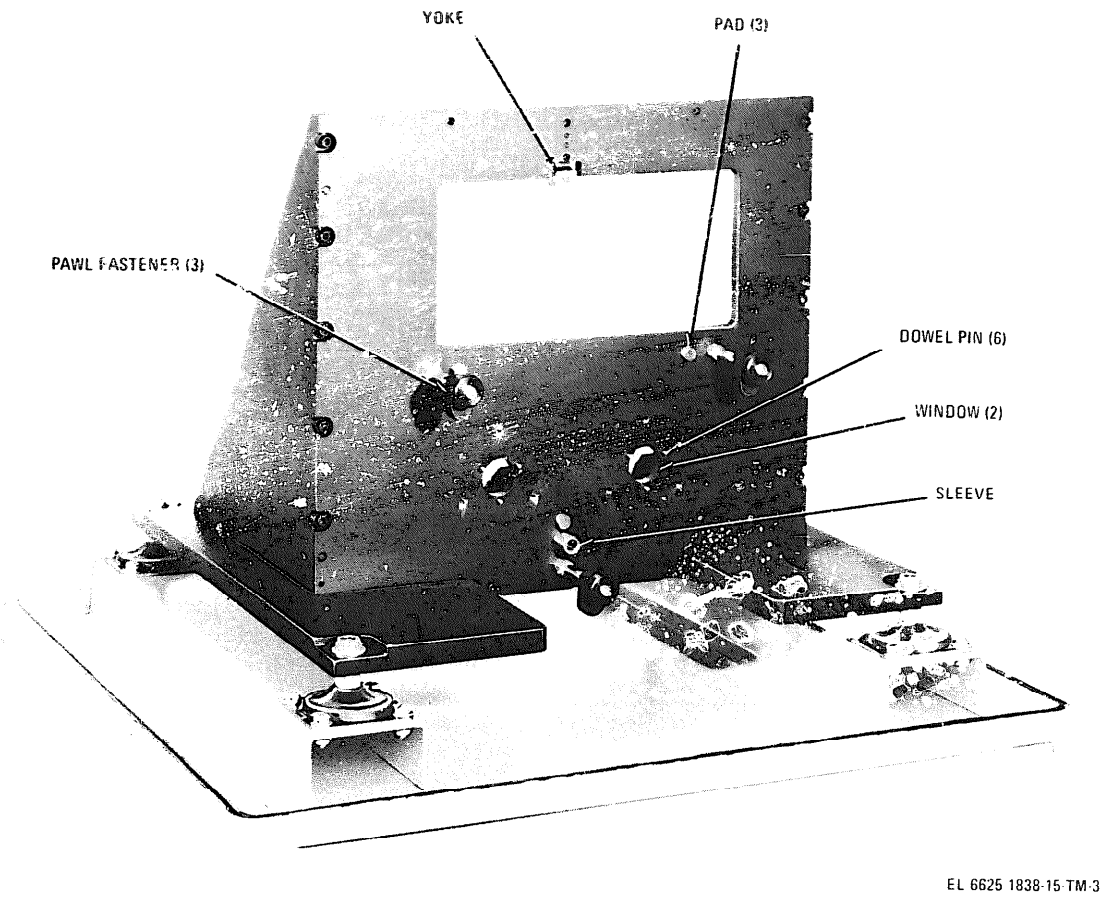

Figure 1-3. Mirror Alignment Fixture Housing, rear oblique view.

of the lower and upper mirrors, respectively, in the optical housing of the RO-352-APS-94D. Each transport consists of three mirror adjustment 'tools assembled on a chassis. When the transports are mounted on the optical housing, the adjustment tools engage the optical housing mirror adjusting screws. Each adjustment tool may he used independently to adjust mirror reflection angle or all adjustment tools may be used simultaneously to adjust mirror position. During simultaneous operation the three adjustment tools are driven with sprockets and a chain. Chain tension is maintained with an idler sprocket. The sprockets and chain are disengaged during independent tool operation.

g. ***Image Plane*** Light. The image plane light is an assembly used in conjunction with 'the lens plane reticle (i below) to position the upper mirrors in the optical housing of the RO-352/APS-94D. The assembly consists of a ventilated steel box that contains a sealed-beam incandescent lamp, light filter, light diffuser, switch, and connector. Operating power for the lamp is supplied through the connector, from the image plane light power cable (h below), and turned on and off with the switch. The light diffuser prevents bright spots in the light transmission from the sealed-beam lamp and the light- t filter light output is at approximately the same wavelength as that produced by the phosphor coating of the cathode-ray tube (CRT) indicators in the RO-352/APS-94D.

h. Image plane light power cable. The image plane light power cable supplies +28 vdc to the image plane light (g above). The assembly consists of a two-conductor, six-foot cable with a type MS 27008 connector at one end and a type MS 3116-F12-3S connector at the other end.

i. Lens ***Plane*** Reticle. The lens plane reticle is an assembly used in conjunction with the telescope (para 1-12) and image plane light (g above) to set optical path length at its maximum

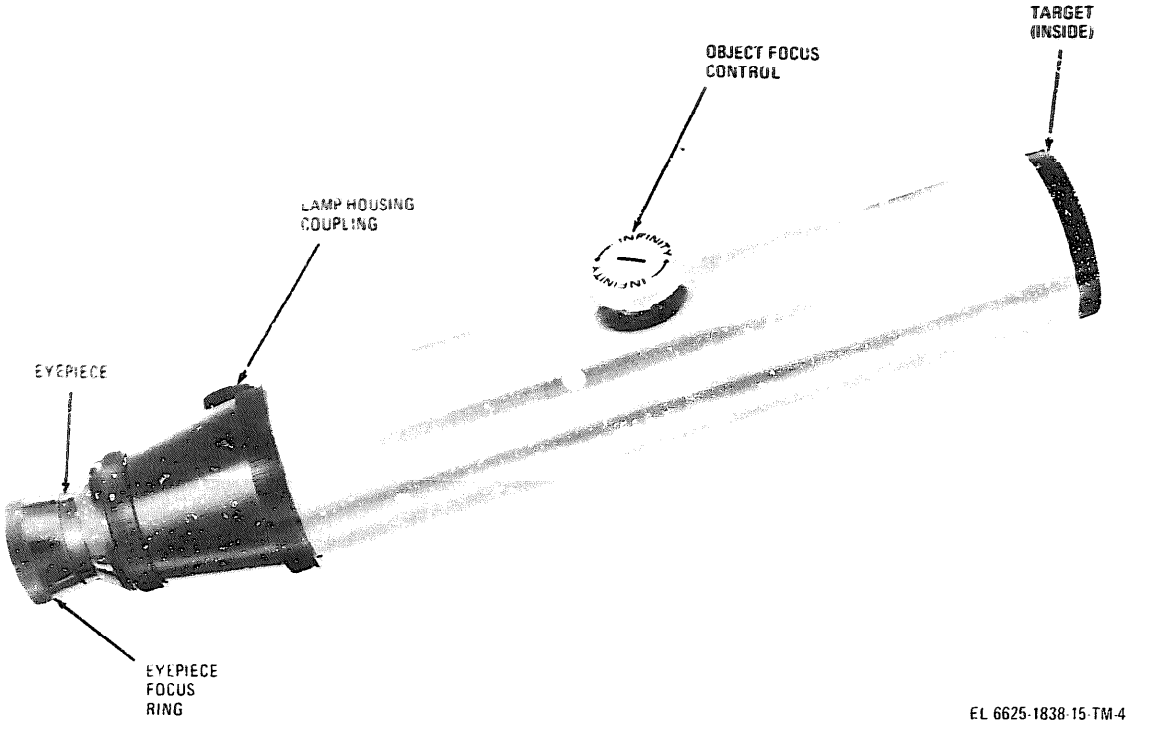

Figure 1-4. Telescope, Straight SU-20/APM-214.

in the optical housing of the RO-352/APS-94D after mirror reflection angles have been adjusted. The assembly consists of a lens, with a reticle pattern, assembled in a steel housing 2.437 inches in diameter. The reticle pattern deposited on the lens is nickel, overcoated with baked silicon monoxide.

1-14. Lens Tool
(fig. 1-6)

The lens tool is a special tool supplied with the mirror a1ignment fixture. The tool, used for reproval and replacement of the optical lenses in the RO-352/APS-94D, is a circular spanner wrench made of aluminum alloy. The spanner is 4 inches long and has an outside diameter of 2.38 inches.

1-15. Description of Lens Focus Fixture
(fig. l-7)

The lens focus fixture consists of a case, lens focus fixture, compound slide, microscope and six minor components. The case is described in paragraph 1-9. The lens focus fixture and compound slide are described in paragraphs 1-16 and l-17, respectively. The microscope is described in paragraph I-18; the minor components, in paragraph l-19.

1-16. Description of Lens Focus Fixture Housing
(fig. 1-8 and l-9)

Front and rear views of the lens focus fixture housing are shown in figures 1-8 and 1-9, respectively. The housing consists of a base plate, front (vertical) plate, and two side plates made of cast aluminum. The compound slide (para 1-17) is secured to the base plate.

a. The base plate (fig. i-8) is secured to the bottom of the case with four shock mounts. The vertical and side plates are assembled on the base plate in a manner that permits mounting of the optical housing of the RO-352/APS-94D on the vertical plate for lens focusing and magnification ratio adjustments.

b. The vertical plate has two small rectangular openings (windows) and a large rectangular opening. The windows pass light from the original housing of the RO-352/APS-94D during lens focusing and magnification ratio adjustments in the MT and FT optical systems. The large rectangular opening permits adjustment of upper

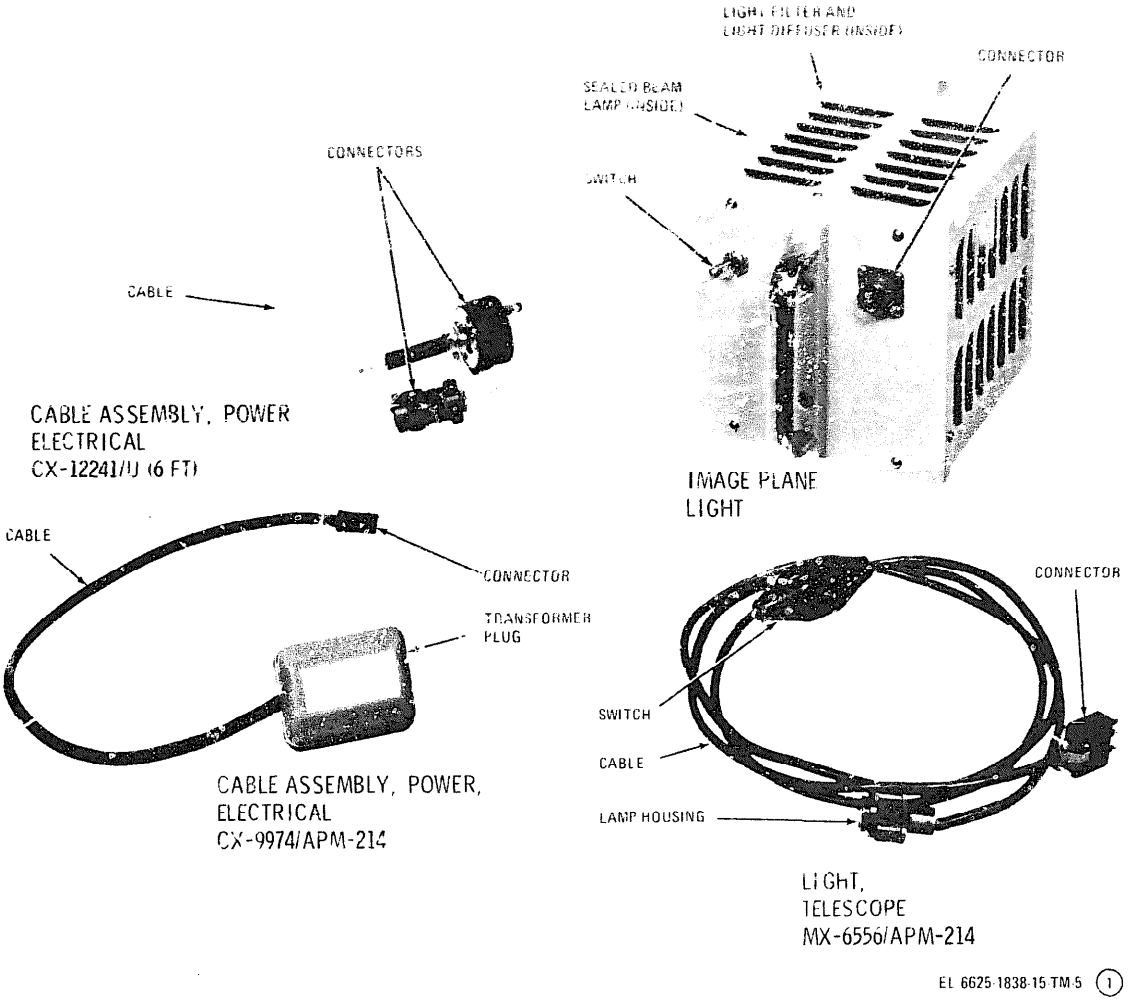

Figure 1-5(1) Test Fixture, Optical Alignment TS-2905/APS-94D, minor components (sheet 1 of 2)

mirror position in the RO-352/APS-94D optical housing and access to the lenses in the optical housing interior.

c. Each side plate has a circular opening. The openings permit aperture adjustment of the lenses in the the RO-352/APS-94D optical housing when the optical housing is mounted on the lens focus fixture housing.

d. The mask bracket (fig. 1-9) surrounds the two windows (b above) in the vertical plate. The bracket holds two object plant masks (para 1-19) over the windows in the vertical plate. The masks are positioned laterally in the mask bracket with positioning screws in the vertical plate.

e. Three dowel pins in the vertical plate, spaced around each window, establish the position of the object plane for RO-352/APS-94D optical alignment in the lens focus fixture housing. Three pads pressed into the vertical plate position the optical housing of the RO-352/APS-94D in the object plane when the optical housing is mounted on the fixture housing.

f. A sleeve and yoke on the vertical plate position the FT and MT optical planes in the RO-352/APS-94D perpendicular to the object plane the lens focus fixture housing. Three pawl fasteners secure the RO-352/APS-94D to the housing, following mounting.

1-17. Description of Compound Slide (fig. 1-10)

The compound slide transports the microscope (para 1-18) and positions it as required during

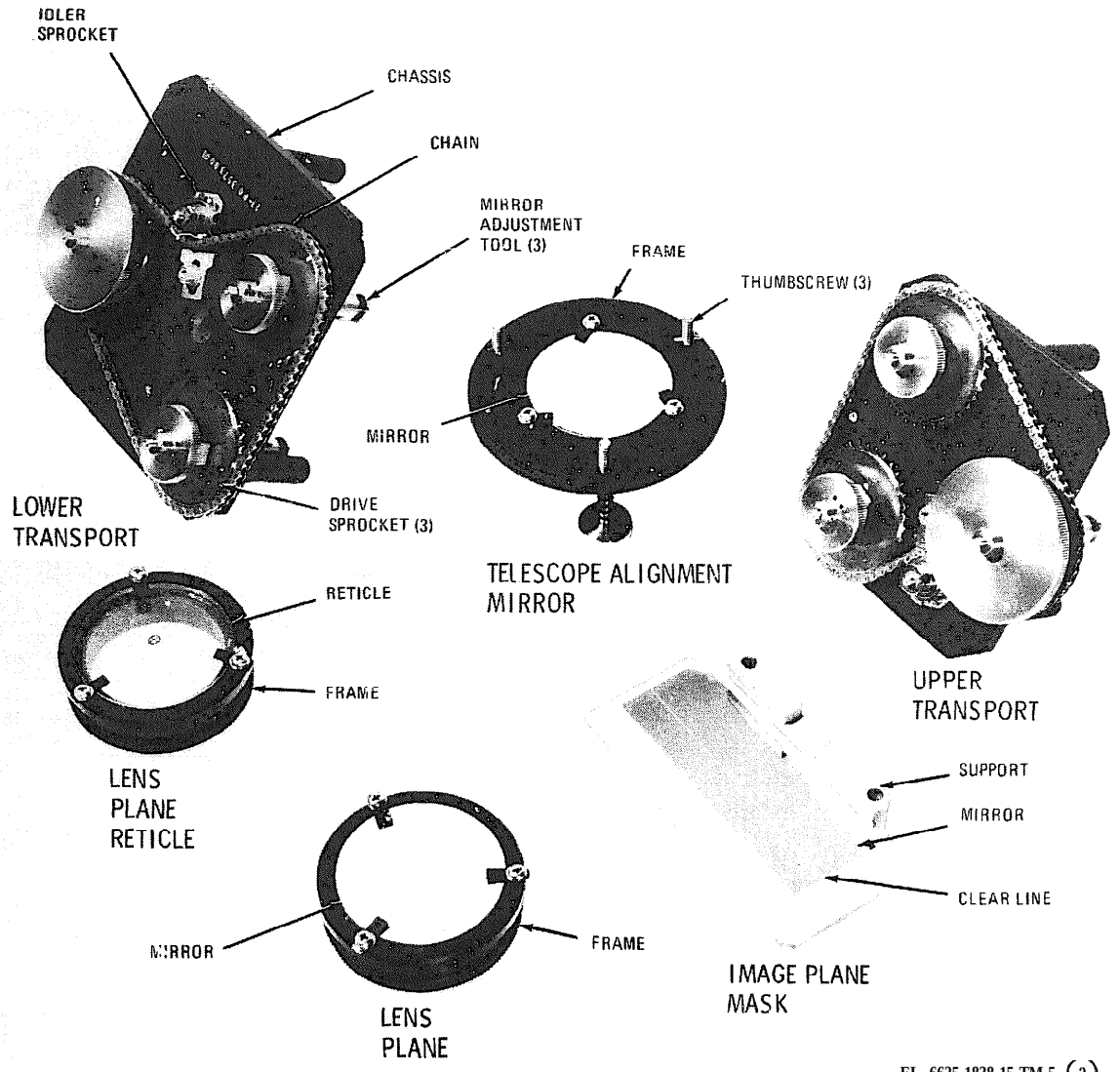

Figure 1-5(2). Test Fixture, Optical Alignment TS-2965/APS-94D, minor components (sheet 2 of 2)

lens focusing and magnification ratio adjustment in the RO-352/APS-94D. The microscope is positioned in the vertical or horizontal axis, with respect to the slide, by turning the proper positioner handle. The vertical and horizontal slides are moved by precision lead screws when the positioner* handles are turned. Slide travel is indicated in increments of 0.001 inch by travel indicators assembled on the slides. Focus pattern location on the object plane masks (para 1-19) can be found by aligning the arrows on the vertical and horizontal slides to the same numbers on the target position indicators affixed to the slide frames.

1-18. Description of Microscope (fig. 1-11)

The microscope is a precision optical instrument used for lens focusing of the optical systems of the RO-352/APS-94D. The microscope eyepiece has 10 X magnification power and contains a standard 90 degree crosshair reticle. The lens of the microscope is 16 millimeters in diameter and also has 10 X magnification power. Object focus is controlled by turning the object focus control at the top of the microscope barrel. Eyepiece focus is controlled by moving the eyepiece in or out.

1-19. Description of Minor Components of Lens Focus Fixture
(figs. 1-5, 1-12)

a. CRT simulator. The CRT simulator (fig. 1-13) us a light assembly used in conjunction with Test Fixture, Optical Alignment TS-2966/APS-94D to test and align the ADAS optical system of TO-352/APS-94D. The CRT simulator consists of a cylindrical housing, an incandescent lamp, image mask, filter lens, and a plug connector.

b. ADAS Image Plane Mask. The ADAS image plane mask (fig. 1-13) consists of a magnifier, a magnifier support, and a lens. Three parallel reticles are scribed on the lens. The reticles are used in conjunction with the CRT simulator image mask to align the ADAS optical system of RO-352/APS-94D. The ADAS image plane mask supplied with the TS-2966/APS-94D lens focus fixture is used to align the ADAS optical system in both the RO-352/APS-94D and the RO-352A/APS-94D.

c. Lens Tool. The lens tool (fig. 1-16) is the same as that described in paragraph 1-14.

d. Mask *Alignment Tool.* The mask alignment tool (fig. 1-12) is used in conjunction with the microscope para 1-18) for lens focusing and magnification ratio adjustment for both mt and ft optical systems of the RO-352/APS-94D.

e. Optical Musks - *(MT)* and - *(FT).* The optical masks (MT and FT) are used in conjunction with the microscope (pasra 1-18) for lens focusing and magnification ratio adjustment in the mt and ft optical systems of the RO-352/APS-94D. The masks are optical glass windows that are clear except for reticle and target areas, which are opaque. The target areas consist of 15 lines-per-millimeter and 30 lines-per-millimeter Ronchi rulings.

1-20. **Additional Equipment Required**

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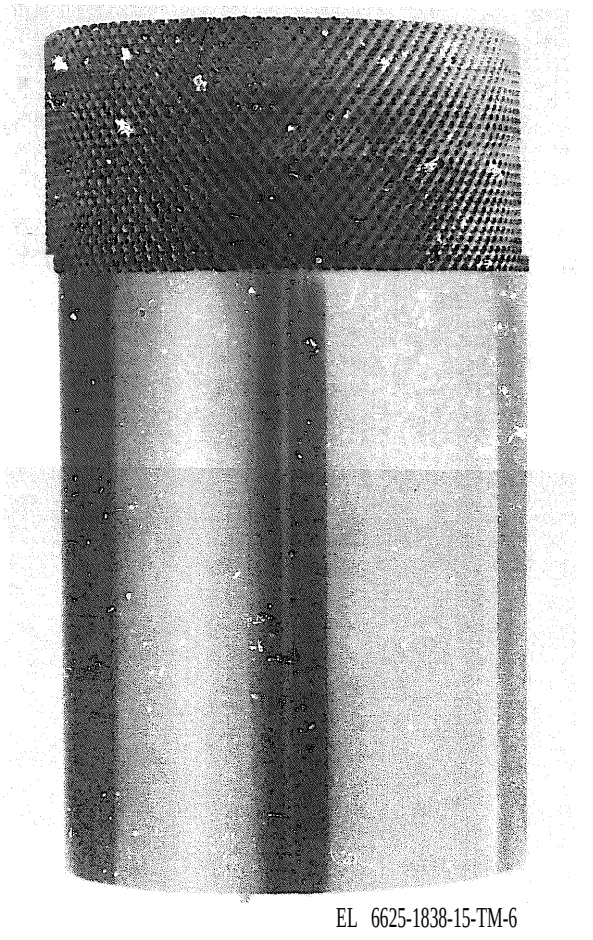

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Figure 1-6. Lens tools.

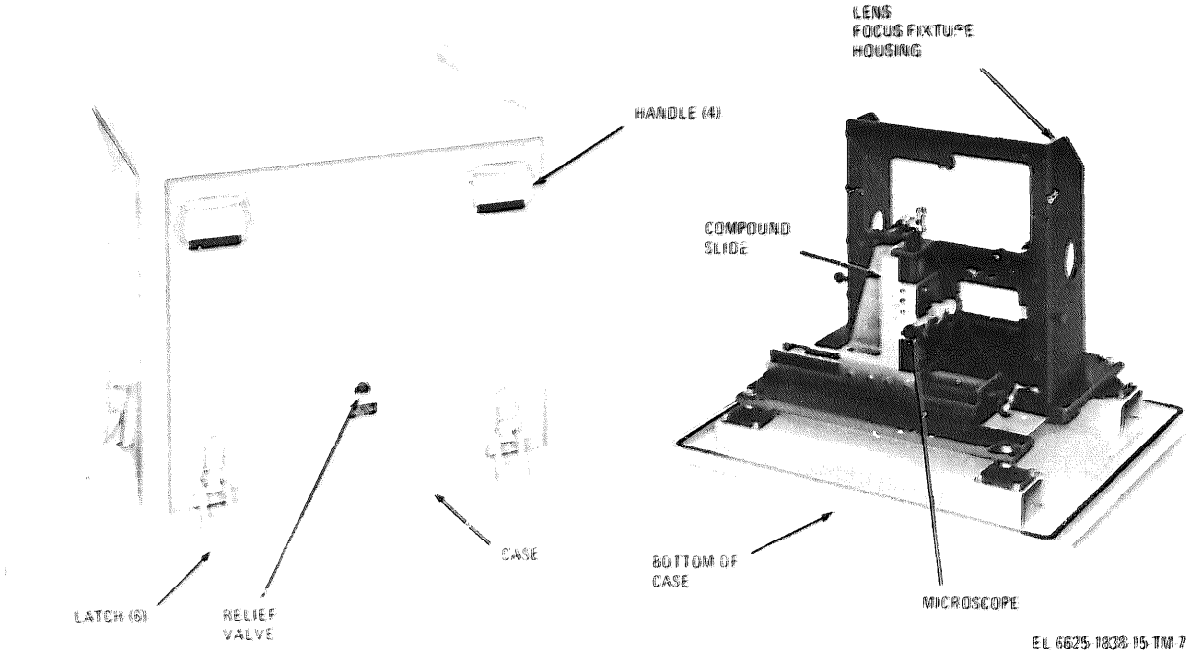


Figure 1-7. Test Fixture, Optical Alignment TS-2966/APS-94D, less minor components.

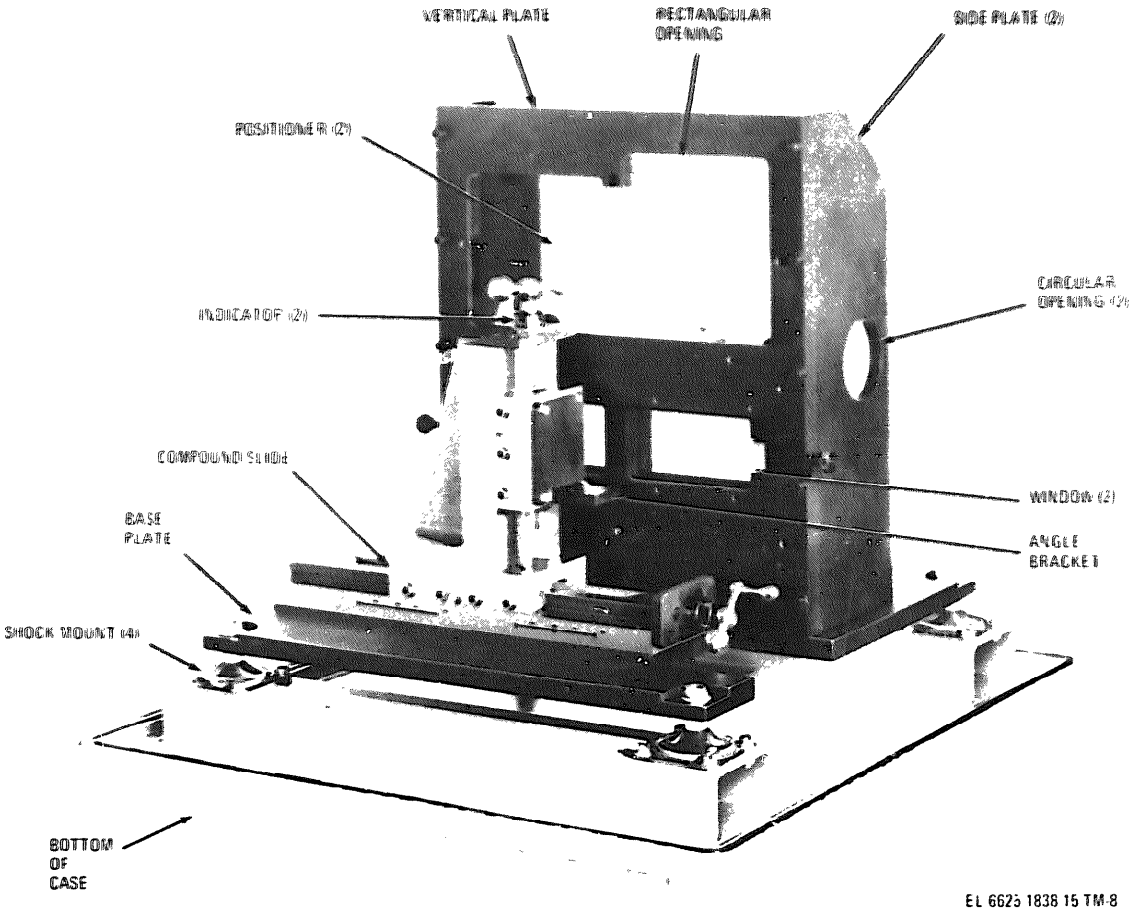


Figure 1-8. Lens focus fixture housing, front oblique view.

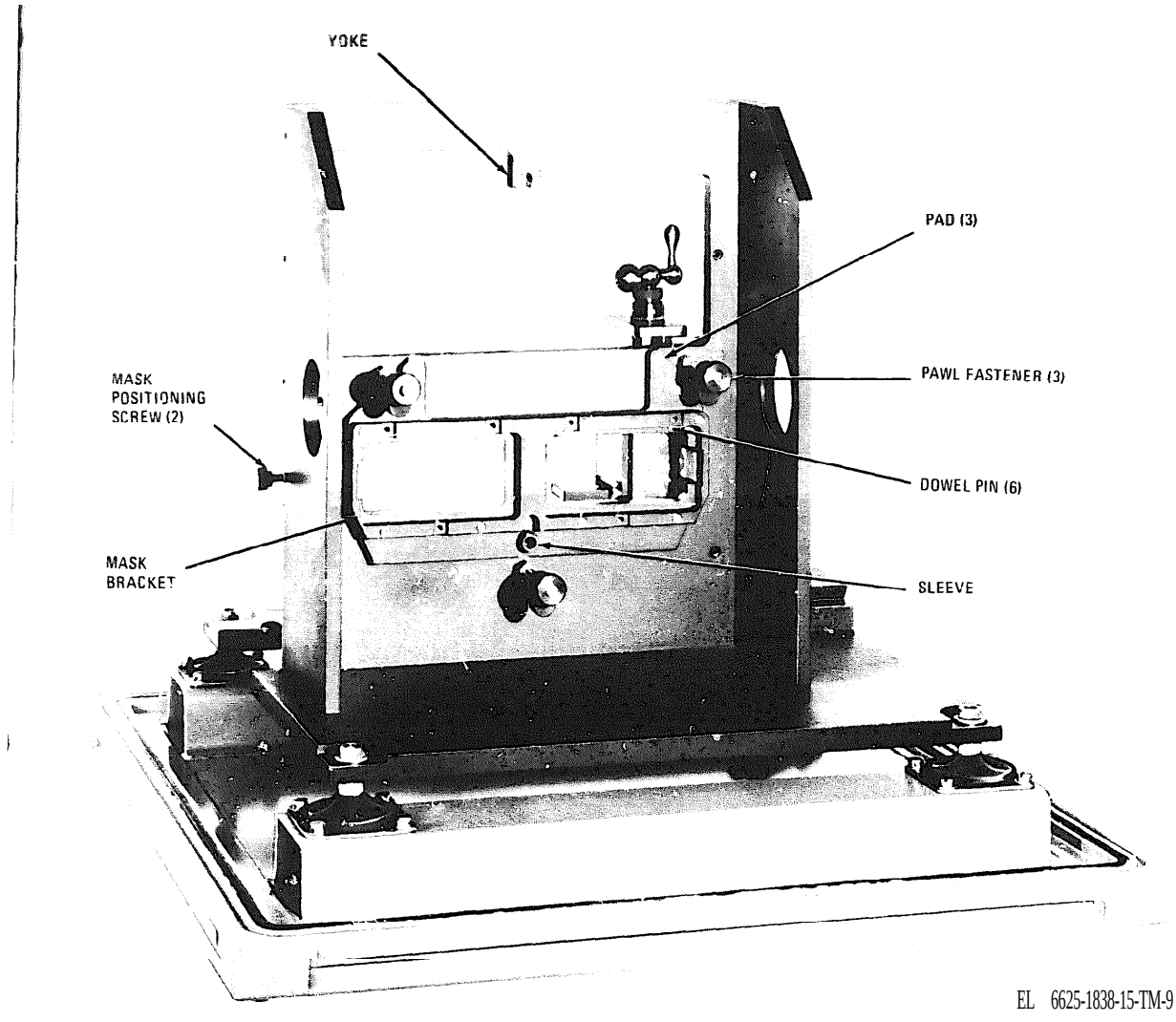


Figure 1-9. Lens focus fixture housing rear oblique view.

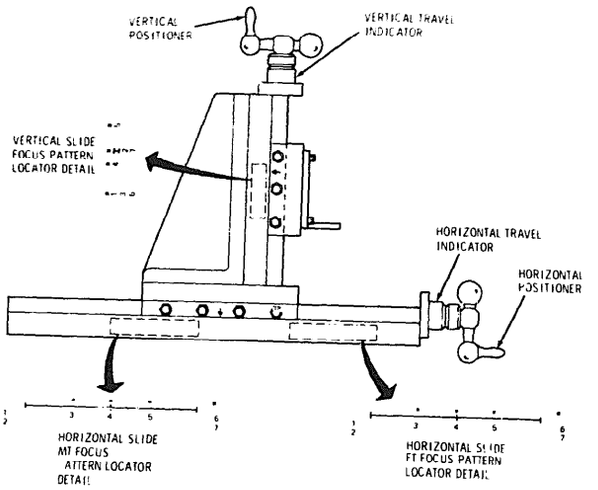


Figure 1-10. Compound and slide.

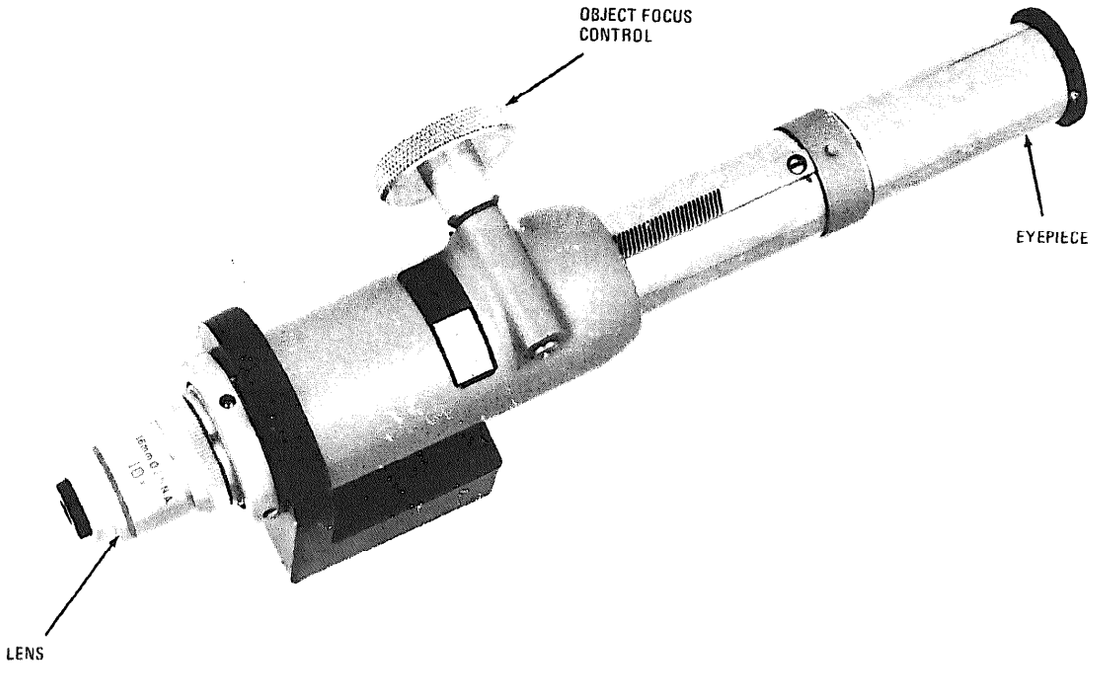


Figure 1-11. Microscope.

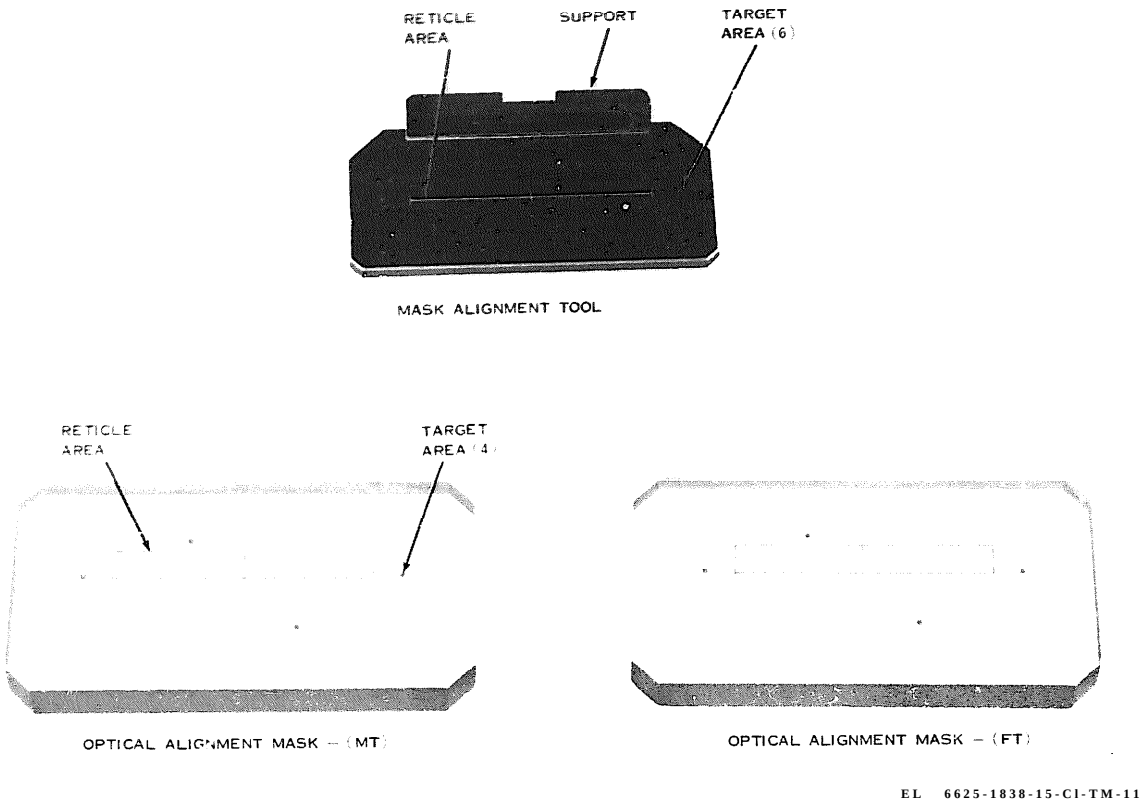


Figure 1-12. Test Fixture. Optical alignment TS-2966/APS-94D.
minor components

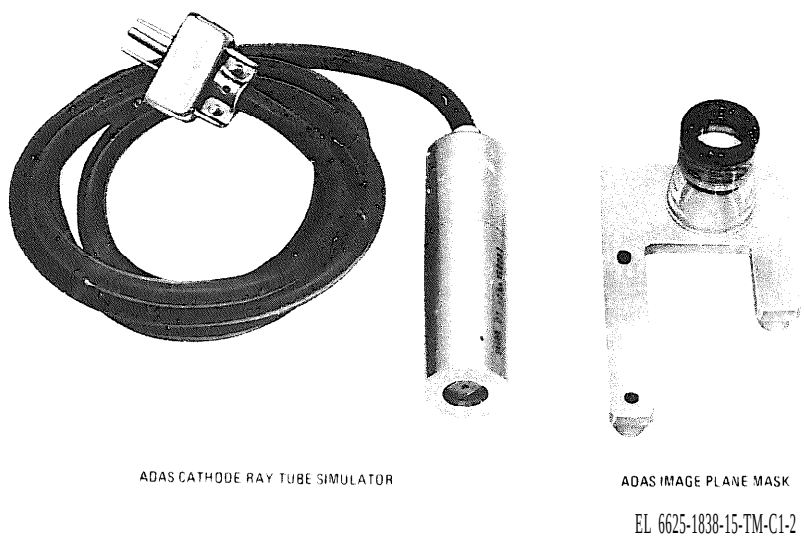


Figure 1-13. ADAS cathode ray tube simulator and ADAS image plane mask.

CHAPTER 2
INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unpacking of Equipment

a. Packaging Data. The components of Test Set Group, Optical Alignment OQ-62/APS-94D are packaged in cleated plywood boxes reinforced with metal straps. The complete shipment consists of two boxes. Packaging data is provided in table 2-l.

b. Case Unpacking Instructions (fig. 2-1).

(1) Cut the metal straps at the top cover of the plywood box.

(2) Remove the nails from the top cover and lift the cover off the box.

(3) Remove the nails that secure the side covers of the box.

(4) Spread the side covers of the box to provide space.

(5) Remove the foam corner blocks and corrugated fiberboard liner(s) from the top of the case.

NOTE

The number of corrugated fiberboard liners used for packing (minimum of one at top, bottom, and all sides of case) will vary, due to the thickness of the foam corner blocks used.

(6) Remove the corrugated fiberboard liner(s) from all sides of the case.

Table 2-1. Component Packaging Data

Component	*Overall dimensions (in.)*	*Volume (cu ft)*	*Shipping weight (lb)*
Test Fixture, Optical Alignment TS-2965A PS-94D	33.5 by 37 by 35	21.5	245
Test Fixture, Optical Alignment TS-2966/APS-94D	33.5 by 37 by 35	21.5	286

(7) Obtain assistance and lift the case out of the plywood box.

(8) Save the plywood box and packing materials.

c. Test Fixture. Optical Alignment TS-2965/APS-94D Unpacking Instructions.

(1) Exert downward pressure to release the six latches (fig. 1-1) and lift the case off its bottom.

(2) Remove the four machine screws (14A, fig. 2-2) and four wingnuts (5) and secure the two retaining straps (4) to the mirror alignment fixture housing (15).

(3) Remove the retaining straps and lift off the top cushioning material (1).

(4) Remove the image plane light (2), lower transport (3). telescope alignment mirror (6), upper transport (17), image plane light power cable (18), and lens tool (19) from the center cushioning material (7).

(5) Lift off the center cushioning material.

(6) Remove the telescope light power cable (8), telescope light (9), telescope (10), lens plane mirror (11), three pawl fasteners (12), image plane mask (14), and lens plane reticle (16) from the bottom cushioning material (13).

(7) Lift the bottom cushioning material (13) out of the mirror alignment fixture housing (15).

d. Test Fixture, Optical Alignment TS-2966/APS-94D Unpacking Instructions.

(1) Exert downward pressure to release the six latches (fig. 1-7) and lift the case off its bottom.

(2) Unscrew the four captive screws that' secure the two retaining straps (8, fig. 2-3) to the lens focus fixture housing (13).

(3) Remove the retaining straps and lift off the top cushioning material (1).

(4) Remove the optical microscope (2), two object plane masks (3). two knurled head screws (4). collet wrench (5). and image plane mask (6) from the center cushioning material (7).

(5) Lift off the center cushioning material.

(6) Remove the ADAS image plane mask (9), lens tool (10), CRT simulator (1), three clamp assembly studs (14), side pin extractor (15), four mask springs (16), and top pin extractor (17) from the bottom cushioning material (12),

(7) Lift the bottom cushioning material (12) out of the lens focus fixture housing (13)

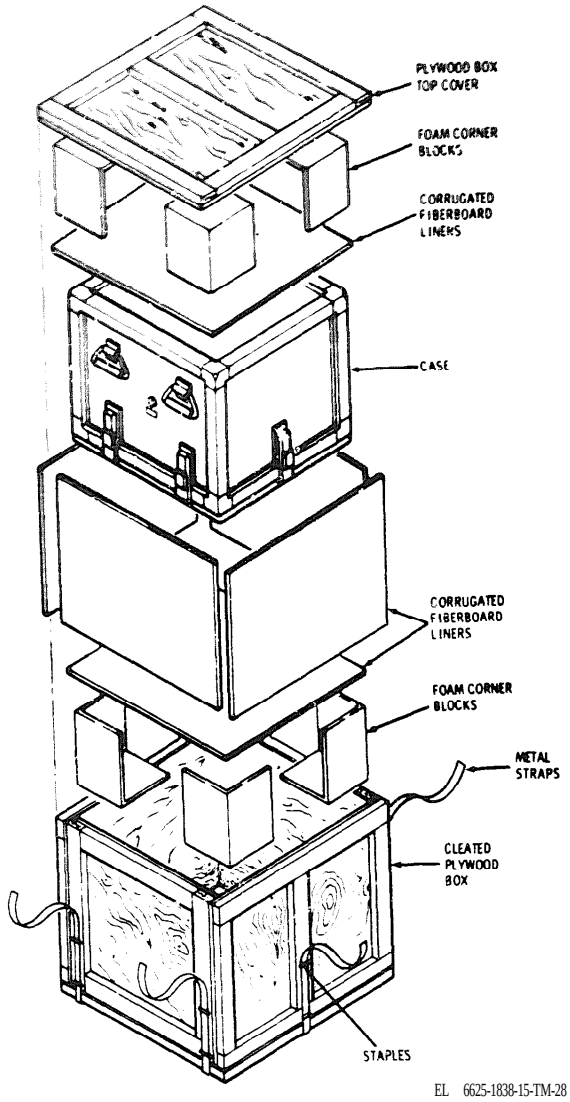
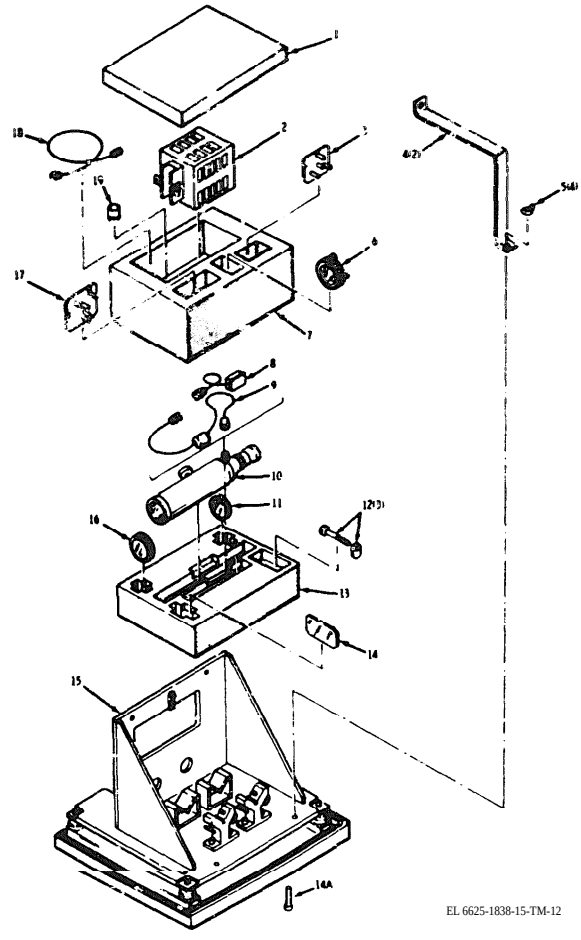
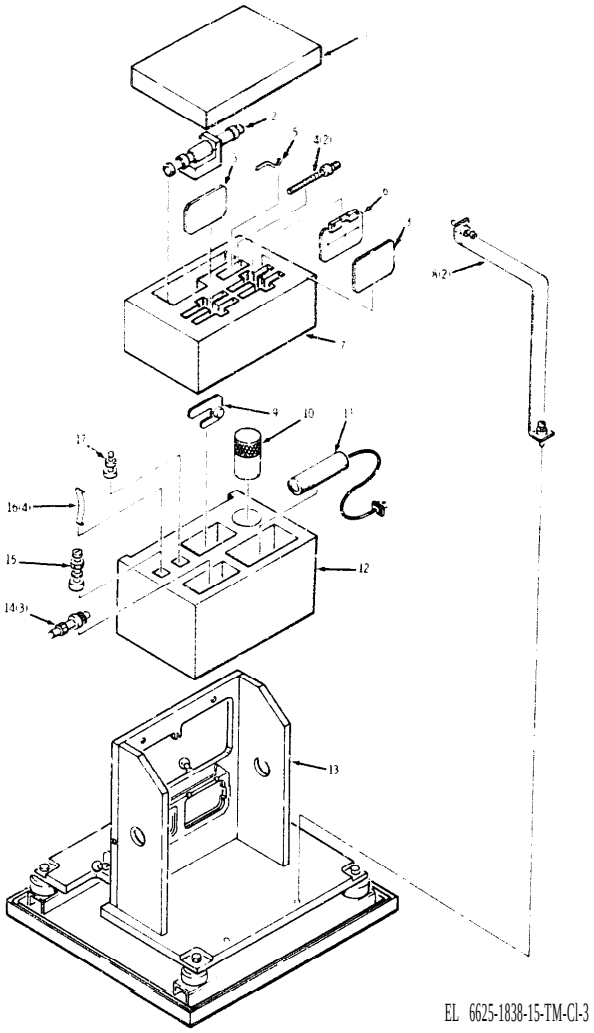


Figure 2-1. Case, typical packaging.



1 Top cushioning material
2 Light assembly
3 Lower transport
4 Retaining strap
5 Wing nut
6 Telescope alignment mirror
7 Center cushioning material
8 Telescope light power cable
9 Telescope light
10 Telescope
11 Lens plane mirror
12 Pawl fastener
13 Bottom cushioning material
14 Image plane mask
14A Machine screw
15 15 Mirror alignment fixture housing
16 Lens plane reticle
17 Upper transport
18 Image plane light power cable
19 Lens tool

Figure 2-2. Test Fixture. Optical Alignment TS-2967/APS-94D packaging



1. Top cushioning material
2. Microscope
3. Object plane mask (2)
4. Knurled head screw (2)
5. Collet wrench
6. Image plane mask
7. Center cushioning material
8. Retaining strap (2)
9. ADAS image plane mask
10. Lens tool
11. CRT simulator
12. Bottom cushioning material
13. Lens focus fixture housing
14. Stud, clamp assembly (3)
15. Side pin extractor
16. Mask spring (4)
17. Top pin extractor

Figure 2-3. Text Fixture. Optical Alignment TS-2966/APS-94D packaging.

2-2. Checking Unpacked Equipment

After unpacking, the equipment must be check for:

a. Completeness. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against table l-l. Report all discrepancies (para 1-3). If an equipment shortage exists that does not affect proper functioning of the equipment, use the equipment.

b. Damage Inspect the equipment for damage incurred during shipment. If the equipment was improperly packaged, or is damaged, use DD Form 6 or (DISREP) (SF 361), as pertinent, to report the difficulty.

c. Modifications. If the equipment has been used or reconditioned, see whether it has been changed by a Modification Work Order (MWO). If the equipmen: has been modified, the MWO number(s) will appear on the unit structure near the equipment identification plate. Check to see whether the modified equipments are covered in the manual.

NOTE

This manual does not include Modification Work Orders for the equipment.

2-3, Installation of Equipment

Install the equipment in the desired location. Installation of the equipment requires four men because of equipment weight. After positioning as desired, remove the case covers.

CAUTION

The equipment and minor components are precision instruments. They must be protected, when not in use, by stowing the minor components and securing the case cover to the base. Stow the minor components as described in the packing instructions in chapter 8.

2-4. Checking the Installation

Following installation. perform an equipment check consisting of a visual inspection, for equipment condition and a manual check for loose hardware. Tighten all loose hardware.

Section II. OPERATING INSTRUCTIONS

2-5. Operator's Controls and Indicators

Operator's controls and indicators are listed in table 2-2. The function performed by each control and indicator is defined in the table.

2-6. Preliminary Operating Procedures for Mirror Alignment

a. Telescope Position Adjustment.

(1) Loosen the locknuts on the mirror alignment fixture vee block thumbscrews (fig. 1-2).

tact the sealing compound used to fill the holes in the telescope barrel.

(2) Carefully position the telescope (fig. 1-4) on the vee blocks (fig. 1-1) with the object focus control at the top.

(3) Insert the lamp housing of the telescope light (fig. 1-5) into the lamp housing coupling on the telescope (fig. 1-4) and tighten the coupling ring on the lam housing.

(4) Set the telescope light switch at OFF and connect the light to the telescope light power cable (fig. 1-5).

Table 2-2. Operators Controls and Indicators

Components	*Control or indicator*	*Function*
TS-2965/APS-94D		
Telescope Straight SU-20/APM-214 (fig. 1-4)	Object focus control.	Focuses telescope on object.
	Eyepiece focus ring.	Focuses eyepiece on internal reticle.
Light. Telescope MX-6556/APM-214 (Fig. 1-5)	ON-OFF switch.	When at ON, connects power to lamp.
Image plane lighting (fig. 1-5).	ON-OFF switch.	When at ON, connects power to lamp.
TS-2966/APS-94D		
Lens focus fixture housing (fig. 1-9).	Mask positioning screws.	Position object plane masks in horizontal plane.
Compound slide (fig. 1-10)	Horizontal positioner.	Positions horizontal slide.
	Horizontal travel indicator.	Indicates horizontal slide travel in increments of 0.001 inch.
	Vertical positioner.	Positions vertical slide.
	Vertical travel indicator.	Indicates vertical slide travel in increments of 0.001 inch.
	Target position indicator and arrow (horizontal slide).	When arrow is opposite decal number, indicates position of object plane mask target in horizontal plane.
	Target position indicator and arrow (vertical slide).	When arrow is opposite decal number. indicates position of object plane mask target in vertical plane
Microscope (fig. 1-11)	Ooject focus control.	Focuses microscope on object.
		Focuses on internal reticle when moved in or out.

(5) Connect the telescope light power cable to the 115 vac primary power circuit and energize the circuit.

(6) Position the telescope alignment mirror (fig. 1-5) over the appropriate window in the mirror alignment fixture vertical plate (fig. 1-3) and secure to the plate with the thumbscrews.

NOTE

Do not handle mirror surface with fingers.

(7) Set the telescope light switch at ON.

(8) Focus the telescope eyepiece on the crosshair reticle in the telescope.

NOTE

If the crosshairs are not in a horizontal and vertical plane. rotate the telescope barrel to achieve this condition.

(9) Focus the telescope on the reflected telescope target pattern (B, fig. 5-2) with the object focus control.

(10) Position the crosshairs in the telescope reticle equidistant from the lines at the center of the reflected telescope target pattern by adjusting the vee block thumbscrews.

(11) Focus the telescope on the reflected crosshair pattern (C, fig. 5-2) with the object focus control

NOTE

The telescope crosshair pattern will also be present. Disregard this pattern.

(12) Carefully adjust the vee block thumbscrews to bring the reflected crosshairs into coincidence. Then lock the vee block thumbscrews with the thumbscrew locknuts.

NOTE

Do not disturb the telescope position after this adjustment has been performed.

(13) Remove the telescope alignment mirror from the vertical plate of the mirror alignment fixture and set the telescope light switch at OFF.

b. Installation of RO-352/APS-94D Optical Housing on Text Fixure. Optical Alignment TS-2965/APS-94D.

(1) Install three pawl fasteners (12, fig. 2-2) on the vertical plate of the mirror alignment fixture housing (fig 2-4).

(2) Position the RO-352/APS-94D optical housing between the pawl fasteners, mate the locator pins on the optical housing with the yoke and sleeve on the mirror alignment fixture housing vertical plate. and secure the optical housing to the vertical plate with pawl fasteners.

CAUTION

Tighten the pawl fasteners evenly until the pads on the optical housing are snug against the pads on the alignment fixture housing vertical plate. Uneven tightening of the pawl fasteners may damage the optical housing.

c. Installation of Image Plane Mask and Image Plane Light on RO-352/APS-94D Optical Housing

(1) Install the image plane mask (fig. 1-5) over the appropriate image window in the RO-352/APS-94D optical housing (fig. 2-4) by mating the pins in the optical housing with the holes in the image plane mask support.

(2) Center the image plane light (fig. 1-5) over the image plane mask and secure it to the optical housing with the locking latches on the image plane light.

(3) Connect the image plane light power cable (fig. 1-5) to the light connector and the +28 vdc primary power circuit and set the light switch at off.

2-7. Preliminary Operating Procedures for Lens Focusing

a. Installation of Microscope.

(1) Position the horizontal and vertical slides of the compound slide (fig. 1-10) so that the angle bracket (fig. 1-8) is near the center of the desired window in the vertical plate of the lens focus fixture housing.

(2) Position the microscope on the angle bracket and secure to the bracket with a knurled-head thumbscrew.

b. Installation of Object Plane Masks.

(1) Locate the mask bracket (fig. 2-5) assembled on the vertical plate of the lens focus fixture housing.

(2) Install two mask positioning screws in the lens focus fixture housing; one at each end of the vertical plate near the housing windows.

(3) Insert one flat spring (15, fig. 2-3) into each window in the mask bracket at the end of the window nearest the enter of the mask bracket.

(4) Install one object plane mask (3. fig. 2-3) in each window of the mask bracket.

NOTE

The reticle patterns of the alignment masks are off center in the vertical dimension. The masks are installed with the reticle patterns nearest the tops of the window in the mask bracket. The reticle pattern side of the alignment masks must be nearest to the compound slide.

(5) Install three spring tension clips (16, fig. 2-3) at each window in the mask bracket (indentations in clips nearest masks) to hold the masks in the windows. Secure the clips to the mask bracket with self-locking screws (17, fig. 2-3).

c. Microscope Focus Adjustment.

(1) Focus the microscope eyepiece on the crosshair reticle in the microscope.

NOTE

The crosshairs in the microscope must be in the horizontal and vertical plane. Rotate the microscope barrel to achieve this condition.

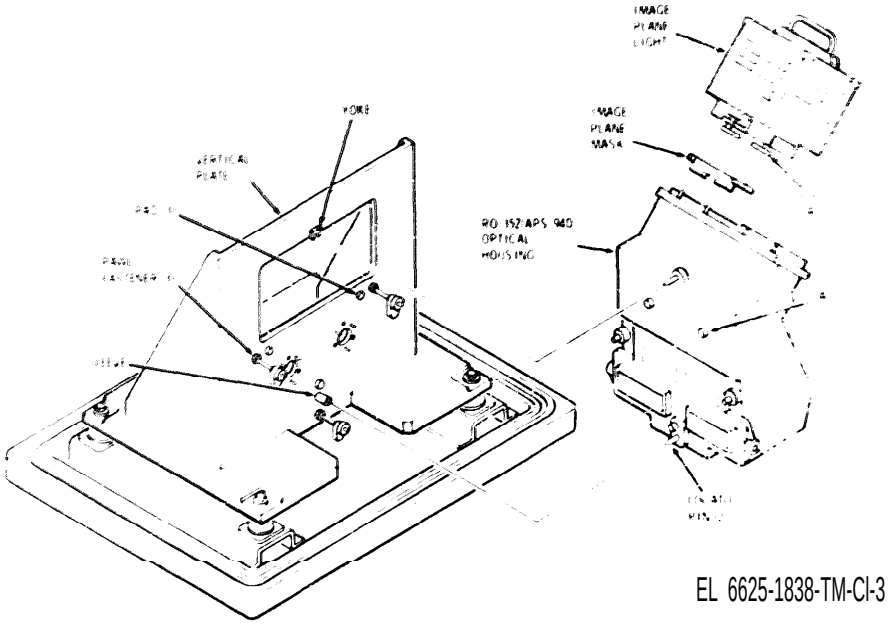


Figure 2-4. Installation of RO-352/APS-94D optical housing on Test Fixture. Optical Alignment TS-2965/APS-94D.

(2) Position the microscope with the compound slide so as to view a target on an object plane mask.

(3) Focus the microscope on the object plane mask target with the microscope object focus control.

d. Installation of RO-352/APS-94D Optical Housing on Test Fixture. Optical Alignment TS-2965/APS-94D.

(1) Install three pawl fasteners (11, fig. 2-3) on the vertical plate of the lens focus fixture housing (fig. 2-5).

(2) Position the RO-352/APS-94D optical housing between paw1 fasteners, mate the locator pins on the optical housing with the yoke and sleeve on the lens focus fixture housing vertical plate, and secure the optical housing to the vertical plate with the pawl fasteners.

CAUTION

Tighten the pawl fasteners evenly until the pads on the optical housing are snug against the pads on the alignment fixture housing vertical plate. Uneven tightening of the pawl fasteners may damage the optical housing.

e. Installation of Image Plane Masks and Image Plane Light on RO-352/APS-94D Optical Housing.

(1) Install the image plane mask (fig. l-12) over either image window of the RO-352/APS-94D optical housing (fig. 2-5) by mating the pins in the optical housing with the holes in the image plane mask support.

(2) Center the image plane light (fig. l-10) over the image plane mask and secure to the optical housing with the locking latches on the assembly.

(3) Connect the image plane light power cable (fig. 1-5) to the light connector and the +28 vdc primary power circuit and set the light switch at off.

2-8. Preliminary Operating Procedures for ADAS Optical Alignment

The optical housing must be installed in the RO-352/APS-94D recorder assembly for alignment of the ADAS optical system. Refer to TM 11-5895-578-50 for installation instructions. After installation has been performed, proceed as follows.

a. Remove the three pawl fasteners (fig. 2-5) from the vertical plate of the lens focus fixture housing.

b. Obtain assistance to mate the locator pins (fig. 2-6) of the optical housing with the yoke and socket on the lens focus fixture housing vertical plate.

c. Hold the recorder assembly in position on the vertical plate and install four cap screws, at locations shown in figure 2-6, to secure the recorder assembly to the vertical plate. Tighten the cap

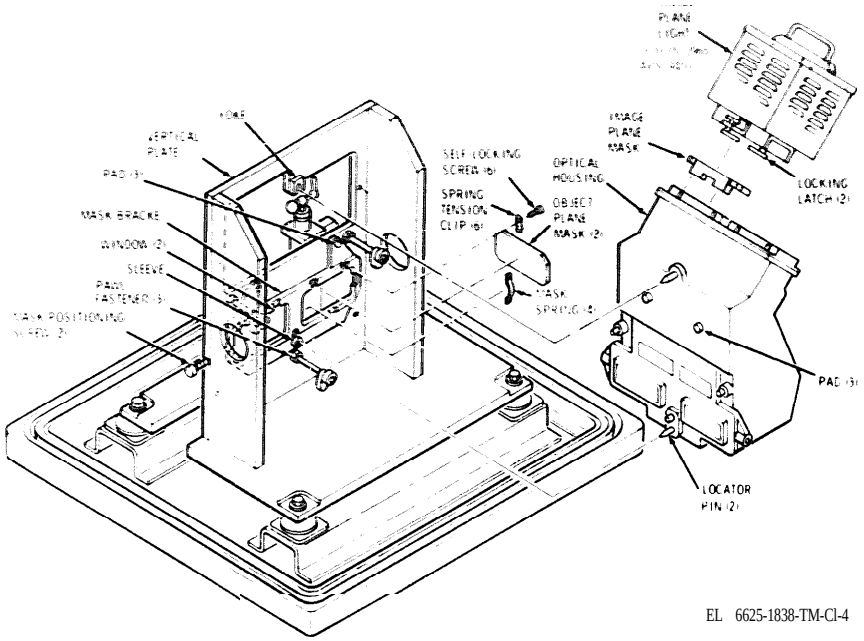


Figure 2-5. Installation of RO-352/APS-94D optical housing on Test Fixture. Optical Alignment TS-2966/APS-94D

screws evenly until the recorder assembly is snug against the vertical plate of the lens focus fixture housing.

d. After removal of the MT image window (TM 11-5745-578-50) install the ADAS image plane mask (fig. l-13) over the MT image window of the RO-352/APS-94 optical housing by mating the pins in the optical housing with the holes in the mask support.

e. Refer to TM 11-5895-578-50 for CRT simulator instructions.

2-9. Operating Instructions

a. Mirror Alignment.

(1) Power turn-on.

(a) Energize the primary power circuits.

(b) Set the image plane light switch (fig. 1-5) at on.

(c) Set the MX-6556/APM-214 light switch at on.

(2) Operation. Refer to TM 11-5895-578-50 for RO-352/APS-94D optical alignment instructions.

(3) Standby operation.

(a) Set the image plane light switch at off.

(b) Set the MX-6556/APS-94D light switch at off.

(4) Shutdown.

(a) Set the image plane light switch at off.

(b) Set the MX-6556/APM-214 light switch at off.

(c) Deenergize the primary power circuits.

b. Lens Focusing.

(1) Power turn-on.

(a) Energize the primary power circuits.

(b) Set the image plane light switch (fig. 1-5) at off.

(2) Operation. Refer to TM 11-5895-578-50 for RO-352/APS94D optical alignment instructions.

(3) Standby operation. Set the image plane light switch at off.

(4) Shutdown.

(a) Set the image plane light switch at off.

(b) Deenergize the primary power circuits.

c. ADAS ***Optical Alignment.*** Refer to TM 11-5895-578-50 for RO-352/APS-94D A DA S optical alignment instructions.

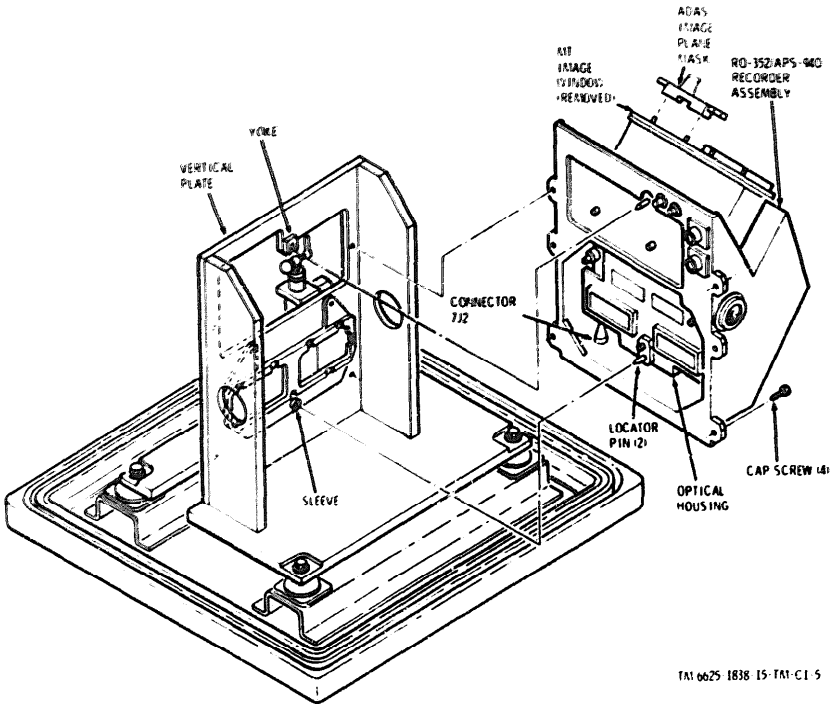


Figure 2-6. *Installation of RO-352/APS-94D recorder assembly on Test Fixture, Optical Alignment TS-2966/APS-94D.*

CHAPTER 3

OPERATOR'S MAINTENANCE INSTRUCTIONS

Section I. SCOPE, TOOLS AND EQUIPMENT

3-1. Scope of Operator's Maintenance

Maintenance duties assigned to the operator of the optical alignment test set are listed below together with references to paragraphs covering specific maintenance functions.

a. Preventive checks and services (para 3-5).

b. Cleaning (para 3-6).

c. Equipment preservation (para 3-7).

d. Lamp removal and replacement (para 3-8).

3-2. Tools, Test Equipment, and Materials Required for Operator's Maintenance

a. The Maintenance Allocation Chart (appendix B) lists the functions for operator's maintenance. Tool kits and common tools are listed in the applicable TOE and TA.

b. Materials required for operator's maintenance are:

(1) Tricholoroethane cleaning fluid.
(2) Cheesecloth.
(3) Lens cloth.
(4) Lens cleaner.
(5) Instrument oil.

Section II. OPERATOR'S PREVENTIVE MAINTENANCE

3-3. General

Operator's preventive maintenance is limited to inspection, cleaning, equipment preservation, and determining the operating capability of the equipment through normal operating procedures. Preventive maintenance checks and services periods are described in paragraph 3-4. Procedures for performing preventive maintenance are provided in paragraph 3-5.

3-4. Operator's Preventive Maintenance Checks and Sector's Periods

a. Preventive maintenance checks and services (PMCS) are required on a daily basis and under the special conditions listed below.

(1) When the equipment is initially installed.

(2) When the equipment is reinstalled after removal for any reason.

(3) At least once each week if the equipment is maintained in a standby condition.

b. Preventive maintenance cheeks and services are presented in tables consisting of four col-

(1) Interval and sequence number column. The checks and services are performed during the interval specified in the column. The order of performance is from number 1 to the highest listed number.

(2) Item to be inspected column. The item to be checked or serviced is identified in this column.

(3) ***Procedure*** column. The procedure for performing the check or service is specified in this column. References in this column are to procedures that are too lengthy to be included in the table.

(4) ***Paragraph, reference column.*** References in this column are to corrective measures the operator can perform v-hen an abnormal condition is found.

3-5. Operator's Preventive Maintenance Checks and Services Charts

a. Operator's Daily PMCS Chart.

Interval and Sequence No.			Item to be inspected	Procedure	Paragraph reference
Before operation	During operation	After operation			
1			Mirror alignment and lens focus fixture exterior surfaces.	Check for dirt and moisture. Clean, if necessary.	Para 3–6.
2			Telescope.	Check operation (para 2–6). If operation is improper, higher category maintenance is required.	None.
3			Microscope.	Check operation (para 2–7). If operation is improper, higher category maintenance is required.	None.
	4		Mirror alignment and lens focus fixtures.	Check functioning of fixtures during operation (TM 11–5895–578–50). If functioning is improper, higher category maintenance is required.	None.
		5	Minor components.	Stow minor components. (para 8-1a and b.)	None.

b. Operator's Weekly PMCS Chart.

Interval and Sequence No.			Item to be inspected	Procedure	Paragraph reference
Before operation	During operation	After operation			
1			Mirror alignment and lens focus fixture minor components.	Check for dirt and moisture. Clean if necessary.	Para 3-6.
2			Telescope.	Clean eyepiece and lens.	Para 3-6.
3			Microscope.	Clean eyepiece and lens.	Para 3-6.
	4		Telescope.	Check eyepiece focus ring and object focus control rotation. If rotation is not free in two directions, higher category maintenance is required.	None.
	5		Microscope.	Check eyepiece movement and object focus control rotation. If movement is not free or rotation is not free in two directions, higher category maintenance is required.	None.
	6		Compound slide.	Check vertical and horizontal slides for free movement. If movement is not free, higher category maintenance is required.	None.
		7	All items.	Check for loose hardware. Tighten if loose.	None.

3-6. Cleaning

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable but exposure of the fumes to an open flame converts the fumes to highly toxic, dangerous gases.

CAUTION

When cleaning. do not get cleaning fluid on the equipment mirrors, telescope eyepiece or target, microscope lenses, mask assemblies, or the light assembly optical filters. Cleaning fluid may damage these components. When cleaning the equipment mirrors and masks, do not rub the pattern lines. Rubbing may damage the patterns.

a. Remove accumulated dust and loose dirt with a clean, soft cloth.

b. Remove grease, fungus. and ground-in dirt from the equipment exterior with a cloth dampened (not wet) with cleaning fluid. Wipe the component dry with a clean, lint-free cheesecloth.

c. Clean the components listed below with a lens cloth. Lens cleaner or water may be used to loosen the dirt on the surface of these components. If use of a liquid is required, use it sparingly and wipe the component surface dry with a lens cloth.

(1) Mirros.
(2) Telescope eyepiece and target.
(3) Microscope lenses.
(4) Mask assemblies.
(5) Light assembly optical filters.

3-7. Equipment Preservation

The compound slide on the lens focus fixture is a precision instrument. The guides upon which the slides travel are not painted. To prevent the formation of rust or corrosion on these surfaces, it is desirable to coat the surface with a thin film of instrument oil. The oil should be applied sparingly with a clean, lint-free cloth.

3-8. Removal and Replacement of Lamp in Light, Telescope MS-6556/APM-214

To replace the lamp, unscrew the lamp from the lamp socket. Then screw the replacement lamp into the socket.

3-9. Removal and Replacement of CRT Simulator Lamp

(fig. l-13)

WARNING

Disconnect the CRT simulator plug connector from primary power source before separating housing.

Separate the two-part CRT simulator housing by unscrewing the part containing the image mask from the part containing the electric cord. Unscrew the lamp from the lamp socket. Then screw the replacement lamp into the socket. Reassemble the two-part CRT simulator housing.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE

Section I. GENERAL

4-1. Scope of Organizational Maintenance

Maintenance duties assigned to organizational maintenance personnel are listed below together with references to paragraphs covering specific maintenance functions.

a. Preventive maintenance checks and services (para 4–5).

b. Cable continuity checks (para 4–6).

c. Touchup painting (para 4–7).

4-2. Tools, Test Equipment, and Materials Required for Organizational Maintenance

organizational maintenance, and maintenance functions, are listed in the Maintenance Allocation Chart (appendix B) and authorized by the Repair Parts and Special Tools List included in the appendix.

b. Materials required for organizational maintenance are:

(1) Trichloroethane cleaning fluid.
(2) Cheesecloth.
(3) Lens cloth.
(4) Lens cleaner.
(5) Instrument oil
(6) Sandpaper No. 000
(7) Primer, color T per MIL–P–8585.
(8) Enamel, light gray type III, class 2 per MIL–E–15090.
(9) Enamel per Specification TT–E–527, color No. 37038 per FED-STD–595.

(PO) Enamel, class A, per Specification TT-E-529, color 27038 per FED-STD–595.

Section II. ORGANIZATIONAL PREVENTIVE MAINTENANCE

4-3. General

Organizational preventive maintenance consists of checks and services beyond the capabilities of the operator of the optical alignment test set. Preventive maintenance checks and services periods are described in paragraph 4-4. Procedures for performing preventive maintenance are provided in paragragh 4-5.

4-4. Organizational Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services are required on a monthly and quarterly basis. The checks and services are presented in tables consisting of four columns. The columns indicate the sequence in which the service or check is to be performed, the item to be inspected, the check or service procedure, and appropriate paragraphs to which reference can be made for remedial action.

4-5. Organizational Preventive Maintenance Checks and Services Charts

a. Organizational Monthly Preventive Maintenance Checks and Services Chart.

Sequence number	Item to be inspected	Procedures	Paragraph reference
1	Mirror alignment and lens focus fixture housings.	Check for paint damage. If paint is damaged, touch up.	Para 4-7.
2	Mirror alignment and lens focus fixture cables.	a. Check cable jackets for fraying and damage. If frayed or damaged, wrap with plastic electrical tape.	a. None.

Sequence number	Item to be inspected	Procedures	Paragraph reference
2 (Cont)		b. Check cable connectors for loose parts, bent pins, and shell damage. Tighten loose parts and straighten bent pins. If shells are damaged, higher category maintenance is required.	b. None.
3	Compound slide.	a. Check for rust and corrosion. Clean, if necessary.	a. Para 3-6.
		b. Check for lubrication. Lubricate, if required.	b. Para 4-8.
4	Mirror alignment and lens focus fixtures.	Check for completeness.	Appendix B.

b. Organizational Quarterly Preventive Maintenance Checks and Services Chart.

Sequence number	Item to be inspected	Procedures	Paragraph reference
1	Mirror alignment and lens focus fixture cables.	Perform cable continuity check. If cables are open circuited or short circuited, higher category maintenance is required.	Para 4-6.
	Mirror alignment and lens focus fixture housings and minor components.	Check for physical damage. If damaged, higher category maintenance is required	None
	Mirror alignment and lens focus fixture cases.	a. Check for serviceability. If not serviceable, higher category maintenance is required.	a. None.
		b. Check Batch operation. If operation is improper, higher category maintenance is required.	b. None.
		c. Check for paint damage. If paint is damaged, touch up.	c. Para 4-7.
	Publications	See that all publications are current, serviceable, and complete.	1-2A.
	Modifications	Determine if new, applicable MWO's have been published. All urgent MWO's must be applied immediately. All normal MWO's must be scheduled.	1-2b.

4-6. Cable Continuity Checks

Continuity checks relative to multiconductor cables are given below. The checks are performed with Multimeter TS-352/U (multimeter).

a. Adjust the multimeter for ohms operation on the highest resistance range.

b. Connect the multimeter common probe to the cable connector shell. Touch the multimeter ohms probe to each connector pin. The multimeter should not indicate continuity.

c. Connect the common probe of the multimeter to a cable connector pin. Touch the multime

ter ohms probe to each of the remaining pins in the same connector. The multimeter should not indicate continuity to any other connector pin. Connect the common probe to another connector pin and repeat the procedure. Continue until each pin has been tested to all other pins.

d. Adjust the multimeter for operation on the lowest resistance range. Connect the multimeter common probe to a pin in a connector at one end of the cable. Touch the corresponding pin in the connector at the ot..r end of the cable with the multimeter ohms probe. The multimeter should indicate zero resistance. Continue the procedures until each conductor in the cable under test has been checked out.

e. Connect the multimeter common probe to the shell of a connector at one end of the cable. Touch the shell of the connector at the other end of the cable with the multimeter ohms probe. The multimeter should indicate zero resistance.

4-7. Touchup Painting

WARNING

The primers and enamels used for touchup painting are flammable. Perform the touchup in an approved area that is away from fire or flame.

CAUTION

Paints that cannot be applied with or over the paint on the equipment are not to be used.

Refer to the applicable cleaning and refinishing instructions contained in TB 746–10, Field Instructions for Painting and Preserving Electronic Command Equipment, for information.

a. Use the primer and enamel specified in paragraph 4–2*b* (7) and (8) for painting the test set cases.

b. Use the primer and enamel specified in paragraph 4–2*b* (7) and (9) for painting the mirror alignment fixture.

c. Use the primer and enamel specified in paragraph 4–2*b* (7) and (10) for painting the lens focus fixture.

4-8. Lubrication

The only item in the optical alignment test set that requires lubrication is the compound slide. Instrument oil should be applied sparingly to compound slide lead screws at monthly intervals.

CHAPTER 5
FUNCTION OF EQUIPMENT

5-1. General

a. The mirror alignment and lens focus fixtures aid in positioning the mirrors and lenses within the moving target (MT) and fixed target (FT) optical systems in Recorder-Processor-Viewer, Radar Mapping RO–352/APS–94D. The mirrors and lenses, when correctly positioned, transmit the light from radar information developed on the phosphor surfaces of the RO–352/APS–94D cathode-ray tube indicators to a photographic film. The light information must be transmitted, in focus, with the correct magnification, position and resolution. The lens focus fixture also aids in adjusting the transmission of airborne data annotation system (ADAS) light information in the RO-352/APS-94D.

b. The MT and FT optical systems in the RO-352/APS-94D are identical. Optical system descriptions that follow are applicable to either system. Alignment of an optical system, using the mirror alignment and lens focus fixtures, is described in paragraphs 5-2 and 5-3. Alignment of the ADAS system is described in paragraph 5-4. The following definitions are provided to simplify the descriptions.

(1) Object plane. The cathode-ray tube phosphor surface.

(2) Image plane. The emulsion side of the photographic film.

(3) Lens plane. A plane that is perpendicular to, and bisects, the light path from the object plane to the image plane.

c. The light path in an optical system is shown in figure 5-l. Two mirrors and a lens are used to transmit light information from the object plane to the image plane as shown in the illustration.

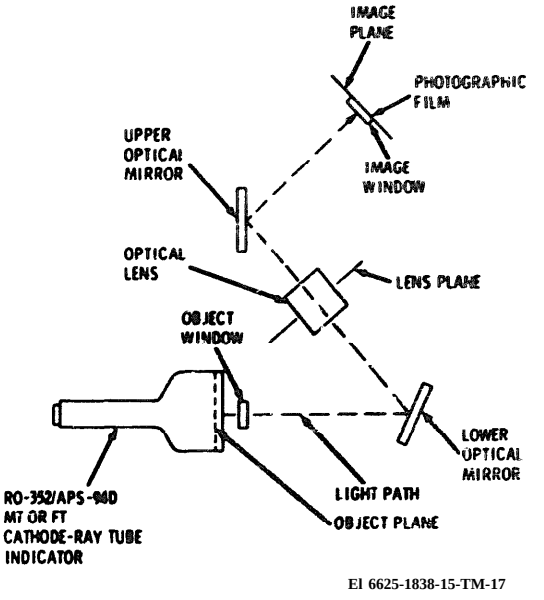


Figure 5-1. Optical system light path, light transmission diagram

5-2. Optical Mirror Alignment

Optical mirror alignment in the RO-352/APS-94D is accomplished with the mirror alignment fixture. Angular and positional adjustments are required. To adjust the angle of the upper and lower optical mirrors in the RO-352/APS-94D, light is projected along a path from the object plane to the image plane and reflected back to the projecting instrument along the same path. The telescope is used, in conjunction with a lamp, to perform this function and substitutes for the cathode-ray-tube indicator shown in figure 5-1. Initial mirror position adjustments are made following the adjustment of mirror angles.

a. Telescope, Position Adjustment (A, fig. 5-2). The position of the telescope in the mirror alignment fixture must be adjusted so that the light transmission from it is exactly perpendicular to the object plane in the fixture. To make the adjustment, the telescope is installed in the fixture vee blocks and the fixture telescope alignment mirror is installed over the object window (in line with the telescope) in the vertical plate of the fixture to enable positioning. The telescope is focused on the reflected telescope target and the vee block thumbscrews are adjusted to center the target on the eyepiece reticle crosshairs in the telescope (B. fig. 5-2). The telescope is then focused on the crosshair reflection (C. fig. 5-2).

and the two crosshairs are brought into coincidence by adjusting the vee block thumbscrews. The vee block thumbscrew locknuts are tightened when coincidence has been achieved to maintain the telescope position. The telescope alignment mirror is removed from the fixture and the RO–352/APS–94D optical housing is installed on the fixture vertical plate.

b. Lower Optical Mirror Reflection Angle Adjustment (fig. 5-3). To adjust the reflection angle of the Bower optical mirror in the RO-352/APS–94D optical housing. the lens in the optical housing is replaced with the fixture lens plane mirror and the fixture lower transport is installed on the lower optical mirror mount (A, fig. 5-3). the telescope is focused en the reflected telescope target (as in a above) and the angle of the lower optical mirror is changed with the transport to center the target on the eyepiece reticle crosshairs in the telescope. The telescope is then focused on the crosshair reflection and the mirror angle is adjusted, as required, to bring the reflected crosshairs into coincidence.

c. Upper Optical Mirror Reflection Angle Adjustment (fig. 5-3). To adjust the reflection angle of the upper optical mirror in the RO-352/APS-94D, the fixture lens plane mirror is removed from the RO-352/APS-94D optical housing. The fixture upper transport is installed on the upper optical mirror mount, and the fixture image plane mask is installed over the appropriate image window (B, fig. 5-3) in the RO-352/APS-94D optical housing. The telescope is focused on the reflected telescope target (as in a above), and the angle of the upper optical mirror is adjusted with the transport to center the target on the eyepiece reticle crosshairs in the telescope. The telescope is then focused on the crosshair reflection and the upper mirror angle is adjusted, as required, to bring the reflected crosshairs into coincidence.

d. Upper and Lower Optical Mirror Initial Position Adjustment (A, fig. 5-4). To initially position the upper and lower optical mirrors so that optical path length is at maximum, the fixture lens plane reticle is installed in the optical housing of the RO-352/APS-94D, and the image plane light is inttalled over the center of the image plane mask on the optical housing. The telescope is focused on the lens plane reticle, and the lower optical mirror is positioned with the lower transport to place the horizontal crosshair in the telescope eyepiece reticle tangent with the lower edge of the lens plane reticle pattern (B, fig. 5-4). The telescope is then focused on the line across the image plane mask, and the upper optical mirror is positioned with the upper transport to bring the image plane mask line into coincidence with the horizonal crosshair in the telescope eyepiece reticle. Following coincidence, the telescope is focused on the lens plane reticle, and the lower optical mirror is repositioned with the lower transport so that the horizontal crosshair in the telescope eyepiece reticle is tangent with the lens plane reticle pattern (C, fig. 5-4).

5-3. Optical Lens Focus and Image Magnification Adjustments

Optical lens focus and image magnification adjustments in the RO-352/APS-94D are accomplished with the lens focus test fixture. To adjust optical lens focus and image magnification in the RO-352/APS-94D, light is projected from the image plane to the object plane, and the light transmission is viewed at the object plane with an optical instrument. The image plane light and microscope are used to perform these functions.

a. Microscope Focus Adjustment (fig. 5-5). The microscope must be focused in the object plane. The microscope is installed on the compound slide, and an object plane mask is installed over an object plane window in the vertical plate

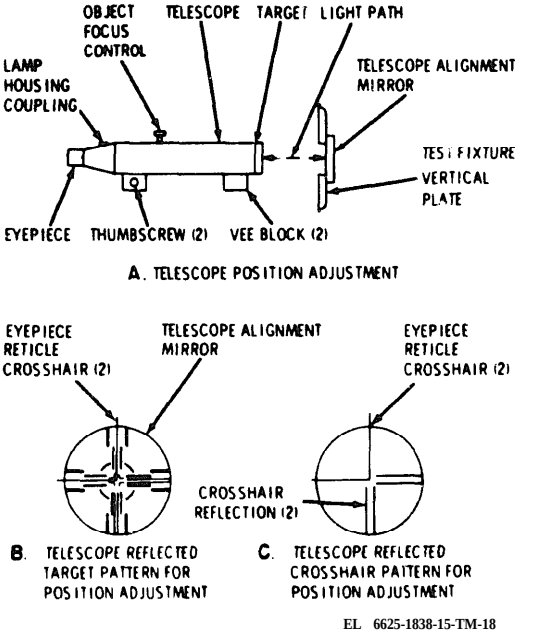


Figure 5-2. Telescope, Straight SU-20/APM-214 position adjustment, light transmission diagram.

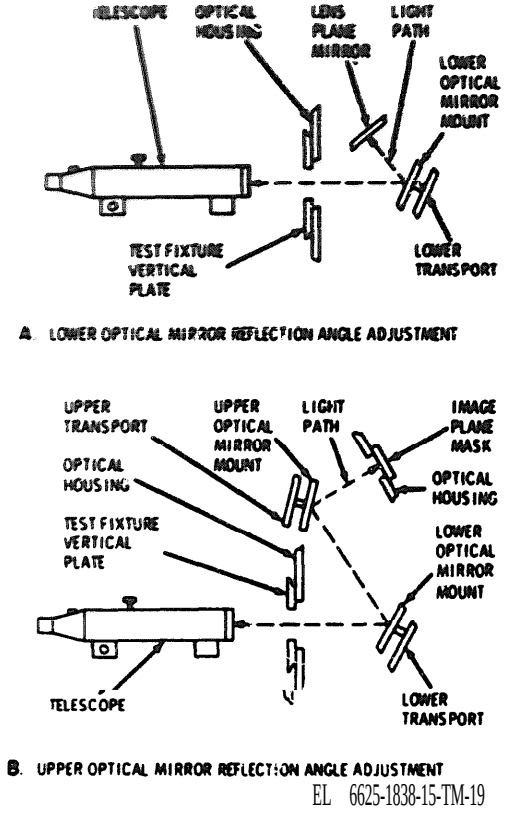


Figure 5-3. Optical mirror reflections angle adjustments, Light transmission diagram.

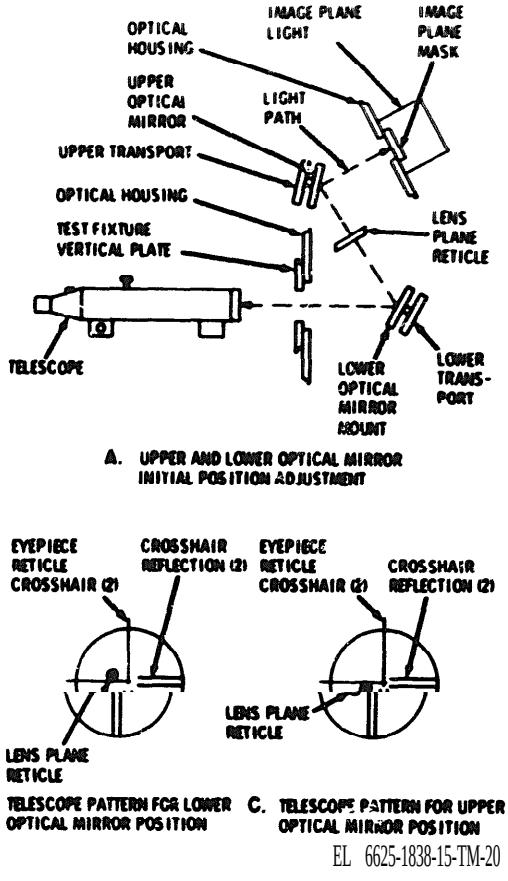


Figure 5-4. Optical mirror initial position adjustments, light transmission diagram.

of the lens focus fixture to enable focusing. A target is selected on the object plane mask, the microscope is positioned with the compound slide to view the target, and the microscope object focus control is turned until the target is in focus.

b. Optical ***System Initial Focus Adjustment*** (fig. 5-6). To initially adjust optical system focus in the RO-352/APS-94D, the optical housing of the RO-352/APS-94D is installed on the vertical plate of the lens focus fixture, the lens in the optical housing is adjusted to the approximate center of ii's positional range, and the lens aperture is set at f/5. The image plane mask and image plane light are installed over the apropriate optical housing image window, and the upper and lower mirror mounts, and transports are installed on the optical housing. A projected target group from the image plane mask (fig. 5-7) is selected for viewing in the microscope. The microscope is positioned to view the target by setting the vertical and horizonal slides of the compound slide at the same numbers on the slide target position indicators. The projected target will be reversed and upside down when viewed in the microscope. The light path in the RO-352/APS-94D is then shortened by alternately adjusting the position of the upper and lower optical mirrors with the transports until the best focus of the projected target is observed in the microscope.

c. Optical System Object *Magnification* ***Adjustment*** (fig. 5-8). The optical systems in the RO-352/APS-94D must be adjusted for an object magnification ratio of 1 to 1. The microscope is positioned to view two vertical lines at the center of the object plane mask (A, fig. 5-8). One line is a part of the object plane mask reticle. The second line is a projection from the image plane mask reticle. The two lines are brought into coincidence by moving the object plane mask laterally with the mask positioning screws provided on the lens focus fixture for this purpose. The microscope is then positioned to view two other vertical lines (B or C, fig. 5-8). These lines are brought into coincidence by rotating an adjustment ring on the lens in the RO-352/APS-94D

optical housing. The foregoing procedures are repeated until all three projected lines coincide with the three vertical lines on the object plane mask.

d. Optical System Fine Focus Adjustment. To fine adjust optical system focus in the RO-352/APS-94D, each target projected from the image plane mask must be viewed in the microscope and the position of the upper and lower optical mirrors must be positioned to obtain the best average focus. The aperture of the lens in the optical housing of the RO-352/APS-94D is set to f/6.3 after the best average focus has been obtained.

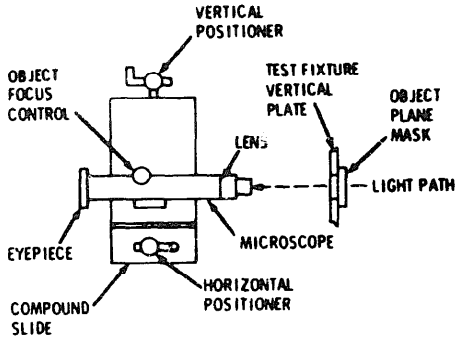


Figure 5-5. Microscope position adjustment, light transmission diagram.

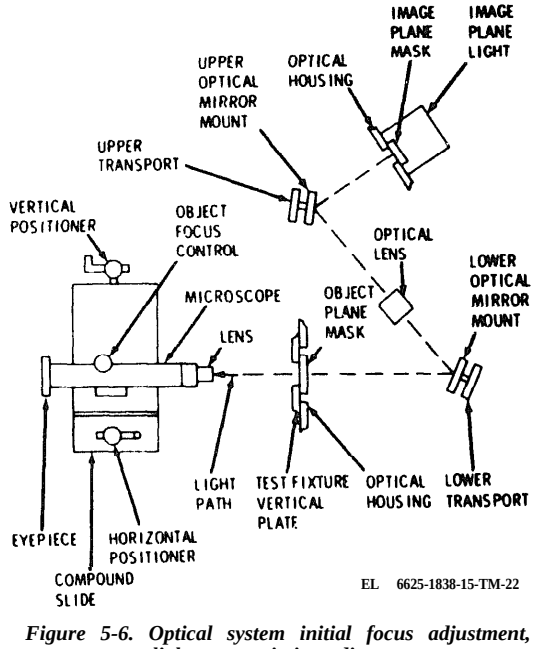


Figure 5-6. Optical system initial focus adjustment, light transmission diagram.

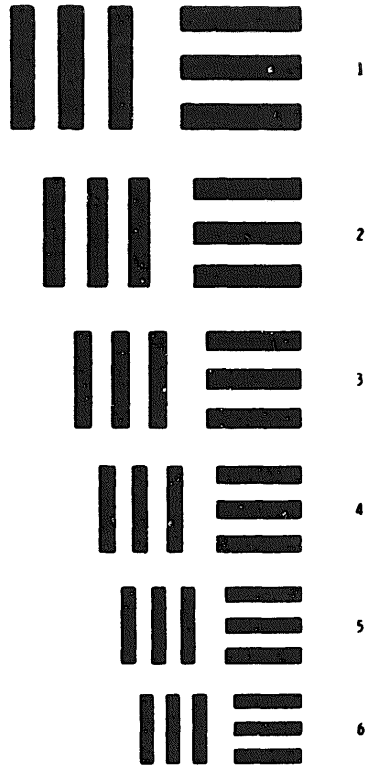


Figure 5-7. Typical image plane projected target group, mask pattern diagram.

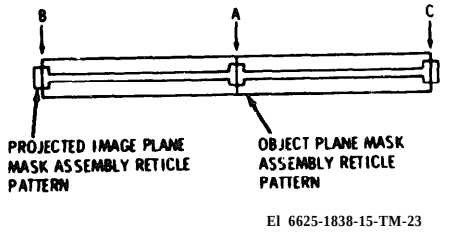


Figure 5-8. Optical system magnification adjustment, reticle pattern diagram.

5-4. ADAS Optical System Alignment

(figs. 5-9 and 5-10)

ADAS system optical alignment in the RO-352/APS-94D is accomplished with the lens focus test set. To optically align the ADAS system, it is necessary to project light through the image mask of the CRT simulator (fig. 5-9), through the ADAS optical window, to the mirror. From the mirror, the light path is projected through the ADAS lens, through the ADAS image plane mask, and through the magnifier. The ADAS image plane mask pattern is shown in A, fig. 5-10. The CRT simulator image mask pattern is shown in B, figure 5-10. Both patterns are viewed through the magnifier.

a. The outer vertical reticles of both patterns must be exactly superimposed. The center vertical reticle of the ADAS image plane mask pattern must be superimposed on the spot of the CRT simulator image mask pattern. Correct alignment is shown in C, figure 5-10. When using the ADAS image plane mask supplied with the TS-2966/APS-94D, adjust its position on the recorder as follows:

(1) For alignment of RO-352/APS-94D ADAS optical system, position the ADAS image plane mask to the right as far as the recorder guide pins will allow.

(2) For alignment of RO-352A/APS-94D ADAS optical system, position the ADAS image plane mask to the left as far as the recorder guide pins will allow.

b. Alignment is accomplished by adjusting the CRT simulator position within the mounting clamps and by adjusting the ADAS lens aperture control ring. Adjustment procedures are covered in TM 11-5895-578-50.

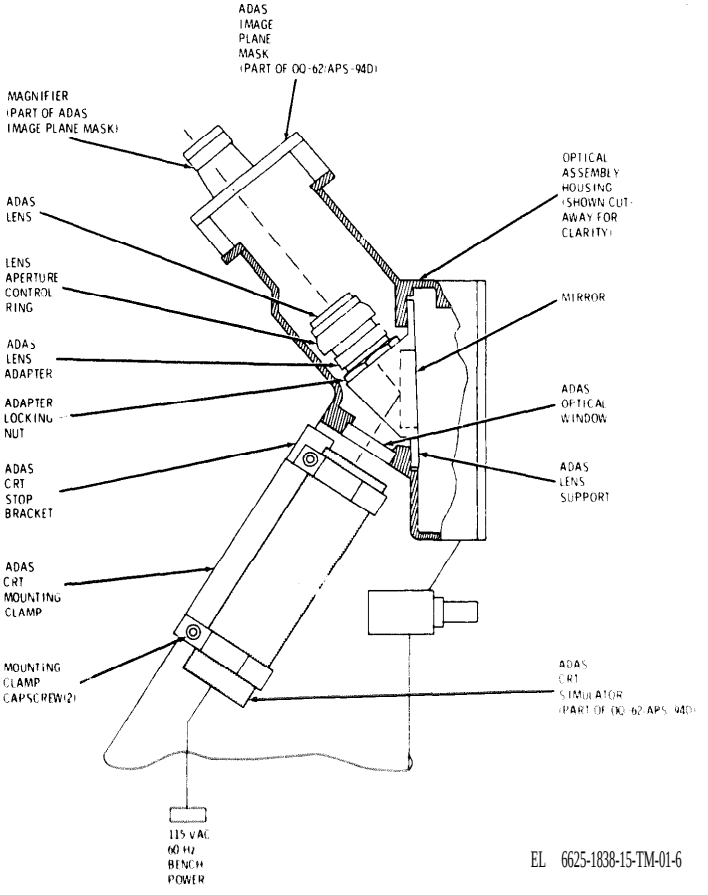


Figure 5-9. ADAS system optical alignment, light transmission diagram.

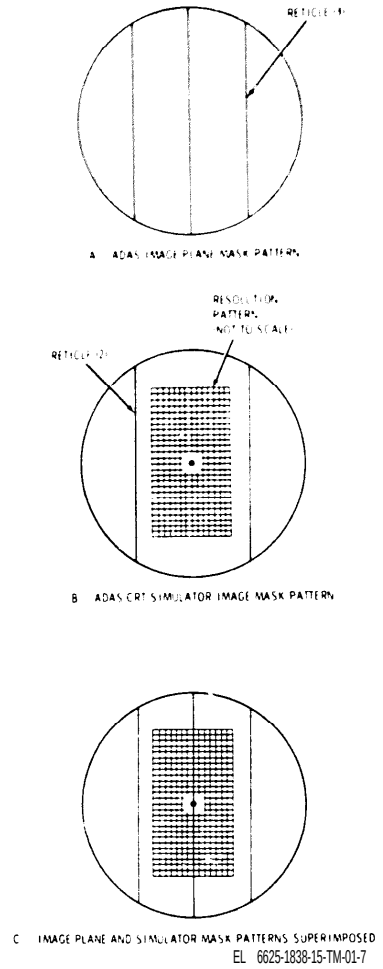


Figure 5-10. ADAS optical system test pattern

*U.S. GOVERNMENT PRINTING OFFICE: 1976-665668/531

CHAPTER 6

DEPOT MAINTENANCE

Section I. GENERAL

6-1. Scope of Depot Maintenance

Maintenance instructions provided in this chapter are for depot maintenance personnel. The instructions pertain to equipment overhaul and repair procedures that are beyond the capabilities of the organizational maintenance category.

6-2. Tools, Test Equipment, and Materials Required for Depot Maintenance

a. All tools and test equipment required for depot maintenance are listed in the Maintenance Allocation Chart (appendix B).

b. Materials required for depot maintenance are identical to those listed in paragraph 4-2 for the organizational maintenance category.

Section II MAINTENANCE PROCEDURES

6-3. Overhaul Instructions

Overhaul of the optical alignment test set is allocated to depot maintenance. Applicable procedures of the depot performing overhaul shall apply.

6-4. Muliticonductor Cable Repair

a Jacket Repair.

(1) Determine the area of repair.

(2) Wrap the worn or frayed area with plastic electrical tape.

b. connector ***Replacement.***

(1) Unscrew the extension sleeve from the connector shell and slide the sleeve back on the cable.

(2) Disconnect the cable shield connection at the connector backshell.

(3) Cut and remove the sleeving over the connector pins, if present.

(4) Unsolder and disconnect the wires from the connector pins. Identify each wire as disconnection is performed.

(5) Assemble heat shrink sleeving on the cable wires, if required.

(6) Connect and solder the cable wires to the replacement connector pins.

(7) Slide the heat shrink sleeving over the solder connections.

(8) Shrink the sleeving with a heat gun.

(9) Connect the cable shield connection to the connector backshell.

(10) Screw the connector extension sleeve onto the connector. shell.

c. Cable Replacement.

(1) Perform (1) through (4) in ***b*** above.

(2) Slide the connector extension sleeves off the cable.

(3) Cut the replacement cable to length and dress the cable wires and shield connections.

(4) Slide the connector extension sleeves onto the replacement cable.

(5) Perform (5) through (10) in b above.

6-5. Disassembly and Reassembly of Lower Transport

(fig. 6-1)

The lower transport (fig. 6-l) is comprised of three drive assemblies and an idler assembly mounted on a chassis. The instructions in a and ***b*** below apply to the idler assembly. The instructions in c and d below apply to all drive assemblies.

a. Disassembly Of Idler Assembly.

(1) Loosen the bracket retaining screw (13) and move the idler bracket (18) to remove tension on the chain (12); remove the chain.

(2) Unscrew the bracket retaining screw (13) remove the screw and associated washers (14, 15).

(3) Lift the idler bracket (18) off the chassis (5) and clamp the bracket in a bench vise.

(4) Remove the C washer (16) from the idler bracket shaft and slide the idler sprocket (17) off the shaft.

b. Reassembly of Idler Assembly.

(1) Assemble the idler sprocket (17) on the idler bracket (18) shaft with the sprocket hub toward the outside and install the C washer (16) on the shaft.

(2) Assemble the idler bracket (18) on the chassis (5) with the bracket retaining screw and washers (13, 14, 15). Do not tighten the screw.

(3) Assemble the chain (12) on the drive sprockets (7).

(4) Engage the idler sprocket (17) and chain (12) and position the idler bracket (18) to hold the chain on the drive sprockets; tighten the bracket retaining screw (13).

c. Disassembly of Drive Assembly (fig. 6–1).

(1) Perform instructions (1) and (2) in *a* above.

(2) Unscrew the detent screw (19) and remove it from the chassis (5).

(3) Loosen the two setscrews (11) in the knob (10) and slide the knob off the adjusting shaft (4).

(4) Loosen the lock screw (9) of the hub sprocket (7) off the adjusting shaft (4).

CAUTION

Use liners on the bench vise jaws to prevent damage to the adjusting shaft.

(5) Withdraw the adjusting shaft (4) from the chassis (5) and clamp the shaft in a bench vise.

WARNING

The straight pin (1) holds the drive adapter (2) on the adjusting shaft (4) under pressure from the helical spring (3) Have an assistant exert pressure on the drive adapter while the straight pin is being driven out to prevent the drive adapter from being ejected by pressure and causing injury.

(6) Drive the straight pin (1) out of the adjusting shaft (4) and remove the pin (1).

(7) Remove the adjusting shaft (4) from the bench vise.

(8) Clamp the chassis (5) in the bench vise.

(9) Drive the shaft bushing (6) out of the chassis 5) from the side opposite the bushing collar.

d. Reassembly of Drive Assembly.

(1) Drive the shaft bushing (6) (from the collar side) into the chassis (5).

(2) Remove the chassis (5) from the bench vise.

CAUTION

Use liners on the bench vise jaws to prevent damage to the adjusting shaft.

(3) Clamp the adjusting shaft (4) in the bench vise.

(4) Assemble the helical spring (3) inside the adjusting shaft (4) and the drive adapter (2) over the adjusting shaft.

(5) Exert pressure on the drive adapter (2) and install the straight pin (1) in the hole in the adjusting shaft (4); drive the straight pin into place.

(6) Remove the adjusting shaft (4) from the bench vise and insert it into the shaft bushing (6) in the chassis (5) from the side opposite the bushing collar.

(7) Assemble the drive sprocket (7) on the adjusting shaft (4), with the sprocket hub toward the outside.

(8) Assemble the hub clamp (8) over the hub on the drive sprocket. (C) and tighten the hub clamp lock screw (9).

(9) Assemble the knob (10) on the adjusting shaft (4) with the pins in the knob toward the inside.

(10) Engage the knob pins and the hub clamp (8) and tighten the two setscrews (11) in the knob.

(11) Assemble the chain (12) on the drive sprockets (7).

(12) Engage the idler sprocket (17) and chain (12) and position the idler bracket (18) for the desired tension on the chain.

(13) Tighten the bracket retaining screw (13).

(14) Screw the detent screw (19) into the chassis (from the side opposite the sprockets) until it contacts the knob (10). Adjust the detent position for the desired tension.

6-6. Disassembly and Reassembly of Upper Transport

(fig. 6-l)

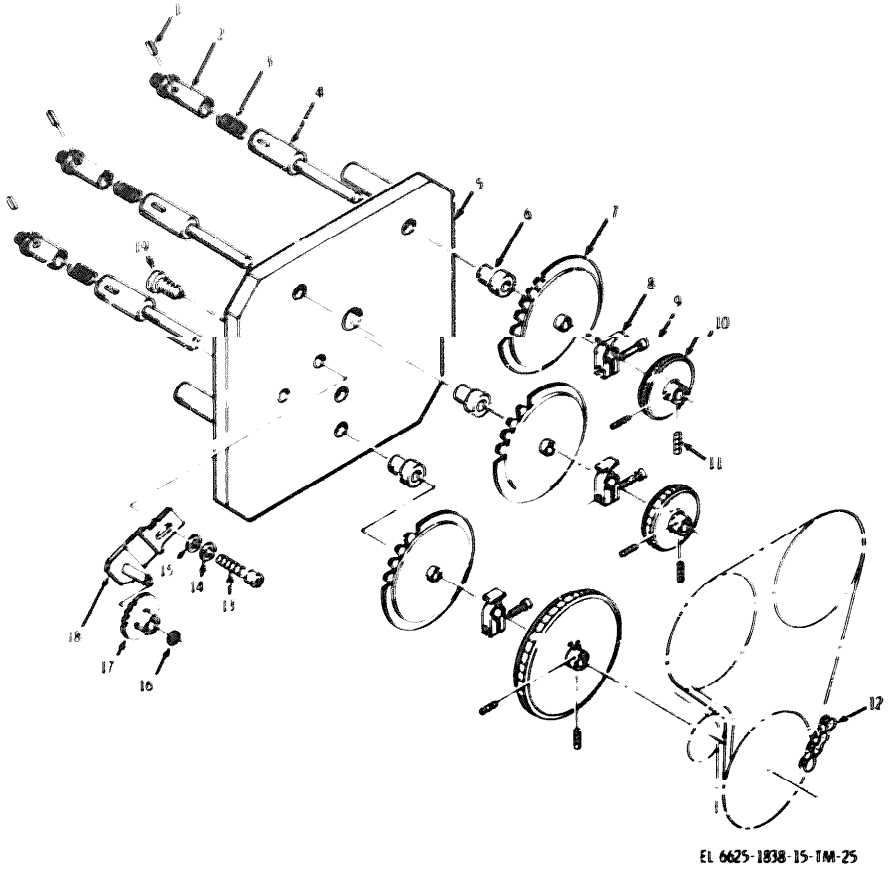
The upper transport is a functional equivalent of the lower transport, but is smaller in size. Disassembly and reassembly of the upper transport is performed in the same manner as that described for the lower transport in paragraph 6-5.

6-7. 'Disassembly and Reassembly of Image Plane Light

(fig. 6-2)

a. Disassembly of Cover Parts.

(1) Unscrew six machine screws (14) that secure the cover (13) to the housing (33) and remove the screws and flat washers (15).



1 traight pin
2 Drive adapter
3 Helical spring
4 Adjusting shaft
5 Chassis
6 Shaft bushing
7 Drive sprocket
8 Hub clamp
9 Lock screw
10 Knob
11 Setscrew
12 Chain
13 Bracket retaining screw
14 Lo&washer
15 Flat washer
16 C washer
17 Idler sprocket
18 Idler bracket
19 Detent screw

Figure F-1. Lower transport exploded view.

(2) Lift the cover (13) off the housing (33) by the handle (6) and loosen the two machine screws (21) and star washers (22) that secure wires to the sealed-beam lamp (27). Disconnect the wires.

(3) Unscrew the four machine screws (2) that hold the lamp holder (28) to the cover (13). Remove the screws (2) and flat washers (1), lockwashers (31), and nuts (32).

(4) Unscrew the four machine screws (3) that hold the connector (5) to the cover (13). Remove the screws (3) and flat washers (4), lockwashers (19), and nuts (20).

(5) Tag and disconnect the connector wire attached to the toggle switch (23) and remove the connector (5) and attached wires from the cover (13).

(6) Loosen and remove the switch nut (12). Then push the toggle switch (23) out of the cover (13).

(7) Unscrew the two machine screws (7) that secure the handle support (8) to the cover (13) and remove the screws (7) and lockwashers (17), flat washers (16), and nuts (18).

(8) IJnscrew the two machine screws (11) that secure the handle (6) to the handle support (8) and remove the screws (11) and flat washers (9) and lockwashers (10).

b. Reassembly** of Cover **Parts.

(1) Assemble the lockwashers (10) and flat

washers (9) on the two machine screws (11). Secure the handle (6) to the handle support (8) with the two machine screws.

(2) Secure the handle support (8) to the cover (13) with two machine screws (7) and flat washers (16), lockwashers (17), and nuts (18).

(3) Install the toggle switch (23) from the bottom of the cover (13). Secure with the switch nut (12).

(4) Install the connector (5) from the top of the cover (13). Secure the connector (5) to the cover (13) with four machine screws (3) and flat washers (4), lockwashers (19), and nuts (20).

(5) Connect and secure the tagged connector wire to the toggle switch (23). The wire may be connected to either switch terminal.

(6) Assemble the lamp holder (28) to the cover (13) with four machine screws (2), flat washers (1), lockwashers (31), and nuts (32). Tighten the screws.

(7) Secure the wires attached to the connector (5) and toggle switch (23) to the sealed-beam lamp (27) with two star washers (22) and machine screws (21).

(8) Assemble the cover (13) on the housing (33). Secure the cover (13) with six flat washers (15) and machine screws (14).

c. Disassembly of Lamp Holder Parts.

(1) Perform instructions (1) through (3) in *a* above.

(2) Loosen the four machine screws (29) that hold the lamp ***retaining clips (26)*** on the lamp holder (28). Remove the screws (29), flat washers (30), retaining clips (26), lockwashers ***(25),*** and nuts (24).

(3) Lift the sealed-beam lamp (27) out of the lamp holder (28).

d. Reassembly of Lamp Holder Parts.

(1) Position the sealed-beam lamp (27) in the lamp holder (28).

(2) Assemble four lamp retaining clips (26) on the inside of the lamp holder (28) with four machine screws (29) and flat washers (30), lockwashers (25), and nuts (24). Tighten the screws.

(3) Perform instructions (6) through (8) in b above.

e. ***Disassembly of Housing Parts.***

(1) Perform instruction (1) in a above.

(2) Lift the cover (13) off the housing (33).

(3) Loosen the four machine screws (52) that hold the retaining clips (50) in the housing (33). Remove the screws (52) and flat washers (51), lockwashers (38), and nuts (37).

(4) Lift the light diffuser (56), light filter (54), and two gaskets (55, 53) out of the housing (33).

(5) Loosen the four machine screws (40) that hold the spring clips (36) in the housing (33). Remove the screws (40), flat washers (39), lockwashers (35), and nuts (34).

(6) Remove the two machine screws (41) that hold the latch assembly (42 through 49) on the lamp holder (28) brackets. Disassembly lockwasher (42), flat washer (43), pawl (44), spacers (45), flat washer (46), spring (47), ferrule (48), and studs (49).

f. Reassembly of Housing Parts.

(1) Assemble studs (49), ferrules (48), springs (47), flat washers (46), spacers (45), pawls (44), flat washers (43), lock washers (42), and machine screws (41) on the lamp holder (28) brackets as shown in figure 6–2. Tighten the screws.

(2) Assemble the four spring clips (36) on the inside of the housing (33) with machine screws (40), flat washers (39), lockwashers (35), and nuts (343. Tighten the screws.

(3) Assemble the gasket (53), light filter (54), gasket (55), and light diffuser (56) in the housing (33), in the listed order.

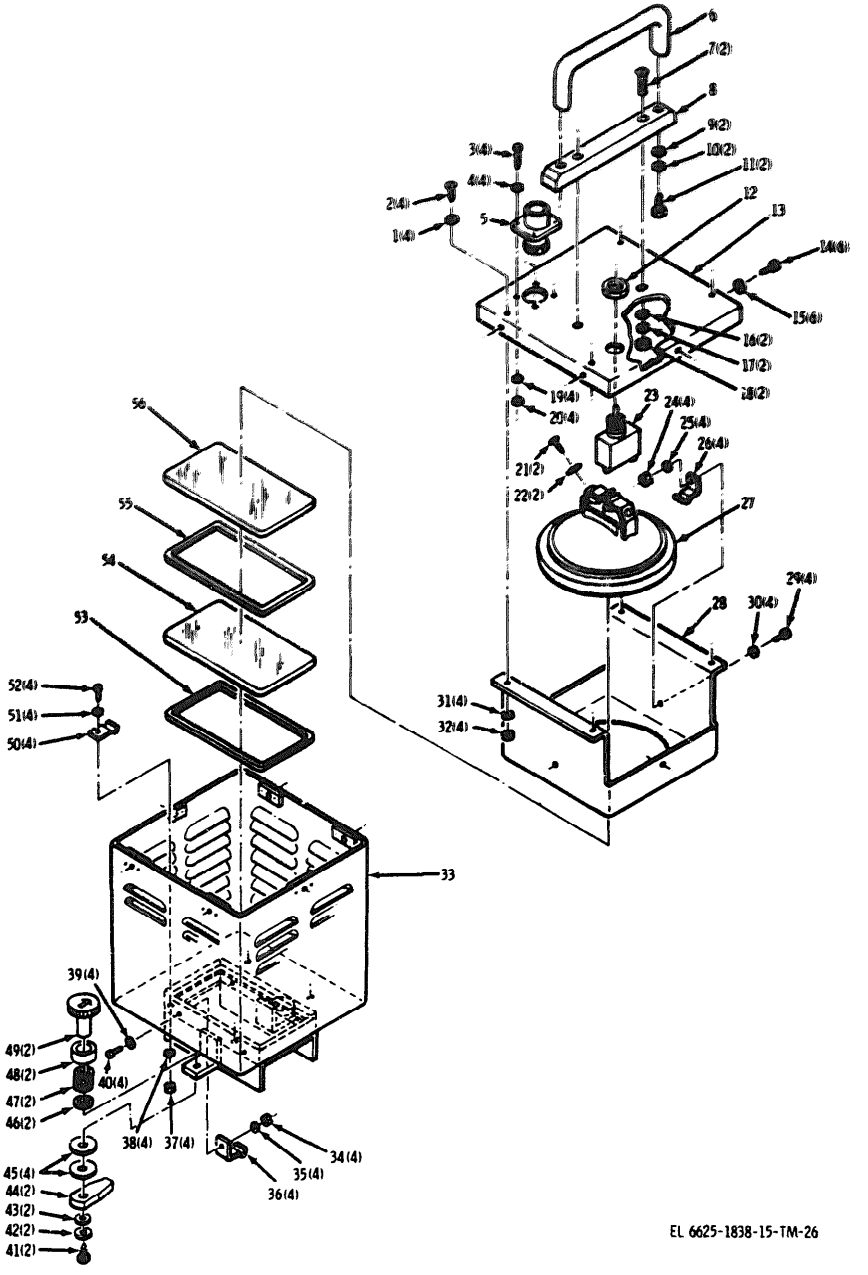
(4) Install the four retaining clips (50) in the housing (33) with machine screws (52), flat washers (51), lockwashers (38), and nuts (37). Tighten the screws.

(5) Assemble the cover (13) on the housing (33).

(6) Secure the cover (13) to the housing (33) with six machine screws (14) and flat washers (15).

6-8. Removal and Replacement of Sealed-Beam Lamp in Image Plane light

Removal and replacement of the sealed-beam lamp in the image plane light is performed in accordance with instructions contained in paragraph ***6-7.*** Remove the lamp as described in subparagraph c. Replace the lamp as described in subparagraph ***d.***



1	Flat washer	13	Cover	25	Lockwasher	36	Spring clip	48	Ferrule
2	Machine screw	14	Machine screw	26	Lamp retaining clip	37	Nut	49	Stud
3	Machine screr	15	Flat washer			38	Lockwasher	50	Retaining clip
4	Flat washer	16	Flat washer	27	Sealed-beam lamp	39	Flat washer	51	Flat washer
5	Connector	17	Lo&washer	28	Lamp holder	40	Machine screw	52	Machine screw
6	Handle	18	Nut	29	Machine screw	41	Machine screw	53	Gasket
7	Machine screw	19	Lockwasher	30	Flat washer	42	Lockwasher	54	Light filter
8	Handle support	20	Nut	31	Lockwasher	43	Flat washer	55	Gasket
9	Flat washer	21	Machine screw	32	Nut	44	Pawl	56	Light diffuser
10	Lo&washer	22	Star washer	33	Housing	45	Spacer		
11	Machine screw	23	Toggle switch	34	Nut	46	Flat washer		
12	Switch nut	24	Nut	35	Lo&washer	47	Spring		

Figure 6-2. ***Image plane light, exploded view.***

CHAPTER 7

DEPOT OVERHAUL STANDARDS

7-1. Applicability of Depot Overhaul Standards

a. The depot overhaul standard tests in this chapter are designed to measure the performance capability of an overhauled or repaired equipment prior to re-issue or return to stock. All equipments must meet the required performance standards designated in the tests.

b. Equipments to which the depot overhaul standard tests in this chapter apply are:

(1) Test Fixture, Optical Alignment TS-2965/APS-94D.

(2) Test Fixture, Optical Alignment TS-2966/APS-94D.

7-2. Arrangement of Depot Overhaul Standards

Depot overhaul standard tests for Test Fixture, Optical Alignment TS-2965/APS-94D are provided in section II of this chapter. Depot overhaul standard tests for Test Fixture, Optical Alignment TS-2966/APS-94D are provided in section III.

7-3. Equipment Modification Work Orders

The depot overhaul standards in this chapter are directly applicable to nonmodified equipments. The procedures will be revised for equipments to which later modifications are made.

Section II. TEST FIXTURE, OPTICAL ALIGNMENT TS-2965/APS-94D DEPOT OVERHAUL STANDARD TESTS

7-4. General

a. Test Equipment Required. An overall list of test equipment required for depot overhaul standard testing of Test Fixture, Optical Alignment TS-2965/APS-94D is provided below. Equipment common names appearing in the listing are assigned to simplify procedural descriptions.

Test equipment	*Common name*
Granite Plate, Collins Micro-Flat (18 inches by 24 inches)	Granite plate
Dial Indicator, Starrett 711-T1S (0.0001 inch graduations!	Dial indicator
Height Gauge, Starrett 454-18 (18 inch)	Height gauge
Screw Jack, Starrett 190 (3 required) (2.25 inch)	Screw jack
Cold Rolled Steel Bar (3 required) (b below)	Screw jack support

b. Special Requirements and Test Facilities. 'Three pieces of cold rolled steel bar are required for depot overhaul standard testing of the TS-2965/APS-94D (mirror alignment fixture). These items are not supplied and must be fabricated. Riake each piece from two-inch square bar stock, cut to a length of 11.5 inches, and machine the ends of the pieces parallel to each other.

7-5. Flatness Test

Three pads pressed into the vertical plate of the mirror alignment fixture housing (fig. 1-3) position the optical housing of Recorder-Processor-Viewer, Radar Mapping RO-352/APS-94D in the optical object plane of the mirror alignment fixture when the optical housing is assembled on the fixture. It is mandatory that the three pads be flat within specified tolerances.

a. Test Equipment Required. Required test equipments are listed in paragraph 7-4.

b. Test Setup (fig. 7-l)

CAUTION

The weight distribution in the mirror alignment fixture is such that imbalance may occur during setup for test. Obtain assistance to position the fixture and, if necessary, use a counter-weight to achieve balance.

(1) Set the granite plate on the bench surface.

(2) Loosen and remove the nuts that secure the mirror alignment fixture housing to the shock mounts attached to the bottom of the mirror alignment fixture case.

(3) Lift the housing off the shock mounts and position the housing on the top of the granite plate as shown in figure 7–1.

(4) Support the housing at three points (in the shape of a triangle) with the screw jacks and jack supports.

(5) Adjust the screw jacks to make the vertical plate of the mirror alignment fixture housing parallel to the granite plate. Use the height gauge for indication.

c. Procedure.

(1) Assemble the dial indicator on the height gauge.

(2) Position the dial indicator on one of the pads on the mirror alignment fixture housing vertical plate.

(3) Adjust the height gauge for a reference indication on the dial indicator. Record the indication.

NOTE

Do not make any readjustment to the height gauge or dial indicator

(4) Indicate the surfaces of the remaining two pads on the mirror alignment fixture housing vertical plate and record the dial indications.

(5) Compare the dial indications recorded in instructions (3) and (4). The variation in the three indications must not exceed 0.0002 inch total indicator reading.

7-6. Telescope Collimation Check

a. Test Equipment Required. None.

b. Procedure.

(1) Loosen the locknuts on the mirror alignment fixture vee block thumbscrews (fig. 1-2).

CAUTION

In following instruction (2) be sure the thumbscrews in the vee blocks do not contact the sealing compound used to fill the holes in the telescope barrel.

(2) Carefully position the telescope (fig. 1-4) on the vee blocks (fig. l-2) with the object focus control at the top.

(3) Insert the lamp housing of the telescope light (fig. l-5) into the lamp housing coupling

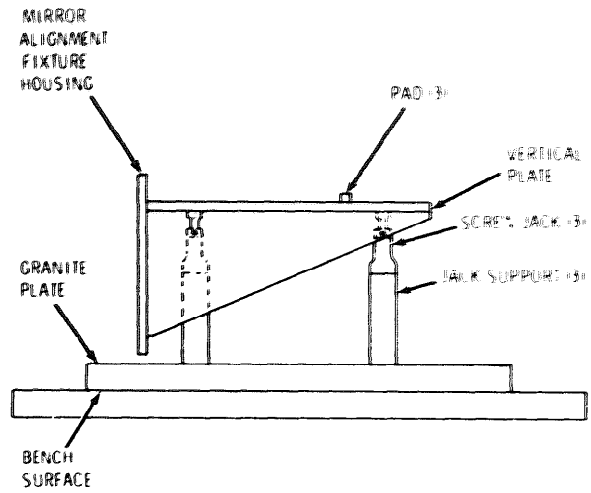


Figure 7–1. Mirror alignment fixture flatness test setup.

on the telescope and tighten the coupling ring on the lamp housing.

(4) Set the telescope light switch at OFF and connect the light to the telescope light power cable (fig. 1–5).

(5) Connect the telescope light power cable to the 115 vac primary power circuit and energize the circuit.

(6) Position the telescope alignment mirror (fig. 1-3) over the appropriate window in the mirror alignment fixture vertical plate (fig. 1–3) and secure to the plate with the mirror thumbscrews.

(7) Set the telescope light switch at ON.

(8) Focus the telescope eyepiece on the crosshair reticle in the telescope.

(9) Focus the telescope on the reflected telescope target pattern (B, fig. 5-2) with the object focus control.

(10) Position the crosshairs in the telescope reticle equidistant from the lines at the center of the reflected telescope target pattern by adjusting the vee block thumbscrews.

(11) Focus the telescope on the reflected crosshair pattern (C, fig. 5-2) with the object focus control.

(12) Carefully adjust the vee block thumbscrews to bring the reflected crosshairs into coincidence. Then lock the vee block thumbscrews with the thumbscrew locknuts.

(13) Evaluate the operation of the telescope. If collimation can not be performed, reject the telescope.

7-7. Image Plane Light Assembly Check

a. Test Equipment Required. None.

b. Procedure.

(1) Connect the image plane light power cable (fig. 1-5) to the light connector and the +28 vdc primary power circuit and set the light switch at ON to be sure the lamp in the image plane light illuminates.

(2) Visually inspect the image plane light for uniform light distribution over the area of the light diffuser and filter.

(3) Reject the image plane light assembly if the lamp does not illuminate or light distribution is not uniform.

(4) Set the light switch at OFF.

Section Ill. TEST FIXTURE, OPTICAL ALIGNMENT TS-2966/APS-94D DEPOT OVERHAUL STANDARD TESTS

7-8. General

a.* Test *Equipment Required. An overall list of test equipment required for depot overhaul standard testing of Test Fixture, Optical Alignment TS-2966/APS-94D is provided below. Equipment common names appearing in the list are assigned to simplify procedural descriptions.

Test equipment	*Common name*
Granite Plate, Collins Micro-Flat (18 inches by 24 inches)	Granite plate
Dial Indicator. Starrett 711-T1S (0.0001 inch graduations:	Dial indicator.
Height Gauge. Starrett 454-18 (18 inch)	Height gauge
Screw Jack, Starrett 190(3 required) (2.25 inch)	Screw jack
Cold Rolled Steel Bar (3 required) (b below)	Screw jack support

b. Special Requirements and Test Facilities. Three pieces of cold rolled steel bar are required for depot overhaul standard testing of the TS-2966/APS-94D (lens focus fixture). These items are not supplied and must be fabricated. Make each piece from two-inch square bar stock, cut to a length of 11.5 inches, and machine the ends of the pieces parallel to each other.

7-9. Flatness Test

Three pads pressed into the vertical plate of the lens focus fixture housing (fig. 1-9) position the optical housing of Recorder-Processor-Viewer, Radar Mapping RO-352/APS-94D in the optical object plane of the lens focus fixture housing when the optical housing is assembled on the fixture. It is mandatory that the three pads be flat within specified tolerances.

a. Test Equipment Required. Required test equipments are listed in paragraph 7-8.

b. Test Setup (fig. 7-2).

CAUTION

The weight distribution of the lens focus fixture is such that imbalance may occur during setup for test. Obtain assistance to position the fixture and, if necessary, us% a counterweight to achieve balance.

(1) Set the granite plat on the bench surface.

(2) Loosen and remove the nuts that secure the lens focus fixture housing to the shock mounts attached to the bottom of the lens focus fixture case

(3) Lift the housing off the shock mounts and position the housing on the top of the granite plate as shown in figure 7-2.

(4) Support the housing at three points (in the shape of a triangle) with the screw jacks and jack supports.

(5) Adjust the screw jacks to make the vertical. plate on the lens focus fixture housing parallel to the granite plate. Use the height gauge for indication

c. Procedure.

(1) Assemble the dial indicator on the height gauge.

(2) Position the dial indicator on one of the pads on the lens focus fixture housing vertical plate.

(3) Adjust the height gauge for a reference indication on the dial indicator. Record the indication.

NOTE

Do not make any readjustment to the, height gauge or dial indicator.

(4) Indicate the surfaces of the remaining two pads on the lens focus fixture housing vertical plate and record the dial indications.

(5) Compare the dial indications recorded in instructions (3) and (4). The variation in the three indications must not exceed 0.0002 inch total indicator reading.

7-10. Microscope Collimation Check

a. Test Equipment Required. None.

b. Procedure.

(1) Position the horizontal and vertical slides of the compound slide (fig. 1-10) so that the angle bracket (fig. 1-8) is near the center of the desired window in the vertical plate of the lens focus fixture housing.

(2) Position the microscope on the angle bracket and secure to the bracket with a knurled-head thumbscrew.

(3) Locate the mask bracket (fig. 2-5) assembled on the vertical plate of the lens focus fixture housing.

(4) Install two mask positioning screws (4, fig. 2-3, fig. 2-5) in the lens focus fixture housing: one at each end of the vertical plate.

(5) Insert two mask springs (16, fig. 2-3, fig. 2-5) into the selected window in the mask bracket at the end of the window nearest the center of the mask bracket.

(6) Remove the three clips from the perimeter of the selected windows. Install one object plane mask (3, fig. 2-3, fig. 2-5) in the selected window of the mask bracket.

NOTE

The target patterns of the object plane mask are off center it: the vertical dimension. The mask is installed with the target patterns nearest the top of the window in the mask bracket.

(7) Reinstall the three tension clips about the perimeter of the selected window in the mask bracket to hold the object plane mask in the window.

(8) Focus the microscope eyepiece on the crosshair reticle in the microscope.

(9) Position the microscope with the compound slide so as to view a target on the object plane mask.

(10) Focus the microscope on the object plane mask target with the microscope object focus control.

(11) Evaluate the operation of the microscope. If collimation cannot be performed, reject the microscope.

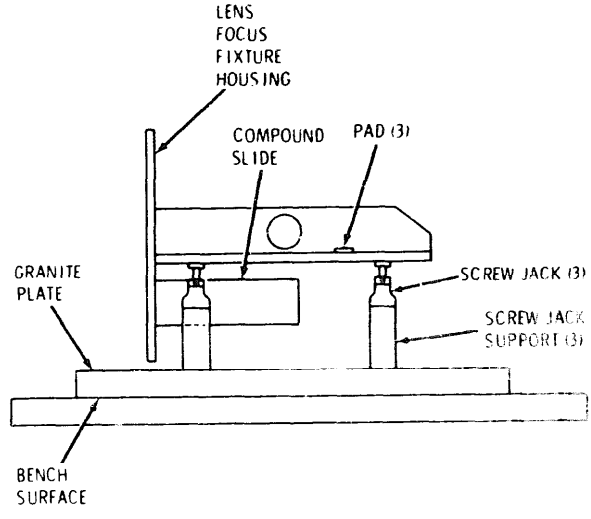


Figure 7-2. Lens fixture, flatness test setup

CHAPTER 8
SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

8-1. Repacking of Equipment

a. Test Fixture. Optical Alignment TS-2965/ APS-94D Repacking Instructions.

(1) Install the bottom cushioning material (13, fig. 2-2) in the mirror alignment fixture housing (15).

(2, Place the lens plane reticle assembly (16). image plane mask assembly (14), three stud clamp assemblies (12). lens plane mirror assembly (11). telescope (10), telescope light assembly (9), and telescope power cable assembly (8) in the bottom cushioning material (13).

(3, Place the center cushioning material (7) on top of the bottom cushioning material (13).

(4) Place the image plane light assembly (2), lens removal tool (19), image plane light assembly power cable (18), lower transport (3), telescope alignment mirror (6), and upper transport (17) in the center cushioning material (7).

(5) Place the top cushioning material (1) on top of the center cushioning material (7).

(6) Position the two hold down straps (4) on the mirror alignment fixture housing (15). Secure the straps (4) to the housing (15) with four machine screws (14A) and wing nuts (5).

(7) Position the case (fig. 1-1) on its bottom and exert upward pressure to secure the six latches.

b. Test Fixture, Optical Alignment TS-2966/APS-94D Repacking Instructions.

(1) Install the bottom cushioning material (12, fig. ***2-3)*** in the lens focus fixture housing (13).

(2) Place the CRT simulator (11). clamp assembly studs (14), side pin extractor (15), four mask springs (16). top pin extractor (17), ADAS image plane mask assembly (9), and lens tool (10) in the bottom cushioning material (12).

(3) Place the center cushioning material (7) on top of the bottom cushioning material (12).

(4) Place the microscope ***(2),*** two object plane masks (3), two knurled head screws (4), collet wrench (5). and image plane mask (6) in the center cushioning material (7).

(5) Place the top cushioning material (1) on tap of the center cushioning material (7).

(6) Position the two retaining straps (8) on the lens focus fixture housing (13). Secure the straps (8) to the lens focus fixture housing (13) using four captive screws.

(7) Position the case (fig. 1-7) on its bottom and exert upward pressure to secure the six latches.

c. Case Repacking Instructions. Use the original shipping boxes and packing materials, if available, and pack the case as described below. If the original shipping boxes and packing materials are not available. fabricate a shipping box and packing materials from materials and dimensions given in table 8-1.

(1) Place the shipping box on the floor.

(2) Pack the case as shown in figure 2-1

Use foam corner blocks and corrugated fiberboard liners as required to restrict any free movement of the case.

(3) Weigh the packed box.

(4) Mark the shipping box for content, weight and destination.

8-2. Limited Storage

Per form the operations listed below to prepare the equipment for limited storage.

a. Inspection. Perform a visual inspection of the equipment.

b. Cleaning. Clean the equipment (para 3-6)

c. ***Painting*** Touch up damaged paint surfaces (para 4-7).

d. Repacking. Repack the equipment (para 8-1)

Table 8-1. *Materials for Fabrication of Shipping Box*

Qty	Materials
2 min.	Fiberboard liners (PPP-F-320, CF, DOM, SW, 200), top and bottom, 30.5 by 28.5 inches
2 min.	Fiberboard liners (PPP-F-320, CF, DOM, SW, 200), sides, 30.5 by 27.5 inches
2 min.	Fiberboard liners (PP-F-320, CF, DOM, SW, 200), ends, 28.5 by 27.5 inches
8	Foam corner blocks (unicellular, polyethylene foam, MIL-C-46842), 12 by 12 by 12 inches with 2-inch thick walls
As req.	Steel strapping, flat (QQ-S-7B1, Type 1, Class B, Grade 2) 0.75 inches wide by 0.023 inches thick
As req.	Cleated plywood box (PPF-B-601, Style A, Domestic Type) inside dimensions 31.5 by 35 by 33 inches

Section II. DEMOLITION TO PREVENT ENEMY USE

8-3. Authority for Demolition

equipment will be accomplished the commander. Use the destruction proceph 8-4 to prevent further use

8-4. Methods of Destruction

a. *Smash.* Smash the fixtures, minor components, and eases. Use sledges, axes, hammers, crowbars. or any available heavy object that can be used in this manner.

b. *Burn.* Burn the technical manuals. Use gasoline, kerosene, oil. flame throwers, or incendiary grenades.

c. *Dispose.* Bury or scatter the destroyed parts if possible. Dispose of parts in slit trenches and foxholes or throw into streams.

8-5. Priorities for Destruction

Priorities for destruction are:

a. Operating instructions. Operat

b. Component parts and t Compe parts of all like equipment.

c. Component cases.

8-6. Destruction of Spare Parts

The same priority for component destruction (para 8-5). necessary to render the components inoperable. must be given to the destruction of similar components in spare parts storage areas.

8-7. Reporting of Destruction

Destruction of equipment must be reported. Reports will be made through command channels.

APPENDIX A

REFERENCES

The following publications contain information applicable to the operation and organizational maintenance of the Optical Alignment test set.

DA PAM 310–4	**Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 4, 6, 7, 8, and 9), Supply Bulletins, and Lubrication Orders.**
DA PAM 310–7	**U.S. Army Equipment Index of Modification Work Orders.**
SB 11-573	**Painting and Preservations Supplies Available** for Field Use for Electronics Command Equipment.
TB 746-l0	**Field Instructions for Painting and Preservin**g Electronics Command Equipment.
TM 11-5895-578-50	**Depot Maintenance Manual, Rad**ar Surveillance Set AN/APS-94D.
TM 11–6625–203–12	**Operator and Organizational Maintenance Manua**l, Multimeter AN/URM-105.
TM 38-750	Army Equipment Record Procedures.

APPENDIX B
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations for OQ-62/APS-94D. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

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

b. Test. To verify serviceability and to 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, preserve, drain, paint, or to replenish fuel/lubricants/hydraulic fluids or compressed air supplies.

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

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

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

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

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

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system. This function does not include the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

j. ***Overhaul.*** That periodic maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (e.g., 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.

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

B-3. Column Entries

a. Column I, 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 noun names of components, 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. When items are listed without maintenance functions, it is solely for purpose of having the group) numbers in the MAC and RPSTL, coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "worktime" 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 that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of man-hours specified by the "worktime" 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 time 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. Subcolumns of column 4 are as follows:

C — Operator/Crew
O — Organizational
F — Direct Support
H — General Support
D — Depot

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.

B-4. Tool and Test Equipment Requirements (Table 1)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test, equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

SECTION II MAINTENANCE ALLOCATION CHART
FOR

TEST SET GROUP, OPTICAL ALIGNMENT OQ-62/APS-94D

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT
			C	O	F	H	D	
00	TEST SET GROUP, OPTICAL ALIGNMENT OQ-62/APS-94D	Replace		0.1				
		Repair[1]		0.5				1, 2
		Overhaul					20.0	9
		Rebuild					20.0	9
01	Test Fixture, Optical Alignment TS-2965/APS-94D	Inspect	0.6					
		Inspect		0.4				
		Test	0.2					
		Test					0.3	3, 4, 5, 6, 7, 8
		Service	0.8					
		Service		0.4				1
		Adjust					0.2	3, 4, 5, 6, 7, 8
		Replace		0.1				
		Repair[2]					0.4	3
0101	Lower Transport	Repair					0.5	3
0102	Upper Transport	Repair					0.5	3
0103	Image Plane Light	Test					0.2	3
		Service					0.5	3
		Repair					0.5	3
0104	Telescope, Straight	Test					0.3	
		Repair					0.4	3
02	Test Fixture, Optical Alignment TS-2966/APS-94D	Inspect	0.7					
		Inspect		0.5				
		Test	0.2					
		Test					0.3	3, 4, 5, 6, 7, 8
		Service	0.9					
		Service		0.6				1
		Adjust					0.2	3, 4, 5, 6, 7, 8
		Replace		0.1				
		Repair[2]					0.4	3
0201	Image Plane Light	Test					0.2	3
		Service					0.5	3
		Repair					0.5	3

(1) By replacement of connectors and/or cable.
(2) By replacement of minor components.

TABLE 1. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR

TEST SET GROUP, OPTICAL ALIGNMENT OQ-62/APS-94D

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O, H	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-00-064-5178	
2	O, H	MULTIMETER TS-352B/U; r/b AN/USM-223(6625-00-999-7465)	6625-00-553-0142	
3	D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-00-610-8177	
4	D	DIAL INDICATOR		711-LS (57163)
5	D	PLATE, GRANITE SURFACE	5220-00-239-8540	
6	D	HEIGHT GAGE		254-18 (57163)
7	D	SCREW JACK (3 required)		190 (57163)
8	D	STEEL BAR, 11.5" (3 required)	fabricated	
9	D	DEPOT FACILITIES		

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NOMENCLATURE OF END ITEM OR COMPONENT

GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTION											TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	TEST FIXTURE, OPTICAL ALIGNMENT TS-2966/APS-94D	O											7	
			D										1, 2, 3, 4, 5, 6, 8	
				O									7	
										D			8	
											D		8	DEPOT FACILITIES
												D	8	DEPOT FACILITIES

TABLE I. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR TEST SET GROUP, OPTICAL ALIGNMENT OQ-52/APS-94D

NOMENCLATURE OF END ITEM OR COMPONENT

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	FSN	TOOL NUMBER
1	D	DIAL INDICATOR, STARRETT 711-TIS		
2	D	GRANITE PLATE, COLLINS MICRO FLAT	NFSN	(18 in. X 24 in)
3	D	HEIGHT GAUGE, STARRETT 454-18	NFSN	(18 in.)
4	D	MULTIMETER, TS-352 B/U	6625-553-0142	
5	D	SCREW JACK, STARRETT 190		(2.25 in) 3 required
6	D	STEEL BAR	NFSN	3 required user-fabricated
7	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-101/G	5180-064-5178	
8	D	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-610-8177	

By Order of the Secretary of the Army:

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

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12–36, Depot Maintenance requirements for the OV–1A, OV–1B and OV–1C aircrafts.

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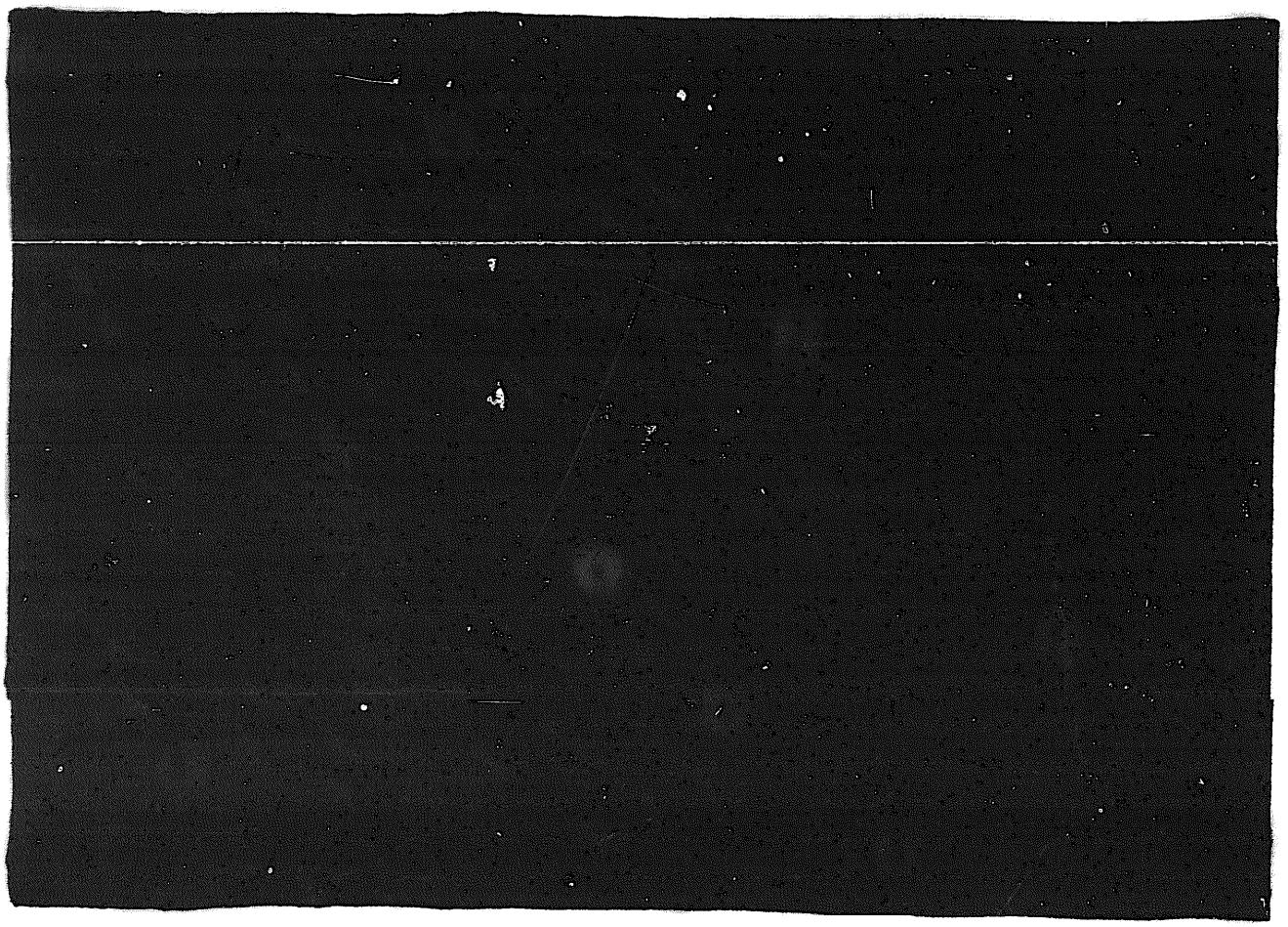

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